

bradscholars

Nudging the capabilities for a sustainable city? When the libertarian paternalist meets the Paretian liberal

Item Type	Book chapter
Authors	Anand, Prathivadi B.
Citation	Anand PB (2024) Nudging the capabilities for a sustainable city? When the libertarian paternalist meets the Paretian liberal. In: Comim F, Anand PB and Fennell S (Eds) Social choice, agency, inclusiveness and capabilities. Cambridge : Cambridge University Press.
Publisher	Cambridge University Press
Rights	(c) 2024 Cambridge University Press. Full-text reproduced in accordance with the publisher's self-archiving policy.
Download date	2026-03-12 10:06:53
Link to Item	http://hdl.handle.net/10454/19821

Advance Author Manuscript

To cite:

Anand PB (2024) Nudging the capabilities for a sustainable city?

When the libertarian paternalist meets the Paretian liberal, pp 85-112 - chapter 5 in Comim F, Anand PB and Fennell S (ed) [*Social Choice, Agency, Inclusiveness, and Capabilities*](#), Cambridge University Press, Cambridge: ISBN 9781009232708

Chapter 5

Nudging the capabilities for a sustainable city?

When the libertarian paternalist meets the Paretian liberal

PB Anand

Abstract

The aim of this chapter is to explore how social choice theory and the capability approach can help in clarifying important ethical dilemmas and issues of injustice that need to be addressed for cities to become sustainable cities. Six types of important injustices are identified covering both intra and inter-generational fairness. Some important criticisms of smart cities are considered and important safeguards and policy priorities for smart cities from the social choice and capability approach framings are identified. The main message of this chapter is that sustainability of cities is an ethical issue and not one of technology or measurement and it is all about the six types of injustices and that cities need to tackle all six of these injustices in their quest to become sustainable. Nudging and smart cities can help but these must be contextualised to priorities participation and equality. Social choice theory as formulated by Amartya Sen provides important insights to understand and deal with conflicts between different demands on freedoms of different individuals.

1. Introduction

Cities offer choices; in general, the larger the city, the greater the range of choices. Thus, in principle, urbanisation (i.e., the increase in the share of the population living in urban areas) and the process of expanding substantive freedoms must go hand in hand. The visionary development economist Sir W Arthur Lewis (1955) foresaw a central role for urban economies in the transformation of societies and in significantly boosting productivity-enhancing jobs. However, this is not universal. For example, we know that as some countries urbanised, their urban poverty also increased significantly, and some countries urbanised without any change in life expectancy at birth of the urban population (Anand,2018).

The UN Sustainable Development Goal 11 (SDG11) focuses on sustainable cities and communities. All SDGs are inter-connected and cities cannot become sustainable unless they become inclusive and equitable especially by taking urgent steps to address gender inequalities (SDG5) and all forms of inequalities (SDG10), conserve water and energy (SDGs 6 and 7), promote innovation for responsible production and consumption (SDG12). Cities have a complex and three-sided relationship with climate change: as significant contributors of greenhouse gases and thus complicit in causing climate change; as important victims of the effects of climate change; and as a source of innovation and public action that can help mobilise global, national and local actions to mitigate climate change. In many cities, the poorest and most disadvantaged people within the cities are the ones who are most vulnerable to climate change impacts, though it is difficult to be precise as vulnerability is contextual and poverty is multi-dimensional. (For some early estimates on the link between urban poverty and climate change see Satterthwaite et al, 2007). Islam and Winkel (2017:5) examined the links between climate change and social inequality within countries using a conceptual framework that connects multi-dimensional inequality to three pathways of climate change effects, namely, "greater exposure to climate hazards"; "greater susceptibility to damages caused by climate hazards"; and "less ability to cope with and recover from the damages caused by climate hazards".

Cities can be great liberators and play an important role in promoting awareness of freedoms, liberty and human rights. The images of Martin Luther King Junior addressing the crowds in Washington DC in August 1963 or the narrative description of the thousands of people that thronged the streets of Cape Town on 11th February 1990 to greet Nelson Mandela at the City Hall in Mandela's *Long Walk to Freedom* (p563) are unforgettable examples of the intimate connection of cities and freedoms. However, these images of cities as cradles of freedom are also contrasted with cities as the theatres of rape, oppression, corruption and obscene wealth inequalities. Inequality in access to education and health entrench existing social inequalities and make them generational inequality-traps. Escaping from such a trap is difficult, rare and

involves opportunism, cleverness, and sheer luck. From Charlie Chaplin's *City Lights* to Raj Kapoor's *Sri 420* to Danny Boyle's *Slumdog Millionaire*, numerous Hollywood and Bollywood films portray such social mobility to be entwined with significant moral dilemmas.

A freedom-centred perspective on cities is about the inherent plurality of the citizens. Different people in the city have different preferences and priorities. Allocating scarce resources of the city to improve infrastructure and public services requires careful attention to the distributional equity and social justice considerations. Therefore, all urban public policy questions require multi-dimensional evaluations and involve some degree of aggregation of preferences. The capability approach helps urban policy analysts to expand the informational space and develop multi-dimensional evaluations. Social choice theory (SCT) can help in understanding the dilemmas and impossibilities of aggregating individual preferences to arrive at socially preferred rankings of alternative projects for public services.

This chapter aims to examine some of the challenges and opportunities in applying social choice theory and the capability approach for urban public policy analysis. Few studies exist on applying social choice theory and the capability approach to urban sustainability issues¹. In the conclusion of an extensive review of Arrow's impossibility theorem for planning process, Sager (1998:136) recommends that: "...further theoretical knowledge of the functions of planning might be drawn from a similar analysis based on Amartya Sen's paradox of the Paretian liberal and other impossibility theorems." This chapter aims to contribute towards bridging this gap but with a greater focus on practical applications. In particular, we want to focus on behavioural dimensions of public policy and critically examine the extent to which nudges can be used in making cities sustainable and what are some of the procedural and moral dilemmas in this context. We take case studies of specific urban challenges and highlight these issues.

2. The elusive quest for an inclusive city: Social choice and the Paretian Liberal in the city

Making a city truly inclusive requires many institutional and policy interventions. While all cities utter the language of participation and inclusion, in reality few cities transform themselves to become 'cities that listen'. Majoritarian rule is an easy (and one may say lazy) solution and a form of local democracy is (incorrectly) considered a pathway to making cities inclusive. There is some confusion here. Drawing from the principles of *justice* by John Rawls (1971), it is possible to set up institutional arrangements to

¹ A search on the Web of Knowledge with the key words "social choice theory" and cities returned seven hits. None of these seven papers used social choice theory as formulated by Amartya Sen.

deliver equality of opportunity for everyone to participate in decisions concerning the allocation of public resources. However, as both Rawls and Sen (2009) have emphasised, equality of opportunity is a necessary element of inclusive institutions but not sufficient in itself to guarantee inclusiveness. The fact that there are so few professors of black and minority ethnicity in the higher education institutions in the UK is a good reminder that equality of opportunity does not translate into equality of outcomes.

In the *Impossibility of a Paretian Liberal*, Amartya Sen (1970) highlighted important dilemmas of social decisions. Suppose that there are at least two different individuals (say 1 and 2) in a city and that they have preferences over some social arrangements such as transport (say x = public transport and y = private vehicle). The condition of unrestricted domain (U) requires that "... every logically possible individual ordering is included in the domain of collective choice rule". Condition P (Pareto principle) requires that if everyone prefers x to y , then that society as a whole should also prefer x to y . Condition L (Liberalism) requires that for each individual citizen, there is at least one preference ordering which the society should accept. (Condition I is about independence of irrelevant alternatives- that is all relevant alternatives are included in the choice sets. In the rest of the chapter, we assume that only options this meet criterion are included in the social choice formulation.)

The impossibility theorem suggests that in a democratic setting, there is no social decision function that meets all three of these conditions simultaneously. In the context of cities, there are numerous situations of social decisions all of which present impossibility. Suppose individual 1 prefers public transport (x) to private vehicle (y) but individual 2 prefers private vehicle (y) over public transport (x). Similar kinds of social ordering issues can be raised with publicly funded schools versus private schooling; publicly funded hospitals to private hospitals and so on. In the case of unrestricted resources, there is no conflict, and it would appear that we can grant both of these choices to the two individuals according to their preference. Let us call this a 'win-win' social choice situation. However, in many cases, allocation of more resources to meeting one citizen's preferences would entail cutting down budget to other projects that are a priority for another citizen. We can call them 'zero-sum' (or 'nosey') social choice situations. Many allocation problems faced by cities are indeed 'zero sum' social choice situations² and

² Think of the meal preferences of passengers on a long-haul flight. Some flyers are vegans while others may be omnivores some of whom may prefer vegan or vegetarian option occasionally (flexitarians). If on a given flight the groundcrew loaded only 20 vegan/vegetarian meals but if the first twenty flexitarians all chose vegan and vegetarian options on that day due to an article they read in the in flight magazine about climate change, our vegan flyers will have to go hungry.

meeting the liberties of one person (or one group) will entail sacrifices of minimal liberties of another person (or other groups).

Let us take a few more examples. Suppose 1 likes to go walking everyday and finds that the city's roads do not have proper pavements or walkable infrastructure for pedestrians (highlighted in Anand, 2018). Citizen 1 would like the city government to invest in pedestrian facilities (x), creating more parks in each neighbourhood (y) and widening the street (z). However, the committed driver that is citizen 2 would prefer the money to be spent on road widening, then perhaps better parks (to which he or she could drive) and thus is least bit concerned about pedestrian facilities ($z > y > x$). Under budget constraints, these choices become 'nosey' and the social choice situation becomes an impossibility.

Another example within the domain of education. Suppose citizen 1 is an adult who did not have a chance to go to high school but now has reached a station in life that their curiosity has been triggered and they want to go to evening school. They would prefer the city government to spend on adult education/ evening classes (x) while they also like better schools for their own children (y). They have little preference for spending on high level scientific research in the University (z). Citizen 2 is a middle class professional and already sends their children to a good quality private school. They would like the local University to maintain its position in the rankings of Universities and thus prefer more research funding (z) and perhaps the remaining money on evening classes (x) so that there is less competition for their own children from other children attending the ill-equipped local schools (y).

A third example is relevant to discussions on the role of city in culture. A group of people (say may be those athletically inclined) would prefer that the city spends the resources to upgrade training facilities and running tracks (x), invest in community gyms and swimming pools (y) than the city spend on repairing the major venue for cultural events (z). Another set of citizens who are aficionados of classical music and opera prefer the city to invest in theatre (z) than on running tracks or gyms. Investing in a theatre might itself advantage certain forms of cultural activities and not others (such as Bollywood dance classes or laughter clubs).

These social choice dilemmas highlight that by nature a city is a battlefield of conflicts of different interests and preferences. Inclusivity here means that the city gives equal value to all freedoms of all individuals, but uses a transparent and consistent approach in imposing restrictions on freedoms where this is justified by the ends. The quest for an inclusive city is elusive for the very reason that such process of sorting social choices from individual freedoms has to be done again and again for every important issue that concerns citizens. By improving the institutions and transparency processes for social choices and their evaluation, the city can strive to become inclusive.

3. An enigma of a sustainable city

The UN (2018) estimated that in 1950, out of just under 3 billion inhabitants on earth, two thirds were in rural areas and the remaining one third were in urban areas. By 2018, there were 4.2 billion people living in urban areas (while 3.4 billion people lived in rural areas). It also estimated that between 2018 and 2050, the world's urban population will increase by a further 2.5 billion people, with nearly a half of this accounted for by just eight countries, namely, India, China, Nigeria, Democratic Republic of the Congo, Pakistan, Indonesia, United States of America and Bangladesh. Thus, as the urban population grew, the recognition that cities are central to realising sustainable development also grew.

The expression 'sustainable cities' has been quite popular (though a bit less popular than green cities) for over two decades, though after 2014, the expression smart cities has become a lot more popular (see Figure 1).

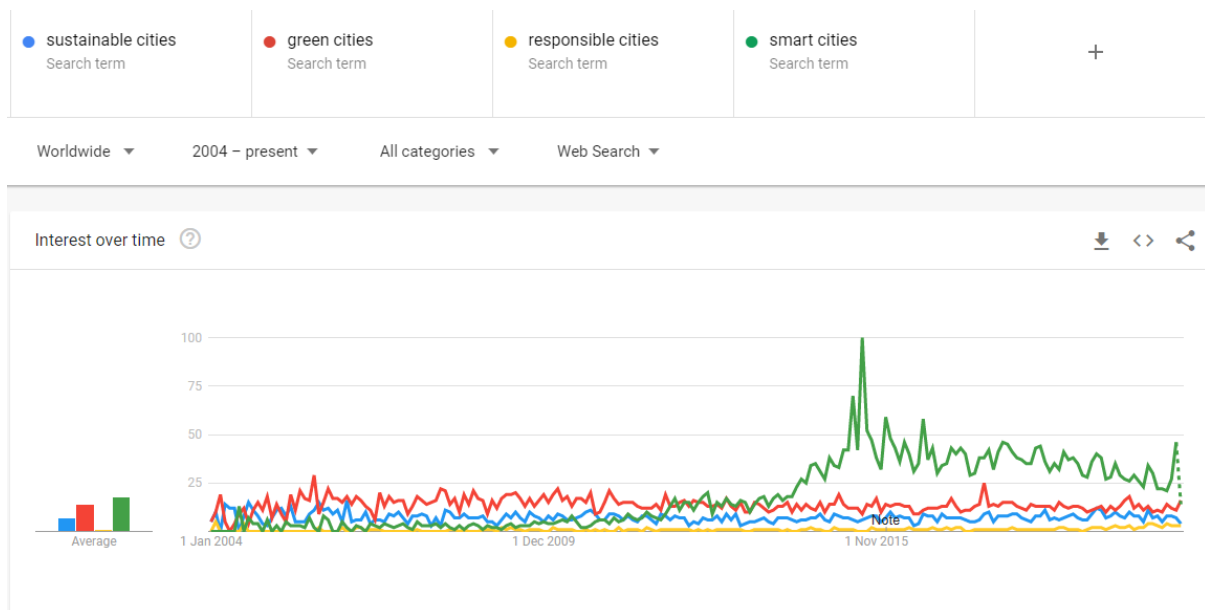


Figure 1: Google Trends – popularity of sustainability cities in Google searches (from January 2004 to April 2021).

For a city to become a sustainable city, the needs of the present generation should be met without imposing an ecological footprint on other communities or compromising the ability of future generations to meet their needs. However, cities do consume a lot of water, energy and other material resources and produce large quantities of waste.

For many cities, the fundamental aspect of sustainability concerns water and food security. Water scarcity is a complex issue and many cities especially in the Global South face chronic shortage of water. In previous publications (Anand, 2007), I have explored in great detail water consumption patterns globally and through various cross-national relationships. We find that even within a city, there are huge variations in the amount of water consumed per person. An entitlements analysis suggests that the urban poor households, typically those living in slums and peri-urban locations tend to have more limited entitlements to water, and thus have a precarious command over their access to water. This is an example of intra-generational inequality that is highlighted by Solow (1993) and Anand and Sen (2000). A campaign urging citizens to save water or reduce their water consumption has no relevance to the urban poor households who already have very limited amount of water. A human right to water is an attractive proposition and many countries have endorsed the UN General Assembly resolution 64/292 of 2010. However, a proclamation of access to water (and sanitation) as a human right does not automatically translate to improved access to water especially for the urban poor households and marginalised individuals (see Anand, 2007). As Sen (2017:347) noted a libertarian approach to justice might accord high priority to rights and liberties but "...even large famines can occur without anyone's libertarian rights being violated".

Data from the Aquastat data portal of the Food and Agriculture Organisation (FAO) suggests that during 2013-17, 183 countries (for which data is available) jointly consumed 475 cubic kilometres (or billion cubic metres BCM) of water for municipal purposes. This works out to approximately 68 cubic metres per person per year or 186 litres of water per capita per day for every one of us on this planet. However, we know that there are huge inequalities in access to freshwater resources. People with municipal access in better organised cities tend to consume more water everyday than people who have to fetch water from communal water points or depend on private water vendors. Thus, power asymmetries impact on social choice. Cities consume large quantities of water often by transfer from distant sources such as rivers, lakes and aquifers. This can raise intra-generational fairness issues let alone inter-generational issues. For example, Chennai city in the Indian state of Tamil Nadu has been facing water scarcity for more than five decades. Arrangements have been made over the years to transfer water from the River Krishna with an inter-state agreement and also from Veeranam lake and so on. Similarly, the Municipal Corporation of Greater Mumbai (MCGM) procures water from various sources including from dams and lakes in the Nasik, Thane and Palghar districts. During summer months, local wells in the villages near Palghar can run dry while water flows without interruption to the distant Mumbai. Similarly, water is transported to Delhi from the distant Tehri dam.

The website of the C40 Cities network estimates on its webpage that cities "... consume over two-thirds of the world's energy and account for more than 70% of global CO₂ emissions". The UN Habitat (2012) estimated a decade ago that cities consumed over 70 per cent of primary energy. The relationship between economic growth in GNI per capita, urbanisation and energy use per capita is rather complex but it appears that pursuit of economic growth can lock in countries to higher energy intensity unless specific steps are taken to decarbonise urbanisation. This requires huge investment in renewable energy and a clear urban energy strategy. Some cities have committed themselves to become net zero Carbon. For example, seven cities including Bistrita, Frankfurt, Manchester, Modena, Tartu, Vilvoorde and Zadar have formed a network to become net zero cities by 2050. Another group of cities have formed a network called the Carbon Neutral Cities Alliance and aim to become carbon neutral in the next ten to twenty years. However, it is not easy to compute a city's CO₂ emissions. There are direct emissions from the city (scope 1) due to energy use by household energy consumption (for heating or cooling, domestic energy use for cooking), transport of passengers and goods, and industry and commercial activities. Then, there are (scope 2) emissions attributable to the city for the electricity it consumes no matter where that electricity was generated. There are also indirect emissions (scope 3) attributable to the consumption in the city even though such emissions occur outside the boundary of the city (whether within the same country or far away in another part of the world). If a city imports meat that is produced in far away Brazil or New Zealand, should we count the CO₂ in the production of that meat as belonging to those countries or should be accounted for at the city where it is being consumed? What about the emissions during the transport of such goods?

To become truly carbon neutral, cities will have to reduce their energy use significantly, switch from fossil fuels to renewables (and export surplus energy), reduce their water and waste footprints significantly, increase their recycling rates significantly, and as far as possible encourage consumption of locally grown produce to reduce emissions in transport. However, global cities are part of international loops and the livelihoods of many poor people in faraway locations who are part of such loops rely on the consumption patterns of cities. If all cities switch overnight to local level looping and start sourcing all materials from local producers, the consequences can be catastrophic for many millions of people producing food and various commodities in many different countries. In the pursuit of carbon neutrality, it should not be forgotten that people living in slums already have very little ecological footprint. In fact, the average CO₂ emissions for cities with slums would appear to be lower than those for comparable cities without slums and such average emission figures hide the considerable inequality within the city (McGee et al 2017).

Calcott and Bull (2007) used the ecological footprint methodology to estimate footprints of 60 cities and found that citizens in the UK have a footprint that ranges from 2.78 global hectares (gha) per capita in New Port and Plymouth and 3.62 gha per capita in Winchester. Kennedy et al (2015) estimated that the 27 largest cities in the world (the mega cities, each with population greater than ten million inhabitants) together accounted for over 9 per cent of global electricity consumption, 10 per cent of gasoline and 13 per cent of solid waste. A World Bank study (Kaza et al, 2018) estimated that 2.01 billion tonnes of municipal solid wastes were generated in 2016 and that per capita waste generation rates were on average about 0.74 kilograms per person per day, but this varies over a wide range from 0.11 kg per person to 4.54 kilograms per person. Typically, citizens in high income countries tend to generate a lot more waste per capita than their counterparts in least developed countries. UN (2010) estimated that 2 million tonnes of human wastes are disposed of in water courses.

Thus, as the world urban population continues to grow, the various environmental impacts of cities will significantly increase in two ways: first there will be more urban residents each contributing to the water, energy and material demands; second the hypothesis of environmental Kuznets curve (EKC) suggests that as economic prosperity grows, the per capita energy and resource consumption rates are likely to increase significantly. Without serious efforts to reduce the environmental and resource impacts of cities, the possibility of making cities sustainable remains a mirage.

However, at first sight, imposing restrictions on citizens and curtailing their freedoms appears to go against the idea of minimal liberties. It appears that to tell someone to spend less time in the shower or to leave their car at home or to use a bit less of their central heating or air conditioning is akin to preventing someone from painting their house pink while everyone else prefers the house to be painted white (an example used in Sen, 1970). Anand and Sen (2000) remind us that:

“...We cannot abuse and plunder our common stock of natural assets and resources leaving the future generations unable to enjoy the opportunities we take for granted today. We cannot use up, contaminate, our environment as we wish, violating the rights and the interests of future generations. The demand of ‘sustainability’ is, in fact, a particular reflection of universality of claims- applied to the future generations vis-à-vis us.”(p2030)

Later in that paper, Anand and Sen ask the question ‘sustaining what’ and emphasise that what needs to be sustained is the “nature of lives that people can lead”. They further remind us that:

“...and the fact that in that sustaining, human agency would be pivotal, does not reduce in any way the significance of human life as an end”.
(p2040)

A central emphasis of the sustainable human development approach is to empower citizens to make choices that recognise this universalism of claims of present and future generations. Deliberative public reasoning may be one of the ways through which important decisions on responsible consumption may be made. I have discussed some criticisms of applying the capability approach to sustainable development and how these criticisms can be overcome in Anand (2014). The main criticisms are that the capability approach is not a dynamic concept; that it may be individual centred and therefore it may be difficult to connect an analysis based on capabilities with systemic level of sustainability constraints; and that while the capability approach helps us in recognising multi-dimensional nature of well-being it may not be useful in explaining decision processes. These are surmountable. Building institutions that empower citizens to exercise their full agency can help to overcome most of these criticisms.

Pursuit of sustainability involves moving from less just to more just situations (more just for the future generations or communities impacted by the ecological footprint of cities). However, due to the magnitude of their impacts, cities pose six types of distributional justice or equity issues³ (see table 1). Of these, three (types A, B and C) are within the present generation (hence, intra-generational equity issues) while another three (D, E and F) are inter-generational issues.

Table 1: Six types of injustices or inequalities caused by cities

	Present generation	Future generations
Within the city	Type A: Present inequalities within the city	Type D: Effects of present citizens on future citizens of the city
Beyond the city- but through direct footprints	Type B: Present injustices due to direct impacts on distant communities due to extraction of water, resources and transfer of wastes	Type E: Inter-generational injustices on indigenous people, deforestation effects

³ These can also be framed as impossibilities in the social choice theory as formulated by Amartya Sen. In this chapter, I shall continue to use them as injustices.

Nationally or globally through extended and indirect footprints	Type C: Present injustices due to indirect impacts and global supply chain effects	Type F: Climate change effects, long term effects due to transfer of hazardous wastes
---	--	---

Source: Author's construction

To some extent, type A inequalities (present inequalities within the city) can be handled through city-wide municipal bodies and planning processes. However, this is not as simple as that. For example, the work of Michael Marmot (2010) has shown that within cities, there can be significant differences in the life expectancy. This has come to be known as 'the social gradient'. I have shown from 2014 data that within the Bradford District, there was a life expectancy gap of nearly 14 years between the residents of inner-city wards such as Manningham as compared with rural Keighley or Ilkley (Anand, 2018). Health inequality reflects the underlying social inequality (IHE, 2020 and Bambra 2016). Social gradients are difficult to estimate for cities in the Global South due to difficulty in getting appropriate data and also that in many cities, the urban poor households are a majority and they live in all locations in the city (with the exception of enclaves of high income neighbourhoods). However, results from Mberu et al (2016) which compare the health outcomes and indicators of slum residents with rural and urban (non-slum) residents in Bangladesh, Egypt, India and Kenya indicate that for almost all health indicators, slum residents fare worse than non-slum urban residents.

Type B inequalities (present injustices due to direct impacts on distant communities) may not be brought to light due to collective action challenges of distant hinterland communities. Think of the difficulty of organising a protest by small farmers in rural Palghar to have their voice heard in Mumbai or of the farmers of distant Tehri to be heard in Delhi.

It is even more difficult to restore injustices of type C (present injustices due to indirect impacts) which are indirect and difficult to trace. Those who cannot be seen cannot be heard. 'Nimbyism' (where nimby stands for 'not in my backyard') contributes to exporting problems to distant locations. A simple example is that of thousands of consumers in the UK and Europe buying cheap clothes made by workers in risky garment factories in places such as Bangladesh. The Rana Plaza fire disaster in April 2013 brought to light the moral dilemmas of consumption decisions that involve global supply chains. That incident has triggered increased attention to corporate social responsibility (CSR) but the problem is not yet fully resolved given that it is difficult to distinguish between real CSR that transforms the core values of a

company and other CSR projects that are mere greenwash. Another example of type C dilemmas can be petroleum that is sourced from conflict locations such as Angola or Libya and used to produce automotive fuels used by consumers in North America or Europe (see Wenar, 2008). Another example concerns plastic wastes. With increased awareness about plastic wastes and their impacts on marine eco-systems, many nations are beginning to take stricter actions aimed at curbing single use plastics and restricting plastic waste imports. In January 2020, Malaysia returned 42 containers of illegal plastic waste to the UK. As more and more consumers care about the environmental impact of their consumption decisions, consumer goods companies such as Unilever are pledging to halve their use of virgin plastic by 2025 and increase the content of post-consumer recycled plastic in their products. Some countries such as Kenya have been early to act by banning single use plastic bags.

An example of type D (effects of present citizens on future citizens) is increased groundwater pumping by today's citizens. Years of such pumping can result in a significant fall in the ground water levels and in some coastal cities this can also lead to saline water ingress. Thus, over consumption of ground water by present citizens can significantly limit the availability of groundwater for future citizens.

An example of type E (inter-generational injustices on indigenous people and deforestation) is the long-term effect of leaching action from solid waste disposal especially through landfill. Wastes exported from consumers in a large city today to landfill locations in the outskirts may continue to leach and affect groundwater and in turn the flora and fauna in the area. For example, there is an infamous waste landfill station near Ghazipur, north of Delhi. Alam et al (2020) noted that due to leachate from the waste site, groundwater in the vicinity of the site is not suitable for domestic or commercial consumption. The WHO (2015) noted that health impacts of landfill sites can include increased incidence of cancer, birth defects and also respiratory diseases. Tomita et al (2020) noted that in South Africa, living within 5 km of waste site was significantly correlated with asthma, tuberculosis, diabetes and depression.

Type F impacts (climate change effects) do not really need elaboration. Current fossil fuel consumption in cities contributes to greenhouse gas emissions and thus increase the risks of climate change effects on future citizens everywhere. Certain climate change impacts are already occurring and in that case they can be included under Type C (present injustices due to indirect effects) in this model.

To be truly sustainable, every city must act on all six of these injustices. However, localism tends to prioritise cities on issues of types A and B; short-termism limits actions on D, E and F. Collective action is essential for some of

the issues to be heard and considered in policy discussions. Many relevant stakeholders especially for injustices of types B, C, D, E and F tend to have limited opportunities to participate in city-level deliberations. Each of these 6 types of challenges to justice raise concerns for the Paretian liberal. Pure liberalism of unfettered freedoms clash with universalism and the responsibility to protect lives of others both in present and future generations. The Covid-19 pandemic required governments, including those of liberal social orders, to impose lockdowns and social distancing measures in order to save lives. The Covid-19 lockdown issues require an in depth analysis of their own something for further research by readers of this volume. This experience, however, shows that there is no real conflict or inconsistency to liberalism when there is clear reasoning that such restrictions are to save lives. Another similar event is when emergency services ask residents to evacuate from their homes due to an impending hazard such as a flood or a volcanic eruption. A commitment to become a sustainable city would require careful consideration of the various injustices and taking necessary steps to remove them. The scheme of deliberative public reasoning can help to set reasonable limits and guide social choice.

4. Nudging towards sustainability

Though behavioural public policy has existed for a long time, Thaler and Sunstein (2008) propelled it to the mainstream of public policy with their influential book 'Nudge'. This is based on the irrationality of our preferences and flaws in the process of choice. Thaler and Sunstein suggest that intervening in the decision-making process to guide the citizen to choose pro-social choices is paternalism but since individual freedoms are not violated it amounts to libertarian paternalism.

Amartya Sen (1976) highlighted the shortcomings of the rational choice models and the theory of revealed preference. If we are observed choosing x when both x and y are available, the revealed preference theorist concludes that we prefer x to y. However, Sen reminds us that there is nothing wrong with inconsistencies in preferences reflected by choosing x over y on one occasion and choosing y over x on another occasion. In fact, we can picture in our minds a twinkle in the eye of Professor Amartya Sen (1976 cf 1982:89) as he suggests "...you can frustrate the revealed preference theorist through more sophisticated inconsistencies as well".

Thaler and Sunstein (2008) suggest that by re-arranging the sequence in which options are presented, the choice architect could influence the decision process. Profit oriented firms have been doing this for decades- for example by keeping high calorie sweets and crisps within easy reach near check out queues in supermarkets and petrol stations. For example,

Marcano-Olivier (2019) report a randomised control study of four primary schools to study the impact of a low-cost nudge namely improved positioning of fruit and better and attractive labelling. They observed a significant increase in fruit consumption by children in the intervention schools. Upton et al (2013) in an earlier study of the so-called 'Food Dudes' programme attempted to study a similar intervention in six schools compared with seven schools without the intervention. Their study showed increased intake of fruit and vegetables three months after the intervention, but no difference was found twelve months after the intervention. Perhaps children were indeed following Professor Sen's advice to frustrate the *randomistas*. Bauer et al (2021) examined three nudges on consumption of fruits and vegetables in a cafeteria of a medium sized company in Germany. One intervention is an email that employees received before lunch time which reminded them about the Green Line (a section of cafeteria with salad bar). A second intervention was to close one of the tills ('under maintenance') for the all-inclusive section thereby increasing queuing time while the Green Line remained unchanged. A third intervention was to paint green footprints on the cafeteria floor to gently draw people towards the Green Line. The strongest increase in Green Line was observed in study 2 but the authors recognise that of the three interventions, this was a natural experiment and was less transparent and less directly related to the goal of increasing vegetable and fruit consumption. Schubert et al (2021) reported that both graphic general health warnings (without mentioning any specific disease) and specific health warnings about diabetes can help reduce the consumption of sugar sweetened beverages. Giacherini et al (2021) in a study of over 23,000 consumers in 14 restaurants show that 'norm' nudging by offering a doggy bag to pack away food leftover by a consumer can help overcome the shyness and sense of shame and significantly reduce food waste in restaurants.

In another study, Hoxby and Turner (2014) showed that a low cost nudge can significantly increase the proportion of low income high achieving school students to apply to selective colleges.

In a study of the adoption of smart meters for energy consumption by European consumers, Giest (2020) notes that nudges are context dependent and various other factors including regulation affect whether a nudge works. Drews et al (2020) note that nudges and incentives have to be used carefully in a policy mix. They study energy use and note that while many studies individually study either nudges or incentives, when using both of these, policy makers need to be cautious as there can be crowding out effects (meaning we should not assume that the effectiveness of a policy instrument when used on its own may be greater than when it is used in combination with other instruments.)

In transport, nudges can help in improving driver behaviour and reduce pollution and accidents. Rubaltelli et al (2021) examined the driving behaviour of a group of college students on a simulator and they tested whether the so called left-digit nudge had any effect on speed of driving. Thus, in the experiment, road signs were modified to show 49 miles per hour instead of 50 miles per hour. Their study showed that the average speed in the experiment group was consistently lower than in the control group where no such change was presented.

Nudges can help in reducing waste and improving recycling rates. Akbulut-Yuksel and Boulatoff (2021) examined the effect of a green nudge, the transparent bag policy in Halifax, Nova-Scotia in Canada on overall recycling rate and municipal solid waste (MSW) generation and noted that such a policy contributed to improved recycling and reduction in the total amount of waste generated. Wensing et al (2020) report that nudges such as pictures as well as detailed information for reflection about environmental impacts can influence consumer willingness to pay for bio-based plastic packaging.

In an extensive review of 95 studies of environmental policy interventions Grilli and Curtis (2021) identify five types of interventions: education and awareness, outreach and relationship building, social influence, nudges and behavioural change instruments, and incentives. They find that all these approaches include successes and failures and that there is no single approach which is better than the others. They suggest that environmental policy makers should choose appropriate strategies carefully.

Nudges have become an important tool for policy intervention. Beshears and Kosowsky (2020) provide an extensive review of the literature on nudging analysing 174 papers including successful and unsuccessful attempts and note that many nudges have only a moderate effect and that "...nudges that automat some aspect of the decision-making process have an average effect...larger than other nudges". Lehner et al (2016:174) review nudges in residential energy use, food and transport sectors and note that "...across all policy domains, the greatest opportunities appear to be the use of nudges as a part of a package of policy instruments". They caution that nudges should be used carefully only when there is a role for government to adapt libertarian paternalism. Hummel and Meadche (2021) conducted a systematic review of 100 studies on nudging and found that these 100 papers reported 317 results of which 308 were significant and 190 effects were statistically significant and overall nudges had a median effect size of 21%. These reviews suggest that there has been considerable growth in the use of nudges especially in the field of health, food choice, energy and transport decisions.

5. Smart cities and smarter citizens

Though there has been considerable growth in the use of the term smart cities, there is a fundamental paradox. On the one hand the definitions of what constitutes a smart city are ambitious, multi-dimensional and emphasise the importance of including all stakeholders (see Anand, 2020 for a critical review). However, most of the smart city projects have tended to reflect centralisation of command and control, intrusive surveillance, and limited transparency (violating the requirement of minimal liberty in the social choice theory as formulated by Amartya Sen). For example, Shasuzzoha et al (2021:11), from a study of smart city projects in Helsinki, London and Singapore note that: "...For a large part the smart city is seen only as a technology exercise, where the latest ICT innovations are expected to solve problems especially in city governance, planning, transportation and mobility, citizen engagement and participation, sustainability, economy and safety. However, the solutions to many of these problems would require a human viewpoint and more holistic evaluation which are still largely missing from the smart city evaluation".

While smart cities proclaim a vision of efficiency and a low carbon future, we do not yet have enough information to evaluate whether smart cities indeed are sustainable. Of course, smart cities can contribute to improved efficiency in the use of certain infrastructure and any efficiency savings are definitely contributes toward sustainability. Thus, if a smart city project helps in smoothing of traffic or reduction in congestion which in turn saves some fuel and reduces emissions that is certainly a positive outcome. However, as of now, we do not yet have such information on the specific effect of smart city projects on emissions or fuel use. An important research question for future research on smart cities is to generate and provide evidence on specific impacts of smart city projects on environmental quality, health benefits, and through longitudinal studies the real impact on life expectancy. For example, if cities need to switch to 100% renewable energy by 2050, this would require the development of an appropriate energy strategy for the city and a holistic plan with great transparency at each step (see for example Thellufsen et al, 2020 for a case of Aalborg). Further, Wang and Moriarty (2019) note that while smart cities have great potential to reduce energy use, in realising this potential caution is needed with regard to privacy of information from consumers.

There are numerous governance challenges for smart cities (see Anand and Navio, 2018). At present, many cities worldwide are pursuing smart city projects. In most cases, the foremost investment is made in developing a command-and-control centre (CAC) with a large wall of television screens. In many cases, as part of smart city project, CCTV cameras are installed in public places and these provide live TV feed to the CAC. However, there is as

yet limited information to understand how the market for smart cities is actually working. While the demand for smart city projects comes from mayors and city authorities wanting better tools for managing the city, the supply of smart city projects is dominated by large digital corporations or management consulting companies. In the absence of full transparency about the product specifications and pricing, it is extremely difficult for market intelligence to emerge. If you were a mayor of a small city looking to procure smart city infrastructure platform for your city, there is at present very little information that you can use to make decisions on how best to spend your budget (and how much to budget in the first place). As a result, the market appears to be one of oligopolistic competition by a few well-known firms and many new start-ups who have never done anything to do with cities. There is a danger that the knowledge of municipal experts is ignored or downgraded in favour of experts in digital technologies. There are few mechanisms for using market competition as a way to keep the cost of smart city projects down. There are huge information asymmetries and risks are disproportionately borne by the cities and their municipalities. There is no insurance market emerging for smart cities. This means that the process of social choice can be biased due to oligopolies and cities who sign up smart cities bear all the risks.

Many smart cities recognise that there is a need to move from top down and one directional information flows to two directional information flows closing the feedback loops. Some smart cities develop smart phone applications or other such platforms. However, there is a lot of naivete and rather limited understanding of the complexity of relationship between the city and the citizens especially within the political economy context of power and its distribution. Prior to smart city development, many cities promoted a single point of contact for reporting problems such as power outage, problems with roads or drainage, nuisance or fly tipping and so on. Smart city projects have helped to digitalise such reporting mechanisms. However, given that there can be significant 'digital divides' in many cities, merely creating such platforms should not be considered as a solution to resolving urban consumer issues. Kontokosta and Hong (2021) analysed data from 311 phone line (a one-point number for citizens to report any problems) from Kansas City and found that such data may be biased because low income and minority residents tend to under-report problems reporting only major issues whereas high income residents could be over-reporting.

Guimaraes et al (2020) in a study of a smart city project in natal in north eastern Brazil conducted a survey of 829 citizens on aspects of transparency, collaboration, participation and partnership, communication, accountability and how important each of these attributes for quality of life and noted that all of these attributes of smart governance have a strong and positive effect on quality of life. Butot et al (2020: 8) used three vignettes to depict smart

urban safety and used qualitative research of interviews with 32 residents of Rotterdam in the Netherlands. Based on their analysis, they argue that "...the tendency to research citizen perspectives on smart urban safety foremost in terms of technology acceptance risks obscuring the variability and complexity of multiple interacting arguments".

The most important challenge for smart cities concerns ethics of the concept of person, of information governance and data privacy. The computational models of smart cities are based on rational choice paradigms of observed choices. As such all the criticisms of rational choice models indeed apply equally to these models too. Urban science and big data analysis of urban data trends approach such data without *a priori* theory or conceptual model of urban economy or urban sociology. Algorithms can be biased (Hedden, 2021) and repeated use of machine learning can generate models and results that are distanced from human oversight or responsibility. As Kitchin (2016:4) noted "...such a framing led to initial spatial and urban science to be roundly criticised within the social sciences for being too closely aligned with positivist thinking, being reductionist, mechanistic, atomizing, essentialist, deterministic and parochial, collapsing diverse individuals and complex multidimensional social structures and relationships to abstract data points and universal formulae and laws".

Smart cities collect and store vast amounts of data about individual citizens. Data security and privacy are fundamental issues but there are several other related ethical concerns also. With regard to privacy, Kitchin (2016:5) identified various dimensions of privacy including: "...identity privacy, bodily privacy, territorial privacy, locational and movement privacy, communications privacy and transactions privacy". Many smart cities are silent on what safeguards they have in place to ensure data security and preventing abuse. They may have appropriate cyber security safeguards and data back up infrastructure to protect their own data but whether they treat data from citizens to be equally worthy of such protections is a moot point.

Smart cities focus on technology and infrastructure services such as energy use, access to cloud and broadband or internet connections or provide regular updates on energy use by consumers through smart meters. While these are all useful services and can contribute to improving the quality of life of some citizens, these cannot be prioritised at the cost of providing urgent services to many poor and low-income households who lack access to clean energy, may live in damp and squalid housing and suffer significantly from air pollution. So, one ethical issue is about how to ensure policy priorities reflect the needs of all citizens and not merely some of the citizens and use deliberative processes to recognise and arrive at trade-offs or restrictions on certain choices in collective interest. This is the foundational issue of social

choice theory as developed by Sen (1970, 2017). Reflecting the needs of all citizens requires smart cities to conduct multi-dimensional analysis. Here, smart cities can benefit significantly from adapting the capability approach for evaluation of what matters to the citizens. Smart tools can make it easier to conduct deliberative public reasoning. However, smart cities need to ensure that the 'hackathon' approach which can be quite popular and promote participation of certain sections of the population may not be appropriate for other citizens such as the elderly residents or those who cannot afford to spend several hours in the city hall due to care responsibilities.

Most importantly, smart cities need to ensure that there is greater transparency and ethics oversight for continuous ethical monitoring. Because smart technologies are intrusive and smart cities rely on surveillance on a very large scale, embedding an ethical oversight mechanism as an integral part of decision process rather than obtaining an ethical clearance at the beginning of the project is essential.

From the capability approach and social choice theories we can recognise some important policy measures: (a) A citizen jury or citizen-led ethics advisory board should be constituted for every smart city and this should have real authority to be able to enquire into and make recommendations for changing policy directions or investment decisions. (b) Due to technological determinism inherent in smart cities, they are likely to be gender blind and in fact may discriminate against women. Therefore, every smart city should also constitute a high-level gender equality panel to advise and have an oversight of its operations and strategies for gender equality impacts. (c) There is no point to smartness if such technologies do not facilitate greater use of democracy and democratic mechanisms to give agency to people whose voices may not be heard in public policy making. (d) There is nothing smart if technologies cannot help to close the gap and reduce inequalities especially in health, education, and well-being. Therefore, important policy decisions should be put to greater level of consultation in a meaningful manner and the goal of making the city more equal and just must override smartness. Smart cities need to try harder to use both digital and non-digital means of genuine consultation and participation by the publics. We shall be impressed by genuineness of consultative and participatory ethos than by the cleverness of algorithms. Citizens of mayors of cities pursuing smart city projects should consider joining international networks such as the Human Rights Cities Network to publicly proclaim their commitment to advancing human rights. The transition of Barcelona from techno-centric view of smart cities to citizen centred view seems to exemplify how such a commitment can prioritise citizens over technology (see Charnock et al, 2021).

6. Smart sustainable city- where the libertarian paternalist meets the Paretian liberal?

This paper aims to draw upon the social choice theory and the capability approach to advance our understanding of key policy issues for sustainable cities. In their transition to be sustainable cities, cities need to address the six types of injustices and for this, they will need to use the full range of policy instruments available including: appropriate pledges and public proclamations of commitment to sustainability and reducing environmental footprints; commitment to embedding sustainability in all aspects of the city; identification of rights and clear designation of duty-bearer institutions; appropriate financial incentives and subsidies to help transition to low-energy and low-carbon buildings and electric vehicles. Smart technologies can be means to achieving some of these instruments. At present, smart cities attract the criticism that they treat all cities and their urban problems to be similar without regard to the historical, political, social and cultural uniqueness of each city. Thus, the core ideas of smart cities remain the same while a superficial attempt is made to identify with the city only in the appearance or naming of the smart city platforms. Naming an app 'Our Chennai' or 'Our Kumasi' is a good starting point but that alone does not create a genuine ownership by local people. Also, many urban problems such as transport involve structural factors that have lock-in mechanisms and path dependence. The capability approach highlights how a disabled person faces social and environmental conversion factors to achieve basic functioning of mobility (Sen, 1999:88). UN (2019:38) global report on disability and development noted that extra costs due to disability can be between 12 per cent of income in Viet Nam to 70 per cent of income in Spain. The report also noted that in eight developing countries included in their survey, namely, Cameroon, Chile, Sri Lanka, Lesotho, Nepal, Mozambique, Malawi, South Africa on average 36 per cent of persons with disabilities considered transportation to be not accessible (p226). In the absence of inclusive public transport, such a person is locked in to using car (if they can afford) or not move at all. Mere sprinkling of smart technologies without addressing these core structural factors will amount to 'smart washing'.

In the portfolio of instruments available for realising smart sustainable cities, nudges can play an important role. Nudges require careful and sensitive design and should be used only when it is appropriate. In a context of acute water scarcity, nudges to reducing water consumption are pointless. Nudges work best when there are some shared and common minimum standards of acceptable behaviours. In the context heterogeneity of views and perspectives, nudges may not be effective. The impossibility theorems remind us that in non-dictatorial settings, in certain cases, (assuming the independent of irrelevant alternative criteria is already met), it is difficult to produce a social choice that meets the three requirements of unrestricted

domain (U), Pareto principle (P) and liberalism (L). However, some limits on liberalism and freedoms are essential when this is to protect the lives or freedoms of other members of the society (S) or the environment for future generations (E). Combining these we can generate the requirement that a smart sustainable city should always check the PULSE and use this to address the six types of injustices that need to be overcome. Thus, a genuine consultative and participatory approach can help cities to advance their progress towards SDG11 and beyond towards becoming net zero Carbon cities without compromising the needs of those who are poor, marginalised and do not have a voice.

Acknowledgements

The paper builds on my research made possible by the British Academy grant IPM 15008 and my presentations at the three Cambridge Capability Conferences. I have learned much from the comments and questions by the fellow participants and keynote speakers at these conferences. I have also presented some of the ideas on nudging as well as those on smart cities at different fora including at the Annual Conferences of the Development Studies Association in Oxford, Bradford, Manchester and Milton Keynes; at JGU Conference at Universitas Muhammadiyah Yogyakarta, at the Edinburgh-Kobe conference; and at a seminar at the Centre for Policy Studies of Indian Institute of Technology, Mumbai. I am grateful to Anita Patil-Deshmukh, Shrutika, Kiran, Bali and Nizam- my sources of inspiration at Partnership for Urban Knowledge and Action Research (PUKAR), Mumbai. I am also grateful to the entire team in Bhubaneswar Smart City, and also to Prof Haider Khan, Prof R Sudarshan, Prof Sudhir Chella Rajan, Sir Richard Jolly, Dr B Chandramohan and S Narayanan. I am also grateful to Eko Priyo Purnomo, Dionysius, Tiwi and Agus at Jogja for hosting me and facilitating my research on Jogja smart city. However, I alone remain responsible for the contents of this chapter and all the flaws that are here.

References

- Akbulut-Yuksel M and Boulatoff C (2021) The effects of a green nudge on municipal solid waste: evidence from a clear bag policy, *Journal of Environmental Economics and Management*, 106 (2021) 102404. stic bags
- Alam P., Sharholy M. and Ahmad K (2020) A study on the landfill leachate and its impact on groundwater quality of Ghazipur area, New Delhi, in

Kalamdhad A (ed) *Recent developments in waste management*, Singapore: Springer.

Anand PB (2007) *Scarcity, entitlements and the economics of water in developing countries*, Cheltenham: Edward Elgar.

Anand PB (2014) Sustainability and the capability approach: from theory to action?, chapter in Tiwary M and Ibrahim S (ed) *Capability approach: From theory to practice*, London: Palgrave

Anand PB (2018) Cities and the capability approach, chapter 21 in Comim F., Fennell S and Anand PB (ed) *New Frontiers of the Capability Approach*, Cambridge: Cambridge University Press.

Anand PB (2020) Assessing smart city projects and their public policy implications in the Global South, *Contemporary Social Science*, 16,2, <https://doi.org/10.1080/21582041.2020.1720794>

Anand PB and Navio J (2018) Governance and economics of smart cities: opportunities and challenges, *Telecommunications Policy*, 42,10,795-99.

Anand S and Sen A (2000) Human development and economic sustainability, *World Development*, 28, 12, 2029-49.

Bambra C (2016) *Health divides: Where you live can kill you*, Bristol: Policy Press.

Bauer J, Bietz S, Rauber J and Reisch L (2021) Nudging healthier food choices in a cafeteria setting: a sequential multi-intervention field study, *Appetite*, 160, 105106, <https://doi.org/10.1016/j.appet.2021.105106>

Beshears J and Kosowsky H (2020) Nudging: Progress to date and future directions, *Organizational Behaviour and Human Decision Processes*, 161, 3-19.

Butot V, Bayerl P, Jacobs G, de Haan F (2020) Citizen repertoires of smart urban safety: Perspectives from Rotterdam, the Netherlands, *Technological Forecasting & Social Change*, 158 (2020) 120164.

Calcott A and Bull J (2007) *Ecological footprint of British city residents*, London: Worldwide Fund for Nature.

Charnock G, March H, and Ribera-Fumaz R (2021) From smart to rebel city? Worlding, provincializing and the Barcelona model, *Urban Studies*, 58 (3) 581-600.

Drews S, Exadaktylos F, van den Bergh J (2020) Assessing synergy of incentives and nudges in the energy policy mix, 144 (2020) 111605. <https://doi.org/10.1016/j.enpol.2020.111605>

Giacherini M, Gilli M, Mancinelli S, and Zoli M (2021) Nudging food waste decisions at restaurants, *European Economic Review*, doi: <https://doi.org/10.1016/j.euroecorev.2021.103722>

Giest S (2020) Do nudgers need budgeting? A comparative analysis of European smart meter implementation, *Government Information Quarterly*, 37 (3030) 101498, <https://doi.org/10.1016/j.giq.2020.101498>

Grilli G and Curtis J (2021) Encouraging pro-environmental behaviours: A review of methods and approaches, *Renewable and Sustainable Energy Reviews*, 135 (2021) 110039.

Guimaraes J, Severo E, Felix Junior L, Preston W, Da Costa L, and Salmoria F (2020) Governance and quality of life in smart cities: Towards sustainable development goals, *Journal of Cleaner Production*, 253 (2020) 119926, <https://doi.org/10.1016/j.jclepro.2019.119926>.

Hedden B (2021) On statistical criteria of algorithmic fairness, *Philosophy and Public Affairs*, <https://doi.org/10.1111/papa.12189>

Hoxby C and Turner S (2012) Expanding college opportunities for high-achieving, low income students, SIEPR Discussion Paper No., 12-014, Stanford Institute for Economic Policy Research, Palo Alto: Stanford University.

Hummel D and Meadche A (2019) How effective is nudging? A quantitative review on the effect sizes and limits of empirical nudging studies, *Journal of Behavioural and Experimental Economics*, 80, 47-58.

Institute of Health Equality (2020) Marmot Review: Ten Years On, London: University College London.

Islam S and Winkel J (2017) Climate change and social inequality, DESA Working Paper No. 152, ST/ESA/2017/DWP/152, Department of Economic and Social Affairs, New York: United Nations.

Kaza S, Yao L, Bhada-Tata P, Van Woerden F (2018) What a waste 2.0: A global snapshot of solid waste management to 2050, Urban Development Series, Washington DC: The World Bank. doi:10.1596/978-1-4648-1329-0.

Kennedy C, Stewart I, Facchini A, Cersosimo I, Mele R, Chen B, Uda M, Kansal A, Chiu A, Kim K, Debeux C, Rovere E, Cunha B, Pincetti S, Keirstead J, Barles S, Pusaka S, Gunawan J, Adegbile M, Nazariha M, Hoque S, Marcotullio P, Otharan F, Ganena T, Ibrahim N, Farooqui R, Cervantes G, and Sahin A (2015) Energy and material flows of megacities, *Proceedings of the National Academy of Sciences*, 112 (19) 5985-5990, <https://doi.org/10.1073/pnas.1504315112>

Kitchin R (2016) The ethics of smart cities and urban science, *Philosophical Transactions of Royal Society A*, 374:20160115, DOI: <http://dx.doi.org/10.1098/rsta.2016.0115>

Kontokosta C and Hong B (2021) Bias in smart city governance: How socio-spatial disparities in 311 complaint behaviour impact the fairness of data-driven decisions, *Sustainable Cities and Society*, 64 (2021) 102503, <https://doi.org/10.1016/j.scs.2020.102503>

Lehner M, Mont O, Heiskanen E (2016) Nudging – A promising tool for sustainable consumption behaviour?, *Journal of Cleaner Production*, 134 (2016) 166-177, <https://doi.org/10.1016/j.jclepro.2015.11.086>

Lewis WA (1955) *The theory of economic growth*, London: Allen and Unwin.

Mandela N (1994) *Long walk to freedom: Autobiography of Nelson Mandela*, London: Abacus

Marcano-Olivier M, Pearson R, Ruparell A, Horne P, Viktor S (2019) A low-cost Behavioural Nudge and choice architecture intervention targeting school lunches increases children's consumption of fruit: a cluster randomised trial, *International Journal of Behavioural Nutrition and Physical Activity*, 16 (1): 20, doi: 10.1186/s12966-019-0773-x.

Marmot M (2010) *Fair Society, Healthy Lives: The Marmot Review*, London: Institute for Health Equality, London: University College London.

Mberu B, Haregu T, Kyobutungi C and Ezeh A (2016) Health and health-related indicators in slum, rural, and urban communities: a comparative analysis, *Global Health Action*, 9: 33163- - <http://dx.doi.org/10.3402/gha.v9.33163>

McGee J, Ergas C, Greiner P and Clement M (2017) How do slums change the relationship between urbanisation and the carbon intensity of well-being?, *PLoS ONE*, 12 (12):e0189024: <https://doi.org/10.1371/journal.pone.0189024>

Rawls J (1971) *A theory of justice*, Cambridge: Harvard University Press.

Rubaltelli E, Manicardi D, Orsini F, Mulatti C, Lotto L (2021) How to nudge drivers to reduce speed: The case of left-digit effect, *Transportation Research Part F: Traffic Psychology and Behaviour*, 78 (2021) 259-266, <https://doi.org/10.1016/j.trf.2021.02.018>

Sager T (1998) Arrow's impossibility theorem and planning process, *Progress in Planning*, 50, 75-140.

Satterthwaite D, Huq S, Pelling M, Reid H and Lankao P (2007) Adapting to climate change in urban areas: the possibilities and constraints in low- and middle-income nations, Human Settlements Discussion Papers Series, London: International Institute for Environment and Development.

Schubert E, Smith E, Brydevall M, Lynch C, Ringin E, Dixon H, Kashima Y, Wakefield M, Bode S (2021) General and specific graphic health warning labels reduce willingness to consume sugar-sweetened beverages, *Appetite*, 161-105141, <https://doi.org/10.1016/j.appet.2021.105141>

Sen A (1970) The impossibility of a Paretian Liberal, *Journal of Political Economy*, 78, 152-7- published in Sen A (1982) *Choice, Welfare and Measurement*, Cambridge: Harvard University Press: 285-90.

Sen A (1976) Rational Fools: A critique of the behavioural foundations of economic theory, Herbert Spencer Lecture, Oxford University- published in Sen A (1982) *Choice, Welfare and Measurement*, Cambridge: Harvard University Press: 84-106.

Sen A (1999) *Development as freedom*, New York: Oxford University Press.

Sen A (2009) *The idea of justice*, London: Penguin

Sen A (2017) *Collective Choice and Social Welfare: Expanded Edition*, London: Penguin.

Shamsuzzoha A, Nieminen J, Piya S and Rutledge K (2021) Smart city for sustainable environment: A comparison of participatory strategies from Helsinki, Singapore and London, *Cities*, 114 (2021) 103194.

Solow R (1993) *An almost practical step to sustainability*, Washington DC: Resources for the Future.

Thaler R and Sunstein C (2008) *Nudge: Improving decisions about health, wealth and happiness*, London: Penguin.

Thellufsen J, Lund H, Sorknaes P, Oostergard P, Chang M, Drysdale D, Nielsen S, Djorup S, and Sperling K (2020) Smart energy cities in a 100% renewable energy context, *Renewable and Sustainable Energy Reviews*, 129 (2020) 109922, DOI: 10.1016/j.rser.2020.109922

Tomita A, Cuadros D, Burns J, Tanser F and Slotow R (2020) Exposure to waste sites and their impact on health: a panel and geospatial analysis of nationally representative data from South Africa, 2008-2015, *Lancet Planetary Health*, 4, e223-34.

United Nations (2018) *World Urbanisation Prospects: 2018 Highlights*, Department of Economic and Social affairs, Population Division, ST/ESA/SER.A/421, New York: United Nations.

United Nations (2019) *Disability and Development: Realising the Sustainable Development Goals by, for and with persons with disabilities: 2018*, Department of Economic and Social Affairs, New York: United Nations.

United Nations HABITAT (2012) *Sustainable Urban Energy: A Sourcebook for Asia*, Nairobi: UN Human Settlements Programme (HABITAT)

Upton D, Upton P, and Taylor C (2013) Increasing children's lunchtime consumption of fruit and vegetables: an evaluation of the Food Dudes programme, *Public Health Nutrition*, 16 (6) 1066-72, doi: 10.1017/S1368980012004612

Wang J and Moriarty P (2019) Energy savings from Smart Cities: A critical analysis, *Energy Procedia* 158 (2019) 3271-3276.

Wenar L (2008) Property rights and the resource curse, *Philosophy and Public Affairs*, 36, 1 2-32.

Wensing J, Caputo V, Carraresi L and Broring S (2020) The effects of green nudges on consumer valuation of bio-based plastic packaging, *Ecological Economics*, 178 (2020) 106783, <https://doi.org/10.1016/j.ecolecon.2020.106783>

World Health Organisation (2015) *Waste and human health: Evidence and needs*, WHO Meeting Report, 5-6 November, Bonn, Germany, Copenhagen: WHO Regional Office for Europe.