



# Bringing together urban systems and food systems theory and research is overdue: understanding the relationships between food and nutrition infrastructures along a continuum of contested and hybrid access

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## Abstract

Urban dwellers' food and nutritional wellbeing are both dependent on infrastructure and can be indicative of wider wellbeing in urban contexts and societal health. This paper focuses on the multiple relationships that exist between food and infrastructure to provide a thorough theoretical and empirical grounding to urgent work on urban food security and nutrition in the context of rapid urban and nutrition transitions in the South. We argue that urban systems and food systems thinking have not been well aligned, but that such alignment is not only timely and overdue but also fruitful for both thematic areas of research and policy. We draw in particular on work within wider urban political economy and political ecology that can be classified as part of the 'infrastructural turn' that is influential with urban studies but little acknowledged within food studies. Drawing on these literatures helps us to better understand the interrelationships between people, things and ideas that make up both infrastructure and food systems. Policy, planning and research relating to both food and urban systems cannot afford to ignore such interlinkages, though much policy still operates on the neat assumptions of progressive connectivity to 'the grid' and formal food retail. Instead we argue how in many urban governance systems, a variety of hybrid mechanisms—on and off the grid, public and private formal and informal—better represent how urban residents, particularly the most marginalised, meet their everyday food and infrastructural needs along a continuum of gridded and off-grid access.

**Keywords** Food · Malnutrition · Infrastructure · Assemblage · Marginalisation

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## Introduction

The Living Off-Grid Food and Infrastructure Collaboration (Box 1) convened to answer, initially, the following question: “how is marginalised people’s food and nutrition security shaped by urban infrastructure assemblages in a variety of ‘off-grid’ settings in Asian and African Cities”?.<sup>1</sup> The conceptual approach outlined here links literatures on urban food governance, urban systems and infrastructure assemblages, and uses this to focus on the interactions of such assemblages in the lives of the marginalised with implications for food. Much of this work has been siloed – whether on food, or work on separate infrastructures, for example on water or electricity. Extending this to look more concretely at how food is implicated within infrastructure assemblages, we draw on urban political ecology and other critical studies of urban systems to understand how such urban infrastructures function, i.e., the everyday improvisations, negotiations, contestations around key forms of urban infrastructure in relation to food. This is based on our premise that people’s food and nutrition situations are both dependent on infrastructure and can be indicative of wider wellbeing in urban contexts including broader infrastructural or societal health. Drawing on the wider literature and some of the earlier empirical work of our partners (Box 1), this paper focuses on the multiple relationships between food and infrastructure to provide a thorough conceptual grounding to the work ahead.

The first section of this paper focuses on the relationship between urban food systems and city systems. While there is some—albeit patchy—work on urban food and malnutrition in the South, dominant conceptualisations of food systems and urban systems have been operating in thematic or epistemic silos and therefore have decades of lost conceptual and empirical ground to catch up on. We argue that urban food systems cannot and must not be theorised and studied as separate from urban systems because a lack of understanding of the realities facing urban dwellers and urban systems will only lead to maladaptive policies, including those that criminalise existing coping strategies and ways of living which do not conform to a planned ideal.

The second section then focuses on the relationship between food and infrastructure. The infrastructural turn in urban studies, geography and other disciplines has largely ignored—and been ignored by—food studies. Infrastructure here is taken to mean the social and material and discursive

relationships that govern how people meet their basic needs. Every point of the food system is bounded by these infrastructural dependencies – growing, producing, storing, transporting, purchasing, cooking. But if this has been studied, it has been only in cursory or instrumental ways which focus on physical infrastructure access. Working with an updated understanding of all infrastructures, including food as hybrids or assemblages (of social, political, material and natural relationships), enhances our understanding of the everyday negotiations necessary to meet all basic needs together. We outline the political-economy of such infrastructure and the need to think of degrees of ‘griddedness’ along a continuum, rather than a binary of ‘off’ or ‘on’ grid, formal or informal, public or private.

A final section focuses on the need for both urban planning and urban food systems thinking to be updated in relation to such developments. The use of food as a lens into the contemporary Southern city facilitates a rich, thick and robust enquiry into Southern urban infrastructure challenges and emergent responses and politics, not just on questions of food, but also consideration of multiple urban challenges. Yet to a large extent, enquiry into urban food systems, and proposed responses, have been informed by limited perspectives, as well as assumptions emerging from Northern cities and processes. These assumptions include those in policy and mainstream infrastructure financing that services will be delivered through increasingly integrated grids that are formal, static and physical and via imagined and ‘progressive, universal’ access. Such assumptions have little engagement with the political economy of cities in the Global South (Gillespie & Schindler 2022; Schindler & Kanai 2021; Gollin et al. 2016). Embracing the idea of hybridity and the continuum of access we set out here can help new planning rationalities adapt to Southern realities of urban food and urban infrastructural access.

### The Living Off-Grid Food and Infrastructure Collaboration

The Living Off-Grid Food and Infrastructure Collaboration is a research partnership of the African Centre for Cities (ACC) at the University of Cape Town, Colombo Urban Lab, the Institute of Development Studies (IDS) at the University of Sussex, UK, the Indian Institute for Human Settlements (IIHS), and the University of Ghana. IDS convened the partnership in March 2020 with funding from the UK’s Economic and Social Research Council. Work has focused on 5 cities across South Asia and Sub-Saharan Africa: Bengaluru, India; Colombo, Sri Lanka; Mossel Bay, South Africa; Harare/Epworth, Zimbabwe and Tamale, Ghana. These cities present a selection of secondary cities, one capital city and a satellite

<sup>1</sup> By ‘off-grid’ we mean in settlements lacking continuous access to a formal grid or network of traditional infrastructure – but as we go on to argue, both the traditional idea of the ‘grid’ and being ‘off-grid’, as well as the notion of infrastructure, need re-examining in the light of much recent literature in this area.

(Epworth) of a capital, with populations ranging from under two hundred thousand (Tamale) to over thirteen million (Bangalore). Research and research outputs are led by teams who live in each city and in most cases have researched the urban environment for many years. Our backgrounds include training in anthropology, geography, urbanism, planning, as well as activism and policy making. Our enquiry into the intersections between food and infrastructure at the city scale is the result of research activities over the past 15 years into urban food, health and nutrition, has been informed by various collaborations between project partners and insights from the research sites. This is the first in a series of papers to emerge from this present collaboration and is intended to bring our thinking together as a partnership and provide a conceptual grounding for further work ahead: as we write in May 2023, we have a number of further empirical contributions already planned and underway. Further outputs from the project will be available at [www.ids.ac.uk/projects/rethinking-the-off-grid-city](http://www.ids.ac.uk/projects/rethinking-the-off-grid-city).

## The context of Southern Urbanism: linked rapid urban and nutrition transitions

Many cities in the South are undergoing significant and rapid demographic (UN DESA 2018) and dietary change (GNR 2020), albeit at different speeds and from different starting points. In South Africa, for example, there has been a rise in the consumption of unhealthy foods and, in particular, ultra-processed foods (Moodie, et al. 2021, p. 970), existing also alongside conditions of urban food scarcity (Van der Berg et al 2022; Battersby & McLachlan 2013). In India, rates of urban obesity have been estimated as high as 44% for women and 34% for men (National Nutrition Monitoring Bureau 2017).

It is possible to contextualise these changes as a set of interrelated transitions, which form the backdrop of this research and the wider policy exigencies faced by municipal and national actors. The first is a continuing demographic transition, with the population of SSA African countries, combined, expected to reach 2.1 billion and the population of South and Central Asia 2.6 billion, by 2050 (United Nations 2022). This is also an urban transition – with 1.56 billion more people living in cities by 2040 compared to 2020; with 52% of this growth in Asia and 30% in Sub-Saharan Africa (Satterthwaite 2020 citing UN DESA 2018). Related to this rapid expansion of Southern cities there is a concerted drive, informed by shifting geopolitics, investment objectives and a general development trajectory, to invest heavily in urban infrastructure. (Gillespie & Schindler 2022). These urban processes influence and direct, in turn,

national development and political processes. As Pieterse et al (2018:151) have argued in the context of Africa “this scalar recalibration assumes greater urgency for Africa[...] because the urban transition of the next few decades will be formative of future developmental opportunities ... the demographic clock is ticking and the next two to three decades will define the urban transition”. Avoiding a path dependency embedded in unsustainable physical and social infrastructures requires urgent theoretical and policy engagement given the uncertainty as to how Southern countries, and cities, figure out different approaches to ensure that the basic needs of their citizens are met, whilst simultaneously creating the infrastructural platforms for growth, but within the context of significant climate and ecological limits.

Related to this demographic and urban transition is a nutritional transition. The population of food and nutrition insecure urban residents is growing in absolute terms in many cities in South Asia and Sub-Saharan Africa (Hawkes & Fanzo 2017; Ruel et al. 2017; Crush et al. 2012; Popkin et al. 2012) and is relatively higher in informal and marginalised urban settlements (Huey et al. 2019; Crush & Frayne 2010). The globalisation and industrialisation of many urban and national food systems has led to longer and more complex food value chains reaching the cities of the global South, as basic ingredients undergo multiple transformations that result in increasingly more complex and processed food products (Gillespie & van den Bold 2017). This has happened to a great extent in Sub-Saharan Africa, particularly South Africa, though to a lesser extent in India, where national legislation has held multinational entry into supermarket retail in check.

While processing infrastructure can reduce food losses (e.g. spoilage or wastage due to palatability) and the likelihood of food-borne illnesses, especially where storage, refrigeration, energy and water and sanitation infrastructure are inadequate, it can also lead to increased consumption of ultra-processed foods and foods high in saturated fats, sugar and salt (Global Panel on Agriculture and Food Systems for Nutrition 2016; International Food Policy Research Institute 2017; HLPE 2017; Baker et al. 2020). These consumption patterns are also influenced by the intensification of advertising and marketing of comparably cheap industrialized products (Moodie et al. 2021). Data from six countries in Sub-Saharan Africa show that over 30% of the purchase of those living on less than \$2 day is highly processed foods, contributing calories but not micronutrients to the diet (GOPAN 2016), influenced by poor availability and limited affordability of healthier options.

Understanding how these transitions combine and interact – and particularly who are the winners and losers of such processes—is the urgent agenda of food systems and urban systems scholarship and policy in Southern cities. The contribution of this paper is to focus on some of the

most contested and important relationships, those between everyday infrastructure access and the food and nutritional wellbeing of urban populations.

## Understanding city systems through the lens of food and understanding food systems through the lens of cities

“In many cities in developing countries, hunger and malnutrition are common amongst the poor, even when food is relatively abundant. Over the past two decades, a considerable literature has accumulated on the problems associated with rapid urbanization in developing countries – a literature that for the most part has neglected the important dimension of urban food systems and how these link production and consumption networks at local, regional and global levels. Similarly, whilst there is a newly burgeoning literature on global food systems, the contextual role of the urbanization process is rarely addressed.”

Smith, 1998: 207

Despite Smith’s call to arms nearly 25 years ago, analysis of how urban systems and the food system intersect have not been the primary focus of urban research in the global South (Hunter-Adams et al. 2019; van der Valk & Viljoen 2014; Donovan et al. 2011). Food and the wider externalities produced by the food system remain largely the focus of rural and agrarian studies in Southern contexts. Urban food and malnutrition *have* been studied, yet still in a very patchy way compared to the sheer volume of work on rural food security and nutrition. Urban planning policies focus on transport or sanitation infrastructure and other public services, paying little heed to food-specific concerns (Pothukuchi & Kaufman 1999; Battersby 2017). Many urban food responses remain small and are largely project based, seldom engaging in wider food system or urban policy questions directly. But greater understanding of food and nutrition in relation to urban arrangements is essential to engage in effective urban food, urban governance and nutrition planning in Southern cities. This understanding needs to interrogate the range of material, structural and socio-political inadequacies in the urban environment that shape both food and urban systems, particularly if it is to be alive to the situation of marginalised urban residents.

It is a productive time to better link together work on urban systems and food systems. In studies of food and food security, the past 5–10 years has seen a transition towards thinking about food in its totality, moving towards an understanding of food as a complex system with multiple

interlinking parts and feedback loops, connecting the food supply chain, the food environment and individual behaviour (Berkum, Dengerink, & Ruben 2018; HLPE 2017). This food systems approach supports a shift to better food and urban studies integration, with an attendant movement away from linear conceptualizations of agricultural ‘value chains’ bringing food from farm to fork, to thinking in terms of processes and interactions in which environmental, technological, political, economic, social, demographic and infrastructural factors shape food environments, which eventually influence diet quality (HLPE 2017). In this understanding, material flows and market exchanges are still important, but are conditioned by technologies, information and infrastructure as well as formal and informal governance processes and their inherent power dynamics. As we argue in the next section, these developments in conceptualising food systems bring food systems thinking more in line with urban systems thinking than has been the case for decades.

Despite these developments, city systems and the range of human and non-human agents which inhabit them are often viewed simply as recipients of food flows, not as active agents in food systems at different scales. This invisibilises the important overlap between informal food retail as a source of livelihood and as a source of food access, especially for marginalised populations in cities of the Global South. Equally, urban residents are often viewed as the key food system decisions makers (in part as a result of Sen’s (1981) entitlements framing). But without context, a view of active individual and household agency driving food system outcomes can be prejudicial, blaming the poor for bad decisions, and for not exerting relevant voice and agency “if they do know better” on one hand, and criminalising the forms of agent-driven, non-formal food retail that are prevalent across cities of the Global South, on the other. A more radical vision, one that would be recognisable to David Smith’s urban political economy of uneven development, sees the current urban food system as the result of deep historical structuring aligned to both dispossession and marginalisation of particular urban communities, cultures, workers (Duminy 2018) and their interaction with socio-natural processes or infrastructures such as water or food. Brunori et al (2020) also challenge the conventional food systems model by suggesting that territories often have multiple, co-existing food models, with multiple conventions, configurations (Fournier & Touzard 2014; Reardon & Timmer 2012), and actors, which adapt and evolve in keeping with changing needs, objectives and capabilities, over time.

Marginalised populations are those socio-economically poorest groups in the city who, by dint of further dimensions of exclusion, find access to formal infrastructure (publicly provided or by a state contracted provider) particularly difficult. These dimensions of exclusion can include physical settlement type and location (e.g. informal slum/shack

dwellings and the range of associated tenures, or resettlement schemes), which intersect with forms of identity based / embodied discrimination (e.g. on the basis of gender, age, caste, ethnicity, sexuality or disability or identities pertaining to legal status or place of origin e.g. ‘migrant’, ‘rural’). Residents in neighbourhoods with grid coverage may also experience access unequally – with marginalisation mediating different experiences of infrastructure (de Groot et al. 2017). Women, for example, already experience this precarity to a higher degree: they may face greater barriers for economic and social mobility, may have reduced access to infrastructure and services, such as transport or sanitation, and bear the brunt of inadequate infrastructure provision as they spend time on water and fuel collection and waste disposal due to the unequal distribution of care tasks (OECD/SWAC 2020; Parikh et al. 2015; Floro & Swain 2013; Mitra & Rao 2019). In many contexts such marginalisation is experienced intersectionally: Yassa Truelove, for example describes how in urban Delhi “[e]verything from one’s age and gender identity to one’s position in networks of social capital shape the means by which water is actually personally procured, the household distribution of such water, and the meaning of particular water-related interactions— which in turn are productive of subjectivities” (Truelove 2011, p. 146).

## Food and infrastructures’ deep relationalities

More than with any other of our biological needs, the choices we make about food affect the shape, style, pulse, smell, look, feel, health, economy, street life and infrastructure of our city... Given the overarching importance of food in urban life, planners need to put food closer to the top of their planning menu

Roberts 2001:4

As Wayne Roberts wrote not long after David Smith, it is also important to take a food lens when considering urban infrastructures: food systems influence city form and infrastructure use, and infrastructure access influences food choices. The linked food and fuel crises experienced by many countries have focused minds and policy on the nexus of dependencies between energy and food and other infrastructural flows including water and transport. In any urban food system, food security and wider nutritional wellbeing is dependent on a wide range of material, social and natural infrastructures, operating as multiple and immanent infrastructural assemblages.

The term infrastructural assemblage draws both on literature from within urban studies but also on wider literature on

assemblages as a way of describing relationships between things, people and ideas that come to matter in immanent socio-material arrangements (Anderson & McFarlane 2011). Such arrangements can reflect a kind of distributed agency between the components of an assemblage: ideas, for example, only hold power when they are given life by the social and physical arrangements that manifest them. These structures can be temporary, or more durable, but the role of the scholar is to understand what particular “patterns of difference which make a difference” (Barad 2007) in any given field – and in social science this tends to involve a focus on the power dynamics, or political economy of who is served by difference assemblages. Hence a focus on assemblage can aid the move from abstract ideas: “the market”, “the city”, “the food system” or even “social structure” to charting particular instances of how these ideas come into being for people at particular times. *Infrastructural assemblages* therefore reference multiple arrangements of infrastructure access determined not only by physical infrastructure, but the social and political relationships, and ideologies operating and influencing access, at multiple city scales (Desai et al. 2015; Redfield & Robins 2016).

Greater understanding is required of how infrastructures interact in different ways and at different times to improve or further burden poor people’s lives. Inadequacies in access and supply to infrastructures can undermine the ability to safely cook, clean, store, supply, manufacture and grow food, and dispose of or reuse food waste (Sibanda & von Blotnitz 2019; Morgan & Sonnino 2010; Morgan 2009). Infrastructural gaps thus become long term stressors that can contribute to the burden of enteric (gut) infection, affecting the long term wellbeing (Hunter Adams et al. 2019), health and productivity of people in poor settlements, and impact child growth and maternal health in particular (Hunter-Adams et al 2019; Ahmed et al 2015). Diet related non-communicable disease are increasingly prevalent in LMICs. This can be attributed in part to urban diets, which are shaped by responses of both food system actors and consumers to lived experiences of infrastructure. Assumptions of health authorities that NCDs are to be addressed at the level of individual consumption and ‘lifestyle’ and dietary ‘risk factors’ ignores the wider infrastructural factors and their interlinkages that determine, for example, what food people can choose, afford and cook.

Because of this dependence on a range of infrastructures, food and nutrition security provides a useful lens to interrogate infrastructure assemblages as well as being a fundamental marker of urban wellbeing. Existing urban research charts the experience of infrastructure access as one of hybridity (Jaglin 2015; Smith 2019; Lawhon et al 2018). These hybrid arrangements are imbued with power structures and socio-political dynamics that are context specific and further condition their experiences. Together these are the factors

that condition or shape the possibilities for individuals and households pursuing different food strategies.

Water stresses represent a classic example of the infrastructural precarities that have been studied extensively in terms of urban infrastructures and which have obvious links to a number of different aspects of food from production, processing and retail, to home preparation, cooking and waste disposal. In areas of high-water stresses, everyday access to water can depend on structures outside the control of many individuals. Infrequent access to water during the day, or perhaps access being dependent on proximity to the supply or social-political connections means even the use of water for cooking is precarious and can change in an instant. Reliance on contaminated water supplies can lead to health risks that can have knock-on effects on individuals and families, especially when it exacerbates already existing gender inequalities where familial roles are pre-defined (Borie et al. 2019; Harris et al. 2018). Contaminated water is not just a natural stress, but can also have economic, political and social elements. Within Indian and Sri Lankan cities there have been examples of how projects, under the guise of development, have led to water being redistributed from poorer communities towards wealthier new building developments (Björkman 2015), or forcing poorer communities to formally access the grid and thereby making it unaffordable to access water as they used to previously through public taps and other common infrastructure. So in this case access is not about physical infrastructure but about the idea of different forms of distribution and ‘cost recovery’.

Given the numerous constraints in accessing formalised grids of infrastructure use, attention has shifted to forms of infrastructure that exist in off-grid categories, sometimes extolling the possibilities of e.g. domestic solar arrays. Granted, such off-grid service delivery arrangements (Jaglin 2014) can make everyday forms of coping possible for many urban residents, and sometimes offer more sustainable solutions to particular urban growth patterns. However, they are also often associated with disproportionately high time and cost burdens, inadequate quality and quantity of services, and vulnerability to political, social and environmental disruptions (McFarlane 2010). Greater understanding is also required of the different arrangements to access infrastructures: rather than conforming to a binary on/off grid categories, access can also be viewed as occurring along a more complex and shifting continuum, in which urban dwellers build in a number of deliberate system ‘redundancies’ in order to ensure, or approach, continuity of supply.

Coutard (2010), as referenced in Jaglin (2014) defines a grid as ‘a set of interconnected structures, centrally planned and managed by a single-monopoly based public utility offering uniform service’. However, the limitations of ‘gridded’ conceptions of infrastructure in the global South has been a recurrent theme for urban scholars (Skinner &

Watson 2017; Leck 2012). Furlong (2014) argues that in cities of the South, infrastructure access is characterised by the coexistence of a number of different configurations of socio-technical systems e.g. in terms of electricity access these might include power sharing, off-grid solutions like electricity generators, etc. Other authors agree that formal grids have limited coverage and limited reach amongst the urban population (Jaglin 2014; Graham & McFarlane 2014; Bayat 2000; Schulman & Roe 2016) and describe arrangements as hybrid (Furlong 2014; Larkin 2008), incremental (Silver 2014), post-networked (Coutard & Rutherford 2011; Monstadt & Schramm 2017), as well as peopled and lived (Graham & McFarlane 2014; Simone 2004).

Lawhon et al (2018: 722) propose the concept of ‘heterogeneous infrastructure configurations’ (HICs), arguing that this enables a clearer analysis of infrastructural artefacts not as individual objects but as parts of geographically spread socio-technological configurations: configurations which might involve many different kinds of technologies, relations, capacities and operations, entailing different risks and power relationships.

[Heterogeneous infrastructure configurations] means recognising people and their movements and connectivities as well as conditions of precarity. It means accepting that sometimes [infrastructures] will not be working, but also that working and not working is not a binary but a multifaceted, constrained decision-making process. It means recognising that [infrastructures] are enrolled in dynamic networks of power that shape not just permission to use, or cost of use, but the possibilities for intervention; there are social norms that construct a toilet’s usability but that usability is always in relation to what other options exist.

Lawhon et al. 2018: 729

Drawing on the critiques of formal grid and planning assumptions we outlined above, we have adopted a focus on a ‘gridded continuum’ of infrastructure access as a framing for our own research. In addition to incorporating the insights from the literature discussed above, the idea of a continuum captures our interest in the full range of shifting and fluid arrangements, moving between formal and unofficial, whilst also enabling understanding of the agency and relationships that lie along the grid/off-grid spectrum, and that animate infrastructure in cities of the global South. In approaching the lived complexities of infrastructure through the nomenclature of a ‘gridded continuum’, we are acknowledging that state-defined urban plans, as well as much of national/ international funding for infrastructure continue to prioritise ‘gridded’ infrastructure systems and focus financial and institutional means towards their progressive realization. As such, pathways of change need to acknowledge

these extant regulatory and fiscal structures, and find ways to expand and move beyond them.

## The need to radically overhaul food and Infrastructural visions

For urban planners and urban governance actors, the development of food systems and the infrastructure that supports them is often assumed—and then subsequently envisioned in formal planning—to involve increasing formalisation of food trade and, in parallel, the development of gridded infrastructure connections (roads, information, water, electricity). However, the Southern urban reality is quite different. With infrastructure network priorities often following real estate development potential in cities, many economically and socially depressed areas continue to remain off-grid despite new capital expenditure. In some cases such service denial and resulting perpetuation of informal settlements might be deliberate to enable future more profitable forms of development (Graham & Marvin 2002; Cabannes et al. 2010; Roy 2005; Swilling 2011). Formal grids of infrastructure for basic services often cater to only a small proportion of the urban population and official plans are often not fully or equally implemented across inhabited urban spaces.

In the absence of the fixed grids envisaged by formal planning, hybrid assemblages of infrastructure provisioning, by individuals and private players, fill the need-gap, often at high prices and/or low quality (Jaglin 2014; Graham & McFarlane 2014) or in ways that transfer risk to the poor. These might include jerry-rigged electricity connections, communal areas for open defecation, water trucks, privately owned bore-wells or generators, networks of kerosene, and gas canister retail or the use of solar panels. Such arrangements can be the reality for people from a range of socio-economic backgrounds. Urban populations, including marginalised households and informal traders, may thus be ‘off-grid’ in multiple and shifting ways, i.e. have limited or no access to formal physical infrastructure grids of water, energy, sanitation, as well as limited or no connections to intangible but official ‘grids’ of government records, information systems and public communications associated with public provisioning of key services and support (Bayat 2000). Gaining connections in the first place, and ensuring their maintenance and repair (Graham & Thrift 2007), depends on a complex set of interpersonal relationships that people must navigate (but often imperfectly). This might include negotiations or building relationships over time with a variety of actors such as kin, local fixers, politicians, private vendors, public servants, police and legal authorities.

A formal gridded approach to planning which attempts to sweep away such other forms of infrastructure may pose unanticipated risks to the most marginalised, who are often

the last to – or never do – access formal provision. Gaps in local authorities’ knowledge and assumptions about the relationship between infrastructure and food (including how people meet their needs at the interstices of ‘on-’ and ‘off-grid’, along a *continuum* of different provisioning – see below) can either undermine (Battersby & Muwowo 2019; Steyn et al. 2013; Mboganie Mwangi et al. 2002) or criminalise existing provision (such as street vending) (Skinner 2016; Bénit-Gbaffou 2016; Roy 2005), adding to the precarity of food supply, of health and of poor people’s livelihoods.

In effect, in many rapidly urbanising cities in low- and middle-income countries, there is a widening gap between official plans for spatial and infrastructural planning (and their partial implementation) and what people have constructed for themselves, some of which may reference the formal grid and official plans, but do not comply with them fully. This might include, for example, local borewell micro-grids that mirror the network plans of city-scale macro-grids of water that supply water brought into the city from regional water sources such as rivers etc., but do not (for example) comply with the municipal water treatment protocols that water supply in the macro grids have to adhere to.. This translates to limited official capacities to improve and regulate on-ground infrastructure arrangements. Perhaps compounding the marginalization and penalization of urban residents has been the urban planner’ modernist approach to planning that has produced plans detached from common people’s lived experience and even criminalise critical urban food infrastructure such as street trading and hawking.<sup>2</sup> Worse, most urban planners working in these poor environments are blind to food matters despite wielding massive authority over land use and infrastructure provision (Toriro, 2019). Critical work on planning has therefore focused on recognising forms of ‘rationality’ in infrastructure use that may be different for the poor (Watson 2003), searching for new workable modes of service consumption (Jaglin 2014) in the off-grid areas of informal settlements (Swilling 2016) and breaking the power regimes that have corrupted efforts at creating universal affordable service coverage (Cirolia 2020). While formal planning policy can assume progressive realisation of ‘grid access’ in the form of greater inclusion in state provision, factors such as reliability (Schulman & Roe 2016) and stability of existing auto-constructed systems that are locally embedded, maintained and repaired, may be more important to build on.

Only by studying a variety of these arrangements will we begin to understand the political economy, the socio-material dynamism (the making, repair, rejigging), and the decentering of agency that characterizes the various arrangements

<sup>2</sup> Though such criminalisation might also relate to other forms of municipal or national regulation such as food hygiene (te Lintelo 2009). See also Skinner 2016; Bénit-Gbaffou 2016; Roy 2005).

for food and infrastructure access for urban residents in Southern Cities. The understanding of these diverse systems is also a way to move beyond the traditional role ascribed to the state as a ‘builder’ of comprehensive macro grids, to that of a ‘regulator’ (of quality, price) and manager of multiple infrastructural provisioning systems, that involve not only a corporate version of the private sector, but also other ‘private’ providers, which may be community- led, non- profit- led, etc..

Such findings lead the way to what further engagement might need to happen between researchers, people with lived experience of such arrangements, policy makers, activists and broader civil society. The kinds of infrastructural assemblages we note in this paper are likely to be hidden or invisible to many policy makers, engineers, planners and others concerned with governing the urban environment, particularly if they are viewed via the binary of being ‘on’ and ‘off-grid’. Notably, when we began this research, understanding food’s infrastructural dependencies was seen as something of a niche topic. The covid, food and fuel crises that have been experienced in many countries has not only highlighted the links between, for example, electricity costs and the ability to prepare basic meals, but it has also highlighted a number of other aspects of the infrastructural assemblages that constitute food and nutrition security for urban families, from the diversity of food provisioning that has sprung up from communities and civil society to deal with the crises (from community kitchens and gardens to community stores and food banks) – bridging in many cases the gaps in the continuum of provision that we refer to as griddedness (Jehlička et al. (2019) make a similar point in relation to widespread networks of home gardening and sharing in the Czech republic which they argue represent both a site of “low-level resistance and [a potential site of] transformation” (p523)). The role of researchers and engaged and action research, we argue, is to help translate and make visible such arrangements, but not by doing so uncritically or romantically, but by bringing to light the underlying ideologies and discourses and deeply historicised processes that lead to provision which still leaves marginalised communities underserved.

## Conclusions

Urban dwellers’ food and nutrition situations are both dependent on infrastructure and can be indicative of wider wellbeing in urban contexts including broader infrastructural or societal health. Food makes a natural starting point to consider infrastructure, but has largely been ignored in many urban and infrastructural studies. Because of its reliance on a range of different socio-material infrastructures, and because

it can itself be considered as part of the essential infrastructure needed to support people’s basic needs, we find this a key omission in both theoretical and policy oriented work. Simply trying to chart urban systems separately can lead to top-down visions and responses to urban issues. Instead, policy and activism, planning and research need to foreground the everyday contestations and experience of food within wider urban systems and view both food and other forms of infrastructure as intersecting assemblages of people and ideas as well as the networks or flows or formal ‘gridded’ arrangements of things most commonly considered as infrastructure. Such arrangements are best viewed not as ‘on-grid’ or ‘off-grid’ but as an instable continuum of possibilities and barriers to access, particularly when viewed through the experience of those who are most marginalised in urban contexts / forgotten by the rationality of planned visions of the city, its food and its other infrastructural systems.

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