



THE LONDON SCHOOL
OF ECONOMICS AND
POLITICAL SCIENCE ■

LSE **Cities**



Ove Arup Foundation

LSE Cities Working Papers

Hybrid Cities: A Review of Relevant Literature

by **Philipp Rode and Sudeep Bhargava**

22 July 2024

Acknowledgements

This LSE Cities Working Paper was prepared as part of the “Towards a Hybrid Cities Programme” pilot project, funded by the Ove Arup Foundation.

1 Introduction

This review establishes the point of departure for conceptualising hybrid cities which blend physical and virtual spaces and engagements, and for related empirical research approaches. Cutting across academic and grey literature, it addresses existing, international knowledge and perspectives across relevant research questions, such as behaviour change in hybrid spaces, the comparative value of online and in-person engagement, the evolution of urban mobility, and the state of public policy in response to hybridisation in cities.

The literature review conceptualises the hybrid city, drawing on key theoretical understandings in multiple disciplines and fields of knowledge to show the virtual-physical hybridity experienced in cities today. Though versions of the hybrid city as a mixture of physical and digital space became popular among scholars, technologists and politicians during the 1990s, the effects of the COVID-19 pandemic have revealed the most urgent, related issues that major cities around the world are now facing. The contemporary perspective suggests that urban hybridity may bring new opportunities for realising sustainable and inclusive futures but also threatens well-being, sociability in cities, privacy and security.

2 General definitions

The term ‘hybridity,’ as it relates to the combination of virtual and physical modes and activities, has entered the common lexicon. The explosion of remote work and learning following the onset of the COVID-19 pandemic resulted in widespread use of hybrid meetings, offices and classrooms. While these examples, and many others relating to the hybrid city, existed well before 2020, we have entered an era in which virtual-physical hybridity is increasingly understood, experienced and even expected.

Scholarship and popular perspectives at the end of the last century increasingly portrayed virtual and physical environments as irreconcilable, claiming that virtual life, and its various spaces and components, would come to replace those of the physical world in a technologically deterministic manner (Graham, 1998). Those claims, as many now experience daily, turned out to be either premature or altogether misleading. Cities today are

experiencing hybridity as a dynamic interrelationship – albeit not without tension – between physical and virtual communication, spaces, activities and systems. The specifics of this relationship will be discussed further along in this review via analysis of existing literature and empirical research, both of an academic nature and otherwise.

The concept of the ‘hybrid city’ has taken several forms in both academic and urban practice fields. The ‘smart city,’ enhanced and mainstreamed by the integration and deployment of data technologies, has long captured the attention of policymakers and researchers alike. While early advocates boasted increased efficiency and resource allocation, its paradigm has been criticised for its top-down and determinist approach favouring the interests of elites (Grossi and Pianezzi, 2017, Sadowski and Bendor, 2019, McNeill, 2015) and failure to recognise the ‘city’ as an ecosystem of diverse actors with varying needs (Datta, 2022, Datta, 2015, Greenfield, 2017, Kitchin, 2015). Conversations among urbanists and technologists have argued for novel approaches and perspectives that fill the gaps and exclusions of traditional smart city thinking. These include the empirical research-based ‘smart urbanism’ (McFarlane and Söderström, 2017) and consideration of the “actually existing smart citizen” (Shelton and Lodato, 2019) in the context of smart city initiatives.

In coining the term “platform urbanism,” Barns (2020) reconciles the growth of urban centres and systems with the expansion of social and communicative selves via digital networks and propriety data structures. From platforms that serve to achieve specific ends, such as Uber and Airbnb, to those which inform our spatial and social whereabouts, experiences in urban settings are increasingly seen “as opportunities for platform intermediation” (p.15) and data extraction (Barns, 2020). The term “platform urbanism” focuses on the monetised value of urban data and the effect of platforms’ design and affordances on urban governance, structure and experience (Barns, 2019).

It should be noted that despite criticism in the academic sphere, governments and policymaking bodies have continued to fund and implement projects aligned with traditional ‘smart city’ and ‘sharing economy’ thinking (Barns, 2020, Shelton

and Lodato, 2019). Kitchin (2022) points out that “a large proportion of smart city research takes place outside of the academy through industry research and development work, and in private consultancies that advise city administrations” (p.156), which could account for the mismatch between critical scholarship and smart city policy implementation around the world.

3 Broader references to hybridity

To establish a standardised definition of the hybrid city, it is necessary to consider the contexts in which

the notion of hybridity has been used. Appropriated from biological fields, the term ‘hybridity’ has, over time, come to describe more nuanced, varied and complex processes in the realm of human interactions with language, law and one another. While only some of these references relate to digital technologies and/or urban studies, understanding their use of ‘hybridity’ helps to avoid the common pitfalls associated with the concept. Table 1 summarises contributions from various fields to the contemporary definition of virtual-physical hybridity and the conditions of hybrid cities that are explored further in this review.

Table 1. Examples of references to ‘hybridity’ across fields of knowledge.

| Field of research | Description of hybridity |
|---|---|
| Cultural Studies (Bhabha, 1994, García Canclini, 1990, Gómez-Peña, 1996, Hale, 1999, Kraidy, 2006, Werbner, 1997) | Postcolonial states in Latin America adopted a <i>mestizaje</i> ideology (racial mixing) to propose the new state as a hybrid between colonial vestiges and indigenous groups. |
| | The hybridity of postcolonial thought, according to Bhabha (1994), is notable in its ability to subvert categorical opposites and reappropriate discourse, as is often witnessed in postcolonial literature and modern literary forms. Hybridity has been used to explain the large-scale power imbalances and contradictions brought to postcolonial states in the aftermath of globalisation. |
| | Hybridity is critiqued for being paradoxical in that: 1) it is considered both marginal and mainstream, subversive and pervasive (Werbner, 1997), and 2) it is defined by its ambiguity, open to divergent interpretations (Gómez-Peña, 1996). Kraidy (2006) calls for hybridity to “examine the relationship between structure and agency as a dialectical articulation whose results are not preordained,” admitting that “hybridity is not a posthegemonic state” (pp.333-334). |
| Legal Studies (Donlan, 2012) | Hybridity in the law refers to “complex and fluid [webs]” (p.7) of laws and norms in a given legal context. Both categories are pre-defined and distinct. |
| | Hybridity, in this legal sense, arises from the diffusion of Western laws into diverse areas where there exist other, distinct legal traditions. Legal hybridity, therefore, in its actual practice, necessarily involves power structures. |
| Linguistics (Mäntynen and Shore, 2014, Stross, 1999, Thomason et al., 1988, Valdman, 1997) | Hybrid communication models and forms arise in response to changes in the environment or context. Hybrid forms of communication are optimal for speakers involved and the context in which communication is taking place (Stross, 1999). |
| | Complex hybridity exists in linguistics in the context of shifting roles of speakers, foreign words and phrases adopted into languages, and transitional genre scenarios (Mäntynen and Shore, 2014). Hybrid genres are produced via mechanisms of embedding, appropriation, and blending (Mäntynen and Shore, 2014). |
| | Scholars theorise that language hybridisation, creolisation and pidgin (simplified language) linguistics arise through contact of groups who do not share a language in common (Valdman, 1997, Thomason et al., 1988). |
| Urban Cultures (Cheshmehzangi, 2015) | Social and urban identities are conceived of as hybrids due to the overlapping dimensions in which they are created and experienced. A complete urban identity is only possible through the interaction of personal, social, cultural and locational identities. |
| | A sense of placeness is constructed from a global identity, a macro urban identity, a medium environmental framework, and a micro individual level. |

4 Virtual-physical hybridity

Contrary to perspectives that dominated popular and academic discourses at the end of the last century, information technologies have not displaced physical space, and “place-based relational webs that rely on adjacency, propinquity and physical flows remain central to the experience of human social, economic and cultural life” (Graham, 1998, p.182). In his definition of “space of flows,” Manuel Castells states that while “the unit is the network... it is not a purely electronic space” (Castells, 1999, p.295) and again that “it does have a territorial configuration related to the nodes of the communication networks” (Castells et al., 2006, p.171). Virtual space, broadly, has always contained an element of physicality due to its physical anchors and the physicality of users (Kellerman, 2023). Hybridity emerges, firstly, in the interrelationship between the “space of flows” and the “space of places,” the latter in which social meaning continues to be organised and experienced (Castells, 1999). Graham (1998, p.172) specifies that “a complex co-evolution, articulation and synergy between place-based and telemediated exchange” is occurring in the contemporary city.

The introduction of mobile digital interfaces (smartphones, etc) has allowed for physical-virtual hybridity in which the boundaries of space are complex and the perception of time de-sequenced (de Souza e Silva, 2006, Kellerman, 2023, Castells et al., 2006). These spaces are connected (contiguous across physical-virtual boundaries), mobile (involving contexts across a range of spaces), and social (a product of materialised networks). As opposed to conceptualisations of desktops as static portals into cyberspace, mobile devices introduce “the possibility of an ‘always-on’ connection when one moves through a city [which] transforms our experience of space by enfolding remote contexts inside the present context” (de Souza e Silva, 2006, p.262). Kellerman (2023, p.10) refers to “dual-space society” as the existence of people, continuously or jointly, in an online and physical location.

Mobility holds a significant role in the establishment of hybrid spaces. Barns (2020) notes that today’s virtual exportation of human senses and communication is preceded by the emergence of various network technologies that altered spatial experience, first physically (via rail networks) and

then sensorially (eg, radio waves). Today’s virtual mobility involves the “the transmission and receipt of information” via digital technologies, presenting new opportunities for human interaction as well as extensibility of the self (Kellerman, 2023, p.4). Further, the integration of the internet of things devices into the built environment creates urban data infrastructures which, in turn, are used to make decisions which affect physical everyday systems in the city (Barns, 2019). Location-based services and such technologies integrate data and virtual objects into the embodied cityscape which is otherwise experienced physically through human senses. Frith (2012, p.145) explains:

“By bringing the searchability of the internet into the information contained in physical places, hybrid spaces afford new ways of organising and filtering experience, transforming the physical city into a database city of sorts, ready to be reordered and personalized.”

The resulting urban environment is navigated and negotiated for both its physical and spatial attributes as well as its digital and algorithmic reconstructions. Graham (1998) employs the term ‘hybrid’ to describe actor-networks enabled by information technologies, continually creating new conceptualisations of hybrid space. Similarly, de Souza e Silva (2006) argues that hybrid environments are created by networks of people and devices acting towards social ends. The transformation of cities in the ‘network society’ is dependent on the “interface between electronic communication and physical interaction” (Castells, 2002, p.554), and so urban spaces of interaction are “defined entirely within the flows of communication” (Castells et al., 2006, p.172).

4.1 Are there any non-hybrid spaces?

The preconditions of ‘purity’ which contribute to the traits and features of hybridity are often constructed as hybrids themselves (Stross, 1999). Scholars in the field of cultural and postcolonial studies often suggest, as a critique of hybridity, that the boundaries of any hybrid text or form are loosely defined, and that any cultural artifact can be conceptualised as a hybrid. Similarly, Donlan (2012) suggests that hybrid legal systems result from the diffusion of pre-existing systems which

themselves can be considered hybrids. It is therefore difficult to establish a ‘pure’ state in the study of hybridity, though doing so helps define the scope of our definition of ‘hybrid.’

In the case of virtual-physical urban hybridity, non-hybrid environments are difficult to find. Planners and engineers increasingly approach the design of urban spaces with the viability and deployment of digital technologies in mind (Bugliarello, 2002). Considering the ubiquity of personal mobile devices (Miller et al., 2021) as well as wider digital systems meant to capture, interpret and utilise urban data (Moreno, 2021), it is almost impossible to objectively label any urban space as entirely void of either physical or virtual elements. These two realms are not equal, nor do they exist in material, historical or imaginary urban realities equally. One can point back in time to a period where the ‘virtual’ urban environment was not only unimplemented structurally, but even inconceivable by engineers, policymakers, scholars etc. It should also be noted that the long-standing employment of spatial metaphors in the language of virtual technology use has obscured the complexity of the virtual-physical interrelationship (Graham, 1998, Castells, 1999).

When discussing the perception of urban environments as either ‘purely’ physical or virtual, we could potentially uncover spaces which belong to only one realm. From an individual perspective, there may be physical locations in the urban landscape that are free from interaction with digital technology. Leaving devices at home when going to a local park or on a run around the neighbourhood could constitute a tech-free environment. At the same time, accessing digital, place-based networks solely through devices could accomplish a task in providing an individual with information, but leave them with a lack of sensory stimulation, resembling a fully virtual urban environment. Hybridity differs on a scale of individual to institutional conceptions of places and technologies (Kalin and Frith, 2016, Miller et al., 2021).

4.2 State of research: When and where the literature comes from

In establishing a conceptual basis for the empirical study of hybrid cities, it is necessary to analyse the current use of the term in literature across fields,

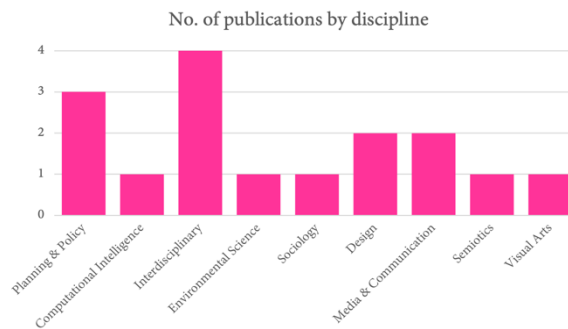
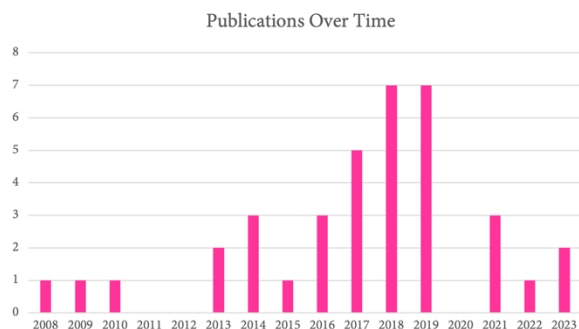
publications and research centres around the world. A standardised review of existing literature was undertaken following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines revised in 2020 (Page et al., 2021). Eligibility was restricted to sources that use the term “hybrid city” or “hybrid cities” in their title, abstract or keywords. Sources were identified from two databases, Web of Science and Scopus. Retrieval of eligible sources was conducted first through Web of Science and then Scopus.

Initial retrieval from Web of Science delivered 87 results, 55 of which were removed for divergent uses of the term, most often referring to the engineering of “hybrid city vehicles” such as buses or cars. While mobility is a central issue in this literature review, research into engineering systems falls outside of this project’s purview. Of the 32 remaining sources, only 19 relevantly describe “hybrid cities” as a combination of physical and digital systems and/or spaces. A similar screening was carried out on Scopus, which yielded 166 initial results and 61 results after screening for divergent titles and abstracts. Of these, only 18 sources refer to “hybrid cities” relevant to the current study and are not included in sources retrieved from the Web of Science.

Sources excluded for irrelevant uses of the terms “hybrid city” or “hybrid cities” described urban hybridity as a combination of historic and futuristic elements; private-public arrangements; Western and non-Western ideologies; socialist and capitalist tendencies; built and natural environments; priorities towards pedestrian and motorised transport design; urban and rural; global and local; planned and unplanned; multiple cultures and languages; various approaches to governance; and/or temporally discontinuous cities.

The 37 sources, pooled from both databases and utilising a relevant definition of the “hybrid city,” consist of 16 peer-reviewed materials and 21 conference papers and proceedings. Most peer-reviewed sources fall under the realm of planning and policy, followed by design, and media and communication. Interdisciplinary materials mostly touch on urban studies, geography, engineering and cognitive intelligence. Figures 1–3 demonstrate the spread of the relevant sources by publication year, the location of the primary author of peer-

reviewed materials, and the disciplines under which the selected peer-reviewed materials fall.



Figures 1–3: Spread of relevant sources by publication year (1), discipline (2) and location of primary author (3).

A range of methods is employed by the selected materials, such as those empirical methods involving real-time captured data (eg, sensor and mobile data) and those that rely on models and predictions (eg, digital twins and predictive algorithms). The selected materials also employ participatory approaches to urban research, such as gamification (user engagement through play) and Delphi methods (a forecasting method using experts). The issues surrounding urban hybridity span both qualitative and quantitative research methods and so face a large volume of data, some of which at times conflict with each other. The full range of methods, on a scale from empirical to modelled, explored in the relevant literature is illustrated in Figure 4 below.



Figure 4: Methods employed by selected materials on a scale from empirical to modelled.

4.3 Urban hybridity in grey literature

Research and discussion surrounding virtual-physical hybridity in cities are also advancing beyond the academic sphere. As stated, much empirical research, innovation and advocacy for the development and practical implementation of hybrid city technologies are driven by industry and see their true impact via decisions made by

governing bodies. It is necessary to note the direction in which both private and public sector publications point.

This review identifies 25 recently published reports and articles from a diverse range of prominent sources that touch upon emerging concepts and ongoing issues related to hybrid cities. These reports and articles, while far from capturing the

entirety of existing publications related to urban hybridity, illustrate the broad relevance and urgency of urban hybridity in industry and government sectors and capture varied topics such as the digitisation of industries, remote and hybrid work, smart infrastructure and advancements in

smart mobility. This review will touch on a handful of these materials, particularly those with novel insights and relevant interests. A complete list of organisations whose materials were included is provided below in Table 2.

Table 2. Organisations with included grey literature.

| Name of Organisation | | |
|---|---|--|
| Arup | European Commission | Microsoft |
| Barclays | European Investment Bank | MIT Technology Review |
| Cambridge Centre for Smart Infrastructure and Construction (CSIC) | Global Future Council on Cities of Tomorrow | Organization for Economic Cooperation and Development (OECD) |
| Centre for Cities | Global New Mobility Coalition | Siemens |
| Centre for Digital Built Britain (CDBB) | Harvard Business Review | UK Department for Business, Energy and Industrial Strategy |
| Centre for Urban Transformation | International Monetary Fund | World Economic Forum (WEF) |
| Deloitte | McKinsey Global Institute | World Bank Group |

Overall, reports are optimistic about the digitisation of urban industries, focusing largely on the positive effects on industrial sustainability and efficiency. The World Economic Forum (WEF) advocates here for the SODPA model (strategy, operation, data, platform and application) (Cai et al., 2023), focusing on strategy and talent development; operation and business; data and infrastructure; platform and technology; and application and scenario. The WEF has also published an Urban Mobility Scorecard (Wylie et al., 2023) for cities to measure their progress on sustainable, inclusive, urban mobility. Reports advocate for cross-sectoral collaborations and public-private partnerships to ensure the quality of urban data and robust privacy standards (Wylie et al., 2023, Körte, 2022, Barclays, 2020). Many reports stress that desired outcomes must be people-focused: providing social, environmental and economic benefits.

Urban space is of particular importance, as retail areas are transformed by digital technologies, and hybrid work rearranges the use of existing office

buildings. Small and medium enterprises have benefitted from the explosion of e-commerce and digital tools, but reports emphasise the continued role that brick-and-mortar stores play in their success (Bianchini and Kwon, 2023). Arup's 2021 report on East Asian retail emphasises how the physical space of malls can facilitate novel hybrid retail experiences for consumers (Wen et al., 2021). McKinsey's 2023 report on urban real estate markets states that demand will vary by city and neighbourhood depending on office density, the housing market, and employers (Mischke et al., 2023). Priorities for cities trying to reignite their real estate markets include developing mixed-use neighbourhoods, constructing adaptable buildings, and designing multi-use office and retail space.

With the shift to hybrid working modes has come a shift in how employers can support employees and encourage positive work environments. Some of these mechanisms are technologically mediated, implementing open communication channels and aiding in skills training. Additionally, the productivity paradigm is being replaced with an

emphasis on well-being, fairness, inclusion and work-life balance (Sienkiewicz, 2022, Microsoft, 2022). Important here is a consideration of the cost of in-office work, particularly in the realm of transport.

5 Hybrid disruptions in cities

This section explores prominent socio-technical disruptions resulting from urban hybridity. It includes boarder questions of behaviour change in cities, the value of on-site and in-person engagement, the reduction of the need to travel and policy responses to urban hybridity.

5.1 Behaviour change in hybrid spaces

Miller et al. (2021, p.119) propose that the ubiquity of the smartphone, referred to as “Perpetual Opportunism”, allows people “to exploit real-time information” through a combination of devices, services and algorithms. It is therefore important to interrogate how human behaviour is affected by hybrid technologies. For example, communication styles are less distinct now than ever before, as digital media objects that are used in mediated communication “[become] just as fleeting and transient” (Miller et al., 2021, p.106). A further defining feature of the hybrid environment is the smart device as a “Transportal Home” through which people can perceptually, and constantly, shift through zones of interaction (Miller et al., 2021). Kalin and Frith (2016, p.223) argue that smartphones and wearable tech “have become the invisible infrastructure for the production of embodied space” in urban settings. Through devices which navigate, capture and represent space, people create “hybrid memory palaces” which combine both data and rhetorical memory.

From work to play, the mobile device as a hybrid ‘portal’ allows for more diverse and ephemeral interactions in the hybrid cityscape. As a prominent example, the popularity of hybrid reality game (HRG) *Pokémon GO* brings to light many issues related to hybrid urban activity, including surveillance of players’ spatial data and changes to local mobility (de Souza e Silva, 2017). Sociability is an important aspect of HRGs as well, and players have been found to engage with each other both locally and across global networks, expanding a

sense of place and enabling new hybrid mobilities (Xu et al., 2023). Djukic, Vlastos, and Joklova (2019, p.46) state that “e-networks have opened up additional channels of communication and diffusion and become a new tool for the continuous development of” open public spaces. Public spaces both influence and are influenced by the activities of people who inhabit them; as such, hybrid spaces open new pathways of interaction and perception (Smaniotto Costa and Šuklje Erjavec, 2019). For example, experiments conducted in museums have demonstrated that virtual reality technologies can allow for “novel museum experiences” wherein audiences report higher levels of learning and enjoyment (Rahimi et al., 2022).

One type of mobile interface that will fundamentally alter public space is the autonomous vehicle. While much empirical research exists on the technical side of this issue, the psycho- and sociological factors affecting pedestrian behaviour is equally important to ensure safety in hybrid spaces. Kalatian and Farooq (2021) use a machine-learning model to determine which factors are most likely to affect street-crossing tendencies. Their findings point towards educational programmes, enhanced safety measures, active modes of transportation, and traffic rule reform as potentially viable and urgent interventions. Safety must be promoted inside the vehicle as well, which is what Xia and colleagues (2023) look at in their research on the adoption of augmented reality head-up displays by automotive users. Factors such as trust, effort, and performance expectations contribute to the relationship people have with the interfaces that enable hybrid spaces.

Hybridity can also be an apparatus for social control. Chen and Oakes (2023) refer to China’s contact tracing programme (‘time-space companion’ or TSC) used to maintain their zero-COVID policy as a hybrid urban system, utilising GPS location and health apps on people’s smartphones to conduct data surveillance. Several digital identifiers were used to operationalise the TSC programme, “such as a companion’s name, phone number, and when and where the phone number intersected with that of the targeted positive case” (Chen and Oakes, 2023, p.293); however, these databases were full of error, both automated and human. While not highly effective

in contact tracing, TSC did influence the public as a surveillance tool by disciplining citizens for engaging in routine activities and shifting responsibilities onto them.

5.2 The comparative value of on-site and in-person engagement

Work and other areas of urban life increasingly occur online; however, there is a need to determine how new working arrangements can be better facilitated and sustained. A work setting's 'media ecology' is "an appropriate mix of face-to-face [communication] and other media depending on the work, its temporal sequence, the context, and the distances to be travelled" (Nardi and Whittaker, 2002, (p102). In their discussion of "new ways of working", Aroles and colleagues (2021) reflect on how the COVID-19 pandemic led to contradictory developments regarding flexibility and mediation in the workplace, enabled by digital and hybrid technologies. Similarly, Vilhelmson and Thulin (2016) explore four factors that can both enable and constrain the diffusion of remote working in Sweden: locational/spatial attributes, technology, arrangements/interpersonal factors, and personal preference. Further, automation in hybrid work environments is shifting the focus away from efficiency and productivity towards enjoyment and satisfaction (Langer et al., 2021).

Referring to the pandemic as a "forced experiment in teleworking, remote shopping, dependency on home deliveries, and even in keeping and developing personal relationships" Florida and colleagues (2021, p.10) differentiate between types of work and workers' ability to telework. In contrast to "essential" and "high-touch" workers, knowledge workers are more easily able to work remotely, stratifying telework by income level. While the adoption of remote work has impacts on urban transport and real estate, not all cities and regions meet the conditions for such widespread transformation. On a macro-geographical level, the researchers predict "another wave of centre-city living" enabled by the hybrid solutions that many relied on during the pandemic's various lockdowns (Florida et al., 2021, p.15). Such solutions, for example, give rise to the "Meta City" (Florida et al., 2023): a corporate, post-pandemic network in which locational strategy plays a significant role. Digitally connected urban areas have similar

economic and social functions that follow employee migration patterns, with crucial implications on connected labour markets and talent retention.

Education is a major area experimenting with mediated communication. Teachers grapple with new technological environments that increase labour, decrease students' motivation, and affect the quality of social relationships (López-Fernández et al., 2021). Sociality online is a much-analysed area of mediated communication, but hybrid environments bring up novel issues regarding the quality of relationships and opportunities. Research has suggested that online social interactions are more role-based and functional than in-person interactions (Schroeder, 2010).

In the realm of public health, digital integration has positive implications on "access to health and health-enhancing information while reducing the cost of health care" (Sabel et al., 2021, p.260). With increased amounts of data, physicians and providers can make better informed decisions, but there are limits. Underserved communities have new worries about their data being exploited or used unethically while adolescents are the subject of increasing reports of deteriorating mental health due to technology use (Sabel et al., 2021).

5.3 The reduction in the need to travel

The COVID-19 pandemic brought to light sustainability issues in urban mobility as it plunged the world's largest cities' transport systems into crises. Ridership around the world has failed to return to pre-pandemic levels and short-term public funds are running dry (Vickerman, 2021). Existing models of transportation have become obsolete as digital technologies and hybrid urban practices continue to take root. Frith (2012, p133) points out that when information flows through space, it alters the perception of that space: "[People] who move through hybrid spaces penetrated with digital information have a qualitatively different experience of mobility than those who do not". Vickerman (2021, p.101) argues for "wholesale rethinking" that focuses on "the demand for mobility and how that mobility relates to the economic and social well-being of a city or region". Looking at the case of Oslo, Di Marino and colleagues (2023) highlight that public transportation and other forms of physical mobility

such as walking and cycling are necessary to enable new workspaces, among other types of hybrid urban spaces.

Since digital technology has failed to make physical travel redundant, an interest in ‘smart mobility’ has emerged as a potential solution to issues such as air pollution, road accidents and traffic congestion (Yigitcanlar et al., 2019). The availability of environmental data has the potential to inform better smart mobility systems. Sumalee and Ho (2018) refer to cyber, social, and physical (CSP) spaces as the ideal data source to enable holistic consideration of the impact of smart mobility systems by urban planners. However, a missing overarching legal framework and limited research on the social and environmental impact of autonomous vehicles are existing challenges to overcoming the risks of implementing such a disruptive technology (Yigitcanlar et al., 2019, Csepinszky et al., 2015).

The pervasiveness of hybrid urban activities also warrants a new evaluation of how physical and virtual spaces are simultaneously and/or complementarily accessed and traversed. Shaw (2023) proposes an updated assessment of time geography, accounting for both physical and virtual activities over time. Ren and Kwan (2007) introduce new methods of tracing and visualizing movements through both physical and virtual urban environments, unveiling discrepancies between how distinct groups of people access both spaces.

5.4 Public policy responses to hybridisation in cities

What are the major policy questions and implications in the hybrid city? Early in this discussion, Castells (1999, p.299) advocated for close attention to paid to the “increasing linkages between people and institutions in an interactive process,” emphasising the role in which information technologies can mobilise citizens to affect political outcomes. Servou, Behrendt and Horst (2023, p.2) use the term “hybrid governance” to describe the “interplay between multiple human actors, levels of governance and non-human actors (data and algorithms)”. Similarly, Yigitcanlar, Wilson and Kamruzzaman (2019) advocate for better insights into the long-term impacts of smart

technologies in order for urban planners to propose viable plans for their implementation. Data is not a neutral entity, and its “collection and deployment [should] become objects of explicit and transparent decision-making” (Servou et al., 2023, p.3).

Urban hybrid activities require new considerations by policymakers. In their briefing paper following the UK Parliament’s assessment on hybrid working after the pandemic, Mutebi and Hobbs (2022) state that the reconvened Flexible Working Taskforce is supporting employers and workers on practical and legal issues associated with hybrid working. A report from the Department for Business, Energy & Industrial Strategy (2022) stated the government’s intention to support employees’ right to request hybrid working agreements from employers, cementing measures to protect that right in the form of policy.

However, effective policy solutions across all fields requires better research and more robust data. Unintended consequences of the implementation of hybrid technologies may require further regulation on energy consumption (Nicholls and Strengers, 2019), and a shift to hybrid-by-default health services could deny certain communities access to such care (Gallegos-Rejas et al., 2023). Gil, Martínez, and Sequera (2023, p.10) similarly discuss the hybrid housing market as “a neoliberal tenant dystopia,” which “influences the power dynamic between landlords and tenants” and creates an unmoored urban tenant population. Public policy, in these cases, is proposed as necessary to protect people from algorithmically managed markets.

Digital urban systems open the door to participatory policymaking through interactive technologies. Innocent (2018, p.6) advocates for the “playable city” as it “makes urban planning more accessible and tangible than traditional surveys and planning documents”. For example, “Playtown,” a hybrid city initiative in Recife, Brazil, successfully revitalised the dilapidated city centre by “[engaging] residents, creatives, policymakers and local businesses in developing city place-making processes” (Marques and Borba, 2017, p.91). As policymakers and urban planners tackle hybrid post-pandemic urban developments, participation by ways of play is a conceptually secure approach,

backed by numerous examples around the globe (Innocent and Stevens, 2021).

Molenaar (2022) discusses the implementation of AI in educational settings, proposing the development of a “common language...to support a coordinated development of a dialogue between researchers, education professionals, entrepreneurs, and policymakers” (p634). Such a language “[supports] a coordinated development of an interdisciplinary dialogue” and “[builds] on the combined strength of human and artificial intelligence” (p.641) (Molenaar, 2022). Policy initiatives in hybrid cities can take on a hybridity of their own, involving a variety of stakeholders and weighing proposed models against lived experiences. Though informed by developments in technology, researchers and experts continue to advocate for the involvement of citizens to avoid top-down solutions which errantly separate the layer of people and society from the layer of policy and infrastructure (Innocent, 2018).

6 Conclusions

This literature review has served to foreground different conceptualisations of hybrid cities, as well as outline the most pressing debates and questions emerging from academic spheres, policy institutions and boardrooms. Issues involving public policy, institutional change, and potential interventions from both public and industry actors are beginning to take shape as post-pandemic effects stabilise in major cities around the world. By taking stock of which issues and demographics these debates are centred around, the review highlights potential areas in which research-backed data is urgently needed as well as existing blind spots in policy initiatives.

Understanding the state of physical-virtual hybridity, its socio-technical developments, and the various policy interventions advocated for both from within and separate from the academy informs the LSE Hybrid Cities Lab’s guiding research questions:

What are short and medium-term implications of the changing relationship between physical and digital spaces for cities and urban development? What agency does civil society

and urban governments have shaping urban hybridity?

These questions will form the basis for related research at LSE Cities. With a cross-sectoral framework and approach to conducting research, and by forming partnerships with institutions across a range of sectors, the proposed Hybrid Cities Lab will investigate unseen and under-researched relations of urban hybridity. While cities around the world may already find themselves on the brink of major shifts and transformations, more proactive exchange and inquiry across the siloed boundaries of urban hybridity, and incorporating a range of scenarios for alternative futures, is imperative for a responsible engagement with contemporary urban development.

References

- AROLAS, J., CECEZ-KECMANOVIC, D., DALE, K., KINGMA, S. F. AND MITEV, N. (2021). New ways of working (NWW): workplace transformation in the digital age. *Information and Organization*, 31, 100378.
- BARCLAYS (2020). Rethinking Smart Cities: Prioritising infrastructure. Barclays.
- BARNES, S. (2019). Negotiating the platform pivot: from participatory digital ecosystems to infrastructures of everyday life. *Geography Compass*, 13, e12464.
- BARNES, S. (2020). *Platform Urbanism: negotiating platform ecosystems in connected cities*, Singapore, SINGAPORE, Springer Singapore Pte. Limited.
- BHABHA, H. K. (1994). *Of Mimicry and Man: the location of culture*. Routledge.
- BIANCHINI, M. AND KWON, I. (2023). SMEs in the era of hybrid retail: evidence from an OECD D4SME survey. *SME and Entrepreneurship Papers*. OECD.
- BUGLIARELLO, G. (2002). Virtual nations or telecommunications. (commentaries and response). *World Future Society*.
- CAI, C., PENG, H., YAN, M., JINGTAO, Z., YUXIONG, Z., THANI, M. AND XU, Y. (2023). Digital twin cities: key insights and recommendations. *Insight Report*. World Economic Forum & China Academy of

- Information and Communications Technology.
- CASTELLS, M. (1999). Grassrooting the space of flows. *Urban Geography*, 20, pp.294–302.
- CASTELLS, M. (2002). Local and global: cities in the network society. *Tijdschrift voor Economische en Sociale Geografie*, 93, pp.548–558.
- CASTELLS, M., FERNANDEZ-ARDEVOL, M., QIU, J. L. AND SEY, A. (2006). *Mobile Communication and Society: A Global Perspective*, Cambridge, UNITED STATES, MIT Press.
- CHEN, X. AND OAKES, T. (2023). Time-space companions: digital surveillance, social management, and abuse of power during the COVID-19 pandemic in China. *Critical Asian Studies*, 55, pp.282–305.
- CHESHMEHZANGI, A. (2015). Urban identity as a global phenomenon: hybridity and contextualization of urban identities in the social environment. *Journal of Human Behavior in the Social Environment*, 25, pp.391–406.
- CSEPINSZKY, A., GIUSTINIANI, G., HOLGUIN, C., PARENT, M., FLAMENT, M. AND ALESSANDRINI, A. (2015). Safe integration of fully automated road transport systems in urban environments: basis for missing legal framework. *Transportation Research Record*, 2489, pp.115–122.
- DATTA, A. (2015). A 100 smart cities, a 100 utopias. *Dialogues in Human Geography*, 5, pp.49–53.
- DATTA, A. (2022). The digitalising state: governing digitalisation-as-urbanisation in the global south. *Progress in Human Geography*, 47, pp.141–159.
- DE SOUZA E SILVA, A. (2006). From cyber to hybrid: mobile technologies as interfaces of hybrid spaces. *Space and Culture*, 9, pp.261–278.
- DE SOUZA E SILVA, A. (2017). Pokémon Go as an HRG: mobility, sociability, and surveillance in hybrid spaces. *Mobile Media & Communication*, 5, pp.20–23.
- DEPARTMENT FOR BUSINESS, E. I. S. (2022). Consultation on Making Flexible Working the Default. In: DEPARTMENT FOR BUSINESS, E. I. S. (ed.). London: His Majesty's Stationery Office.
- DI MARINO, M., TABRIZI, H. A., CHAVOSHI, S. H. AND SINITSYNA, A. (2023). Hybrid cities and new working spaces – the case of Oslo. *Progress in Planning*, 170, 100712.
- DJUKIC, A., VLASTOS, T. AND JOKLOVA, V. (2019). Liveable Open Public Space – From Flaneur to Cyborg. In: SMANIOTTO COSTA, C., ŠUKLJE ERJAVEC, I., KENNA, T., DE LANGE, M., IOANNIDIS, K., MAKSYMIUK, G. AND DE WAAL, M. (eds.), (2019). *CyberParks: the interface between people, places and technology: new approaches and perspectives*. Cham: Springer International Publishing.
- DONLAN, S. P. (2012). To hybridity and beyond: reflections on legal and normative complexity. In: PALMER, V. (ed.) *Mixed Legal Systems, East and West: Newest Trends and Developments*. 1 ed.
- FLORIDA, R., BOUTENKO, V., VETRANO, A. AND SALOO, S. (2023). The rise of the meta city. *Harvard Business Review* [online].
- FLORIDA, R., RODRÍGUEZ-POSE, A. AND STORPER, M. (2021). Critical commentary: cities in a post-COVID world. *Urban Studies*, 60, pp.1509–1531.
- FRITH, J. (2012). Splintered space: hybrid spaces and differential mobility. *Mobilities*, 7, pp.131–149.
- GALLEGOS-REJAS, V. M., THOMAS, E. E., KELLY, J. T. AND SMITH, A. C. (2023). A multi-stakeholder approach is needed to reduce the digital divide and encourage equitable access to telehealth. *Journal of Telemedicine and Telecare*, 29, pp.73–78.
- GARCÍA CANCLINI, N. (1990). *Culturas híbridas: estrategias para entrar y salir de la modernidad*, Mexico City, Grijalbo.
- GIL, J., MARTÍNEZ, P. AND SEQUERA, J. (2023). The neoliberal tenant dystopia: digital polyplatform rentierism, the hybridization of platform-based rental markets and financialization of housing. *Cities*, 137, 104245.
- GRAHAM, S. (1998). The end of geography or the explosion of place? Conceptualizing space, place and information technology.

- Progress in Human Geography*, 22, pp.165–185.
- GREENFIELD, A. (2017). Practices of the minimum viable utopia. *Architectural Design*, 87, 16–25.
- GROSSI, G. AND PIANEZZI, D. (2017). Smart cities: utopia or neoliberal ideology? *Cities*, 69, pp.79–85.
- GÓMEZ-PENÑA, G. (1996). *The New World Border: Prophecies, Poems, and Loqueras for the End of the Century*, City Lights Publishers.
- HALE, C. R. (1999). Travel warning: elite appropriations of hybridity, mestizaje, antiracism, equality, and other progressive-sounding discourses in Highland Guatemala. *The Journal of American Folklore*, 112, pp.297–315.
- INNOCENT, T. (2018). Play about place: placemaking in location-based game design. *Proceedings of the 4th Media Architecture Biennale Conference*. Beijing, China: Association for Computing Machinery.
- INNOCENT, T. AND STEVENS, Q. (2021). Urban play as catalyst for social well-being post-pandemic. *Frontiers in Computer Science*, 3.
- KALATIAN, A. AND FAROOQ, B. (2021). Decoding pedestrian and automated vehicle interactions using immersive virtual reality and interpretable deep learning. *Transportation Research Part C: Emerging Technologies*, 124, 102962.
- KALIN, J. AND FRITH, J. (2016). Wearing the city: memory p(a)laces, smartphones, and the rhetorical invention of embodied space. *Rhetoric Society Quarterly*, 46, pp.222–235.
- KELLERMAN, A. (2023). *Understanding Personal Mobilities*, Cheltenham, UK, Edward Elgar Publishing.
- KITCHIN, R. (2015). Making sense of smart cities: addressing present shortcomings. *Cambridge Journal of Regions, Economy and Society*, 8, pp.131–136.
- KITCHIN, R. (2022). Conceptualising smart cities. *Urban Research & Practice*, 15, pp.155–159.
- KRAIDY, M. M. (2006). Hybridity in cultural globalization. *Communication Theory*, 12, pp.316–339.
- KÖRTE, P. (2022). The emergent industrial metaverse. *MIT Technology Review Insights*. Siemens.
- LANGER, M., KÖNIG, C. J. AND BUSCH, V. (2021). Changing the means of managerial work: effects of automated decision support systems on personnel selection tasks. *Journal of Business and Psychology*, 36, pp.751–769.
- LÓPEZ-FERNÁNDEZ, I., BURGUEÑO, R. AND GIL-ESPINOSA, F. J. (2021). High school physical education teachers' perceptions of blended learning one year after the onset of the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, 18, 11146.
- MARQUES, L. AND BORBA, C. (2017). Co-creating the city: digital technology and creative tourism. *Tourism Management Perspectives*, 24, pp.86–93.
- MCFARLANE, C. AND SÖDERSTRÖM, O. (2017). On alternative smart cities. *City*, 21, pp.312–328.
- MCNEILL, D. (2015). Global firms and smart technologies: IBM and the reduction of cities. *Transactions of the Institute of British Geographers*, 40, pp.562–574.
- MICROSOFT 2022. Microsoft New Future of Work Report 2022. In: TEEVAN, J., BAYM, N., BUTLER, J., HECHT, B., JAFFE, S., NOWAK, K., SELLEN, A. AND YANG, L. (eds.). Microsoft.
- MILLER, D., ABED RABHO, L., AWONDO, P., DE VRIES, M., DUQUE, M., GARVEY, P., HAAPIO-KIRK, L., HAWKINS, C., OTAEGUI, A., WALTON, S. AND WANG, X. (2021). *The Global Smartphone: Beyond a youth technology*. In series: *Ageing with Smartphones*, London, UCL Press.
- MISCHKE, J., LUBY, R., VICKERY, B., WOETZEL, J., WHITE, O., SANGHVI, A., RHEE, J., FU, A., PALTER, R., DUA, A. AND SMIT, S. (2023). Empty spaces and hybrid places: the pandemic's lasting impact on real estate. McKinsey & Company.
- MOLENAAR, I. (2022). Towards hybrid human-AI learning technologies. *European Journal of Education*, 57, pp.632–645.

- MORENO, C. (2021). Living in proximity in a living city. *Glocalism: Journal of Culture, Politics and Innovation*, 3.
- MUTEBI, N. AND HOBBS, A. (2022). The impact of remote and hybrid working on workers and organisations. In: TECHNOLOGY, P. O. O. S. A. (ed.). London.
- MÄNTYNEN, A. AND SHORE, S. (2014). What is meant by hybridity? An investigation of hybridity and related terms in genre studies. *Text & Talk*, 34, pp.737–758.
- NARDI, B. A. AND WHITTAKER, S. (2002). The Place of Face-to-Face Communication in Distributed Work. In: HINDS, P. J. AND KIESLER, S. (eds.) *Distributed Work*. Cambridge: MIT Press.
- NICHOLLS, L. AND STRENGERS, Y. (2019). Robotic vacuum cleaners save energy? Raising cleanliness conventions and energy demand in Australian households with smart home technologies. *Energy Research & Social Science*, 50, pp.73–81.
- PAGE, M. J., MCKENZIE, J. E., BOSSUYT, P. M., BOUTRON, I., HOFFMANN, T. C., MULROW, C. D., SHAMSEER, L., TETZLAFF, J. M., AKL, E. A., BRENNAN, S. E., CHOU, R., GLANVILLE, J., GRIMSHAW, J. M., HRÓBJARTSSON, A., LALU, M. M., LI, T., LODER, E. W., MAYO-WILSON, E., MCDONALD, S., ... AND MOHER, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, 372, n71.
- RAHIMI, F. B., BOYD, J. E., LEVY, R. M. AND EISERMAN, J. (2022). New media and space: an empirical study of learning and enjoyment through museum hybrid space. *IEEE Transactions on Visualization and Computer Graphics*, 28, pp.3013–3021.
- REN, F. AND KWAN, M.-P. (2007). Geovisualization of human hybrid activity-travel patterns. *Transactions in GIS*, 11, pp.721–744.
- SABEL, C. E., AMEGBOR, P. M., ZHANG, Z., CHEN, T.-H. K., POULSEN, M. B., HERTEL, O., SIGSGAARD, T., HORSDAL, H. T., PEDERSEN, C. B. AND KHAN, J. (2021). Urban health and well-being. In: SHI, W., GOODCHILD, M. F., BATTY, M., KWAN, M.-P. AND ZHANG, A. (eds.) *Urban informatics*. Singapore: Springer Singapore.
- SADOWSKI, J. AND BENDOR, R. (2019). Selling smartness corporate narratives and the smart city as a sociotechnical imaginary. *Science, Technology, & Human Values*, 44, pp.540–563.
- SCHROEDER, R. (2010). *Being There Together: social interaction in shared virtual environments*, Oxford University Press.
- SERVOU, E., BEHRENDT, F. AND HORST, M. (2023). Data, AI and governance in MaaS – leading to sustainable mobility? *Transportation Research Interdisciplinary Perspectives*, 19, 100806.
- SHAW, S.-L. (2023). Time geography in a hybrid physical–virtual world. *Journal of Geographical Systems*, 25, pp.339–356.
- SHELTON, T. AND LODATO, T. (2019). Actually existing smart citizens. *City*, 23, pp.35–52.
- SIENKIEWICZ, Ł. (2022). PES staff management - challenges in the ‘new normal’. In: SERVICES, E. N. O. P. E. (ed.).
- SMANIOTTO COSTA, C. AND ŠUKLJE ERJAVEC, I. (2019). The rationale of cyberparks and the potential of mediated public open spaces. In: SMANIOTTO COSTA, C., ŠUKLJE ERJAVEC, I., KENNA, T., DE LANGE, M., IOANNIDIS, K., MAKSYMIOUK, G. AND DE WAAL, M. (eds.) *Cyberparks – the interface between people, places and technology: new approaches and perspectives*. Cham: Springer International Publishing.
- STROSS, B. (1999). The hybrid metaphor: from biology to culture. *The Journal of American Folklore*, 112, pp.254–267.
- SUMALEE, A. AND HO, H. W. (2018). Smarter and more connected: future intelligent transportation system. *IATSS Research*, 42, pp.67–71.
- THOMASON, S. G., KAUFMAN, T. AND AMERICAN COUNCIL OF LEARNED, S. (1988). *Language Contact, Creolization, and Genetic Linguistics*, University of California Press.
- VALDMAN, A. (1997). *French and Creole in Louisiana*, Plenum Press.
- VICKERMAN, R. (2021). Will COVID-19 put the public back in public transport? A UK

- perspective. *Transport Policy*, 103, pp.95–102.
- VILHELMSON, B. AND THULIN, E. (2016). Who and where are the flexible workers? Exploring the current diffusion of telework in Sweden. *New Technology, Work and Employment*, 31, pp.77–96.
- WEN, A., TSUI, R. AND LENORMAND, Y. (2021). Hybrid Retail Asia. Arup.
- WERBNER, P. (1997). Television, ethnicity and cultural change. *American Ethnologist*, 24, pp.484–485.
- WYLIE, J., LOANE, M. AND KEYES, H. (2023). The urban mobility scorecard tool: benchmarking the transition to sustainable urban mobility. *Briefing Paper*. World Economic Forum & Global New Mobility Coalition.
- XIA, T., LIN, X., SUN, Y. AND LIU, T. (2023). An empirical study of the factors influencing users' intention to use automotive AR-HUD. *Sustainability* [online], 15.
- XU, J., PAPANGELIS, K., DUNHAM, J., BOULANGER, C., LEE, J. H., LALONE, N. AND SAKER, M. (2023). Understanding social interactions in location-based games as hybrid spaces: coordination and collaboration in raiding in Pokémon GO. *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. Hamburg, Germany: Association for Computing Machinery.
- YIGITCANLAR, T., WILSON, M. AND KAMRUZZAMAN, M. (2019). Disruptive impacts of automated driving systems on the built environment and land use: an urban planner's perspective. *Journal of Open Innovation: Technology, Market, and Complexity*, 5, p.24.