Smart Cities and Behavioural Change: (un)sustainable mobilities in the neo-liberal city

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Abstract

The smart cities agenda has garnered considerable interest recently as the spread of mobile technologies and notions of 'big data' have opened possibilities for promoting greater efficiencies in urban metabolisms. This has been particularly prominent in the realm of environmental sustainability, where smart technologies have been viewed as a way of reducing traffic congestion and delivering energy efficiencies. Key to these aspirations is the way in which technologies are seen to interact with human behaviour and how digital technologies can promote behavioural change through the provision of 'better' information. However, smart city programmes adopt a particular intellectual and pragmatic framing of behavioural change that we argue is fundamentally narrow and unambitious, raising concerns about how behavioural science is mobilised, by whom and its potential to promote sustainable urban futures. First, we propose that the focus in smart city narratives on quantitative data and insights from 'big data' is methodologically narrow and is representative of a highly individualised, libertarian paternalist perspective that privileges rationalistic and atomised understandings of behaviour. Second, we argue that the logic of smart cities leads city governments towards a focus on superficial change and the language of 'encouraging' shifts in individual behaviour that presents a distraction from the urgent need to reconfigure city infrastructures for low carbon forms of living. Third, we explore how such behavioural change approaches are fundamentally didactic and often lapse into assuming that publics are the passive receivers of 'smarter' information rather than active citizens who can question, campaign and present alternative visions to those of corporate-government interests. In this way, we argue that the suffusing of the smart cities and behavioural change agendas act as a neo-liberal distraction to the ways in which cities can develop to support the priorities of human and ecological wellbeing.

Key words: Smart cities; mobilities; climate change; behaviour change

1. **Introduction**

Thomas More's (1516) *Utopia* still has a great deal to offer as a cautionary lesson for how society is organised. His detailed description of a mythical island presents a highly regulated, rationalised and ordered society that prioritised efficiency and production. Settlements of 6000 people were envisaged, with household units of between 10 and 16 persons and a hierarchical governing system for every 30 households. 450 years later, the regulated ordering of Modernist architecture brought similar principles to bear on post-war housing developments in the UK, where research on human behaviour attempted to design housing estates and whole cities along the lines of efficiency and rational choice (Bullock 2002; Grindrod, 2013). As a Central Office of Information film (COI, 1946) proclaimed about *New Towns* in the UK:

> "Our town was going to be a good place to work in, and a grand place to live in, with plenty of open spaces; parks, and playing fields where people could enjoy them, flower gardens, and of course there'd have to be an attractive town centre too, with plenty of room for folks to meet. Good shops, a posh theatre, cinemas, a concert hall, and a civic centre" (COI, 1946).

Once again, in the 21st Century, we are now witnessing another attempt to deploy a particular kind of model for urban development. However, this model is not prescriptive about settlement size or family routine, but rather it is founded on the neo-liberal assumption that cities can and should be made more 'efficient' through the utilisation of so-called big data and urban analytics:

> "The premise of a smart city is that by having the right information at the right time, citizens, service providers and city government alike will be able to make better decisions that result in increased quality of life for urban residents and the overall sustainability of the city" (Khansari et al. (2013, p. 46).

Through these kinds of visions, the language of solutions is invoked by city-based promoters of smart urbanism in aspiring to such goals as 'energy independence' and 'zero congestion' (Exeter City Futures, 2017). The way to achieve these goals is through a particular kind of engagement with science that privileges certain kinds of data and 'insight'. As CityScience (2017) argues: "In a world awash with data, insight is the only thing that matters. Clear, independent, trusted science". Moreover,

this science prescribes a particular way of working with publics in cities that prioritises expert-led approaches:

"The science of cities will enable improved perception, better prediction, superior risk management and enhanced decision-making" (CityScience, 2017).

Accordingly, the kinds of methods and tools for delivering congestion free cities, and smart uses of energy and water, are grounded in the interaction between technologies and human behaviour, with the assumption being that greater levels of integration, predictive modelling and behavioural insights will lead to better decision making and shifts in transport, energy and water use. In this paper, we challenge the logic of the smart city specifically through the lens of behavioural change, using urban mobility as an example. We develop three arguments that challenge the current formation of behavioural change narratives for the smart cities agenda. First, we propose that the focus in smart city narratives solely on quantitative data and insights from 'big data' is methodologically narrow and is representative of a highly individualised, libertarian paternalist (Jones *et al*., 2011a) view of both society and human behaviour. In other words, smart city advocates have an epistemological view that privileges rationalistic and atomised understandings of behaviour, rather than the historically contingent, shared and dynamic nature of social practices (Cass and Faulconbridge, 2016; Shove *et al*., 2012). In so doing, we argue that fundamental questions about how practices form, are shaped and how they could be changed in urban settings are avoided. Second, we suggest that the smart cities agenda is a distraction from the urgent need to reconfigure cities for low carbon forms of living, of which mobility is a particularly major challenge (Barr, 2018; Banister; 2011; Schwanen *et al*., 2012). We argue that the logic of smart cities leads city governments towards a focus on superficial change and the language of 'encouraging' shifts in behaviour, whereas there are deep-seated infrastructural and cultural narratives concerning mobility that need to be addressed before large-scale change can be realised. Third, smart city approaches are fundamentally didactic when it comes to research and engaging publics (Cardullo and Kitchin, 2019; Kitchin, 2019; Kitchin *et al*., 2019). There is often a lapse into assuming that publics are the passive receivers of 'smarter' information (Hollands, 2015). Yet we suggest that discussions on environmental sustainability and the role of behaviour ought to be transparent, democratic and recognise the broad scope of changes required to achieve sustainable mobility. In particular, we challenge the

instrumentalism that underlies many behavioural change campaigns that, through their incremental and short-term nature, avoid questions of how reducing carbon emissions from personal mobility open up opportunities for re-making cities that are focused on human and ecological wellbeing, as places of dwelling and sociability.

The paper is structured in the following way. We first explore the logics and existing critiques of smart cities, through examining literatures within human geography and social science that have pointed to some of the challenges of this emergent agenda. Specifically, we identify three key attributes of behavioural change and the smart cities agenda that we wish to challenge, namely the focus on particular kinds of data and rational decision making; the political agenda of atomising publics; and the narrow framing of engaging publics in smart city developments. Second, the paper develops these ideas through the use of data gathered as part of a project on Engaged Smart Transport in South West England, where we expose the ways in which alternative framings of behaviour and engagement can develop wider notions of smart mobility. Finally, we end the paper with a call to researchers to re-conceptualise the role of behavioural change in urban development, through focusing on how cities can evolve structurally and politically to support mobility practices that sustain ecological and human wellbeing.

2.   Being smart: technological utopianism in an age of climate change

Smart cities, as a concept, might be said to be emblematic of two converging ideas in urban and sustainability policy. On the one hand, the concept has much to do with the broad sweep of neo-liberalising sustainability policy that has been at the heart of sustainable development since its formalisation in the form of *Agenda 21* (United Nations, 1992). Despite vigorous debate in the literature (Robinson; 2004; Hollands, 2015), most urban policy for sustainability has followed a techno-centric path for pursuing environmental sustainability (Kotsilia *et al*., 2020), in the form of grandiose eco-city developments (e.g. Masdar in the United Arab Emirates) or the utilisation of smart technologies for delivering greater urban efficiencies. These have included smart meters (Bickerstaff and Hinton, 2013), networked heating controls (Kleiminger *et al*., 2014) and the broader range of technologies for efficiently sorting, collating and recycling of wastes (Fujii *et al*., 2014). In this way it is argued that cities can continue to grow, to be economically productive and overcome the limits to economic growth

that might be imposed by resource scarcity or pollution. As noted by Robinson (2004) this vision of sustainability is fundamentally techno-centric and tends to be focused on the maintenance of the political status quo rather than envisioning a different kind of sustainability:

> "The concern here is that sustainable development is seen as reformist, but it mostly avoids questions of power, exploitation, even redistribution. The need for more fundamental social and political change is simply ignored. Instead, critics argue, proponents of sustainable development offer an incrementalist agenda that does not challenge any existing entrenched powers or privileges" (Robinson, 2004, 376).

This analysis of sustainability connects well with the second key agenda underpinning the smart cities concept, which has emerged out of a neo-liberalisation of urban policy since the 1980's in which private investment, grand infrastructure projects and the city as an entrepreneurial space for (consumer-focused) innovation has flourished (Hamnett, 2005; Pacione, 2009). Most importantly, smart cities as a concept has been made knowable through the lens of two key drivers of policy: modelling cities through data analytics and the use of the Rational Actor Paradigm (Renn *et al*., 2000). The modelling of urban metabolism is a recurrent topic in fields such as transport geography (Rodrigue, 2013), but the growth of computing power to run complex models that harness the power of data has generated both academic and commercial interest in the potential for integrating large bodies of data to accurately model urban energy systems, transport flows and resource demand. Such models are, so it is claimed, potentially useful in making cities more efficient and therefore more economically productive (Angelidou, 2014).

Such efficiencies are, however, only realised through a particular kind of interaction between data and individuals who make rational decisions about how and when to travel, to consume energy and use water (Khansari *et al*., 2013). The smart cities concept is therefore founded on there being a reliable and predictable relationship between individuals and the cues they may receive from information sources. The logic proceeds thus: if the integration of data sources and knowledge on human behaviour can be harnessed, powerful algorithms can be created that can be used to supply more and better information to intervene in behavioural decision making and therefore influence individual action. Changing such actions will result in more efficient decisions, which will enable cities to become more competitive and economically efficient. In this paper we challenge this seemingly compelling logic of

smart city behavioural interventions through three analytical lenses. First, we contest the underpinning epistemological and methodological assumptions of how 'data' are defined and used within a rational actor framework. Second, we highlight the atomised nature of smart behavioural change, which yearns for individuals to be rationalised and made efficient through 'correct' decision making. Third, we explore how the smart cities agenda stifles citizen-led behavioural change through prescriptive, unambitious and democratically narrow visions of the urban.

Data and rational action

To begin with, many smart city initiatives that involve a behavioural component present an underpinning epistemological flaw that privileges forms of so-called 'hard' data, 'everyware' and rational action over the role of broadly conceived forms of data, and subjective and collective forms of activism (Evans, 2016; Kitchin, 2013; 2016). There are two issues of concern here. The first is specific to the smart cities agenda, which has much to do with its origins in the fields of computer science, engineering and mathematics. Much of the literature on smart cities is exemplified by the concept of the city as an assemblage of definable, measurable and modifiable units and systems, which might be technical or human in nature. Utilising the underpinning logic of logical positivism, the city becomes diagnosed and standardised through the development of models and algorithms that can manage energy, transport and other forms of public service (Angelidou, 2014). Most importantly, diagnosis can be turned into cure through the manipulation of factors (Shove, 2010), the success of which can be evaluated and refined. Accordingly, current incarnations of the smart city make quantitative manifestations of behaviour a key requirement.

A second issue is broader and has to do with the privileging of the so-called Rational Actor Paradigm (RAP) (Renn *et al*., 2000) that underpins the political enthusiasm for smart cities. Here we encounter the promise of being able to insert logic and reason into the ways that cities work (City Science, 2021). Theories of rational action have long been the subject of critique by geographers (e.g. Barnes and Sheppard, 1992), but it is worth noting how powerful the basic properties of the Rational Actor Paradigm are in relation to smart city behaviour goals. As Renn *et al*. (2000) highlighted, the RAP is based on an understanding that individuals seek to individually pursue self-chosen goals based

on rational selection; they can distinguish between means and ends; they seek to maximise utility through their decisions; and they can use knowledge to make decisions, all of which can be predicted if personal goals and preferences are understood. The pervasiveness of theories of rational action and choice has occurred not only in disciplines like economics (Renn *et al*., 2000), but has also been used as the basis for developing tools and techniques for developing extensions and modifications to rational choice within the field of social psychology (Slovic, 2000). Specifically, the logic of being able to model, predict and modify behaviour is demonstrated through the interest in and power associated with travel behaviour studies, which have deployed the logic of prediction in efforts to understand and modify travel behaviour (Lanzini and Khan, 2017).

The appeal of rational choice approaches therefore lies in the possibility and the apparent certainty that human behaviour can be modified in urban contexts through reason, logic and the provision of information. Indeed, a preference for quantitative measures of evidence that can be numerically manipulated and made directly comparable across contexts makes such approaches potentially marketable. In this way, human behaviour in the urban is simplified, literally codified and rendered knowable through analyses of systems and services. As such, measures of success relate to particular kinds of pre-determined outcomes, such as changes in energy use or traffic flows. The measure of success for the city therefore becomes about the management of resources and the savings these can accrue.

Atomising the smart city

Related to the basic assumptions of the Rational Actor Paradigm is a second concern for us, which is the critical role that the individual (as an atomised 'decision maker') has to play and the efforts that have been made to personalise the urban through behavioural efficiency. However, the smart cities agenda has introduced a particular form of atomisation through the ways in which individuals connect and may be controlled by technologies (Lehofer *et al*., 2016). From household smart meters, to networked central heating controls to personal travel apps, there is a move towards a hybridised form of human decision making that begins to blur the boundary between human agency and technological control (Stern, 2011). Technologies here are very much deployed for managing resources efficiently

(based on understandings of human decision making), whilst still maintaining levels of consumption, comfort, perceived cleanliness and personal mobility. As such individuals make self-maximising decisions based on knowledge and technological manipulation provided by the purveyors of smart cities. In this way, the behavioural change agenda in smart cities invokes a curious but pervasive narrative of paternalistic governance (Jones *et al*., 2011b; 2014) that has become established over the last 20 years and which we argue needs to be challenged if we are to empower people to make meaningful choices about urban life and sustainability.

Here choice as it is currently framed lies within the purview of a narrow 'citizen-consumer' framework (Clarke *et al*., 2007), in which citizenship characteristics are mobilised through the lens of personal responsibility for delivering particular policy outcomes (e.g. carbon reductions from transport and travel). Johnston (2008) refers to this framing of citizenship as fundamentally passive, neglecting other characteristics that could lead to broader, creative and more radical approaches for achieving environmental sustainability. Instead, citizenship *as responsibility* is used as a means by which to encourage individuals to adopt specific behaviours that relate to particular policy goals (House of Lords, 2011). As noted by Clarke *et al*. (2007), individual responsibilities are framed within framework of consumer choice, an important component of a neo-liberal approach to behavioural change that views regulation and restriction of choice with suspicion (Barr and Prillwitz, 2014). Rather:

> "[through]…using the new sciences of choice from psychology, economics and the neurosciences – as well as appealing to an improved understanding of decision-making and behaviour change – a libertarian paternalist mode of governing is being promoted in the UK (Jones *et al*., 2011a, p. 15).

Within libertarian paternalism, the state, commercial organisations and local authorities can both design a vision of the efficient city and prescribe the behaviours that individuals need to adopt to make this a reality. As such, behavioural change becomes much more about selling a message and manipulating outcomes, rather than an engaged conversation about the future of urban sustainability. This means that what's required are innovative forms of behavioural science (Jones *et al*., 2013; Whitehead *et al*., 2011b) to 'nudge' individuals in the 'right' direction (Thaler and Sunstein, 2008). The success of such approaches is attested to by the investment in behavioural sciences within central

government (Behavioural Insights Team, 2017) and the ways in which many academic researchers have joined in undertaking research directly on behavioural change (see the debate in *Environment and Planning A*: Shove, 2010; 2011a; 2011b; Whitmarsh and O'Neill, 2011; Wilson and Chatterton, 2011)). This has involved the use of behavioural economics theories such as nudge (Thaler and Sunstein, 2008), in which choice architectures are modified to achieve shifts in behaviours alongside social marketing (Andreasaen, 2008; French *et al*., 2009), which applies the theory of commercial marketing to promote social and environmental goals (Peattie and Peattie, 2009).

The underpinning logic of nudge and social marketing approaches, aimed at individuals, is that behaviours can be easily and measurably modified to suit particular policy goals, making the citizens of smart cities passive consumers of prescriptive knowledges (Gabrys, 2014; Vitanen and Kingston, 2014). Yet there is a growing evidence base in the social sciences which suggests individualised forms of behavioural understanding overlook the role of wider social practices (Reckwitz, 1992) in shaping the ways in which energy use, water consumption and mobilities develop in urban environments (Shove and Walker, 2014). Here the focus of attention is not on the individual, but rather the practice, such as the practices of showering, satisfying thermal comfort using central heating, or commuting to work (Spaargaren and Mol, 2008; Verbeek and Mommaas, 2008). The argument is that such practices are both historically embedded (perhaps even chronic) and dynamically shifting (Shove *et al*., 2012), being governed and performed through complex assemblages of infrastructure, architecture, technology, aesthetics and the individual (Kennedy *et al*., 2015) . Indeed, such practices frequently have a corporeal element, enacted through shared daily and routinized performances of movement and interaction with technologies (Adey, 2010; Cresswell and Merriman, 2011; Spinney, 2009; Urry, 2007). As such, the question of why, for example, an individual travels to work by car using a certain route and time would be approached from the perspective of how the practice and performance of commuting has emerged over time; how private motor transport has become privileged through forms of infrastructural investment, urban prioritisation, aesthetic appeal and commercial marketing; and why the logics of speed, efficiency, immediacy and flexibility are so valued in neo-liberal economies (Rajan, 2006). In other words, we argue here that to focus solely on the individual and their responses to and perception of certain external nudges is to ignore the over-arching architectures of choice that form assemblages

which govern certain types of (environmentally and socially damaging) practice and the corporeality of their performance.

Manipulating change

A third concern for us is to highlight that much of the scholarship and policy-focused research on behavioural change is predicated on the underpinning logic of trying to change individual behaviours through a process of what Rose and Miller (1992) termed 'governing at a distance'. Indeed, the ways in which this kind of vision can be achieved have been questioned from an ethical standpoint (House of Lords, 2011; Kitchin, 2016; Nurock *et al*., 2021) in terms of the openness of institutions in attempting to manipulate behaviours (Hollands, 2015; Söderström *et al.*, 2014). Indeed, we argue here that this pressing issue connects to the ways in which narrowly conceived views of behavioural change and an apparent ignorance of social practices leads to restricted, hierarchical and centralised discussions of urban futures (Banister, 2008; Marsden *et al*., 2014). Here we suggest that forms of neo-liberal city governance are being invoked to present a vision of cities that is both hyper-technical and technologically utopian. Moreover, the trend for using cities as sites for designer-led technological experimentation leads to questions about the ethics of using citizens in experimental urbanism (Bulkeley and Broto, 2013), something which Cugurullo (2021) refers to a *Frankenstein Urbanism*. In this way, forms of entrepreneurialism are promoted for innovating to provide urban 'solutions' (CityScience, 2017) that can make places more efficient, competitive and wealthier. Indeed, the iconography of such places is cast in a hyper-technical form, through neatly regulated blocks, flows, route-ways and seamless mobilities. Through this process, models of urban innovation, efficiency and productivity can be derived and made portable without regard to place (Kitchen, 2015; Hollands, 2015).

Our concern is that this vision is both highly value laden and also accords to one that is neither embedded in place nor democratically accountable to place (Cardullo et al., 2019; Glasmeier and Christopherson, 2015). There are two issues here. First, smart city programmes are often about the development and commercialisation of models of networks, flows and systems that can be packaged and sold as products to different places. As such, these products are not in place or in context (Glasmeier and Christopherson, 2015). Second, smart city visions are largely the ideas of technological utopians,

who hold a particular set of values about how places work, what they are for and what they might become (Khansari *et al*., 2013). Accordingly, such visions have clearly emerged from a particular kind of framing of the city and critically sustainability where the focus seems to be on how technologies can help humans become more efficient users of urban infrastructures, resources and products (for example, through the use of shared space: Dias *et al*., 2017; 2018). Our argument in this paper is not to assert that technology has no role in urban futures, but rather that individualised and passively accepted forms of behavioural change (such as nudging) have been cast as the means of delivering a particular vision of the urban; one that is atomised, passive and manipulable. This raises pertinent ethical questions about the role of technology and artificial intelligence in governing behaviours (Nurock *et al*., 2021). Indeed, there is a wider connection to recent research by geographers that has demonstrated how smart city programmes adopt particular formulations of citizen engagement that are frequently paternalist, instrumental and focused on short-term pragmatism, avoiding questions of social justice, citizenship and the common good (Cardullo and Kitchin, 2019a; 2019b; Cardullo *et al*., 2019; D'Ignazio *et al*., 2019; Schliva, 2019;). However, our point is that to tackle the challenges posed by personal mobility requires not only a different form of engagement through the lens of smart city programmes, but a recognition that the design and infrastructures of (smart) cities actively re-produce forms of un-sustainable mobility that lock-in practices which are harmful to both the environment and human health. Smart city engagements through behavioural change therefore detract from the need to collectively consider how mobility practices can be developed that sustain long-term human and ecological wellbeing. In short, we need to actively question the ethic of inter-twining technological utopianism with atomised behavioural change as a way of achieving sustainability.

3.   Engaged Smart Transport

The research reported in this paper is based on a set of critical reflections and evidence from a two year Innovate UK funded project on Engaged Smart Transport, undertaken in the city of Exeter, south west England. The project was led by a Japanese data company, NTT Data and the consortium comprised three other businesses from the data analytics sector (Black Swan, Dynniq and Vaisala), along with Exeter City Council and Devon County Council. The University of Exeter provided research in the form

of insights from a large scale survey of commuters in the city and a series of in-depth workshop sessions with participants representative of five key commuter segments.

The project was initiated through an interest by the lead partner, NTT Data, in the ways in which different kinds of data sources (e.g. traffic flow data, weather conditions, public transport statistics and behavioural research) could be integrated to develop approaches for reducing congestion in the city. Exeter is a medium sized city with a population within the city limits of 121,000 (Devon County Council, 2016) and a rapidly growing suburban area to the east and south of the city. As a city still primarily using Roman and Medieval street networks, the city centre and arterial roads can be narrow and there are few opportunities for road widening. Moreover, the expansion of pedestrianised areas of the city centre has led to a progressive 'pushing' of car parking to the outer parts of the centre, along with considerable on street parking. Recently Exeter has been classified as one of the most congested cities in the UK and the ongoing developments on the outskirts of the city are likely to result in increases in traffic volumes for commuting.

The Engaged Smart Transport project aimed to examine if there are ways in which existing and real time data can be integrated with understandings of travel behaviour to promote reductions in personal car use and switches to walking, cycling and public transport. Specifically, the project was concerned with those who commute into or within Exeter for work, school or college/university. In this way, the project was a typical example of conventional smart transport research, with an emphasis on delivering technically-focused interventions. However, a key component of the project from the perspective of the social science researchers, has been to critically reflect on the practice of being engaged with a smart city initiative and also the development of a sustained and ongoing conversation with publics concerning travel experiences, and the ways in which these can challenge and overturn existing assumptions about the role and place of solely technologically focused interventions for changing behaviours. Accordingly, in adopting this critical perspective, our engagement with publics sought not to start with a grand narrative or theoretical device, but rather to explore the performances, experiences and frustrations with daily commuting through shared conversations and open thinking concerning potential changes to not only individual behaviours but changes to the infrastructural, economic and cultural conventions surrounding travel. Nonetheless, we should note that from an ethical

standpoint, as researchers involved in a funded research programme to deliver specific outputs, we also recognise an ethical tension in both having been involved in a smart city research project and seeking to write a critique of the concept. However, we argue that it is our very experience of how such programmes work that has enabled us to reflect on how behavioural change is scripted in smart city programmes and to consider how we might formulate an alternative vision for sustainable places.

The research was undertaken from May 2016 until July 2017 and involved three discrete components. First, a major engagement initiative was launched in early May 2016 to highlight the research and its aims to publics in and around the city of Exeter. In particular, the research team hosted a high profile exhibition stand within Exeter's main shopping centre during the daytime for six days, at which publics were encouraged to hold conversations with the research team and write down ideas for improving transport in the city. This activity led to the second phase of the research, which was a large-scale online survey of commuters, to explore the factors that influence individual commuting behaviours. This survey was widely publicised and resulted in 3,050 responses over a seven week period. Through analysis of the survey data (Dawkins *et al*., 2018), five key commuting groups were identified and become the focus for the third stage of the research, on which this paper will focus, namely those who predominantly commuted by private motor vehicle, public transport, cycling, walking/running and a combination of modes (e.g. park and ride).

The third stage of the research, on which the data and critical reflections in this paper are based, involved an invitation to all participants in the survey to attend one of five workshops, with each one being dedicated to a specific commuter group. The workshops were designed to be fully inter-active, using discussion tables as a focus for exploring broad issues highlighted by the research team on the basis of the survey results. Each session commenced with an ice breaker activity where participants explored the 'best and worst' elements of their commute with a partner. The sessions then focused on four key discussion activities, broadly framed such as: 'Talk through your journey to work and the routes you decide to take' or 'What would improve travel for you in Exeter?' Small groups of 3 to 4 participants made notes and then collaboratively agreed on key issues to report back to the main group. Through plenary sessions at the end of each discussion, more feedback and collective narratives were generated. Each workshop lasted 3 hours and participants were given a financial remuneration of £15.

The ideas from the workshops were coded and cross-cutting narratives were identified that yielded a series of themes that connected to assemblages of mobility practice (e.g. infrastructure, services, employment and social norms). Critically, these assemblages often cut across different forms of mobility, with a dominant theme being the role, purpose and practices of using shared spaces, both in terms of highways and pavements. We use these assemblages to make three points. First, that commuting needs to be understood as a set of practices that necessarily have shared meaning beyond the individual and cognitive scale. Second, that these practices offer an opportunity to re-imagine urban mobility as 'more than individual' assemblages of infrastructure, economic infrastructure and cultures of transport services that can be used to plan for long-term transformations in human and ecological wellbeing. Third, that achieving these long-term transformations necessitates an alternative mode of urban governance that (re)empowers publics and challenges the logic of the atomised, passive and instrumental city.

3.1 Beyond behaviours: uncovering commuting practice

The emergence of the smart cities agenda has certainly accentuated the focus that many policy makers and commercial organisations have had on utilising the notion of Nudge (Thaler and Sunstein, 2008) and insights from psychological research to develop forms of regulating and governing individual behaviour (Jones *et al*., 2013). Many of these are based on the provision of information and the logics of defining specific 'factors' (Shove, 2010) that can be adjusted to promote desired outcomes, such as prompting shifts from private car to bike or bus use. Yet these kinds of atomistic and rationalistic forms of reasoning hide the complexity of mobility practices and how they are narrated. First, there is the illusion that individual 'decision making' is something that can be rationalised, measured and accounted for, providing insight into the purpose of travel and its relative importance. Importantly, individuals are often compelled through survey instruments or interviews to define why they travel in certain ways and to apportion specific decisions to particular reasoning. Articulating mobility is therefore often driven down by researchers to linking behaviour with reason. Yet as the following participant indicates, attempting to 'rationalise' behaviour reveals its complexity:

"I'm flexible because I change the route I go… it kind of depends. If the weather's a bit nicer I'll go by the river and if it's chucking it down with rain I want to get home quicker. Going in is always the same route as you're in a rush to get there – going home via the river is a nicer experience. In summer I go home longer routes, sometimes because I want the exercise, or simply want to go by the food markets along the quay or pop into Southernhay or the supermarket, rather than try to plough up Heavitree Road" (Cyclist, female)

This reveals a critical methodological challenge to researchers adopting a rationalistic framing of behaviour, because we argue that it compels participants to frame, shape and narrate their experiences through the lens of particular categorisations: travelling for work, shopping, school and so on. And this leads to a second, epistemological, challenge that we identify through our data, which demonstrates the dis-connect between individualistic forms of reasoning and the broader framing of mobility as social practice (Verbeek and Mommaas, 2008). We found in particular that attempts to 'bolt down' particular behaviours and determine their origin runs counter to the ways in which mobility has become embroiled into everyday life, such that it becomes implausible to neatly segregate out 'travel decisions':

"So there are no hard and fast rules and many factors to consider, school drop-off, activities after work, fitting in other jobs, availability of our family car, and those all vary on different days" (Walker, female)

Epistemologically, behaviour therefore becomes problematized through both the notion that it is measurable, but more importantly that it is conceptually distinct. Rather, we argue here that the narration of personal travel behaviour is an expression of everyday life politics (Giddens, 1991), comprising shifting practices and the fulfilment of social interaction through movement (Cresswell and Merriman, 2011). In this way, 'the daily commute' is a representation of and corporeal working through of daily life (Spinney, 2010). However, alongside the very practical methodological challenge of trying to tease out rational decision making and the epistemological framing of travel behaviour is a third justification for why the smart cities agenda needs to re-conceptualise behaviour change. This has more to do with the experiential nature of mobility and demonstrating the role that wellbeing can play in framing practice (Spinney, 2009). What follows are two quotations from the workshops, both of which

highlight how mobility needs to framed around the emotional and often tactile experiences of travel, as opposed to the rationalisation of decisions, based on cost, time and distance:

"I love my walk to work. It clears away the cobwebs, puts me in a great mood and sets me up for the day as I enjoy the world around me. I feel the same whether I'm striding out to get some exercise or taking my time. I can't think of anything worse than having to be stuck in a car, fighting with all that traffic" (Walker, male)

"My car is so convenient. I'm in my own space, don't have to talk to anyone, can leave when I want, know a number of different routes so I can change the way I go if I come across unexpected traffic and can listen to the radio. I use the time to I catch up on the news and what's going on in the world" (Car user, female)

Accordingly, moving beyond the narrow prescriptions of behaviour change that have become so characteristic of smart city programmes necessitates a recognition of the methodological and epistemological challenges involved in explicit and quantifiable measures of rational decision making. Rather, mobility is constitutive of social practice, linked to the geographies of everyday life and the emotional and corporeal connections we have through movement.

3.2 Re-imagining urban mobilities

If the smart cities agenda has overlooked the complexity of social practices when seeking to deploy behavioural change as a device for 'solutionising' the city (Morozov, 2013), it is also the case that behavioural change as a policy and political device has also been very narrowly framed. Aligned to the logics of libertarian paternalism (Jones *et al*., 2011a), technological utopians consider that cities can and should be made more efficient through aligning and regulating infrastructures, services and people to reach an optimum outcome (City Science, 2021). What is therefore required are compliant and rational publics who respond to the carefully honed choice architectures of place (Thaler and Sunstein, 2008). Yet such logics raise fundamental questions about what constitutes a choice, who defines it and how cities are becoming shaped and behaviourally moulded by corporate interests (Kitchin, 2015).

However, our research demonstrates that there is both a yearning and creativity for re-imagining urban mobilities through dealing not with behaviour but rather with place; that is, to recognise the

intimate connections that exist between movement and the built environment, and to be able to vision different ways of being mobile that do not become contained by the passification of publics through behaving in an ordered and atomised manner (Johnston, 2008). Indeed, this was an alternative narrative that was manifested in various creative ways by the participants in our workshops. Not surprisingly, one main way to envision a different way of organising mobility was through infrastructural change and the privileging of non-car based transportation:

"It's easy – pedestrianize the centre of the City, widen the cycle lanes along the main routes in, extend the railways and reduce the width of the roadways for cars and lorries. Then have distribution points on the fringes for deliveries and use local sustainable transportation to bring it into the City" (Public transport user, male)

Unlike the proponents of smart cities and those who would prefer to side-step the politically challenging issues of regulation and pricing, workshop participants expressed frustration at the lack of alternatives and dis-investment in public transport, alongside a recognition that other political systems govern mobility differently (and more successfully):

"Even I get fed up with all the cars – need to make it harder for cars, so less parking, higher taxes, raise the costs of using a car, congestion charges, the whole lot – but then you must also make the alternatives feasible. So like other countries do, efficient public services, on time, frequent, friendly – better cycle lanes. The Local Authority needs to invest large and take the plunge – no one's got the nerve unfortunately" (Car user, Male)

However, this and the preceding extract also highlight a wider perspective on how the spatial design of cities ought to facilitate motor vehicle reductions. The workshops demonstrated that there was discontent and frustration at how a city like Exeter had been planned around the car and how this was continuing to be perpetuated through both spatial planning policies (such as suburban expansion without policies to reduce private car use) and the implicit privileging of motor-based, private transport through the design of urban developments. Moreover, there was a sense that streets appeared no longer to be for people, for dwelling and for socialising:

"I'd like to see people, pedestrians, being at the centre of future planning in the City centre. Not even cyclists – they just move too fast and break up the flow for others walking. Or maybe put

an 8 to 10 mile an hour limit so bikes are welcome if they go slowly. But let's make it a place for stopping and chatting and noticing what's going on around us. Sounds divine!" (Walker, female)

The sense that a city re-made for people, for dwellers, provides genuine hope that an alternative to the rationally regulated and competitive city exists. Such hope connects to the viable prospect of 'slowing down' cities and the development of a sustainable mobility paradigm (Banister, 2008; 2011; Marsden *et al.*, 2014) within planning, which privileges place and dwelling (Kunstler, 1998). In this paper, we argue that the smart cities agenda has fundamentally missed the opportunity to explore the renewed interest in the urban to examine how cities can be re-imagined as spaces of low carbon mobility, which promote health and wellbeing (Ogilvie *et al.*, 2010) and that can suppress the need to travel. Moreover, we argue that this is indicative of the corporatisation of city infrastructures, which have in part seen cities become experimental sites (Bulkeley and Broto, 2013) as technologists pursue the agenda of making cities efficient through the perpetuation of individualised forms of mobility and the speeding-up of movement. In contrast, we stress the need for a re-collectivisation of urban imagining and an emphasis on place, as we now go on to explore.

3.3 (Re)empowering mobilities

Our third argument therefore pursues the idea that publics in cities ought to be re-empowered to shape the vision of the places in which they live and the urban mobility futures of those places. This directly challenges the ways in which smart city governance has been deployed through corporate associations between commercial providers and city governments (Hollands, 2015; Kitchin, 2016) and connects with broader narratives in human geography on the governance of smart cities and how processes of technological change and experimentation connect with daily life, materiality and democratic governance (Bulkeley and Broto, 2013; Dowling *et al.*, 2014; Herrschel, 2013; Vitanen and Kingston, 2014). From the perspective of mobility, smart cities agendas are dominated by a deeply embedded hierarchical notion of governance, in which individuals are atomised 'choice makers', be that in motor vehicles or as respondents to information, data and interaction with smart devices, all of which are used to process data to derive a desirable outcome. Our argument here is that this agenda is both

presumptuous (it presumes that 'smartness' is an optimal position) and exclusive (scientific and technical expertise are privileged). Based on these two conditions, the ability for citizens to express alternatives for urban mobility and place making are highly limited. Indeed, Sadik-Khan and Solomonov (2016) have demonstrated that to counter the powerful lobbies governing street space and the ubiquity of the private vehicle requires sustained and collective political action. Yet the benefits for both urban dwelling and diversity of movement stand for themselves, as attested by examples where street space, liveability and diversity have been promoted by local governments (Buehler and Puscher, 2011; Donovan, 2017; Kenworthy, 2006; Medearis and Daseking, 2012; Ryan and Throgmorton, 2003).

The participants in our workshops expressed considerable frustration at the ways in which urban mobility was governed in a rapidly expanding city like Exeter in the UK. This took several forms, but focused on a recognition that the political affordances privileging private motor transport were 'fundamental' in framing mobility practices:

> "The fundamental difficulty that you're up against is that there are places where to provide better cycling infrastructure and proper cycling infrastructure (so segregated lanes on main roads), the only way of doing that is taking space away from motor vehicles… [But] no politician, well, very few politicians are willing to stick their neck out and force that sort of thing through because they know how unpopular it will be. Longer term, society generally would be better off and some of those people sat in the traffic in their cars would then see cycling as a viable option and [would] be able to get out of their cars and therefore lessen the impact of reducing the amount of space; [but] getting over that hurdle, that's – it's like entrenched views in politics and money" (Cyclist, male)

The recognition of the privilege afforded to private vehicle transport through both decision making and the prevailing neo-liberal view that city economies rely on revenue generated from car drivers able to easily access spaces of consumption was vocalised by the flowing participant, who saw the contradiction between the need to reduce carbon emissions to meet climate change targets and the implicit signals being sent by city authorities about the privileging of motor transport through city infrastructure:

"Climate change is a big thing. I don't understand why we have currently got a planning application in to have more car parking. What are we doing? Stop it! Come up with a better way of dealing with this than wanting to have more car parking" (Public transport user, female)

"I want a sign when you come into Exeter that does this: Exeter is a city for people, walking and cycling. Drivers are welcome as guests, not king. It just says as you come in you can come in with your car but you are not king of this space, this is a city for people and just to change the tone on the roads, you are a guest not king. Because every driver thinks it's their space, don't they?" (Cyclist, female)

These extracts illustrate both the inherent contradictions in transport planning for sustainability (Banister, 2008; Marsden *et al*., 2014) and the major dis-connect between the incrementalist and narrowly framed aspirations of nudging, and the infrastructural signals that arise from current city development. However, we argue more fundamentally that these extracts and the experience of most city dwellers is that the smart cities agenda does not offer the change needed to transform urban mobilities. This is because the car still dominates both the political philosophy of city planning, and because conveniently the smart city is founded on an individualised notion of mobility – fast and economically efficient:

"…it's the willpower. If they can spend £10 million on less than a kilometre of road to help people in Exmouth get to Exeter faster to congest our roads, then the thinking mentality is 'we'll just widen the neck of that funnel'" (Cyclist, male)

Challenging the convergence of these two tightly entwined agendas to re-think urban mobility-place connections is a major task and reinforces Sadik-Khan and Solomonov's (2016) assertion that to transform city streets for people is one charged with conflict between corporate visions of the city as a deliverer of economic performance, and those visions which seek to build what Donovan (2017) has articulated as the compassionate city.

4. Discussion: beyond smart behaviourism

Being 'smart' in the current urban political context appears to be seamlessly equated with a series of assumptions and practices that combine technology and experimentation for producing urban metabolic

efficiency (Bullkeley and Broto, 2013; Dias et al., 2017; 2018). Key to this approach is the notion that behavioural change can be enacted, controlled, measured and modelled to produce *better* decision making of individuals (CityScience, 2021). The result of such decisions should be reduced congestion, freer flowing traffic and an informed public, able to use virtual and cognitive devices to make better choices. Moreover, city governments are becoming embroiled with the purveyors of smart city 'solutions' (Kitchin, 2015; Morozov, 2013), such that this particular incarnation of behavioural change is now considered a kind of Holy Grail in tackling long-standing problems like congestion, air pollution and climate change targets (Jones *et al.*, 2014).

In this paper we have challenged the smart city concept specifically through the lens of behavioural change in three ways. First, we have demonstrated the problematics of analysing behavioural change at an atomistic scale. Second, we have illustrated the ways in which smart city prescriptions of behaviour change crowd out questions of planning, infrastructure provision and more ambitious visions of the urban that explore the re-making of cities around a sustainable mobility paradigm. Third, we have explored how dis-empowered public feel in the light of a behavioural change agenda that seeks to 'encourage' change, rather than providing the vision, infrastructure and planning to 'enable' change. In the remainder of the paper, we reflect upon how the limitations of deploying behavioural change mobilised by smart city programmes can be re-framed to promote a broader understanding of mobility practices that are enabled through pursuing human and ecological wellbeing in long-term urban development.

First, we argue for a re-telling of the behavioural narrative that moves away from placing blame on individuals for making the 'wrong' choices. As Shove (2010) has noted, dominant policy narratives have tended to focus on uni-dimensional and rationalistic frameworks of behaviour that seek to frame the 'problem' around poor choices (Pykett *et al.*, 2016; Whitehead *et al.*, 2011). Instead we propose a re-positioning of the behavioural narrative to focus on the ways that policy makers, institutions, businesses and publics frame the architectures of mobility that lead to embedded practices, which often appear to be the result of individual decision making. In other words, what are the networks of politics and influence that produce particular kinds of mobility architecture and how do these come to (re)produce mobility practices that are frequently unsustainable? From an intellectual standpoint, such

a change requires transport researchers to challenge and move beyond the behavioural change narrative that smart city promoters advocate, to appreciate the role of planning, economic development and social networks in the framing of mobility practices (Hopkins and Higham, 2016; Marsden *et al.*, 2014).

A second concern is with how smart city advocates view the scale and ambition of change required to deliver major and necessary changes towards low carbon mobility practices. We argue here that smart city behaviour change programmes are fundamentally unambitious and seek to work within existing frameworks of technocentric development, which focus on sustaining existing practices through technological innovation. Moreover, this has not been a hard strategy to sell to financially strained city governments (Vitanen and Kingston, 2014). However, what it has done is to equate the notion of a smart city with one that perpetuates doctrines of unsustainable planning and the city as a utilitarian site of economic productivity, rather than a place for dwelling, sociability and even beauty. We argue here that our evidence demonstrates the need to radically re-shape cities for a lower-mobility future (Banister, 2011; Schwanen *et al.*, 2012), which will enable spaces of mobility to be reclaimed for multiple uses, not merely the efficient flow of autonomous and de-humanised vehicles (Macmillan and Mackie, 2016). This requires vision-making rather than technical prowess and so our second call is for geographers and planners to provide a space for discussing city futures that support long-term changes in practices, rather than technological futures resting on incremental behaviourism. In pursuing this, an agenda is required that frames sustainable mobility through values of human and ecological wellbeing (Barr, 2018), mobility justice (Scheller, 2018) and the promotion of what Donovan (2017) refers to as the compassionate city. In so doing, city planners need to consider the signals and biases inscribed within the 'hardware, software and orgware' of the urban; in other words, we need to grapple with how we can we provide the design, aesthetics and management of cities that makes them inclusive places that promote physical and emotional wellbeing.

Third, therefore, we find a need to challenge existing governance orthodoxies of behavioural change that are manifest in smart city programmes by also commenting on the ways in which publics are assumed to be the passive consumers of knowledge, insight, new technology and interventions in experimental and smart cities (Soriano *et al.*, 2016). Current formations of behavioural change are very much focused on the delivery of programmes *to* publics who are enlisted in programmes to test

the effectiveness of intervening in certain ways (Cardullo and Kitchin, 2019; Manika *et al.*, 2016). Yet our research demonstrates the desire of publics to break this didactic mould and to go far beyond the confines of the smart city concept as a way of re-visioning urban mobility futures. Accordingly, in addressing what we mean by behavioural change, we not only need to move away from publics as subjects of experiments (Barr and Shaw, 2016; Bulkeley and Broto, 2013; Donovan, 2017), but we also need to wrestle with the urban governance agenda that has become dominated and sometimes driven by technologists, data scientists and corporate interests that are presenting a particular vision of the sustainable city (Cardullo *et al.*, 2019). Through this governance agenda, publics are frequently positioned as atomised agents of delivery, responding to data-driven prompts and calls to engage in reinforcing the smart city visions.

5. Conclusion: the limits of behavioural solutionism

We began this paper with a description of the 16th Century depiction of *Utopia* from Tomas Moore. Five hundred years hence we are witnessing yet another attempt to develop a vision for communities that seeks to deploy rational ordering in how places work and the conduct of behaviours. Through what Morozov (2013) refers to as (the folly of) technological solutionism, city governments and technology corporations claim that challenges such as climate change and environmental pollution can be solved or brought to 'net zero' by the efficiencies, improved decision making and enhanced understanding provided by big data and the algorithms of life such data can produce. This upsurge of interest in smart cities has generated much comment and activity within geography and planning (Cardullo and Kitchin, 2019; Kitchin, 2015). Scholars have come to ask pertinent questions about the role technology can play in achieving more ambitious forms of place-specific sustainability (Glasmeier and Christopherson, 2015), the implications of how cities are working with private companies to promote particular visions of the urban (Vitanen and Kingston, 2014) and the ethics of smart city governance (Hollands, 2015) and experimentation (Bulkeley and Broto, 2013; Nurock, 2021). Pragmatically, geographers are asking how and whether social researchers should work with city governments and private companies pursuing a techno-centric approach to behavioural change (Kitchin, 2013) and are beginning to consider the ways

in which individual citizens are engaged in smart city programmes through what Cardullo and Kitchin (2019) refer to as frequently pragmatic, paternalist and incremental approaches.

In this paper we have sought to specifically examine the particular scripting and role of behavioural change in smart city programmes related to personal mobility and the ways in which this dominant approach frequently jars with both the complexity of mobilities and the opportunities to re-think sustainable mobility as something that promotes long-term, place-based human and ecological wellbeing. We have sought to demonstrate how the reliance of smart city programmes on what we term behavioural solutionism has framed individuals as atomised subjects to be 'encouraged' and entrained into particular forms of behaviour, embroiled within an agenda to make cities more efficient. In contrast to this view, we argue that geographers need to challenge the proponents of smart city behavioural change agendas (technologists, data analysts and city governments) to realise the importance of more ambitious urban futures centred on human and ecological wellbeing and a central role for publics in delivering such futures. Critically, this requires a re-connection between geographers concerned with both behavioural science and theories of social practice (Reid and Ellsworth Krebs, 2018), and those working in urban studies and planning to tackle the 'wicked' intellectual and political challenge of how to make cities sustainable. In turn, this plays to agendas that are simultaneously concerned with both ecological and human wellbeing (Barr, 2018), which recognise that the threat of climate change requires radical shifts in mobility practices and that there is an alternative, compassionate vision of the city that can be pursued (Donovan, 2017). And finally, it necessitates a broader pragmatic engagement by geographers with the task of seeking alternative narratives for urban sustainability to those offered by proponents of the technologically utopian neo-liberal city.

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