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Urban Planning in the 15-Minute City: Revisited under Sustainable and Smart City Developments until 2030

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Abstract: The 15-minute-city concept 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 urban-planning principles that enable the realization of the 15-minute city variably embody planning in mixed-use neighborhood units, proximity-based planning, planning for active transport, citizen participation in planning, and innovation and intelligence-driven planning. We revisit these urban-planning premises in the light of emerging social, physical, and structural developments through 2030, with a focus on European cases. The findings provide important additions and recommendations to the urban-planning principles of 15-minute cities 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 15-minute city 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.

Keywords: 15-minute city; urban planning; urban policy; governance; transport; energy; sustainable cities; smart cities; new concepts; emerging developments; Europe

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1. Introduction

The 15-minute-city (FMC) model for urban development and planning represents a relatively new way of thinking about urban planning and policy that is centered on the human scale and experience of the city. Its core premise is that cities should be designed so that, within a walking or cycling distance of 15 min from their residence, citizens should be able to meet all their daily needs: work, home, food, health, education, culture, sports, and leisure [1]. To this end, it gives prominence to the neighborhood as the basic element of spatial and functional organization and argues that cities should be organized into neighborhoods within which any need should be satisfied within a 15-minute walk or bike ride. Beyond proximity, other important planning principles of the FMC include an enhanced land-use mix, the optimization of land use by allowing for multiple functions in one place, and varied and affordable housing options [2]. The envisioned outcome is the development of complete, self-sufficient neighborhoods that are designed to ensure safe and convenient ways for citizens and visitors to access the amenities that they need in daily life [3].

The idea of an FMC is based on well-established precedents. The importance of the neighborhood as a building block of the city has been debated since 1920, starting with Clarence Perry's proposal for the New York Metropolitan Area Development Plan, which introduced and incorporated design concepts such as what we would call today the "nucleus" of the neighborhood by gathering functions related to education, places of

worship, retail, and services. Perry's proposal also specified quantitative measures of ideal population density, housing density, and neighborhood radius [4]. Although concretely conceived in 2016, the FMC model rose in popularity after the onset of the COVID-19 crisis. Recent research highlighted that highly urbanized areas were struck more forcefully by the social and economic repercussions of the pandemic [5] and that neighborhoods, as places in which communities develop, offered a critical safety net for enhancing the resilience of their communities, infrastructures, and services during difficult times [6,7]. It was in this context that the FMC model surfaced and became popular in contemporary urban planning and policy, presenting an alternative developmental model for enhancing urban sustainability and resilience as they have evolved over time [8,9]. In parallel, the FMC concept made its way into universal planning practice, with cities such as Paris, Portland, Oregon, and Melbourne taking the lead [2].

Having started shortly before the onset of the COVID-19 crisis, the Research and Innovation (R&I) project RRI2SCALE, "Responsible Research and Innovation Ecosystems at Regional Scale for Intelligent Cities, Transport and Energy", is a three-year project funded under the Horizon 2020 program of the European Commission (Grant Agreement No. 872526) [10]. It seeks to identify ways to balance sustainable territorial development with breakthrough research and innovation in the domains of smart cities, smart transport, and smart energy in the rapidly changing socio-technical environment of cities and in the face of emerging environmental and health challenges. Although RRI2SCALE had already begun when the COVID-19 crisis broke out, the research team decided to accommodate the emerging circumstances and adapt its research design to the proverbial "new normal". That being said, our recent analyses in that project revealed that European urban innovation ecosystems are expected to undergo major, even structural, socio-technical changes through 2030. Such changes include the increasing digitalization of public services, the enforcement of citizen-centric innovation strategies, a surging demand for better and safer public transport services, and an increase in energy needs [11]. More information about the project and the research conducted is provided in Section 3.2, while the relevant research results are presented in Section 4.1.

Bringing the two strands of research together, the purpose of the present paper is to uncover the repercussions of emerging developments, as identified in RRI2SCALE [11], on the increasingly popular FMC concept [2]. Our focus is on the urban planning and design principles of the FMC, since there is limited knowledge about precisely what they are [12]. In terms of structure, the paper begins by meticulously breaking down the urban-planning premises of the FMC model (Section 2). It then presents the methodology that followed, including the rationale behind the research presented, our overall research question, and the research design (Section 3). We then present our findings, describing anew the physical urban-planning premises of the FMC in the light of emerging developments (Section 4). We close by detailing the emerging developmental trajectories for urban planning in the FMC paradigm (Section 5).

2. The Eight Urban-Planning Premises of a 15-Minute City

The COVID-19 crisis enhanced and brought to the surface long-standing structural deficiencies in contemporary cities worldwide. Examples of issues that were exposed include (i) the unequal access of the population to urban amenities and functions, (ii) the lack of basic services at the neighborhood level, (iii) the lack of accessible and adequate green and open spaces at the neighborhood level, (iv) the occasional irrational use of land and the existence of empty or suboptimally used land, (v) the importance of the neighborhood for the community setting it provides, (vi) time spent on commuting to and from work, (vii) the impact of human activity on natural environments, and (viii) the digital divide and its manifestations in the physical space [13,14]. In this section, we break down the most important urban-planning premises of the FMC model that help us identify the core elements that form the basis of our research. They are featured in Figure 1 and described in detail below.

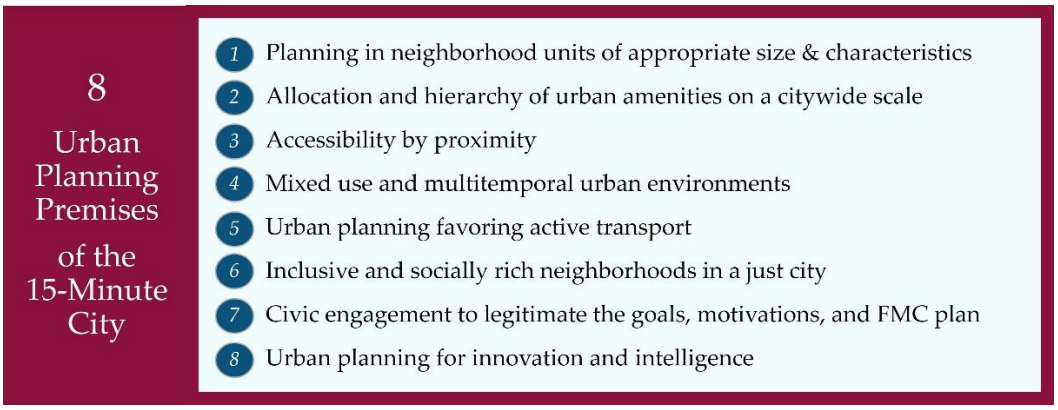

Figure 1. The eight urban-planning premises of the 15-minute city (authors).

Planning in neighborhood units of appropriate size and characteristics is the cornerstone of the FMC. The model envisions urban planning in neighborhood units where the majority of residents can fulfill their basic daily needs with just a few minutes of walking or cycling [2]. There are a host of variations of the FMC model, ranging from the one-minute to the 20-minute city, with the most common timeframes being 15 or 20 min. For instance, the optimal radius for a 20-minute neighborhood is 800 m (the distance the average human walks in that time) [12,15], which corresponds to an average area of two square kilometers. In parallel, while urban density is inarguably an important determinant of urban livability and is positively associated with better and more balanced availability of infrastructures enabling healthier urban environments, further research is needed to determine optimal density ranges in the FMC [14]. Net density, in particular, is significantly understudied when compared to gross density [14]. Neighborhoods may be part of a mono- or polycentric urban system, and either approach may successfully meet FMC goals [12,16,17]. In any case, urban density should be distributed in such a manner that spatial structures enable human capital networks to grow organically and adaptation measures to be developed more rapidly [14].

Allocation and hierarchy of urban amenities on a citywide scale. Several studies highlight the importance of high-density urban environments in creating the agglomeration forces needed to compose cores of urban amenities, and vice versa [18,19]. Urban density is correlated with population density and population size, and the latter is a critical variable in the efficient and egalitarian allocation of urban amenities throughout a city. The key concept here is the catchment area [20], which is a critically important metric for robust and reliable estimation of the population denominator used in city planning, enabling the estimation of amenities, commodity needs, and mapping applications. The FMC presents an opportunity to rethink resource allocation on a citywide scale based on a hierarchical order of primary, secondary, tertiary, ... z-iary urban amenities. Each type of amenity requires a different catchment area and population to ensure its efficient operation, so an FMC application needs to combine population-size and population-density thresholds to capture the full hierarchy of urban amenities. This inevitably creates a hierarchical order of multiple FMCs that are part of a system rather than simple hierarchies or single entities [2] in a wider territory of x minutes. The value of x here is related to and defined by the overall spatial and functional order of the urban territory. Therefore, successful application of the FMC presupposes accurate metrics of service access and catchment areas based on the catchment population and complexities of urban amenities, with all the expected implications for public service planning. This is critical when it comes to planning core public commodities such as health, education, and social care.

Accessibility by proximity. The type, distribution, and number of amenities within an FMC neighborhood are a key determinant of its success [12]. As the key characteristic of an FMC is to support local access and living, basic amenities and services should be offered in close proximity, thus making urban planning and design in a mixed-land-

use regime a necessity [15]. In the FMC neighborhood unit context, existing research posits that essential urban services should be available within a distance of 500 to 800 m from a place of residence [12,15], and while urban planning based on mixed land use in appropriate variations is more or less an established value in achieving sustainable urban environments, the FMC highlights an additional characteristic that can complicate the situation: providing local access to the workplace [2]. Workplace localization is especially important if we consider the socioeconomic benefits of reducing commuting to and from work [21]. In the short term, in a chrono-urbanism setting and considering the lack of additional open spaces in already urbanized environments, workplace localization can be achieved predominantly by means of remote work. Essentially, this can be achieved in one of three ways: (i) encouraging and enabling work from home; (ii) providing common spaces such as community centers and co-working spaces in a neighborhood, with citizens occupying a fixed amount of space for a fixed amount of time to work remotely; and (iii) working during transit [22]. Over the long term, localizing employment opportunities presupposes fundamental changes in the current employment allocation models that will consider job provision at the local level as not merely a public good but as a key element of public policy. In such a model, and in partnership with the private sector, there will be concerted efforts to change the employment paradigm by downsizing central offices, transforming work style to more hybrid modes, and reducing employees' right of presence in physical workspaces [2].

Mixed-use and multitemporal urban environments. As a natural consequence of proximity-based planning, providing a mixed use of land is also a core element of the FMC. That being said, it is clear that, in the FMC, there will be fierce competition over land use, as the more variety there is in land use, the more successful an FMC will be in fulfilling its proximity mandate [15]. In parallel, it is important to have variations in the land-use mix to enable the existence of and transitions between urban and rural environments and their in-betweens (urban core, urban center, general urban, suburban, etc.) [12]. Changes in the use of land may occur not only in space but also in time; this is an essential attribute of chrono-urbanism [8]. The FMC realizes the frequent call for space to become increasingly disassociated with time, with every human and every function having its own rhythm and place being polychronic [23]. This means that spaces might be used differently according to a variety of schedules [24]. Traditional urban planning is thus replaced by spatiotemporal urban planning [14].

Urban planning favoring active transport: accessibility, connectivity, and linked public and open spaces. FMC neighborhoods should clearly enable and promote active transport, as walking and cycling lie at the core of the model [12,24]. That being said, FMC neighborhoods can be planned in a number of ways. Recent research has identified five types of FMC neighborhoods: isolated and circular, semi-compact and semi-linear, compact and linear, organic, and semi-compact and circular. The same research showed that all of them—although to different extents—have the potential to promote active travel [12]. Internal connectivity (the number of connections within the neighborhood unit) and external connectivity (the number of connections with different neighborhood units or cities) are also crucial elements of urban health [14]. In addition, it has been shown that the characteristics of the built environment may have a positive impact on active travel [25], and the availability of adequate, high-quality, and easily accessible public and open spaces is a paramount determinant of urban health [26]. Roads could be transformed into open spaces for use by the general public and mixed-mobility streets, increasing walkability through usefulness, safety, comfort, and attractiveness [24]. It is worth mentioning that, in the FMC, Transit-Oriented Development (TOD) and access to high-quality public transport are still important, but the focus of attention is on delimiting any kind of motorized transport through localization and active transport. That being said, TOD in an FMC context should focus not on maximizing density around transit stations but optimizing services and land uses in their immediate vicinity [24].

Inclusive and socially rich neighborhoods in a just city. FMC neighborhoods are by definition socially mixed and rich urban environments. Inclusive or ubiquitous societies provide employment and housing opportunities for everyone to ensure economic prosperity that will, in turn, contribute to reductions in crime, violence, and poverty. In economic terms, inclusion concerns the issue of providing equal opportunities for employment, education, lifelong learning, financial resources, and so on, and to ensure a fair share in rising prosperity. The spatial dimension concerns accessibility to a wide array of affordable housing options, transportation options, and urban services and amenities; it also involves the regulation and control of available land and housing stock [2,27]. The FMC concept aspires to create neighborhoods that are available and affordable to everyone [1] and counterbalance the risk of creating a socially polarized city.

Civic engagement to legitimate the goals, motivations, and FMC plan. The close relationship between urban health and citizen satisfaction with life, personal relationships, leisure, and other critical quality-of life-elements [5], along with the importance of the neighborhood as a livable and community-enabling setting [6], highlights the need to systematically address citizen needs in urban planning. Thus far, political agendas for the FMC have called for an incremental transformation process that incorporates citizen participation [24]. While citizen participation in urban planning is not a new concept and does not come without hurdles [28], it is an essential part of the inclusive and egalitarian approach to planning that the FMC proposes [2]. That being said, citizen participation in planning the FMC needs to address all the important aspects and qualities of the neighborhood in a community setting, including planning for equitable access to infrastructures, services, and amenities and envisioning places that enhance social interaction and cultivate a sense of community, safety, pride, and identity [2]. Tactical urbanism is a core element of developing a successful FMC, as it enables citizens to gain ownership of the city [29]. Small-scale informal entities and collectives—such as households or families, neighborhood groups, and local and virtual communities—rely on proximity and form networks with strong ties that can initiate small, slow, and incremental social changes [30,31]. These changes are considered essential structural elements in the production of equal opportunities in fragile environments [32]. FMC models should acknowledge the transformative nature of user-generated power to counteract mundane systemic pressures and overcome global crises (health, economic, climate, etc.) on a local scale [32,33]. Being collectively active and mobilizing individual agents and the community as a whole concerns all stages of planning, from vision setting and strategy design up to implementation and monitoring, all striving to achieve desired future outcomes that incorporate inputs from the less well-represented and marginalized parts of the population, as well as local small- and medium-sized businesses, which are essential drivers of neighborhood economies [2].

Urban planning for innovation and intelligence. The FMC is fully compliant with contemporary and innovative thinking about cities, incorporating strategy and planning concepts related to real time and adaptive smart, resilient, regenerative, energy-positive, and circular cities [8,24,34,35]. More specifically, researchers posit that an FMC, as a model of a needs-driven living environment, should be monitored and optimized both in real time and diachronically. This would lead to an optimization of its metabolism and urban functions; for example, its degree of connectivity would be monitored dynamically, offering a measure for regulating travel restrictions [14]. That being said, on the side of intelligence, it is necessary to adopt an Internet of Things (IoT) and digital twin applications to monitor and simulate urban functions, predict trends that cannot be detected by the human eye, and adjust the urban metabolism as necessary [24,35]. On the side of energy consumption and greenhouse gas emissions, the FMC has all the prerequisites to minimize energy consumption and encourage the consumption of local products and services, essentially by enhancing localized living. Overall, the FMC represents an urban regeneration scenario in which all the necessary preconditions for optimized living come together [24].

3. Methodology

3.1. Rationale and Research Question

In light of the analysis presented above, it is clear that, while there are several recommendations about the premises of urban planning in an FMC, there is still limited knowledge about several aspects of it, and this is even more true in the ever-evolving socio-technical environment of cities and in the face of emerging environmental challenges. The COVID-19 crisis accelerated many socio-technical urban phenomena, such as teleworking and suburbanization, while slowing other ones, such as socio-spatial segregation and the construction of massive office complexes. In the post-COVID-19 era, then, urban planners, policymakers, and scholars need access to updated and practical recommendations and guidelines that will enable them to study and plan FMCs in the light of emerging phenomena. To address this gap, the overall aim of the present paper is to identify new developmental trajectories for more effective urban planning in an FMC paradigm. Our overall research question is as follows: "What are the repercussions of emerging developments in sustainable and smart cities for urban planning in the 15-minute city?"

3.2. Research Design

The present study brings together two strands of our previous research: on one hand, urban planning in the FMC [2]; on the other, emerging developments in sustainable and smart cities identified in RRI2SCALE [11]. The purpose of the paper is to uncover the repercussions of those emerging developments on the increasingly popular conception of the FMC. The overall design of our research is presented in Figure 2. We started with the identification of the urban-planning premises of the FMC described in the recent literature (Section 2). We then revisited them under the light of the most prominent developments that are likely to materialize until 2030, as identified in an RRI2SCALE Delphi survey (Section 4), and we identified new developmental trajectories for urban planning in an FMC paradigm (Section 5).

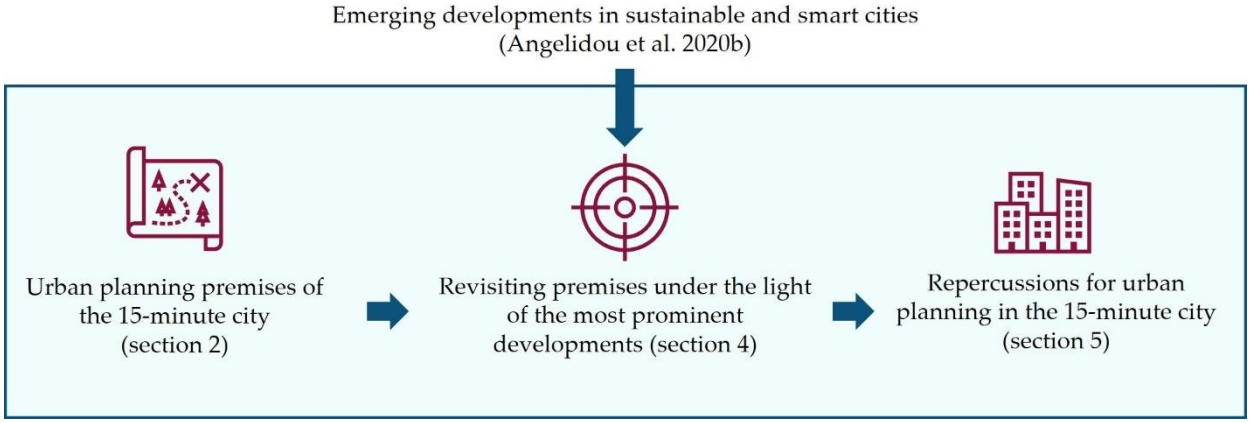

Figure 2. Research design (authors).

During the implementation of RRI2SCALE, 120 European experts in the fields of sustainable and smart cities and with thematic expertise in governance, transport, energy, and responsible innovation in territorial settings were recruited to participate in a two-round Delphi survey, a forecasting technique that solicits and refines experts' views [36]. The purpose of the survey was to uncover key developments expected to alter the urban landscape from a socio-technical and environmental viewpoint by 2030. The analysis sourced both quantitative (by rating the likelihood of different trends materializing) and qualitative (in the form of comments) information and adopted a 10-year time horizon in a European context. The first round of the survey was conducted in November 2020 with the participation of 120 experts. During the second round, which took place in December 2020, 88 valid responses were received from the initial round of experts. In the present

paper, aiming to make our results as relevant and usable as possible, we focus our attention on the emerging phenomena that, according to those experts' opinions, are most likely to happen through 2030, enriching those insights with works from the academic literature published after 2020. These are analytically described in Section 4.1. The full research report detailing the research design and results of the Delphi survey is openly available on the public repository of the Community Research and Development Information Service (CORDIS) of the European Commission [11]. The dataset with the anonymized Delphi survey results is openly available from Zenodo [37].

4. Results

4.1. Emerging Developments in Sustainable and Smart Cities through 2030

In this section, we present the emerging trends in the fields of sustainable and smart cities through 2030, with a particular focus on urban governance, transport, and energy, as well as responsible and inclusive innovation. The developments are featured in Figure 3 and analyzed below.

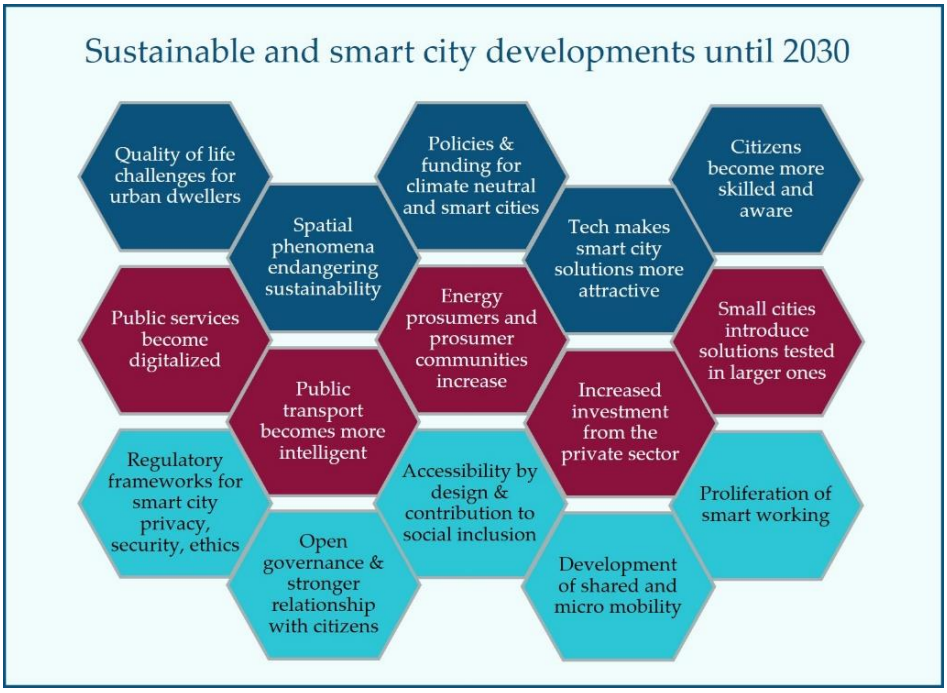

Figure 3. Emerging developments in sustainable and smart cities through 2030 (authors).

The experts confirmed that, in the years to come, there will be an increase in the various challenges that cities face, undermining urban dwellers' quality of life and exacerbating social polarization [38]. That being said, cities will continue to face a high demand for housing, leading to an increase in overall housing prices and making housing less affordable for middle-income people [39]. Moreover, cities will often be unable to accommodate the increasing number of cars, and traffic congestion will cause inconvenience, economic loss, and more pollution [40]. Air pollution will thus continue to be a major cause of premature death in cities [41]. As urbanization advances and such challenges are exacerbated, smart cities will offer ways to design cost-effective solutions and support policymaking [42]. Nevertheless, several experts who participated in the survey expressed concern that cities might not be able to take timely action and that political factors might hinder the implementation of optimal decisions.

On top of all of these points, cities themselves will continue to grow larger. The average urbanization level will rise from 56.2% globally in 2020 to 60.4% in 2030 [43]. Against this background, the experts agreed that spatial phenomena that jeopardize environmental, social, and economic sustainability will continue to exist, with the most prominent ones

being the sociopolitical divide between city and hinterland [44]; the clustering of social, cognitive, and financial capital in metropolises [45]; and the increasing vulnerability of the natural ecosystems around cities [46]. In some parts of the world—mostly in developing countries—we will also continue to see suboptimal control of urban sprawl [47,48]. On the other hand, digitized public services will help monitor and manage these spatial phenomena. For instance, intelligent infrastructure generating data on informal sectors and vulnerable societal groups may be used to deliver services to more remote areas [49].

In this context, national governments and their coalitions and large public organizations (e.g., the European Commission and the United Nations) will increasingly become aware of the crucial role that cities play in driving a more sustainable future both globally and regionally, especially in the face of climate change. Increasing government policy emphasis on and funding schemes for climate-neutral and smart city projects will drive their actual implementation [50,51]. In parallel, many countries have signed and will continue to sign agreements that create enabling conditions. Such policies and agreements include the European Green Deal [52], the European policy for climate-neutral smart cities [53], the New Urban Agenda [54], and the Sendai Framework for Disaster Risk Reduction [55]. However, the experts expressed concerns that cities might not be able to take full advantage of such opportunities due to their (sometimes) limited power and autonomy in territorial and fiscal policymaking [56], their unequal capacity to obtain funds, and the lack of capability to sustain smart city projects beyond their initial funding scope and period.

Technological innovation, according to the experts' views, will continue to be a major driver of smart city initiatives [57]. In 2025, 5G networks will reach 20% of the total connections globally; they were below 1% in 2019 [58]. Moreover, technological advancements in cloud computing, big data, the IoT, artificial intelligence (AI), blockchain, extended reality, and social robotics will drive smart city initiatives even further [59]. Nevertheless, the process of integrating new technologies will not take place without security, financial, accessibility, and social-integration challenges [50,60]. Indeed, the experts participating in the survey expressed grave concerns regarding the speed of technology integration in real life, as it will take place more slowly than predicted in the past. They are also wary of the lack of significant successful experience in the application of such devices for public purposes, which would be consistent with a more "social" vision of the smart city.

That being said, there was agreement that the mass adoption of smart city applications also requires that citizens have the digital skills needed to use them [50,61]. City authorities will increasingly undertake initiatives to build those skills and increase awareness about smart governance applications and digital services [62–64]. The increasing access to and uptake of mobile internet worldwide will provide an additional boost to increasing such awareness and improving those skills [58]. From this viewpoint, there was agreement that urban policymakers in Europe will move in this direction in the coming years.

As a result of the developments described above, governments will continue to work toward public-service digitalization, although at different speeds [65]. Local authorities, for instance, will variably use IoT, geographic information systems, and other edge technologies in a broad variety of domains, including water and waste management, urban transit, public space maintenance, and street lighting [66,67]. In this context, public-service digitalization will alter the characteristics of citizen interaction with government, a change that should be considered when designing for urban development [68]. Policymakers will gradually acknowledge that sustainable and smart city strategies should be more citizen-centric, focusing on the needs and preferences of city dwellers and driven less by available technologies or existing infrastructure capabilities [69]. Nevertheless, the experts participating in our survey expressed concerns about the actual capability of government to effectively design and deploy user-centric public services.

For instance, according to Luo et al. [70], middle- or large-size cities will leverage intelligent technologies to develop more efficient public transport systems. Using IoT technology, they will obtain various types of real-time data that will help them (i) manage their fleets, stations, and the traveling experience more efficiently; (ii) reduce uncertainty;

and (iii) increase the system's ability to respond quickly. As a result, they will be able to design better scheduling schemes and control strategies, ultimately using the systems' available resources more effectively and increasing passenger satisfaction [70,71]. The experts also noted that community transport, operated by trained volunteer drivers, will increase. As seamless connectivity across transport modes and users, along with options for shared mobility and Mobility-as-a-Service, will surely proliferate, further research is needed about how intelligent transport will shape urban futures [72].

Another notable development that the experts cited is the increasing number of energy prosumers and organized energy communities that comprise individuals, households, and small businesses that produce, consume, share, and trade energy [73,74]. Solar photovoltaics, batteries, electric heating, and other flexible load technologies will allow traditionally passive consumers to evolve into active prosumers who will simultaneously manage their energy generation, storage, and consumption [75]. Emerging prosumer support schemes and enabling regulations will also contribute in this respect [76,77]. In the frame of a sustainable and smart city, taking full advantage of prosumers' flexibility requires developing a prosumer energy management system [78]. To this end, urban planning will be crucial by providing enabling infrastructures and building provisions that enhance resilience, inclusion, and affordability in local communities [79], all with a social purpose [74].

Arguably, developing sustainable and smart city solutions requires a significant initial investment [80], and savvy cities deploying such initiatives will be deeply concerned with developing the appropriate business models and ensuring the initiatives' social and economic viability [81,82]. Typically, such solutions are funded locally by the city itself or by means of private–public partnerships that leverage private sector funds [81]. The documented tendency to use off-the-shelf, plug-and-play solutions developed by information technology companies, however, can prevent such initiatives from appropriately tackling issues related to culture, metabolism, and governance [83]. To effectively incorporate the human, social, and cultural factor in smart city development, several sustainable and smart city initiatives and research strands of the past decade have employed and will continue to use public–private-people partnerships (PPPPs) as a more viable funding alternative [82,84]. The experts in the survey confirmed that they foresee an overall increase in investment from the private sector; however, they cautioned that many cities will also use investment from banks and regional funds, along with bottom-up crowdfunding. Based on their views, a sound coordination mechanism is needed, with commonly accepted objectives and values driving the governance of any smart city initiative.

According to Charalabidis and Theocharopoulou [85], the resources available for sustainable and smart city development (including people, the crucial third "P" of PPPPs) are usually even further constrained in small- and medium-sized cities. Furthermore, these cities often lack the capacity and expertise required to select and implement the most appropriate interventions [85]. Thus, local policymakers in smaller cities will be keen to replicate solutions that have already been developed and tested in larger cities and consider their peers from such cities as a source of valuable know-how for new projects [86]. Although the experts confirmed that this is a powerful trend, they cautioned that such practices might be risky due to the very different needs, requirements, and capabilities of small cities compared to larger ones. Moreover, smaller cities should not miss out on or be denied the opportunity to deploy more agile, faster, and simple solutions.

The experts also believe that regulatory frameworks for smart city solutions will adapt to accommodate privacy, security, and safety issues, along with other ethical concerns. There is a long way to go regarding these aspects in the sustainable and smart city context [87,88]. Current standards and regulations have not clearly defined the roles and responsibilities of the relevant parties (e.g., of software developers and data processors), opening the door to security and safety concerns [89]. With the advent of AI and superintelligence, this effort should be accelerated to increase the prospects of achieving

a more fruitful symbiosis of AI with sustainable and smart urbanism [90] and adopting anticipatory regulations [91].

The survey experts also supported the view that smart city and e-governance platforms can improve interactions between the public, government, and businesses [92]. At a time when only 51% of people across OECD countries trust their governments and public institutions [93], governance innovation and legitimacy can be achieved only by nurturing new forms of collaboration amongst the key stakeholders of the urban ecosystem [94]. The various e-governance platforms can be used for information, consultation, participation, and co-creation [92]. Based on the experts' input, expanding e-governance will improve the relationship between local governments and the citizens they serve, provided that it is genuinely interactive and supported by appropriate engagement policies. Moreover, political figures and policymakers will be obliged to adopt a more customer-centric stance by seeing their citizens as "customers" when appropriate. Crucially, collaboration should be sought also by more traditional means, which continue to be more effective for delivering sound results and building trust-based relationships [94].

The experts agreed that, in some respects, sustainable and smart city applications and practices have the potential to advance social inclusion. On one hand, they include technological features such as voice recognition, magnification devices, and touch and gesture functionalities that can facilitate access by disabled citizens; on the other hand, an increasing number of policymakers and manufacturers realize that accessibility features must be embedded in device design [95]. This is not to say that newer solutions will have a universal or equally distributed effect on social inclusion. There will surely be significant differences between countries and cities, as the adoption of inclusive sustainable and smart city solutions will depend on each country's political regime, level of development, culture of participation, and leaders' and designers' understanding of active citizenship [96]. The experts confirmed that, while the overall trend cannot be denied, there will be vast differences in how countries interpret accessibility and social inclusion. Policy doctrines and budget and time constraints may interfere with how sustainable and smart city initiatives are designed. The issue of design will also depend on standardization, which might be slower than the actual rollout of the solutions.

Smart cities, connectivity, and the availability of other technologies will also enable the development of alternative, shared, and micro-mobility solutions [97], significantly supporting the realization of more intelligent and sustainable cities [98]. Micro-mobility solutions enabled by lightweight devices and mini-vehicles, such as bicycles, scooters, Segways, skateboards, and hoverboards, will be either shared or privately owned; they have been proven to be exceptionally useful for short-distance trips [99]. Moreover, while the introduction of shared modes of transportation in cities alone will not solve every issue of congestion and sustainability, as their uptake will depend heavily on energy sources and perceived safety risks [100], they have an undeniable potential to reduce urban pollution and improve quality of life for citizens [101]. Residential proximity to shared mobility stations, including micro-mobility ones, is crucial to installing a successful shared mobility scheme in a city [102]. In the wake of the COVID-19 crisis, its seems that bike-sharing and micro-mobility have emerged as the most preferred modes of shared mobility, with the clear potential to support the development of human-centric development in urban areas through city planning models such as the FMC [103]. The experts in our survey confirmed that, at the moment, bike-sharing and micro-mobility are, by far, the most prominent way to go; however, issues related to security and the availability of appropriate nearby infrastructure have yet to be addressed.

Another very important development by 2030 is smart working, which broadly refers to an agile form of labor in which the act of working is disconnected from a specific place and time. It is essentially a socio-technical phenomenon enabled by the technological advances of the last decade that allow citizens to choose when, where, and how they will work [104]. The phenomenon already existed in many EU countries before the pandemic; however, COVID-19 accelerated it at an unprecedented rate. This has brought us to today's

situation, in which smart working—especially home-based work—has become a norm [105]. Smart working offsets the undesirable hurdle of commuting from home to work [106], saving an average of 38 min of daily travel time each way [107]. The survey experts, however, hinted that home-based work could lead to increased aggregate household energy consumption when compared to organized workspaces, removing important advantages of economies of scale.

4.2. Revisiting Urban-Planning Premises in the FMC in the Light of Emerging Developments through 2030

In revisiting the urban-planning premises of the FMC under emerging developments identified in our survey, the results of our research were naturally grouped into four themes: proximity-based planning, use of land and urban form, urban governance and citizen participation, and inclusive digitalization (Figure 4). We then describe the outcomes under each theme.

Figure 4. Emerging themes for urban planning and policymaking in the 15-minute city (authors).

Theme 1: Proximity-based planning

Workplace localization emerges as possibly the most critical and hard-to-realize element of proximity-based planning in the FMC. Our survey confirmed that commuting to and from work is generally considered a time-wasting activity by commuters and that a considerable amount of time in the daily life of each citizen is "lost" or at least suboptimally used during commuting. In addition, proximity-based planning should consider the rapidly expanding smart working trend. That being said, a regime of fully home-based work does not accord well with recent thinking about the FMC, because there is a well-justified rationale about the adverse effects of extreme digitalization, which could lead to social polarization and alienation. Thus, urban planning in the FMC should factor in the potential to increase energy consumption and reduce the benefits of economies of scale achieved through organized workplaces when working from home. FMCs should seek to promote smart, flexible, and hybrid modes of working in which neighborhood-based working spaces offer the opportunity to citizens to interact socially and enjoy the benefits of organized workplaces, while reducing the frequency of commuting and saving energy. In addition, a long-term strategy should consider that job provision at the local level should be treated as a "public service" and use PPPPs to change the current employment paradigm.

One more important issue that emerges is proximity and easy access to shared and micro-mobility. This is of critical importance for incentivizing the uptake of more climate-friendly modes of transport and for saving critical land (by reducing road space) that could be used for more meaningful purposes. Urban planning should provide for the physical integration of the necessary infrastructure (parking and charging stations and road space) in proximity to both residential areas and to strategic nodes in communal spaces, urban service facilities, and public-transit stations. This would allow for a more seamless transition of citizens between active transport and shared mobility nodes. To achieve this goal, urban planning in the FMC should introduce land-use regulations that describe the conditions, guidelines, and requirements for shared mobility planning in the neighborhood context; encourage the adoption of urban design principles that allocate

adequate space and increase the accessibility, connectivity, and overall attractiveness of shared transport; and connect shared mobility strategies with affordable housing, social equity, and quality-of-life strategies.

Theme 2: Use of Land and Urban Form

As we have seen above, for the FMC to be both "living" and "livable", it is essential that every locale benefits from a multiplicity of choices expanding in time. This would allow for a more efficient and productive use of space over the long term. Spatiotemporal urban planning in the light of emerging developments should account for a multiplicity of such configurations. Depending on schedules, for example, publicly owned buildings, such as schools, could be used in the afternoons and on weekends as community centers, providing co-creation and open education programs to local residents. While this is already an important element of the FMC, our research showed that it should be enforced even further to allow for a more efficient addressing of the increasing challenges related to social polarization and lack of productive space within cities. Time-specific land-use planning could prove a helpful tool in this regard.

Advancing to more specific topics related to urban planning in order to address the increasing vulnerability of natural ecosystems that are close to (or sometimes within) urbanized areas, we suggest that FMC neighborhoods incorporate highly protected areas and contain those areas by means of holistic spatial-planning approaches. This means that such areas should be not only well protected and preserved but also well connected with FMC neighborhoods, acting as valuable assets for urban health, leisure, and community building. *X*-minute territories and metropolitan level planning have a key role to play in this regard, as they are the locus for introducing the necessary environmental protection regulations and organizing natural and green spaces in conjunction with the overall FMC neighborhood layout. FMCs should also take advantage of the large number of high-level funding opportunities to protect, preserve, and restore those areas, while also experimenting with innovative approaches to environmental services monitoring, such as citizen science. In sequence, protecting these areas will help alleviate undesirable phenomena such as urban flooding and urban air pollution and mitigate climate change over the long term.

As urban functions become more localized and commuting becomes less common, energy consumption will be increasingly localized, as well. This means that FMC neighborhoods, in addition to reducing energy consumption in the first place, should be able to achieve energy autonomy and become renewable energy production cells, producing the energy that they consume. Urban-planning practice should thus satisfy the need to produce energy at both the community and individual level, and the urban form should facilitate the implementation of positive energy strategies. Urban planning can influence energy production and consumption through a wide range of measures, which could include (i) promoting compact and infill development, rather than new construction; (ii) designing for a more efficient microclimate at the building, block, and neighborhood level; (iii) providing appropriate energy infrastructure, such as renewable energy supply systems, district energy systems, and smart grid systems; (iv) retrofitting existing buildings and designing energy-efficient new ones, if and when needed; and (v) promoting active travel and electromobility when active travel is not possible. In parallel, the energy transition should advance social justice, allowing energy communities to develop from the bottom up, providing access to affordable energy and enhancing resilience and inclusion.

As COVID-19 restrictions begin loosening and employers settle into hybrid and remote working policies, it will soon become clear exactly how much office space in cities is redundant. Office-to-residential conversions are thus one more option that should be considered. The massive office spaces constructed in the pre-COVID era can be retrofitted into affordable housing, as is already happening in several parts of the world, allowing cities to address one of the most pressing challenges, which, based on our survey, is expected to increase: access to affordable housing by a growing part of the population. A recent study in the Paris region, for example, showed that 20% percent of office buildings have significant potential for conversion to affordable housing [108]. Although recent experience

showed that office-to-housing conversions might not be straightforward, as they often involve bureaucratic processes and may not be economically attractive to developers, there have been cases of impressive and cost-effective conversions, such as the 100 Van Ness apartment building in San Francisco. European countries in which relevant options are being explored include France [108], Sweden [109], and the United Kingdom [110]. Local authorities should use building and business-operation permits to facilitate the conversion of redundant office spaces into housing, while also reconsidering technical standards; reducing the administrative burden of conversions; and gradually adopting policies that support the development of more inclusive, efficient, and sustainable housing markets.

Theme 3: Urban Governance and Citizen Engagement

The first governance-related issue is associated with the allocation of urban amenities based on a 15- or 20-minute neighborhood prototype and the wider *x*-minute territory. As explained above, resource allocation on a citywide scale is a highly complex process that is related to the catchment area for each amenity, urban density, and the overall spatial and functional order of the territory. Public-service digitalization plays a significant role in the simplification of such a complex procedure by providing vital services online, which also helps equalize access to them. On the other hand, allocation of resources at the neighborhood level could create location advantages that eventually lead to spatial inequalities. Therefore, urban governance at the city scale is crucial to ensuring the citywide allocation of resources without the emergence of any spatial inequalities.

The second governance-related issue that emerged in our research is associated with integrated urban policymaking. It is increasingly evident that local authorities can and should actively exercise—besides offering everyday public services—their authority in the following areas:

- Real-estate policymaking, ensuring that the right urban functions are in place, processes are made faster, and market gaps are addressed.
- Policymaking for social inclusion and justice to ensure sure that social missing is nurtured and protected, basic urban amenities are accessible and secure (physically and digitally), and that there is adequate affordable housing (which can also be addressed through real-estate policymaking).
- Policymaking for climate resilience to ensure that open and green spaces within and around the edges of the FMC are well protected, embedded, and connected with the urban fabric, along with facilitating and incentivizing the use of renewable energy at both the individual and community levels.

There is, thus, an urgent need to improve government capacity to effectively design and implement citizen-centric public services. This was a recurrent theme articulated by our experts across a broad range of topics related to emerging sustainable and smart city developments. We suggest that, depending on the situation, FMC administrations adopt clear business, governance, and operating models with a social and environmental mandate and that FMC government staff receive proper training and incentivization to apply those mandates, along with additional training in citizen-centric service design. When possible, citizens should be surveyed and engaged in the design and implementation of these programs, which would thus allow genuine citizen–government relationships to be cultivated and support the transition to a more thoroughly interactive governance of the FMC.

In parallel, citizen engagement and participation, combined with the participation of other urban stakeholders, such as local businesses and civil-society organizations, should be nourished and actively practiced. FMC authorities not only need to build citizen awareness of and skills in participation but also should offer genuine and meaningful opportunities to participate while embedding co-creation, co-implementation, and co-validation components in policymaking and implementation. Collaboration should always be sought not only through digital means but also by using the more traditional modes that have been used for decades in policymaking, such as public meetings. Self-organization

of bottom-up communities should also be facilitated, as by offering accessible meeting spaces and equipment and communication and interaction channels under the auspices of the FMC administrative authority. Participation can be incentivized, as is practiced in contemporary citizen science, through either non-monetary or monetary rewards in order to overcome the usual challenges related to attracting adequate participation.

It is also worth looking more deeply into the imperative of FMC neighborhoods to experiment with and adopt innovative business, governance, and operating models. In terms of governance and operating models, FMCs should clearly define (i) their vision and objectives of sustainable and resilient urban development in a community setting; (ii) the facilities and infrastructures that play a key role in realizing this vision, along with their standards of operation; (iii) the organizational structure, roles, and responsibilities of the multi-stakeholder team that will oversee and manage the FMC function; (iv) the procedures through which citizens and businesses will partake in the governance of the FMC; (v) any ethics and legal codes and codes of conduct defining the rights and obligations of FMC stakeholders; and (vii) the method for assessing the performance and impact of the FMC on society, the economy, and the environment. In a similar manner, the business model of the FMC should clearly define (i) the mission of the FMC; (ii) its value proposition and the key activities, infrastructure, and resources required to generate that value; (iii) the partners that are crucial to making the business model effective; (iv) the cost structure and revenue streams of the FMC; and (v) the social and environmental benefits, along with risks and costs. The governance, operation, and business model of the FMC should be discussed, co-created, and regularly updated through the contributions of urban stakeholders.

A final and critical governance issue that is closely related to both the business model and the governance capacity of the FMC is securing funding to realize the FMC in a sustainable manner. FMCs can and should take advantage of the numerous smart and sustainable city knowledge exchange networks and funding schemes offered by national and international authorities, such as the European Commission through the Climate-Neutral and Smart Cities Mission and the Circular Cities and Regions Initiative. Moreover, FMC government officials and personnel should be trained to carry out all the basic steps for participating in these networks and obtaining funds for which they are eligible. This will enhance their capacity to undertake smart city projects that can be sustained beyond the initial funding scope and period.

Theme 4: Inclusive Digitalization

There was an agreement among our experts that smart city solutions can help contain many urban challenges (e.g., uncontrolled urban expansion), optimize urban functions, monitor the urban climate, manage traffic congestion, and so on. However, the "social" vision of the smart city was a recurrent issue throughout the survey, highlighting the lack of overall awareness, the predominance of market-driven solutions, and the absence of extended and successful experience in applying sustainable and smart city solutions for public and social welfare. We suggest that FMCs should start with citizen-driven small experiments with such applications, which could be scaled up to the neighborhood and city level if they prove successful. There is, for example, already significant experience in FMCs (and beyond) with participatory budgeting, active travel, and micro- and shared mobility management, the design of intelligent public transport systems, "intelligent" public space maintenance, and smart urban water and waste management. This experience should be shared and used to guide FMC developments in other cities, especially smaller ones. Small incremental steps will allow for the design of sustainable and smart city services that effectively address the human, social, and cultural aspects of living in an FMC.

That being said, FMCs should also create an enabling environment for smart city initiatives to be developed, taken up, and become sustainable in the long term. In light of our findings, FMCs should adopt open standards, build citizen skills and awareness, and ensure that applications are secure, inclusive, and interoperable at the design stage. Any digitalization initiative should thus embody user-centric principles such as complementing digital interaction with other interaction modes, adopting a consistent design,

making sure that services can be easily found and used, providing websites that can be easily understood and accessed by any device in all relevant languages, providing offline assistance and the possibility of solving administrative and functionality problems through human intervention, and ensuring that citizens and businesses are genuinely empowered by the usage of digital services by allowing them to voice their ideas and contribute to problem-solving and policymaking. Both the design and use of sustainable and smart city services should be handled by the FMC administration as a learning and cultural transition process. Design thinking and co-creation approaches should thus be the cornerstone of any such service offered by the FMC.

5. Conclusions: Planning Now for a More Sustainable Urban Future

In this paper, we identified the urban-planning premises of the FMC concept that can be gleaned from experience. We then enriched them with new insights and information that emerged from our recent survey on developments expected to emerge through 2030 in the sustainable and smart cities' domain, with a specific focus on recurring headline topics, such as governance, transport, and energy production and consumption. The results suggest that FMCs can provide a holistic place-bound framework for integrated urban development in which proximity-based planning prioritizes workplace localization and proximity to shared and micro-mobility and the use of land incorporates spatiotemporal functions, protects and embodies natural ecosystems, encourages local renewable energy production, and accommodates the emerging forms of smart working. Holistic governance and citizen participation in urban planning and policymaking in the FMC are also of central importance and are related to increasing government capacity to design and implement relevant initiatives and improving the participation skills of the population. Inclusive digitalization is also of utmost importance in the FMC and should be geared toward supporting the "social" vision of a smart FMC.

Overall, it is abundantly clear that there is a paradigm shift in urban planning and policymaking geared toward more sustainable and livable cities not only for the future but also for the present day. The COVID-19 pandemic helped us to comprehend the urgency of the climate crisis more deeply, that change is possible even in the short term, and that urban communities can demonstrate their humane and resilient nature. As we gradually enter the post-COVID era, it is essential to preserve these precious learnings and use them to guide and inform our current and future policies. From this viewpoint, FMCs offer a clear vision for taking action now.

That being said, FMCs should not be interpreted as a strict system of urban development and planning standards; rather, they are a paradigmatic model for sustainably managing urban development and for thinking about cities. What we can start implementing today, then, are the core FMC values of urban planning and management in real practice: planning for proximity, planning for mixed use of land, and planning for more vibrant and cohesive local communities. Urban planners and policymakers who are well educated on the values of the FMC can already start implementing the FMC intuitively, regardless of existing standards and interpretations.

This is not to say, of course, that regulatory frameworks for urban development and planning need no change to accommodate FMC values. On the contrary, depending on the planning traditions and cultures of a given country, some or many changes will be needed. These could range from very basic ones, such as planning in neighborhood units and allowing for a mixed use of land in the first place (these are still not a given in many parts of the world), to very sophisticated or bold ones, such as planning for positive energy districts, radically enriching the land-use mix of business districts, and implementing flagship pedestrianization, affordable housing, net-zero, and digitalization projects. In any case, it is clear that, although planners and policymakers can start empirically developing strategies and initiatives now, holistic updates of urban-planning frameworks will be needed in order to enable the full potential of meaningful proximity-based planning over the longer term.

Like any change that has to do with the built environment, the transition toward the FMC will be gradual and take time to materialize. Still, we can start building the FMC today and acquire meaningful wins that will help put in place the foundations of a more sustainable, inclusive, and vibrant future for our cities.

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References

1. Moreno, C. The 15-Minute City (TED Video). Available online: https://www.youtube.com/watch?v=TQ2f4sJVXAI (accessed on 12 April 2022).
2. Pozoukidou, G.; Chatziyiannaki, Z. 15-Minute City: Decomposing the New Urban Planning Eutopia. *Sustainability* **2021**, *13*, 928. [CrossRef]
3. City of Portland, Bureau of Planning and Sustainability. The Portland Plan (Study). Available online: https://www.portlandonline.com/portlandplan/index.cfm?c=56527 (accessed on 9 March 2022).
4. Perry, C.A. The Neighborhood Unit. A Scheme of Arrangement for the Family Life Community (Study). *Reg. Plan N. Y. Reg. Surv. N. Y. Its Env.* **1929**, *7*, 1.
5. Mouratidis, K.; Yiannakou, A. COVID-19 and Urban Planning: Built Environment, Health, and Well-Being in Greek Cities before and during the Pandemic. *Cities* **2022**, *121*, 103491. [CrossRef] [PubMed]
6. Vatavali, F.; Gareiou, Z.; Kehagia, F.; Zervas, E. Impact of COVID-19 on Urban Everyday Life in Greece. Perceptions, Experiences and Practices of the Active Population. *Sustainability* **2020**, *12*, 9410. [CrossRef]
7. Laopoulou, M.; Pozoukidou, G. The "Meanwhile" City: Temporary Land Uses and Flexible Planning Strategies for Urban Crisis Recovery. *under Publication*.
8. Moreno, C.; Allam, Z.; Chabaud, D.; Gall, C.; Pratlong, F. Introducing the "15-Minute City": Sustainability, Resilience and Place Identity in Future Post-Pandemic Cities. *Smart Cities* **2021**, *4*, 93–111. [CrossRef]
9. Amirzadeh, M.; Sobhaninia, S.; Sharifi, A. Urban Resilience: A Vague or an Evolutionary Concept? *Sustain. Cities Soc.* **2022**, *81*, 103853. [CrossRef]
10. RRI2SCALE. Responsible Research and Innovation Ecosystems at Regional Scale for Intelligent Cities, Transport and Energy. European Commission, Horizon 2020 Programme (Grant Agreement No. 872526). Available online: https://rri2scale.eu/ (accessed on 12 April 2022).
11. Angelidou, M.; Politis, C.; Psarra, F.; Trendafili, K.; Fellnhofer, K.; Bakratsas, T.; Panori, A.; Buongiovanni, C.; Kuijper, J.A.T. Report on the Identification of Emerging Territorial Trends, Drivers & Potential Impacts (D2.1 of the European Commission, Horizon 2020 Project 'RRI2SCALE: Responsible Research and Innovation Ecosystems at Regional Scale for Intelligent Cities, Transport and Energy' Project, Grant Agreement No. 872526). Available online: https://cordis.europa.eu/project/id/872526/results (accessed on 12 April 2022).
12. Kamruzzaman, L. Typologies of 20-Minute Neighbourhoods, Active Transport Use, and Spatial Spillovers. *Findings* **2022**, 33158. [CrossRef]
13. Sharifi, A.; Khavarian-Garmsir, A.R. The COVID-19 Pandemic: Impacts on Cities and Major Lessons for Urban Planning, Design, and Management. *Sci. Total Environ.* **2020**, *749*, 142391. [CrossRef]
14. Teller, J. Urban Density and COVID-19: Towards an Adaptive Approach. *Build. Cities* **2021**, *2*, 150–165. [CrossRef]
15. Shatu, F.; Kamruzzaman, M. Determining Optimum Design Density for 20-Minute Neighbourhoods. *Findings* **2021**, 27391. [CrossRef]

16. Park, K.; Ewing, R.; Sabouri, S.; Choi, D.; Hamidi, S.; Tian, G. Guidelines for a Polycentric Region to Reduce Vehicle Use and Increase Walking and Transit Use. *J. Am. Plan. Assoc.* **2020**, *86*, 236–249. [CrossRef]
17. Zhang, W.; Lu, D.; Zhao, Y.; Luo, X.; Yin, J. Incorporating Polycentric Development and Neighborhood Life-Circle Planning for Reducing Driving in Beijing: Nonlinear and Threshold Analysis. *Cities* **2022**, *121*, 103488. [CrossRef]
18. Rappaport, J. Consumption Amenities and City Population Density. *Reg. Sci. Urban Econ.* **2008**, *38*, 533–552. [CrossRef]
19. Duranton, G.; Puga, D. The Economics of Urban Density. *J. Econ. Perspect.* **2020**, *34*, 3–26. [CrossRef]
20. Macharia, P.M.; Ray, N.; Giorgi, E.; Okiro, E.A.; Snow, R.W. Defining Service Catchment Areas in Low-Resource Settings. *BMJ Glob. Health* **2021**, *6*, e006381. [CrossRef] [PubMed]
21. Delventhal, M.J.; Kwon, E.; Parkhomenko, A. Journal of Urban Economics Insight: How Do Cities Change When We Work from Home? *J. Urban Econ.* **2022**, *127*, 103331. [CrossRef]
22. Everett, C. How the "15-Minute City" Will Transform Work (Raconteur). Available online: https://www.raconteur.net/workplace/15-minute-city/ (accessed on 31 March 2022).
23. Crang, M. Rhythms of the City: Temporalised Space and Motion. In *Timespace: Geographies of Temporality*; Routledge: London, UK, 2001; pp. 187–207.
24. Abdelfattah, L.; Deponte, D.; Fossa, G. The 15-Minute City: Interpreting the Model to Bring out Urban Resiliencies. *Transp. Res. Procedia* **2022**, *60*, 330–337. [CrossRef]
25. Tao, T.; Wu, X.; Cao, J.; Fan, Y.; Das, K.; Ramaswami, A. Exploring the Nonlinear Relationship between the Built Environment and Active Travel in the Twin Cities. *J. Plan. Educ. Res.* **2020**, 0739456X20915765. [CrossRef]
26. Pozoukidou, G. Designing a Green Infrastructure Network for Metropolitan Areas: A Spatial Planning Approach. *Euro-Mediterr. J. Environ. Integr.* **2020**, *5*, 1–15. [CrossRef]
27. World Bank. Available online: http://documents.worldbank.org/curated/pt/402451468169453117/pdf/AUS8539-REVISED-WP-P148654-PUBLIC-Box393236B-Inclusive-Cities-Approach-Paper-w-Annexes-final.pdf (accessed on 9 March 2022).
28. Angelidou, M.; Fróes, I.; Karachaliou, E.; Wippoo, M. Co-Creation Techniques and Tools for Sustainable and Inclusive Planning at Neighbourhood Level. Experience from Four European Research and Innovation Projects. In *Proceedings of the Advances in Mobility-as-a-Service Systems: Proceedings of 5th Conference on Sustainable Urban Mobility, Virtual Conference, 17–19 June 2020*; Springer: Heraklion Crete, Greece, 2020; pp. 562–572.
29. Angelidou, M. *Tactical Urbanism: Reclaiming the Right to Use Public Spaces in Thessaloniki, Greece*; Springer: Berlin/Heidelberg, Germany, 2018; pp. 241–248.
30. Rajan, S.R.; Duncan, C.A. Ecologies of Hope: Environment, Technology and Habitation-Case Studies from the Intervenient Middle. *J. Political Ecol.* **2013**, *20*, 70–79. [CrossRef]
31. Bessant, K.C. Evolving Conceptions of Community. In *The Relational Fabric of Community*; Springer: Berlin/Heidelberg, Germany, 2018; pp. 65–97.
32. Chinis, I.; Pozoukidou, G.; Istoriou, T. Renegotiating Spatial Planning Practices: The Role of Collective Initiatives and Informal Networks. *Eur. Plan. Stud.* **2021**, 1–18. [CrossRef]
33. Istoriou, T.; Pozoukidou, G. *Towards a Collaborative Future? The Emerging Ecosystems of Citizens' Initiatives in the City of Thessaloniki (in Greek)*; University Studio Press: Thessaloniki, Greece, 2019; pp. 455–465.
34. Angelidou, M.; Balla, C.; Manousaridou, A.; Marmeloudis, S.; Nalmpantis, D. Spatial Planning for Urban Resilience. Assessing Current Prospects through a Multilevel Approach and a Use Case in Northern Greece. *Reg. Sci. Inq.* **2018**, *10*, 33–45.
35. Allam, Z.; Bibri, S.E.; Jones, D.S.; Chabaud, D.; Moreno, C. Unpacking the '15-Minute City'via 6G, IoT, and Digital Twins: Towards a New Narrative for Increasing Urban Efficiency, Resilience, and Sustainability. *Sensors* **2022**, *22*, 1369. [CrossRef] [PubMed]
36. European Foresight Platform. Delphi Study. Available online: http://www.foresight-platform.eu/community/forlearn/how-to-do-foresight/methods/classical-delphi/ (accessed on 9 March 2022).
37. Angelidou, M.; Politis, C. Dataset: RRI2SCALE_D2.1_Delphi Survey_2021.10.15_v1. 2021. Available online: https://zenodo.org/record/5571361#.Y0OWQ0xBxPY (accessed on 9 March 2022).
38. Van Ham, M.; Tammaru, T.; Ubarevičienė, R.; Janssen, H.J. Rising Inequalities and a Changing Social Geography of Cities: An Introduction to the Global Segregation Book. In *Urban Socio-Economic Segregation and Income Inequality: A Global Perspective*; Springer: Berlin/Heidelberg, Germany, 2021; pp. 3–26.
39. Nijskens, R.; Lohuis, M.; Hilbers, P.; Heeringa, W. *Hot Property: The Housing Market in Major Cities*; Springer: Cham, Switzerland, 2019; Volume 15.
40. Afrin, T.; Yodo, N. A Survey of Road Traffic Congestion Measures towards a Sustainable and Resilient Transportation System. *Sustainability* **2020**, *12*, 4660. [CrossRef]
41. Khomenko, S.; Cirach, M.; Pereira-Barboza, E.; Mueller, N.; Barrera-Gómez, J.; Rojas-Rueda, D.; de Hoogh, K.; Hoek, G.; Nieuwenhuijsen, M. Premature Mortality Due to Air Pollution in European Cities: A Health Impact Assessment. *Lancet Planet. Health* **2021**, *5*, e121–e134. [CrossRef]
42. Kaivonen, S.; Ngai, E.C.-H. Real-Time Air Pollution Monitoring with Sensors on City Bus. *Digit. Commun. Netw.* **2020**, *6*, 23–30. [CrossRef]
43. United Nations. World Urbanisation Prospects: The 2018 Revision. Available online: https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf (accessed on 12 April 2022).

44. Mitsch, F.; Lee, N.; Morrow, E.R. Faith No More? The Divergence of Political Trust between Urban and Rural Europe. *Political Geogr.* **2021**, *89*, 102426. [CrossRef]
45. Chakravarty, D.; Goerzen, A.; Musteen, M.; Ahsan, M. Global Cities: A Multi-Disciplinary Review and Research Agenda. *J. World Bus.* **2021**, *56*, 101182. [CrossRef]
46. Meerow, S. A Green Infrastructure Spatial Planning Model for Evaluating Ecosystem Service Tradeoffs and Synergies across Three Coastal Megacities. *Environ. Res. Lett.* **2019**, *14*, 125011. [CrossRef]
47. Guastella, G.; Oueslati, W.; Pareglio, S. Patterns of Urban Spatial Expansion in European Cities. *Sustainability* **2019**, *11*, 2247. [CrossRef]
48. Yasin, M.Y.; Yusoff, M.M.; Abdullah, J.; Noor, N.M. Is Urban Sprawl a Threat to Sustainable Development? A Review of Characteristics and Consequences. *Geografia* **2020**, *16*, 56–68. [CrossRef]
49. United Nations. Smart Cities and Infrastructure (Report of the Secretary-General). Available online: https://unctad.org/meetings/en/SessionalDocuments/ecn162016d2_en.pdf (accessed on 12 April 2022).
50. Agbali, M.; Trillo, C.; Ibrahim, I.A.; Arayici, Y.; Fernando, T. Are Smart Innovation Ecosystems Really Seeking to Meet Citizens' Needs? Insights from the Stakeholders' Vision on Smart City Strategy Implementation. *Smart Cities* **2019**, *2*, 307–327. [CrossRef]
51. Atha, K.; Callahan, J.; Chen, J.; Drun, J.; Green, K.; Lafferty, B.; McReynolds, J.; Mulvenon, J.; Rosen, B.; Walz, E. China's Smart Cities Development (Research Report Prepared on Behalf of the U.S.-China Economic and Security Review Commission (SOS International LLC Report). Available online: https://www.uscc.gov/sites/default/files/2020-04/China_Smart_Cities_Development.pdf (accessed on 9 March 2022).
52. European Commission. A European Green Deal. Striving to Be the First Climate-Neutral Continent. Available online: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en (accessed on 9 March 2022).
53. European Commission 100 Climate-Neutral Cities by 2030; By and for the Citizens (Directorate-General for Research and Innovation). Available online: https://data.europa.eu/doi/10.2777/347806 (accessed on 9 March 2022).
54. United Nations. New Urban Agenda (Report). Available online: https://habitat3.org/the-new-urban-agenda/ (accessed on 9 March 2022).
55. United Nations. Sendai Framework for Disaster Risk Reduction (2015–2030) (Report). Available online: https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030 (accessed on 9 March 2022).
56. De Falco, S.; Angelidou, M.; Addie, J.-P.D. From the "Smart City" to the "Smart Metropolis"? Building Resilience in the Urban Periphery. *Eur. Urban Reg. Stud.* **2019**, *26*, 205–223. [CrossRef]
57. Angelidou, M. Smart Cities: A Conjuncture of Four Forces. *Cities* **2015**, *47*, 95–106. [CrossRef]
58. Global System for Mobile Communications. The Mobile Economy 2020. Available online: https://www.gsma.com/mobileeconomy/ (accessed on 9 March 2022).
59. Ahmed, I.; Zhang, Y.; Jeon, G.; Lin, W.; Khosravi, M.R.; Qi, L. A Blockchain-and Artificial Intelligence-enabled Smart IoT Framework for Sustainable City. *Int. J. Intell. Syst.* **2022**, *37*, 6493–6507. [CrossRef]
60. Yu, Z.; Song, L.; Jiang, L.; Sharafi, O.K. Systematic Literature Review on the Security Challenges of Blockchain in IoT-Based Smart Cities. *Kybernetes* **2021**, *51*, 323–347. [CrossRef]
61. Han, M.J.N.; Kim, M.J. A Critical Review of the Smart City in Relation to Citizen Adoption towards Sustainable Smart Living. *Habitat Int.* **2021**, *108*, 102312. [CrossRef]
62. Peng, G.C.A.; Nunes, M.B.; Zheng, L. Impacts of Low Citizen Awareness and Usage in Smart City Services: The Case of London's Smart Parking System. *Inf. Syst. e-Bus. Manag.* **2017**, *15*, 845–876. [CrossRef]
63. Lee, J.B.; Porumbescu, G.A. Engendering Inclusive E-Government Use through Citizen IT Training Programs. *Gov. Inf. Q.* **2019**, *36*, 69–76. [CrossRef]
64. Mora, L.; Deakin, M.; Zhang, X.; Batty, M.; de Jong, M.; Santi, P.; Appio, F.P. *Sustainable Smart City Transitions: Theoretical Foundations, Sociotechnical Assemblage and Governance Mechanisms*; Routledge: London, UK, 2022; ISBN 1-00-054078-2.
65. OECD. Digital Government Index (DGI) 2019. Results and Key Messages (Report). Available online: https://www.oecd.org/gov/digital-government/digital-government-index-2019-highlights.pdf (accessed on 9 March 2022).
66. Komninos, N. Intelligent Cities: Variable Geometries of Spatial Intelligence. *Intell. Build. Int.* **2011**, *3*, 172–188. [CrossRef]
67. De Mello, L.; Ter-Minassian, T. Digitalisation Challenges and Opportunities for Subnational Governments (OECD Report). Available online: https://www.oecd-ilibrary.org/taxation/digitalisation-challenges-and-opportunities-for-subnational-governments_9582594a-en (accessed on 9 March 2022).
68. Lindgren, I.; Madsen, C.Ø.; Hofmann, S.; Melin, U. Close Encounters of the Digital Kind: A Research Agenda for the Digitalization of Public Services. *Gov. Inf. Q.* **2019**, *36*, 427–436. [CrossRef]
69. Sepasgozar, S.M.; Hawken, S.; Sargolzaei, S.; Foroozanfa, M. Implementing Citizen Centric Technology in Developing Smart Cities: A Model for Predicting the Acceptance of Urban Technologies. *Technol. Forecast. Soc. Chang.* **2019**, *142*, 105–116. [CrossRef]
70. Luo, X.-G.; Zhang, H.-B.; Zhang, Z.-L.; Yu, Y.; Li, K. A New Framework of Intelligent Public Transportation System Based on the Internet of Things. *IEEE Access* **2019**, *7*, 55290–55304. [CrossRef]
71. Asiag, J.J. Smart Cities Transportation Systems, Are What Make Smart Cities Smart (Otonomo). Available online: https://otonomo.io/blog/smart-cities-transportation-systems/ (accessed on 12 April 2022).
72. Nikitas, A.; Michalakopoulou, K.; Njoya, E.T.; Karampatzakis, D. Artificial Intelligence, Transport and the Smart City: Definitions and Dimensions of a New Mobility Era. *Sustainability* **2020**, *12*, 2789. [CrossRef]

73. European Commission. *Joint Research Centre. Energy Communities: An Overview of Energy and Social Innovation*; Publications Office of the European Union: Luxembourg, 2020.
74. Dóci, G. Collective Action with Altruists: How Are Citizens-Led Renewable Energy Communities Developed? *Sustainability* **2021**, *13*, 507. [CrossRef]
75. smartEn. The SmartEn Map 2020-Prosumers (Report). Available online: https://smarten.eu/the-smarten-map-2020-prosumers/ (accessed on 9 March 2022).
76. REN21. Renewables 2019 Global Status Report. Available online: https://www.ren21.net/wp-content/uploads/2019/05/gsr_2019_full_report_en.pdf (accessed on 9 March 2022).
77. Sołtysik, M.; Kozakiewicz, M.; Jasiński, J. Profitability of Prosumers According to Various Business Models—An Analysis in the Light of the COVID-19 Effect. *Energies* **2021**, *14*, 8488. [CrossRef]
78. Bin, Z. Key Enabling Technologies for Prosumer Energy Management (Call for Manuscripts in Closed Special Sections). Available online: https://ieeeaccess.ieee.org/closed-special-sections/key-enabling-technologies-for-prosumer-energy-management/ (accessed on 9 March 2022).
79. McLean, L.; Roggema, R. Planning for a Prosumer Future: The Case of Central Park, Sydney. *Urban Plan.* **2019**, *4*, 172–186. [CrossRef]
80. Skowron, J.; Flynn, M. The Challenge of Paying for Smart Cities Projects. Available online: https://www2.deloitte.com/xe/en/insights/industry/dcom/the-challenge-of-paying-for-smart-cities-projects.html (accessed on 11 March 2022).
81. Law, K.; Lynch, J. Smart City: Technologies and Challenges (IEEE Computer Society Report). Available online: https://par.nsf.gov/servlets/purl/10126466 (accessed on 9 March 2022).
82. Mirzaee, A.M.; Sardroud, J.M. Public–Private-Partnerships (PPP) Enabled Smart City Funding and Financing. In *Smart Cities Policies and Financing*; Elsevier: Amsterdam, The Netherlands, 2022; pp. 117–131.
83. Allam, Z.; Newman, P. Redefining the Smart City: Culture, Metabolism and Governance. *Smart Cities* **2018**, *1*, 4–25. [CrossRef]
84. Mora, L.; Deakin, M.; Reid, A.; Angelidou, M. How to Overcome the Dichotomous Nature of Smart City Research: Proposed Methodology and Results of a Pilot Study. *J. Urban Technol.* **2019**, *26*, 89–128. [CrossRef]
85. Charalabidis, Y.; Theocharopoulou, C. A Participative Method for Prioritizing Smart City Interventions in Medium-Sized Municipalities. *Int. J. Public Adm. Digit. Age* **2019**, *6*, 41–63. [CrossRef]
86. Roland Berger. Smart Cities: The New Mega-Market for Utilities. Why Mid-Sized Cities Promise Big-Time Opportunities (Report). Available online: https://www.rolandberger.com/publications/publication_pdf/roland_berger_smart_cities_the_new_mega_market_for_utilities.pdf (accessed on 9 March 2022).
87. Kitchin, R. The Ethics of Smart Cities and Urban Science. *Philos. Trans. R. Soc. A* **2016**, *374*, 20160115. [CrossRef]
88. Clever, S.; Crago, T.; Polka, A.; Al-Jaroodi, J.; Mohamed, N. Ethical Analyses of Smart City Applications. *Urban Sci.* **2018**, *2*, 96. [CrossRef]
89. Vitunskaite, M.; He, Y.; Brandstetter, T.; Janicke, H. Smart Cities and Cyber Security: Are We There yet? A Comparative Study on the Role of Standards, Third Party Risk Management and Security Ownership. *Comput. Secur.* **2019**, *83*, 313–331. [CrossRef]
90. Yigitcanlar, T.; Cugurullo, F. The Sustainability of Artificial Intelligence: An Urbanistic Viewpoint from the Lens of Smart and Sustainable Cities. *Sustainability* **2020**, *12*, 8548. [CrossRef]
91. Armstrong, H.; Rae, J. A Working Model for Anticipatory Regulation (Nesta Report). Available online: https://media.nesta.org.uk/documents/working_model_for_anticipatory_regulation_0_TpDHt7z.pdf (accessed on 9 March 2022).
92. Gil, O.; Cortés-Cediel, M.E.; Cantador, I. Citizen Participation and the Rise of Digital Media Platforms in Smart Governance and Smart Cities. *Int. J. E-Plan. Res.* **2019**, *8*, 19–34. [CrossRef]
93. OECD. Government at a Glance 2021 (Report). Available online: https://www.oecd-ilibrary.org/governance/government-at-a-glance-2021_1c258f55-en;jsessionid=6uEmhZvOGt_PdO08s4aFoOcu.ip-10-240-5-152 (accessed on 19 April 2022).
94. Meijer, A.J.; Lips, M.; Chen, K. Open Governance: A New Paradigm for Understanding Urban Governance in an Information Age. *Front. Sustain. Cities* **2019**, *1*, 3. [CrossRef]
95. Mehta, M.C.; Kumar, C. A Discussion on E-Governance Initiatives for Disabled Citizens. *Int. J. Res. Appl. Sci. Eng. Technol.* **2020**, *8*, 2036–2042. [CrossRef]
96. Malek, J.A.; Lim, S.B.; Yigitcanlar, T. Social Inclusion Indicators for Building Citizen-Centric Smart Cities: A Systematic Literature Review. *Sustainability* **2021**, *13*, 376. [CrossRef]
97. Gori, P.; Parcu, P.L.; Stasi, M. Smart Cities and Sharing Economy. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2706603 (accessed on 9 March 2022).
98. Koźlak, A. The Relationship between the Concepts of Sharing Economy and Smart Cities: The Case of Shared Mobility and Smart Transport. *Int. J. Sustain. Soc.* **2020**, *12*, 152–184. [CrossRef]
99. Abduljabbar, R.L.; Liyanage, S.; Dia, H. The Role of Micro-Mobility in Shaping Sustainable Cities: A Systematic Literature Review. *Transp. Res. Part D* **2021**, *92*, 102734. [CrossRef]
100. Milakis, D.; Gedhardt, L.; Ehebrecht, D.; Lenz, B. Is Micro-Mobility Sustainable? An Overview of Implications for Accessibility, Air Pollution, Safety, Physical Activity and Subjective Wellbeing. In *Handbook of Sustainable Transport*; ElgarOnline: Cheltenham, UK, 2020.
101. Machado, C.A.S.; de Salles Hue, N.P.M.; Berssaneti, F.T.; Quintanilha, J.A. An Overview of Shared Mobility. *Sustainability* **2018**, *10*, 4342. [CrossRef]

102. Marsden, G. Social Benefits of Shared Mobility: Metrics and Methodologies (26 Th ACEA SAG Report). Available online: https://www.acea.auto/files/Social_benefits_of_shared_mobility-26th_ACEA_SAG-report.pdf (accessed on 9 March 2022).
103. Allam, Z.; Sharifi, A. Research Structure and Trends of Smart Urban Mobility. *Smart Cities* **2022**, *5*, 539–561. [CrossRef]
104. Bednar, P.M.; Welch, C. Socio-Technical Perspectives on Smart Working: Creating Meaningful and Sustainable Systems. *Inf. Syst. Front.* **2020**, *22*, 281–298. [CrossRef]
105. Marino, L.; Capone, V. Smart Working and Well-Being before and during the COVID-19 Pandemic: A Scoping Review. *Eur. J. Investig. Health Psychol. Educ.* **2021**, *11*, 1516–1536. [CrossRef] [PubMed]
106. Humagain, P.; Singleton, P.A. Would You Rather Teleport or Spend Some Time Commuting? Investigating Individuals' Teleportation Preferences. *Transp. Res. Part F Traffic Psychol. Behav.* **2020**, *74*, 458–470. [CrossRef]
107. Jachimowicz, J.M.; Cunningham, J.L.; Staats, B.R.; Gino, F.; Menges, J.I. Between Home and Work: Commuting as an Opportunity for Role Transitions. *Organ. Sci.* **2021**, *32*, 64–85. [CrossRef]
108. France24. COVID-19: Could Empty Office Buildings Help Solve France's Housing Crisis? Available online: https://www.france24.com/en/live-news/20210221-covid-19-could-empty-office-buildings-help-solve-france-s-housing-crisis (accessed on 8 May 2022).
109. Johnson, S. Empty Stores and Offices: How Sweden Aims to Plug Housing Gap (Reuters). Available online: https://www.reuters.com/article/health-coronavirus-sweden-housing-idUSKBN28X0K5 (accessed on 8 May 2022).
110. BBC News. City of London to Convert Offices into Homes in Post-COVID Revamp. Available online: https://www.bbc.com/news/business-56888615 (accessed on 8 May 2022).