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# Edinburgh and the n-minute neighbourhood concept; an exploratory study

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# Edinburgh and the n-minute neighbourhood concept; an exploratory study

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on-line GIS resource:  Edinburgh 20-Minute Neighbourhood

## 1- Introduction

Over the course of the COVID-19 pandemic, the concept of the N-minute neighbourhood (NMN) has risen in prominence. From Ottawa and Bogota, to Seoul and Paris, this concept has captured imaginations as people were forced to adapt their lifestyles and maximise use of the amenities on their doorsteps during lock down. The appeal of the concept perhaps lies in its perceived simplicity whilst the use of an actual number of minutes (20 , 15 or 10 minutes; the choice seems somewhat arbitrary) makes it sound more measurable for policy making and more concrete and relatable for local citizens. It provides a single banner to examine questions of improved accessibility to key services based on active travel or on affordable and effective public transport. The concept implies a minimum standard for service accessibility across the city (thus reducing spatial urban inequalities), encouragement of active travel (walking and cycling) for health benefits, strengthening neighbourhood identity and community coherence (social benefits) and simultaneously reducing the use of cars in cities, which yields not only local environmental benefits and carbon emission reductions, but also facilitates the above-mentioned benefits.

This working paper shares some of the insights from a project which the University of Edinburgh ran with the City of Edinburgh Council in 2021, to explore what the NMN concept might mean and how it could be operationalised in Edinburgh to inform ongoing council commitments and forward looking strategies. As the NMN concept was so new at the time, the project was exploratory in nature, consisting of a literature review, GIS analysis and feedback workshops with council practitioners responsible for various council services which could potentially be informed or influenced by the application of the NMN logic. These workshops were run on-line (during the pandemic) and were attended by 10-20 council practitioners.  The ability to display GIS maps dynamically, zoom in or show

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particular layers, turned out to be a powerful facilitation tool for discussions with and (especially) between council practitioners across different council departments and service areas. The project thus created a thinking and talking space for council practitioners and university researchers alike, co-producing knowledge and mutual understanding about possible interpretations of the NMN concept and how it can be visualised in GIS with existing data. This working paper can only capture some of the findings and the authors accept sole responsibility for its contents.


**Background to the n-minute neighbourhood (NMN) concept**

Much of the early literature and practice around the NMN concept has been practitioner led, starting with the cities of Portland (Portland City Council 2012) and Melbourne (Victoria State Government 2016) both of whom have pioneered its implementation. Melbourne in particular has been the focal point of research on issues such as the economic benefits of 20-minute neighbourhoods (Angelopoulos et al. 2019), designing healthy communities (Gunn et al. 2017), transit-orientated urban design (Dovey & Woodcock 2014; Stanley et al 2015) and building equity into 20-minute plans (Clark 2019). Beyond these two cities, there have been a growing number of papers explicitly exploring this concept as a tool with which to develop more inclusive, sustainable places (Pozoukidou & Chatziyiannaki 2021; Moreno et al. 2021; Weng et al. 2019).

It is no accident that this concept was first embraced in cities like Portland and Melbourne. In contrast to the pre-industrial beginnings of many European cities, the original design and subsequent expansion of many North American and Australian cities in the post-industrial era was explicitly delivered with the automobile in mind (Gandy 2002; Harris & Lewis 2001). In reaction to this, some 20th century urban planners began advocating for more accessible urban design that recognises the importance of neighbourhoods as key building blocks of the city. The work of practitioners and writers such as Clarence Perry (1929) and Jane Jacobs (1961) pushed back against the centralisation of cities which happened during the 20th century and advocated for the creation of liveable, accessible and thriving local neighbourhoods. In particular Jacob's book, *The Death and Life of Great American Cities* (1961) in which she coined the terms 'social capital', 'eyes on the street' and 'mixed primary uses', remains one of the most influential books in the history of American Urbanism and is regularly cited as an influential inspiration behind the contemporary 20-minute neighbourhood concept (Moreno et al 2021; Pozoukidou & Chatziyiannaki 2021).


Planned and built before the automobile began to shape urban design, the core of older cities was already made up of a collection of neighbourhoods, each with its own local centre, transport links, services and leisure spaces. London for example, has over 600 high streets (Talk London 2020) while cities such as Barcelona have hundreds of local squares and plazas. For centuries, these places have been the centre of local economies, places of retail, work and social activity. But after decades of funding cuts and changing consumer habits, many of these local services have disappeared; in the UK the declining high street has been a central feature of planning narratives for decades (Dolega & Lord 2020; Eichler 2018; Oxford Analytica 2018; Turner & Gardener 2014). The shift to working from home and the re-orientation to local geographies, catalysed by lock-down measures during the COVID-19 pandemic has sparked a renewed interest in the role of local centres in local social and economic resilience,  whilst also addressing health and sustainability concerns. The 20-minute concept has now been picked up by a number of European local and national governments in a way that has seen it evolve from a planning and design principle to an overarching policy for future urban governance. (e.g.

van der horst D. et al (2021). Edinburgh and the n-minute neighbourhood concept; an exploratory study. Working paper. School of Geosciences, University of Edinburgh

Victoria State Government 2017; Comune di Milano 2019; Ottawa City Council 2019; Scottish Government 2020; O'Sullivan 2020; Moreno 2020).

One high profile example of this rapid adoption of the concept is in Paris where, spurred on by the COVID-19 crisis, Mayor Anne Hidalgo made the '15-minute neighbourhood' a central feature of her successful Mayoral campaign in 2020 and is currently building on the City's existing work using the 15-minute neighbourhood as a way of creating a 'city of proximities' (Moreno et al 2021; Yeung 2021). This vision takes a holistic approach built around the concept of 'hyper proximity' which focuses on ease of travel, walkability and public services as well as considering changing workplaces, cultural activities and social connections (O'Gorman & Dillon-Robinson 2021). Hidalgo aims to create a city for people rather than cars by turning over 70% of on-street car parking space to other uses, increasing the provision of offices and co-working spaces in neighbourhoods, expanding the uses of infrastructure and buildings outside of standard hours, encouraging people to use their local shops and creating small parks in school playgrounds that would be open to local people outside of school hours to combat the city's lack of public green space (ibid).

## 2- Case study: Putting the 20-minute concept to work in Edinburgh

### Project background

In Autumn of 2020 the idea of 20-minute neighbourhoods was captured in the Scottish Government's 'Programme for Government', which pledged to work with local government to implement this concept across the country (Scottish Government 2020). In Edinburgh, the call for 20-minute neighbourhoods has been echoed by both the Poverty and Climate 'Commissions' who have highlighted the potential for this concept to underpin not only infrastructure design and implementation but poverty prevention, wellbeing and sustainability. This increasingly popular concept has become a new boundary object around which to orientate goals and to help move strategies forward.

Through statutory policy such as Edinburgh's City Plan 2030, City Mobility Plan, and Active Travel Action Plan, the Council has recognised the need for developing well-connected, sustainable, diverse and affordable neighbourhoods, bridging the gap between land use and transportation governance in the process. The current draft versions of these plans already align with many of the principles of the '20-minute' concept, particularly on the issues of mobility and active travel. With this in mind, the aspirations of the research project to be reflected on here (and involving both University of Edinburgh researchers on this project and officers at the Council) were to think through how this then translates into decision-making at the neighbourhood scale, how some of the impacts of these decisions on the city's '20-minute' status might be modelled and forecasted, and how the concept might bring together different elements of the Council's portfolio of responsibilities. Aligning here with the importance of 'digitalization' to the 20-minute idea's application (the 4th and final aspect of Moreno et al's (2021) framework), the project sought to draw on available spatial datasets and GIS capabilities in order to explore how the different iterations of the 20-minute idea presented above could be put to work in Edinburgh. As Moreno points out digitalisation aligns closely with the concept of Smart Cities, a key inspiration for the 20-minute idea. Within the Smart City concept digital platforms are a key tool

van der horst D. et al (2021). Edinburgh and the n-minute neighbourhood concept; an exploratory study.  Working paper. School of Geosciences, University of Edinburgh

through which to engage citizens, better understand urban geographies, and model future scenarios (Moreno et al 2021).
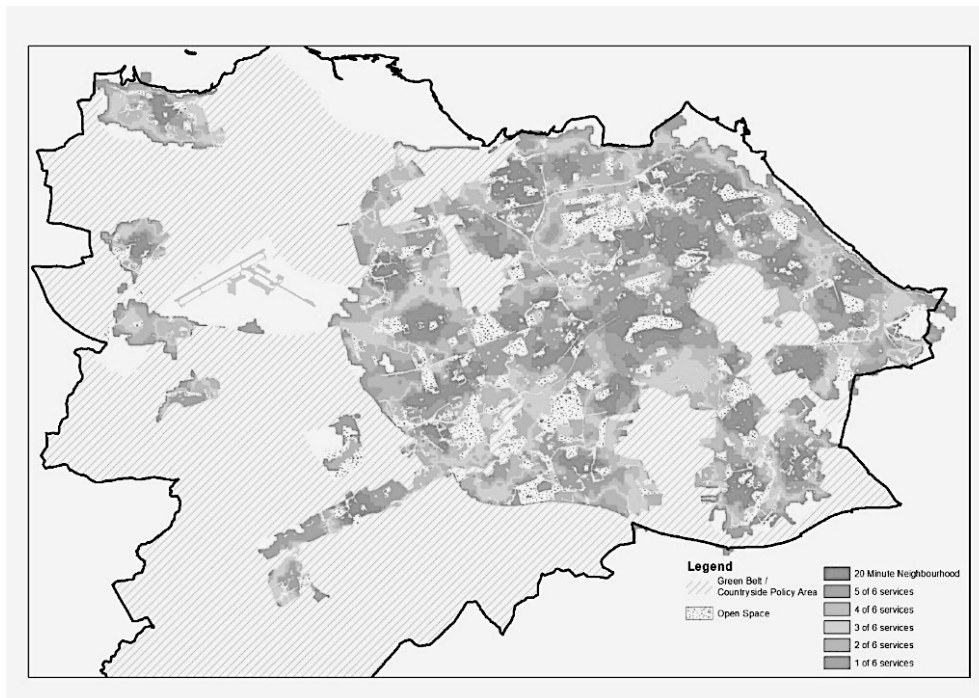
By reflecting on our experiences through this case study, we intend to explore if, when, and how the different iterations outlined in the previous sections are able to be put to work by local government officials; how the different approaches complement and at times contradict one another when applied to a city such as Edinburgh; and discuss the implications this has for the potential to usher in a data-driven approach to '20-minute' urban governance. As the research is a co-produced piece of work alongside City of Edinburgh Council, we do not draw on direct quotes from participants here to illustrate the points being made but, instead, reflect more broadly on how the ideas discussed above have been taken up in the city through the research project.

**20-minute Edinburgh**

Service distribution and accessibility are key elements of the 20-minute concept. The inevitable first step towards embracing the 20-minute concept is therefore an evaluative exercise to better understand the distribution of key services across the city. Prior to the initiation of the collaborative research involving the University and the City, council officers in the GIS department had begun to develop a city-scale heatmap (figure 2 below) to act as a baseline from which to think about current and future geographies of service delivery across Edinburgh. Also pre-dating the formalised adoption of the 20-minute idea by the City of Edinburgh Council, the development of this heatmap took on a somewhat experimental form, with officers themselves deciding on what might ultimately come to be deemed a 'key' service, for which all residents can expect to reach within a certain amount of walking time. These two variables: how long a 20-minute walk actually *is*, and the services which should be rendered as important enough to be accessible for all within this time would come to pose challenges both for the research project's adopted methodologies and for any strategic policy agendas that seek to build upon it.

The six selected key services to use in running this initial analysis of Edinburgh's status as a 20-minute city were: a health centre (general practitioner); a pharmacy; a food shop; a public library; a play park; and a primary school. As figure 1 demonstrates, mapping the spread of these services across the city-space shows Edinburgh to have relatively high levels of accessibility with large swathes of the city living in close proximity to these 6 services. For Edinburgh, then, this heatmap became as much an important device for illustrating where the status quo is preforming well as one for identifying parts of the city that are underperforming with regards to the idea of being a 20-minute' city. Indeed, despite starting life as an experimental mapping exercise in the backrooms of the council's GIS department, the heatmap has subsequently made its way into the City Mobility Plan and City Plan 2030. Given that these visions take the form of long-term strategy documents, the issue of how the 20-minute city concept might be drawn upon in the short and medium term remains an important question.

Figure 1. The council's heatmap indicating access to key services. This was created by applying 'as the crow flies' buffer zones around locations of a particular service, and then overlaying (six of) these service specific maps.   Source: Edinburgh City Council

van der horst D. et al (2021). Edinburgh and the n-minute neighbourhood concept; an exploratory study. Working paper. School of Geosciences, University of Edinburgh



Legend
Green Belt / Countryside Policy Area
Open Space
20 Minute Neighbourhood
5 of 6 services
4 of 6 services
3 of 6 services
2 of 6 services
1 of 6 services

In this vein, as an object for starting conversations and orientating stakeholders to this idea of a '20-minute city', the map raised as many questions about how to do urban governance as it has answered questions about the existing urban morphology. These questions inevitably focused on the issue of which services had been chosen and designated as 'key' and whether 20-minutes meant there and back or one-way (both versions of the map are included in the city's recently adopted City Mobility Strategy 2030). However in response to such questions, concerns were raised by those in the planning team about turning the question of what counts as a 'key' service into something prescriptive. Such a scenario might result in a considerable loss of power on the part of the council when it comes to negotiation with developers and landowners who would be able to point to 'missing' services in different parts of the city as justification for what they were offering. In other words, it is only by keeping the question of what counts as a 'key' service context dependent and variable, that authority over the future of urban space can be retained by local governments. As highlighted at the outset of this working paper, by becoming too prescriptive about what is and is not included within a 20-minute neighbourhood, and the geographical extremities of this neighbourhood, the very dynamism and 'intermingling' potential of urban space that the 20-miunte idea was spawned out of, becomes curtailed.

The heatmap in figure 1 provides a useful baseline planning tool and is something that through the project we have taken down to the granular level of assigning every building across the city an accessibility 'level' based on the number of key services that can be accessed in a certain period of walking time. When taken down this level of granularity, one area where there has been enthusiasm for the potential of service accessibility mapping to aid local decision making is around housing allocations. By mapping the proximity of services, it becomes conceivable that future home construction might be delivered in a manner that ensures additions to the city's housing stock does not impinge on its 20-minute status by prioritising (re)-development in already serviced areas. This

van der horst D. et al (2021). Edinburgh and the n-minute neighbourhood concept; an exploratory study. Working paper. School of Geosciences, University of Edinburgh

possibility, of course, in no way mitigates the powerful forces of politics and economics that currently shape decision making around approving where new housing developments can be located.

It is also important to recognise that different services will likely have different accessibility requirements across different timescales. For example, while it may be the case that people are willing to walk a 40-minute round trip to visit the dentist once every 6 months, it is unlikely that this length of trip would be one people would take on a daily basis in order to buy groceries. This presents a question of how to weight services based on how often the services are needed. Similarly, its crucial to take into account the quality of the services on offer, for example the price and range of goods available in shops, opening hours and demand. Assessing these factors requires a not only a large number of up-to-date datasets but, importantly, a significant degree of 'ground truthing' including community engagement and consultation. With this in mind analysis such as the 20-minute heat map needs to be balanced with the needs of citizen groups across the different geographies of the city.

## 20-minute Neighbourhoods

One of the challenges of thinking about governance at the city-scale is the diverse and heterogenous set of stakeholders and actors who are involved with shaping the landscape and fabric of urban space. The number of historically and culturally rendered variables at play in shaping urban morphology means that city governments are not in a position to comprehensively operationalise new mandates (such as the 20-minute city idea), from the top down. In contrast to a city-scale evaluation of service proximity and accessibility, the idea of the 20-minute *neighbourhood* engages with this governance challenge head on, prioritising the delivery of densely co-located services in easily accessible locations spread across the city. It does so in two important ways. Firstly, by focusing attention on the areas of urban governance where local councils have most authority and power to intervene. And secondly by thinking through the viability of devolving questions of governance to smaller constituent geographies across the city.

The principal implication of the 20-minute idea is its emphasis on the *neighbourhood* scale and, therefore, the re-orientation of land-use and transportation decision-making away from the city-scale and towards a network of service 'activity centres'. Led by the council's estate management team and drawn upon to re-evaluate *how* service delivery should be coordinated across the city a process is underway in Edinburgh to prioritise attention to key areas where services are either i) already densely present and can be further strengthened with maximum impact; ii) currently lacking in areas where they are most needed; and iii) have unique characteristics by virtue of the city council's unusual portfolio comprising both heavily urbanised as well as rural space. Totalling 19 sites spread across the geography of Edinburgh, these strategic 'focus areas' are made up of: i) 8 historic town centres; ii) 7 areas of recognised disadvantage (according to the Scottish Indices of Multiple Deprivation, SIMD); iii) and 4 'rural centres' located in the city's hinterland but under the authority of the city government. Figure 2 below shows the locations of these places.

6

van der horst D. et al (2021). Edinburgh and the n-minute neighbourhood concept; an exploratory study.  Working paper. School of Geosciences, University of Edinburgh

Figure 2. The council's 19 focus areas for neighbourhood multi-service provision. Source: City of Edinburgh Council
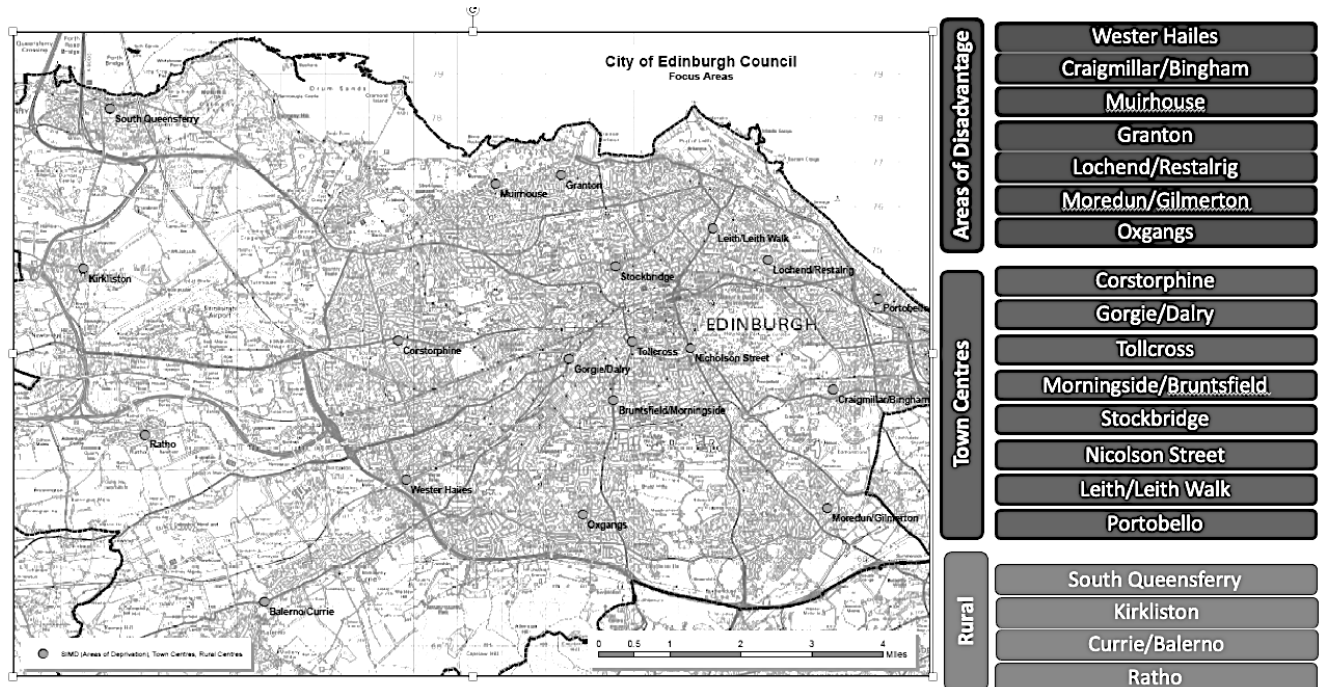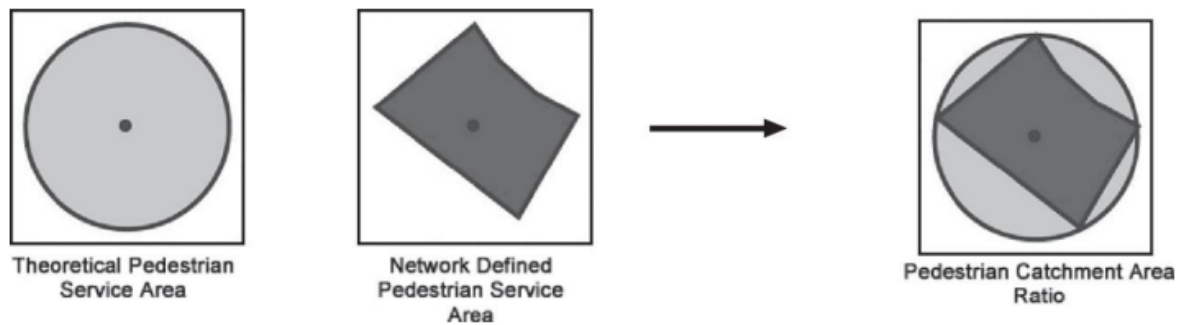


Representing the City of Edinburgh Council's strategy towards the delivery of 20-minute neighbourhoods, the aspiration is to pursue the development of multi-service 'hubs' located within each of these focus areas. Such co-location hubs are becoming an increasingly popular idea across local authorities in Scotland and across the UK. For local councils the co-location of services in one central neighbourhood hub provides a cost-effective method of service delivery as not only does it reduce the cost of utilities and maintenance, but it would allow the council to consolidate its existing assets, prioritising the delivery of densely organised buildings, serviced by well-established and integrates active travel networks- something which is seen as increasingly necessary given current financial pressures.

Having taken the lead in identifying *where* co-located service hubs should be delivered across the city space, attention for both the council and the research team turned towards ensuring that these locations are highly 'walkable', allowing as many citizens as possible residing in the areas immediately surrounding these hubs, to access them. While a great deal of academic research has been done to develop sophisticated means of generating walkability 'indicators', once again the 20-minute idea offers a simplistic means of interpreting this in practice and, in doing so, facilitate comparison at the neighbourhood level (between the different identified hub locations), and even down to the individual building level (with regards to how assets may be managed *within* a particular hub location). This can be done by contrasting the 'theoretical' distance one might be able to travel from a particular location in 10 minutes with the actual distance it is possible to travel using the exiting pedestrian infrastructure network.  Referred to as a 'Neighbourhood Walkability Ratio' (NWR), this is shown below in figure 3.

van der horst D. et al (2021). Edinburgh and the n-minute neighbourhood concept; an exploratory study. Working paper. School of Geosciences, University of Edinburgh

Figure 3. A visual representation of the Neighbourhood Walkability Ratio, i.e. dividing the size of the area you can reach from the centroid while covering distance x along existing roads, by the area you could theoretically reach by covering distance x 'as the crow flies'. (Source: Schlossberg, 2006)



Theoretical Pedestrian Service Area

Network Defined Pedestrian Service Area

Pedestrian Catchment Area Ratio

Starting with the neighbourhood scale, the research developed a means of applying this NWR approach to the 19 identified focus areas across the city. Figure 4 below shows this for the area of 'Corstorphine', located to the West of the city-space in figure 2 above. As shown in the image, an overall 'theoretical' 20-minute walking space is capture by the dark line around the Corstorphine town centre, while the shaded inset illustrates the space from which one can currently access the centre using the existing footpath network. An NWR of 0.667 is the generated for this location and can be used to compare walkability ratios across the different hubs.

van der horst D. et al (2021). Edinburgh and the n-minute neighbourhood concept; an exploratory study. Working paper. School of Geosciences, University of Edinburgh
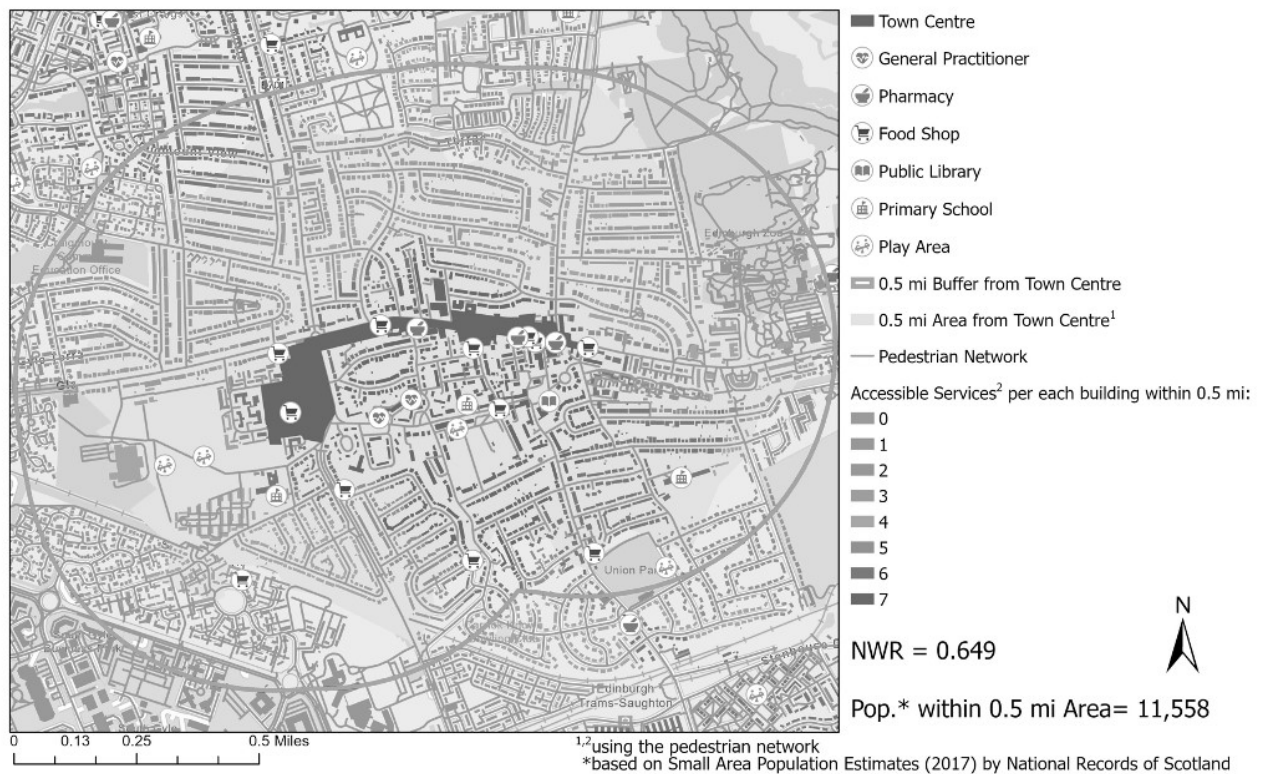
Figure 4. Map of 20 minute walkability around Corstorphine on the west side of Edinburgh, yielding a walkability ratio of 0.667. Rather than using a single centroid (as in figure 3), our GIS analysis used multiple 'town centre access points' around the 'town centre' identified by the council as the focus area for multi service location. (Source: Authors)



.667

While comparison between different areas of the city in terms of relative NWR offers some insight into the viability of these locations as priority service delivery hubs for the city, this alone offers limited insight into how decision making around the governance *of* these new 20-minute neighbourhoods, might make best use of the available data. This is where, upon zooming in to the neighbourhood scale, the application of walkability ratios and service accessibility levels mutually benefit from being brought into conversation with one another, rather than treated as abstract, academic evaluation indicators. By generating a granular, building-level service accessibility heatmap and overlaying the NWR map on top of this (Figure 5), it is possible to identify areas around the proposed focus centres where improvements to the pedestrian infrastructure would result in a greater number of buildings being able to access the town centre and, vice versa, where areas of the city suffering from poor service access levels lie outwith even the theoretical 20-minute catchment areas of these new service delivery hubs.

van der horst D. et al (2021). Edinburgh and the n-minute neighbourhood concept; an exploratory study. Working paper. School of Geosciences, University of Edinburgh

Figure 5: Mapping key service accessibility at the building level in Corstorphine. Source: Authors



Turning attention to the question of governance *within* the different focus area hubs, the addition of demographic information about the number of people living within a 20-minute walk of different builds (accessed by the research team from National Records of Scotland data from 2017) allows for analysis to be undertaken which examines the levels of walkability and accessibility associated with specific buildings. Located in the area of the city directly north of Corstorphine, and therefore beyond the reach of any of the 19 focus areas, the Drumbrae area contains a number of assets owned and operated by City of Edinburgh Council (Table 1). By drawing together indicators of walkability and service accessibility, along with the populations serviced by particular buildings, it becomes possible for the council to not only *identify* those assets that are most difficult to access on the part of the population, but also to *explain* why this is the case, whether it be because the service is isolated from other services (lacking in urban density) or due to inefficiencies in the existing pedestrian network.

For example, while a pattern can be identified which correlates a strong (>0.5) NWR with a high service accessibility level and ultimately with a significant number of people able to access the building in question within 10 minutes, anomalies to this pattern point to potential places where council intervention would be well valued. The example of Clermiston Primary School illustrates how strategic investment in improving the pedestrian infrastructure around this site could potentially grant access to a whole host of services for a much greater number of people.

van der horst D. et al (2021). Edinburgh and the n-minute neighbourhood concept; an exploratory study. Working paper. School of Geosciences, University of Edinburgh

Table 1. How GIS analysis can be used to rate existing council assets in terms of accessibility; current urban morphology (NWR), catchment population and inter-service accessibility. Source: Authors

| Council Asset Name | Neighbourhood Walkability Ratio (NWR) | Number of key services Accessible | Estimated '10-minute' Population Served |
|---|---|---|---|
| Drumbrae Library | 0.53 | 7 | 5313 |
| Drumbrae Care Home | 0.54 | 7 | 4872 |
| Fox Covert R.C. Primary School | 0.37 | 2 | 2648 |
| East Craigs Nursery/Primary School | 0.55 | 7 | 6335 |
| Clermiston Primary School | 0.17 | 6 | 1301 |

Alongside an analysis of each of the 19 town centres, we have also taken a 'deep dive' into the neighbourhood of Granton in the north of Edinburgh to gain a better understanding of the specific characteristics and needs of a neighbourhood. Granton is undergoing significant redevelopment driven by the city's housing shortage and desire to address levels of inequality in the neighbourhood and the surrounding area (City of Edinburgh Council 2021B). The council's ability to take a leading role in this redevelopment, is strongly linked to land ownership; in 2018 the council bought a 66-acre site from the National Grid, and will be adding adjacent sites through Compulsory Purchase Order. Through the development of this site the council plans make the Granton waterfront area a key 'destination' for residents and visitors to the city. An important part of this plan involves the construction of over 450 affordable and mid-market homes (City of Edinburgh Council 2020). For this reason the Council has asked us to take a closer look at this neighbourhood to explore how the 20-minute concept might be used to guide the plans for development. In addition to the opportunities afforded by Granton's status as somewhat of a 'blank slate' redevelopment space, this steer was also based on the fact that Granton is seen as somewhat of a testbed for thinking through how ideas around service co-location (aspired towards across the city as a whole) might be put to work in practice.

**20-minute Edinburghers**

Although the 20-minute data analytics can inform policy at the city level and shape the design of neighbourhood scale redevelopments, citizens' experiences and perspectives are the ultimate litmus test for the success of any intervention measure. In practice, intervention options tend to be constrained (e.g. by finance, competences, ownership of assets, legal rules), whilst public perceptions

van der horst D. et al (2021). Edinburgh and the n-minute neighbourhood concept; an exploratory study.  Working paper. School of Geosciences, University of Edinburgh

and preferences are known to be diverse and dynamic. People may not only have different perspectives on what types of services are essential or what constitutes good access, but they may also have personal preferences that are harmful for themselves and/or for others.

As a consequence, 'success' should not be perceived as a state or end-point but rather as an inclusive process of public and stakeholder engagement and a dynamic alignment of service provision that is feasible and citizens' experiences that are acceptable. Observed behaviour (e.g. travel patterns, footfall) can yield important empirical evidence of the aggregate effectiveness of interventions, but the value of such technical, ex-post monitoring can be hugely improved through active citizen participation in design, data collection and analysis. Ensuring citizen participation that is sufficiently proactive and diverse is an ongoing challenge in democratic governance.

Whilst the practical limitations of our project meant we were not able to engage directly with citizens about the 20-minute idea, our conversations have yielded three observations that are worth sharing.

First of all, whilst our council counterparts were interested in the 20-minute GIS analysis we showed them, they were also willing and able to engage critically with the limitations from a resident perspective. Some expressed concerns about inclusivity, wishing the analysis to be made more sophisticated to account for the mobility needs of particular groups, for example parents with prams or people in a wheelchair. Others asked if we could take account of car traffic, as it slowed down pedestrians or increased their risk of exposure to air pollution and traffic accidents. As our GIS analysts on the video call shared their screen to show the GIS maps, civil servants expressed desire to see their own part of town, and some were happy to express personal preferences with regards to key services. For example, one person pointed out that as someone without children, they would prefer NOT to live close to schools, as these bring the disamenities of noise and car traffic to pick up or drop off the pupils. It made us realise that 20-minute GIS analysis has direct value for people moving home, if it is a dynamic on-line system where they can select the criteria (amenities and disamenities) that are important for them. If such on-line, open access GIS facilities are made available, how does this influence the debate on 20-minute citizens? To what extent would or should '20 minute informed' citizens who have the freedom (financial and otherwise) to make a residence choice, have a say about changes in service provision? Under what kind of conditions could increased residential mobility provide a(n alternative) route to mitigate some of the inequalities arising from the uneven spatial patterns of existing services?

Secondly, it is important to acknowledge the existence of citizen-oriented local urban governance projects running in Edinburgh with input or support from various city stakeholders, including the council. These include both city-level mapping of assets valued by citizens, including many cultural assets that might not feature on the city council's GIS database and community-level mapping of problems, assets and desired improvements (Currie & Correa 2021).

Finally, we noticed an interest from data scientists to develop more sophisticated assessments of accessibility, to bring it closer to the lived experience of residents. These improvements can consist of tailoring the key services (e.g. frequency of use, opportunities for multi-purpose trips), adding more relevant information about the routes (e.g. width, steepness, quality of the surface, amenities and disamenities along the route) and taking account of more dynamic travel factors (e.g. weather conditions, traffic jams, crowdedness, sense of safety after dark). It is beyond the scope of this working paper to explore access modelling in more detail, but in terms of citizen involvement, it may be useful to crudely distinguish between two types of dynamic accessibility models. First of all there are models

van der horst D. et al (2021). Edinburgh and the n-minute neighbourhood concept; an exploratory study. Working paper. School of Geosciences, University of Edinburgh

that are informed by observed behaviour, which can predict aggregate mobility patterns within certain set parameters. Within those parameters that are set by the empirical data, these models can be highly accurate and reliable. They are suited to identify bottlenecks and quantify and rank the expected improvements in aggregate mobility arising from relatively minor and specific infrastructural interventions (e.g. moving a particular key service from location A to location B; building a footbridge at location C). The other type is characterised by a more extensive input of personal preferences. It allows the tailoring of accessibility modelling to reflect the needs and wants of particular individuals and groups. These models have a greater potential for use in citizen engagement and if adopted more widely, they can yield novel insights into potentially conflicting demands for accessibility to services and urban mobility more broadly.

## 3- Discussion

Whilst the underlying ideas are not new, the '20-minute' concept has captured people's imaginations and has the potential to act as a unifying and accessible vision around which to plan holistically and exchange information. Against this backdrop this working paper had two core purposes. Firstly, to broach the existing grey and academic literature on the concept of 10/15/20 minute neighbourhoods and, in doing so, set out a conceptual framework capable of thinking through how this idea is being (and might be in the future) interpreted to offer new insight and tools for urban governance at three different *scales.* Secondly, we have sought to apply this framework to the city of Edinburgh, via an ongoing research collaboration between the University of Edinburgh and the City of Edinburgh Councill, targeting a data-driven approach to the 20-minute concept's application. In doing so the paper has built explicitly on the work of Moreno et al. (2021) and their aspirations for a 'digitalization' of how we bring about 15 and 20-minute 'smart' cities. In this final section we return to this work to reflect both conceptually and practically on how our experiences with the 20-minute concept in the context of Edinburgh helps to further understandings of how (and with what potential challenges and opportunities) it can be transformed from a descriptive ideal used to evaluate urban morphology, to a more concrete set of analytical capabilities, deployed to key datasets, that can aid future decision making on urban design and the management of council assets and infrastructures of service provision.

**Urban Governance in the Data-Driven Era**

Perhaps *the* most important takeaway from the analysis carried out as part of our research alongside the City of Edinburgh is that questions of walkability, of accessibility, and of demography must be used alongside one another, drawn together to illuminate not only the parts of the city that perform well as 20-minute neighbourhoods and the parts that do not, but to shed further light on how this might be addressed within the existing capacity of local governments to shape the development of urban spaces. Using Moreno et al's (2021) associated terminology, priority themes of 'proximity', 'density' and 'diversity' go hand in hand with one another, and it is the role of the fourth element of their framework -digitalization- to act as the glue which can hold these other aspirational characteristics together by illuminating where the city is at today and how decision making might take it on a different path to the future.

In particular the process of digitalization has been useful when identifying areas where pedestrian infrastructure upgrades would have the most 'impact'- i.e. improving accessibility in those parts of the city that are currently not within the walkable catchment area of the 19 focus centres. The limited service provision may well encourage a higher level of car use by those who have cars. This might lead to more social inequality, especially between those who don't have cars and thus have to walk, cycle

van der horst D. et al (2021). Edinburgh and the n-minute neighbourhood concept; an exploratory study.  Working paper. School of Geosciences, University of Edinburgh

or use public transport, and those who have cars and are using them more to drive in the city to reach key services. By identifying these areas of the city, this analysis helps to inform council decision-making about sufficient, equitable and car-free access to services across urban space.

Identifying and subsequently targeting areas such as Ravelston, offers the potential to reduce car dependency thus creating safer streets and lowering air pollution which has detrimental impacts on human and environmental health (Turner et al 2020; Engemann et al 2019; Chau-Ren 2015). Meanwhile, as some commentators have pointed out, the ability to move about and switch locations is integral to innovation and advancement (Whittle 2020). With this in mind, maintaining affordable, efficient and frequent transport connections between urban neighbourhoods is vital to maintain social and cultural mixing across the city. Lastly, by increasing access to essential, affordable and well-maintained services both within and beyond people's neighbourhoods this concept has the power to build social capital, increase wellbeing and reduce emissions (Stanley 2020; Davern et al 2017; Ambrey 2016; Ward 2016; Forrest & Kearns 2001).

**Collaboration amongst place-based civic actors**

Beyond these concerns, the 20-minute concept must overcome a number of practical challenges. While this idea has captured imaginations, in practice its implementation in unique geographies across the world will not come without challenges, particularly during this uncertain and unstable period. In cities already working with this concept, governments have voiced the need to adapt to support increasing densities and intensity of activity, while also providing for high amenity and social inclusion (Victoria Planning Authority 2020). Perhaps most pressingly questions of funding pose a significant challenge for local authorities across the world, many of who were already facing financial difficulties before the pandemic hit. In England for example the financial impact of COVID-19 on local government is estimated at £10.9 billion (Honeyben 2020).

The 20-minute concept has risen to prominence at a time when the COVID-19 pandemic has meant that the turn to digital technologies has been one of necessity rather than aspiration. A key reflection from the research collaboration presented in this working paper stems from the very uncertainty created by the pandemic. This is the relationship between research and policy practice, represented in this project by stakeholders from the university and from the Council. Relationship building between these two groups undoubtedly benefited from the move to online meetings precipitated by the pandemic as this allowed different combinations of stakeholders to meet more frequently. In part, the organic nature of this relationship was also helped by the lack of clarity about the 20-minute concept on both sides. Although frustrating at times, this lack of direction allowed for more open discussions and presented the opportunity to forge new relations which draw on the respective resource bases of key civic actors within cities to help build up clearer pictures of how the city is used, how this is shifting, and how it could potentially be used in the future.

From a practical perspective there is also the challenge of data collection and standardisation. The assessment, implementation and monitoring of 20-minute neighbourhood requires the collection and standardisation of a plethora of different data sets, from public transit GPS data and area demographics, to environmental quality and the availability of affordable and healthy food. Not only will much of this data come in different formats but it will likely be owned and curated by different council departments, state agencies and the private sector.

**Looking Forward**

van der horst D. et al (2021). Edinburgh and the n-minute neighbourhood concept; an exploratory study. Working paper. School of Geosciences, University of Edinburgh

Although local neighbourhoods have often borne the brunt of funding cuts and changing patterns of work and consumption, made worse by austerity policies after the 2008 financial crash, the shift to working from home and re-orientation to local geographies, catalysed by the COVID-19 pandemic has sparked a renewed interest in the role of local centres in local economies.

Beyond the issue of finance, the challenge of monitoring and reporting has been highlighted by a number of 20-minute city plans which fail to specify what 'access' means and how it is measured (Whitzman 2017). This is challenging given the fact that, as we have explored, different people move around urban space in different ways and at different speeds so what is a 10-minute walk to the shops for one person, might be much longer for someone else. Secondly, the use of GIS comes with the limits of existing spatial data sources, which will often fail to capture key things that are important to citizens, like the perceived quality of the pavement or the surrounding green space, sense of security, relative crowdedness, noise and traffic. Furthermore, it is important to recognise that the term 'essential services' will vary from person to person depending on individual needs. With this in mind however, it's also important to also consider the quality of those services such as the affordability of food, environmental quality of green space and the frequency, affordability and perceived convenience of public transport. Furthermore, people will often seek to undertake multi-purpose trips for the sake of time management, or may seek the opposite; longer walks for leisure or health.

Whilst we can see the NMN concept as a generic post-pandemic, low carbon retrofit challenge for existing cities especially in the global north, the practical consequences are yet to emerge, and are likely to vary between cities (e.g. old world vs new world; big cities vs small towns) and across urban space (e.g. city centre versus suburbia). It remains to be seen to what extent the 20-minute concept can work its way into the more granular aspects of urban governance in Edinburgh and elsewhere, e.g. decision making on housing development sites, where to prioritise upgrades to the active travel network, how to best utilise existing council assets. What we can be sure of, however, is that the ultimate delivery of 20-minute neighbourhoods and the benefits that can be obtained through the embracing of a digitalization of the urban landscape, will require a concerted effort on the part of local government and the active participation of its citizens.

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