Mobility as a Service as an instrument to mitigate transport-related social exclusion.

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ABSTRACT

Contemporary urban societies present gaps in *the right to the city* achievement and socio-spatial inequalities. This article links the *right to the city* as ethical political foundation to equal accessibility as an expression of transport-related social exclusion (TRSE), and the potentialities of digital-based mobility platforms to contribute to social inclusion. The article relates TRSE characteristics to MaaS prerogatives to understand how MaaS could contribute to accessibility capabilities towards equal access to urban opportunities. The results of this relation among TRSE and MaaS enables an analysis of the association of characteristics and prerogatives that could be strategic to empower MaaS as an equal accessibility instrument.

keywords: Right to the city, accessibility, transport, transport-related social exclusion, mobility as a service.

INTRODUCTION

The lack of human rights and unequal access to resources and opportunities by a significant part of the global urban population and its environmental havocs must be the object of research, policies, planning and design hoping to develop science-based guidelines to cities policies and practices (Burdett; Sudjic, 2011; Mostafavi et al., 2016; Brenner, 2017). Assuming the complexity of dealing with the city as a socioenvironmental system with a multilayer network of interdependent networks like transport, e.g. (Biazzo; Ramezanpour, 2020), it is important to establish values as a basis for urban decision making. The right to the city is an ethical and political guidance for urban planning, management and design oriented to equal access to resources and opportunities. Inequalities of access can lead to greater social and economic divisions, and environmental impact (Nelson et al., 2019).

The DNA of the right to the city in this research is based on the contribution of Lefebvre (1968) and the development of contemporary research since then. Lefebvre's right to the city means the right to take part in urban life, to integrate the social construction of the city. The *right to the city* is assumed as "a moral claim, founded on fundamental principles of justice of ethics, of morality, of virtue, of the good." (MARCUSE, 2009, p. 192) understood as the "full enjoyment of the material wealth and cultural richness socially generated and concentrated in the cities" (SOUZA, 2015, p. 410). So, from Lefebvre's theoretical, philosophical and political recognition of use values, the right to city drives a logic of urban development that may lead to promote alternative, radically democratic and just forms of urban space production (Fernandes, 2007; Souza, 2010; Attoh, 2011; Purcell, 2003; 2014).

Urban mobility is conditioning for participation and personal freedom as fundamental human rights (Tomanek, 2017). Geurs and Wee (2004) connect social exclusion to urban space by noting the participation gap, both individual and collective, in desirable social activities. The *right to move* is intrinsic to equal access, "right to mobility subsumes also the right to accessibility, as fundamentally linked to questions of just access to resources and assets" (VERLINGHIERI; VENTURINI, 2018, p. 127). The right to the city is an ethical orientation related to social and environmental justice, and to urban decision making that is ethically oriented towards social inclusion and environmental conservation.

Transportation-network services must be oriented towards social inclusion and equal access to urban services and spaces, and this research is intended as a theoretical introduction enabling further analysis for answering how mobility services contribute to social inclusion, or reinforce social exclusion, by promoting equal accessibility. Accessibility can be taken as the condition for fulfilling a will to

move, achieving the right to come and go, a basic human right that is currently in crisis in unequal societies.

Urban facilities and services are changing, mainly from the increasing impact of digital technologies, the access to the city includes information and communication technologies (ICT's) solutions guided to enhance citizen (user) experience (Kitchin; Cardullo; Di Feliciantonio, 2019). Digital technologies inputs, without regulating policies, shall result in higher amplitude in accessibility gaps. Sassen (2011) advocates that technologies urbanization requires modifications, mediations and should become transparent to create public shared domain to push this urbanizing of technologies to strengthen horizontal practices and initiatives. The strategical orientation to mobility-oriented ICTs must consider the contemporary scenario of socioenvironmental inequality and guide the democratization of quality of life and well-being. Transport technologies as services and infrastructure, plays an important role in urban accessibility levels.

New ICT's solutions oriented to supply transportation needs are increasing, since the disruption generated by ride-hailing companies' applications (*Lyft, Uber,* i.e.), on demand systems and the integration of transport modes points to the shift from mobility based in ownership to mobility as a service (MaaS) (Utriainen; Pöllänen, 2018; Sochor et al., 2018; Fioreze; De Gruijter; Geurs, 2019). MaaS could potentially optimize travels by aggregating mobility information and impact mobility behavior to switch from an ownership-based system to an access-based system (Dadashzadeh et al, 2022).

Contemporary research in urban mobility and transportation is massively influenced by ICT inputs. Mobility ecosystems, especially transportation services, are deeply affected by on-demand possibilities enabled by ICT platforms (Wee et al., 2013). The belief and trend that shifting mobility from ownership to on-demand shared services may guide transportation towards more efficient and sustainable practices, lead to confidence in a sociotechnical phenomenon called Mobility as a Service (MaaS) (Giesecke et al., 2016; Holmberg et al., 2016; Kamargianni et al., 2016; Jittrapirom et al., 2017; Goodall, 2017; Utriainen; Pöllänen, 2018; Sochor et al., 2018; Fioreze; De Gruijter; Geurs, 2019).

Alternative concepts of MaaS have been suggested by many authors, in a narrow definition, Mulley (2017) considers MaaS as a technology-enabled Mobility Management service where customer interface and business back office are integrated. Giesecke et al. (2016) adds some complexity and density to this definition, suggesting that MaaS "is a socio-technical phenomenon with sustainability as a critical aspect", thus shedding the light on the sociological level and the sustainability dimensions of the concept. Sochor et al. (2018) observe MaaS as a strategic alternative moving away from private vehicle ownership towards sustainable mobility.

The easy access to digital informal by smartphones contributes to mobility apps popularization, but "they may create a form of transport disadvantage and

digital inequality" (DADASHZADEH ET AL, 2022, p. 192) the challenge is how to guide transport-related ICTs as a social inclusive strategy. This change has the potential to promote efficiency and sustainability from the commuting behavior based in shared transport practices. The question that arises is whether MaaS could impact to mitigate transport-related social exclusion (TRSE) (Jittrapirom et al., 2017; Durand et al., 2018; Dadashzadeh et al, 2022) and TRSE characteristics (Luz;Portugal, 2021). The article goal is to understand whether mobility services by digital platforms (MaaS) represents a potential impact to social inclusion by enabling access to urban resources and opportunities.

The research structure brings next the research methodology, development and discussions, and final comments. The methodology presents the description of how the concepts and characteristics of TRSE and MaaS were related to the enable the analysis whether the potential to promote access and, consequently mitigate social exclusion. The development brings a brief conceptualization regarding the (i) relation among right to the city, urban accessibility and TRSE, and MaaS, for the identification of the analytical framework relating TRSE characteristics and MaaS prerogatives. The results show an analytical framework with the relation among TRSE characteristics and MaaS prerogatives. This analytical framework grounds the discussion regarding the potential interactions among TRSE and MaaS towards equal accessibility. The final comments, last session, present the research perspectives for the next steps.

METHODOLOGY

Sociospatial outcomes of this mixture among land-use, transportation and individual capacities impacts the accessibility conditions of a population to urban rights, including the communication and information usability enabled by MaaS tools. From the objective to understand the potential impacts of MaaS to TRSE mitigation, the first research step was the literature review regarding the main issues as (i) the relation among right to the city, urban accessibility and TRSE, and (ii) MaaS as an ICT tool oriented to social inclusion.

The research methodology is based in this literature review concepts, TRSE characteristics and MaaS prerogatives to enable the cross analysis of these elements, resulting in an assessment of MaaS as a tool to transport-related social exclusion mitigation.

DEVELOPMENT

The achievement of access equality is conceptually based in ethical aspects like equity and inclusion to orient the planning and management of cities (Shen, 1998; Wee; Geurs, 2011). The ethical orientation to promote equal access to urban rights must ground the construction of transportation technologies including tech systems. The accessibility as a human capability is a concept to guide the goals of

public policies of equal of access and grounds a framework of transport-related social exclusion analysis (Luz; Portugal, 2021). The accessibility to urban activities derives from three dimensions of accessibility, individuals, transport resources and land use resources (Luz; Portugal, 2021). The integration among these dimensions defines a human capability to access urban life. Transport and land-use are classified as *spatial* resources. And the integration among transport and individual abilities and perceptions are defined as *mobility as a capability*, that are influenced by *political, social and economic environment*. Luz and Portugal (2021) relate the three dimensions of *accessibility as a human capability* to ten characteristics of transit-related social exclusion (Figure 1). These ten characteristics are:

1. Exclusion from facilities relates to the dimension *land-use*, and occurs due to the absence or distance to key opportunities such as employment, healthcare, schools, shops, or leisure services from where the individual lives. Exclusion from facilities.

2. Geographical exclusion relates to the dimensions *land-use* and *transport*, and occurs when a person's residence location prevents him/her from accessing transport services, or the transport system does not connect to the places that the person wants to access.

3. Space exclusion relates to the dimensions *land-use* and *transport*, and occurs when security or space management of some public and private spaces discourages certain groups from using public and quasi-public transport spaces.

4. Physical and cognitive exclusion relates to the dimensions *land-use*, *transport and individual abilities*, and occurs when transport systems or the built environment may impose physical and cognitive barriers to individuals. Among the factors that may prevent individuals to access and use transport and activities are the inability to read timetable information. These are more frequently faced by the elderly, disabled, and illiterate, commonly digital exclusion characteristics.

5. Time-based exclusion relates to the dimensions *land-use*, *transport and individual abilities*, and occurs when the low frequency of the transport system, lack of punctuality, or person's demands on time. The time people spend accessing, waiting for transport and travelling may by optimized by the intermodality and on-time information accessed by personal gadgets.

6. Exclusion based on fear, prejudice, or feelings relates to the dimensions *land-use*, *transport and individual abilities*, and refers to the fear of crime and the perception of insecurity or prejudice that makes people avoid certain places aspects such as quality of the transport mode.

7. Informational exclusion relates to the dimension *transport*, and refers to the lack of available information on public transport and destination options that prevent individuals from planning their journey and, therefore, limit its use.

8. Economic exclusion relates to the dimensions *transport and individual abilities*, and occurs when the monetary costs of travel prevent people from travelling or restrict their access to destinations around their homes or mandatory activities.

9. Digital-divide exclusion relates to the dimensions *transport and individual abilities*, and occurs when the lack of digital connection or inability to use appropriate ICT may prevent individuals from using app-based transport systems. Vulnerable populations have considerably lower access to the "smart mobility ecosystem".

10. Social position-based exclusion relates to the dimension *individual abilities*, and refers to the prevention from moving in public spaces due to censure, social control, or any other restriction based on one's social position. The lack of digital access, language skills and literacy may represent a level of exclusion.

Figure 1 - Framework presenting the relation among the three dimensions and the ten charactristics of transport-related social exclusion based on accessibility as a human capability. Source: Luz e Portugal, 2021, p. 16.
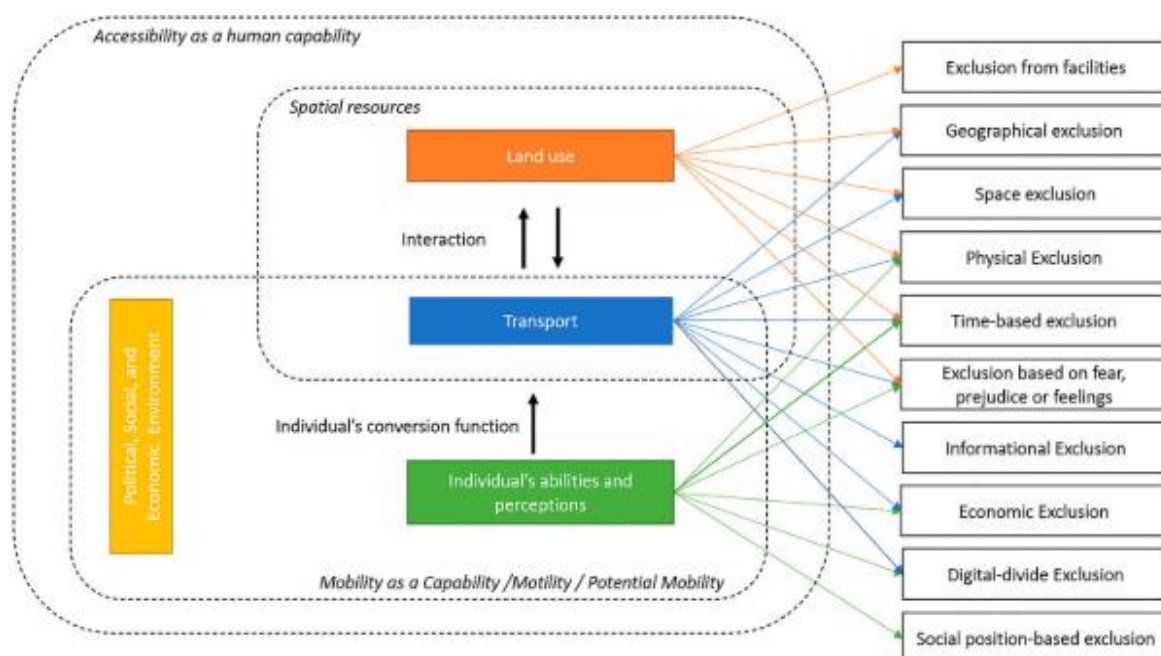
From a combination of concepts, MaaS is a data-driven, user-centered paradigm, powered by the growth of smartphones (Goodall et al., 2017) based on

facilitating user experience by providing travel possibilities and payment possibilities on one single platform (Sochor et al., 2018) and real-time information that enables immediate decision making (Melis et al., 2017). MaaS characterization depends on levels of complexity and innovativeness, and on ownership vs. integration (Holmberg et al., 2016) of combined mobility services (CMS) (Holmberg et al., 2016; Sochor et al., 2018; Fioreze et al., 2019).

A MaaS collaborative environment prerequisites are inclusive digital infrastructure, interaction of users and providers, transport and mobility, and a range of travel possibilities, all integrated by friendly and trustworthy platforms. Author suggests guidelines towards achievement of environmental and social goals. Giesecke et al. (2016) approach four main issues that must be included in a systemic analysis, i) the nature of MaaS-based travel; ii) interoperability between MaaS and Intelligent Transportation Systems (ITS); iii) the end-user perspective on MaaS offerings; and iv) MaaS sustainability. "Transition to MaaS may be considered sustainable if MaaS contributes to the fulfilment of societal goals, such as the need for decarbonization of the transport system, reduced congestion, innovation, and better accessibility" (SOCHOR ET AL. 2018, p. 12). "The technology now seems to have come of age to enable wide scale on-demand mobility services" (MULLEY, 2017, p. 248), the question here is the political drive of this asset.

Some core elements for achieving a transition towards MaaS as an applicable tool are presented by Jittrapirom et al. (2017, p.16) as:

a. The integration of transport modes, including shared mobility and more traditional modes;
b. The tariff option (i.e. pay-as-you-go and mobility packages);
c. A single platform, where users can plan, book, pay and get tickets for their trips;
d. Multiple actors (customers, providers, platform owners, authorities, etc.);
e. The use of technologies (smartphones, Internet networks, ICT, etc.);
f. Demand orientation;
g. Registration requirement, to facilitate the use of the service and allow for customization;
h. Personalisation to the needs of the user;
i. Customisation, enabling the user to modify the offered option based on their preferences.

A MaaS collaborative environment prerequisites are inclusive digital infrastructure, interaction of users and providers, transport and mobility, and a range of travel possibilities, all integrated by friendly and trustworthy platforms. MaaS access and usability depends on ICT skills and instigate which the discussions about the digital divide and inclusion (Durand et al., 2018).

The research development relates the ten characteristics of TRSE to MaaS prerogatives to understanding the potential to drive MaaS towards equal accessibility by social inclusion orientation.

RESULTS

The relation among TRSE characteristics and MaaS prerogatives shows that many, but not all, interactions could determine a MaaS contribution to social inclusion, consequently equal accessibility. MaaS may not contribute to the TRSE characteristics strictly related to land-use and transport dimensions, classified by Luz and Portugal (2021) as *space resources* dimensions, except *informational exclusion*, that relates exclusive to *transport* dimension. The characteristics that integrate *space resources* are *exclusion from facilities, geographical exclusion* and *space exclusion*. MaaS may not contribute directly to the distribution of facilities and transport systems in determined regions, neither with the space features of public and quasi-public transport spaces. Although, MaaS can contribute to benefit the access to information regarding transport services.

Following Luz and Portugal (2021) sequence, the first TRSE characteristic that may have the contribution of MaaS is the *physical and cognitive exclusion* from the capacity of apps to enable friendly information and communication to individuals with any disability. MaaS prerogatives as *single platform*, *ICT use*, *personalization* and *customization* might be driven to social inclusion of disabled individuals. MaaS could also impact *time-based exclusion* by reducing time people spend accessing, waiting and travelling by *transport integration* and on-time communication enable by *ICT use* in a *single platform*. The *exclusion based in fear*, the sixth TRSE characteristic could be strategically impacted by MaaS prerogatives as *multiple actors*, including authorities that could contribute to safety improvement strategies. The *ICT use* could ease the communication of violence occurrences enable by smartphones, including emergence calls. The *registration requirement* could contribute as well by enabling to track responsible for crimes.

Regarding *informational exclusion*, MaaS could be directly responsible for informational improvement by *single platform* and the *ICT use*, and by promoting access to disable individual by the *personalization* and *customization* of mobility apps interfaces. The *economic exclusion* overcome by MaaS starts with the capability of people to access ICT gadgets, as smartphones, to access mobility apps. From the access to mobility apps, the potential contribution of MaaS is a *tariff option* and packages to enhance the affordability of transport services use. The integration of *multiple actors* might allow the definition of subsidies to low-income and vulnerable individuals or groups. The prerogative of *on demand* services could also contribute to suitable fees that might enable the access to mobility services.

Digital-divide exclusion, as economic exclusion, depends on the individual's access to smartphones, but once the gadget is available, it could be mitigated by MaaS *single platform* prerogative that favors the mobility apps usability, as *personalization* and *customization* possibilities. Considering the last TRSE characteristic, *social position-based exclusion* restriction based on one's social position could represent a lack of digital access. The MaaS prerogative of *single platform,* could potentially contribute to the access to mobility services by simplifying usability, and *tariff option* could also contribute from the same logic applied to *economic exclusion*. Table 1 systematizes the relation among TRSE characteristics to MaaS prerogatives to allow a visualization of the potentialities of MaaS to contribute to TRSE mitigation towards equal accessibility.

Table 1 – Relation among TRSE Characteristics by Luz and Portugal (2021) and MaaS prerogatives by Jittrapirom et al. (2017).

TRSE Characteristics	MaaS prerogatives by Jittrapirom et al. (2017)								
	Transport integration	Tariff option	Single platform	Multiple actors	ICT use	Demand orientation	Registration	Personalization	Customization
Physical and cognitive exclusion			■		■			■	■
Time-based exclusion	■		■		■				
Exclusion based on fear				■			■		
Informational exclusion			■					■	■
Economic exclusion		■		■		■			
Digital-divide exclusion			■					■	■
Social position-based exclusion		■				■			

DISCUSSIONS

MaaS must be driven to be affordable to everyone and broadly accessible. Smartphones ownership and data access is fundamental to the democratization of ICT-based systems. Despite the challenge of digital division, the first to be

overcome, the relation among TRSE characteristics and MaaS prerogatives enables the understanding that the potential of MaaS to mitigate TRSE. The MaaS prerogative of single platforms has the greater potential to impact social inclusion, relating with five TRSE characteristics - physical and cognitive exclusion, time-based exclusion, informational exclusion, digital-divide exclusion and social position-based exclusion. The single platform contribution relates to the capability to manage mobility apps to ease commuting activities.

The MaaS prerogatives ICT use, personalization and customization could contribute in the same direction, with special contribution to individuals that presents any disability to deal with digital technologies. So, an orientation to MaaS systems might be driven to overcome lacks in digital access, disabilities (visual and hearing impairments), language skills and literacy to overcome physical and cognitive, informational and digital-divide exclusion.

Tariff option relates to affordability to use transport services, thus, connects with economic and social position-based exclusions. These exclusions could be mitigated by the participation of public authorities as one of the multiple actors to promote vulnerable people participation in urban opportunities by special conditions as subsidies or compensations. Beyond economic exclusion, public authorities as a multiple actors could also represent a role in contributing to exclusion based in fear, by the government responsibility in promoting safety and security. The registration of users could also represent a safety benefit.

The transport integration as a MaaS prerogative, infers only one but strategic and relevant characteristic of TRSE, the time-based exclusion. Time-based measurements of urban accessibility demonstrates that the time expenditure is a key element to enable the access to urban opportunities (Wee; Geurs, 2011).

MaaS represents a massive potential for an effective paradigm shift towards sustainable mobility. The challenge lies in the underlying political (or societal) orientation of MaaS-driven decision making in regulating, planning, managing and designing its operation. The conceptual process fundamental to MaaS projects might be grounded by ethical orientation towards the enhancement of equal accessibility and mitigation of environmental degradation.

FINAL COMMENTS

From the Lefebvrian logic, the right to the city relates to the right to information, the abundance and accessibility to information of current times requires the promotion of equal access to services, spaces and information as well. Availability of data and information, and the myriad of communication improvement from digital platforms calls citizens to participate, engage and act towards communities changing from socio-technical relations in a more agile way.

MaaS may represent an upgrade to the system when integrated into mapped locations, mobility modalities (walking, cycling) and services (public transportation,

ride-hailing), payment, and many other interfaces. Data, as well as technologies, are not neutral, they are political. Thus, scientific results are not neutral, but politically charged – and should therefore be subject to social debate from the outset (Duarte; Alvarez, 2019). Public or multisectoral MaaS regulation must integrate societal goals and sustainability-driven practices, such as social inclusion and mitigation of socioenvironmental injustice.

In urban contexts with high rates of unequal access, as characteristic of Latin-America, the most unequal region in the world (Oxfam, 2017), platforms for the integration of mobility services must be developed from the political orientation of social and environmental justice. What means the application of the stage 4 of Giesecke's et al. (2016) approach for public policies to regulate the use of services enabled by digital platforms. The incipience of Latin-American cities, e.g., in MaaS platforms and the high presence of informal mobility services (Moscoso; LAake; Quiñones, 2019), must be seen as an opportunity to integrate and formalize transportation services towards equal access to the rights in the city, to promote social and environmental justice.

A next step of this research is the assessment of the potential of territories to use MaaS to social inclusion towards equal accessibility, by the analysis of transport and digital related social data. Potentially starting with Curitiba's case study, because of ongoing research that identifies the incidence of transport-related social exclusion in regions of the city known as the cradle of BRT.

REFERÊNCIAS

ATTOH, Kafui A. What kind of right is the right to the city?. Progress in human geography, v. 35, n. 5, p. 669-685, 2011. https://doi.org/10.1177/0309132510394706

BIAZZO, Indaco; MONECHI, Bernardo; LORETO, Vittorio. General scores for accessibility and inequality measures in urban areas. Royal Society open science, v. 6, n. 8, p. 190979, 2019. https://doi.org/10.1098/rsos.190979

BIAZZO, Indaco; RAMEZANPOUR, Abolfazl. Efficiency and irreversibility of movements in a city. Scientific reports, v. 10, n. 1, p. 1-8, 2020. https://doi.org/10.1038/s41598-020-60744-6

BIJKER, Wiebe E. Technology, social construction of. The International Encyclopedia of Communication, 2008. https://doi.org/10.1002/9781405186407.wbiect025

BRENNER, Neil; MARCUSE, Peter; MAYER, Margit. Cities for people, not for profit. City, v. 13, n. 2-3, p. 176-184, 2009.

BRENNER, Neil. Beyond state-centrism? Space, territoriality, and geographical scale in globalization studies. In: Theory and methods. Routledge, 2017. p. 313-336. https://www.jstor.org/stable/3108505

BURDETT, Ricky; SUDJIC, Deyan. Living in the endless city. 2011.

CHURCH, Andrew; FROST, Martin; SULLIVAN, Karen. Transport and social exclusion in London. Transport policy, v. 7, n. 3, p. 195-205, 2000. https://doi.org/10.1016/S0967-070X(00)00024-X

DADASHZADEH, Nima et al. Mobility as a Service Inclusion Index (MaaSINI): evaluation of inclusivity in MaaS systems and policy recommendations. Transport policy, 2022. https://doi.org/10.1016/j.tranpol.2022.09.006

DUARTE, Fábio; ÁLVAREZ, Ricardo. The data politics of the urban age. Palgrave Communications, v. 5, n. 1, p. 1-7, 2019. https://doi.org/10.1057/s41599-019-0264-3

DUARTE, Fábio; JOHNSEN, Lenna; RATTI, Carlo. Reimagining urban infrastructure through design and experimentation: Autonomous boat technology in the canals of Amsterdam. In: The Routledge Companion to Smart Cities. Routledge, 2020. p. 395-410. https://www.taylorfrancis.com/chapters/edit/10.4324/9781315178387-27/reimagining-urban-infrastructure-design-experimentation-f%C3%A1bio-duarte-lenna-johnsen-carlo-ratti

DURAND, Anne et al. Mobility-as-a-Service and changes in travel preferences and travel behaviour: a literature review. 2018. https://english.kimnet.nl/publications/documents-research-publications/2018/09/17/mobility-as-a-service-and-changes-in-travel-preferences-and-travel-behaviour-a-literature-review

FERNANDES, Edésio. Constructing the Right to the City in Brazil. Social & legal studies, v. 16, n. 2, p. 201-219, 2007. https://doi.org/10.1177/0964663907076529

FIRMINO, Rodrigo José; DUARTE, Fábio; MOREIRA, Tomás. Pervasive technologies and urban planning in the augmented city. Journal of Urban Technology, v. 15, n. 2, p. 77-93, 2008. https://doi.org/10.1080/10630730802401983

FIOREZE, Tiago; DE GRUIJTER, Martijn; GEURS, Karst. On the likelihood of using Mobility-as-a-Service: A case study on innovative mobility services among residents in the Netherlands. Case Studies on Transport Policy, v. 7, n. 4, p. 790-801, 2019. https://doi.org/10.1016/j.cstp.2019.08.002

GEURS, Karst T.; VAN WEE, Bert. Accessibility evaluation of land-use and transport strategies: review and research directions. Journal of Transport geography, v. 12, n. 2, p. 127-140, 2004. https://doi.org/10.1016/j.jtrangeo.2003.10.005

GEURS, Karst T.; DE MONTIS, Andrea; REGGIANI, Aura. Recent advances and applications in accessibility modelling. Computers, environment and urban systems, v. 49, p. 82-85, 2015. https://doi.org/10.1016/j.compenvurbsys.2014.09.003

GIESECKE, Raphael; SURAKKA, Teemu; HAKONEN, Marko. Conceptualising mobility as a service. In: 2016 eleventh international conference on Ecological Vehicles and Renewable Energies (EVER). IEEE, 2016. p. 1-11. doi: 10.1109/EVER.2016.7476443.

GOODALL, Warwick et al. The rise of mobility as a service. Deloitte Rev, v. 20, n. 1, p. 112-129, 2017. https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/consumer-business/deloitte-nl-cb-ths-rise-of-mobility-as-a-service.pdf

HASSELWANDER, Marc et al. MaaS for the masses: Potential transit accessibility gains and required policies under Mobility-as-a-Service, 2022. https://elib.dlr.de/186276/1/MaaSforthemasses_Manuscript_new%20-%20Kopie.pdf

HOLMBERG, Per-Erik et al. Mobility as a Service-MaaS: Describing the framework. In: Tuesday, February 16, 2016. 2016. https://www.viktoria.se/sites/default/files/pub/www.viktoria.se/upload/publications/final_report_maas_framework_v_1_0.pdf

JIMÉNEZ, Alberto Corsín. The right to infrastructure: a prototype for open source urbanism. Environment and planning D: Society and space, v. 32, n. 2, p. 342-362, 2014. https://doi.org/10.1068/d13077p

JITTRAPIROM, Peraphan et al. Mobility as a service: A critical review of definitions, assessments of schemes, and key challenges. 2017. https://doi.org/10.17645/up.v2i2.931

KAMARGIANNI, Maria et al. A critical review of new mobility services for urban transport. Transportation Research Procedia, v. 14, p. 3294-3303, 2016. https://doi.org/10.1016/j.trpro.2016.05.277

KAROU, Saleem; HULL, Angela. Chapter ACCESSIBILITY MEASURES AND INSTRUMENTS. Accessibility instruments for planning practice, p. 1, 2012. DOI: 10.13140/RG.2.1.1868.3605

KITCHIN, Rob; CARDULLO, Paolo; DI FELICIANTONIO, Cesare. Citizenship, justice, and the right to the smart city. In: The right to the smart city. Emerald Publishing Limited, 2019. https://www.emerald.com/insight/content/doi/10.1108/978-1-78769-139-120191001/full/html

LEFEBVRE, Henry. Le droit à la ville. Anthopos, Paris, 1968.

LUCAS, Karen. Making the connections between transport disadvantage and the social exclusion of low-income populations in the Tshwane Region of South Africa. Journal of Transport Geography, v. 19, n. 6, p. 1320-1334, 2011. https://doi.org/10.1016/j.jtrangeo.2011.02.007

MARCUSE, Peter. From critical urban theory to the right to the city. City, v. 13, n. 2-3, p. 185-197, 2009. https://doi.org/10.1080/13604810902982177

MELIS, Andrea et al. Integrating personalized and accessible itineraries in MaaS ecosystems through microservices. Mobile Networks and Applications, v. 23, n. 1, p. 167-176, 2018. https://doi.org/10.1007/s11036-017-0831-z

MOSCOSO, M.; LAAKE, T. van; QUIÑONES, L. (Eds.). Sustainable Urban Mobility in Latin America: assessment and recommendations for mobility policies. Despacio: Bogotá, Colombia, 2019. https://sutp.org/publications/sustainable-urban-mobility-in-latin-america-assessment-and-recommendations-for-mobility-policies/

MOSTAFAVI, Mohsen et al. (Ed.). Ecological urbanism. Zurich: Lars Müller, 2016.

MULLEY, Corinne. Mobility as a Services (MaaS)–does it have critical mass?. Transport reviews, v. 37, n. 3, p. 247-251, 2017. https://doi.org/10.1080/01441647.2017.1280932

NELSON, Andy et al. A suite of global accessibility indicators. Scientific data, v. 6, n. 1, p. 1-9, 2019. https://doi.org/10.1038/s41597-019-0265-5

OXFAM. Latin America remains the most unequal region in the world, 2017. Available at: https://blogs.oxfam.org/en/blogs/17-12-18-latin-america-remains-most-unequal-region-world/index.html.

PEREIRA, Rafael HM. Future accessibility impacts of transport policy scenarios: Equity and sensitivity to travel time thresholds for Bus Rapid Transit expansion in Rio de Janeiro. Journal of Transport Geography, v. 74, p. 321-332, 2019. https://doi.org/10.1016/j.jtrangeo.2018.12.005

PURCELL, Mark. Possible worlds: Henri Lefebvre and the right to the city. Journal of urban affairs, v. 36, n. 1, p. 141-154, 2014. https://doi.org/10.1111/juaf.12034

PURCELL, Mark. Citizenship and the right to the global city: reimagining the capitalist world order. International journal of urban and regional research, v. 27, n. 3, p. 564-590, 2003. https://doi.org/10.1111/1468-2427.00467

SASSEN, Saskia. Open source urbanism. The new city reader: a newspaper of public space 15, 2011. https://www.domusweb.it/en/opinion/2011/06/29/open-source-urbanism.html

SHEN, Qing. Spatial technologies, accessibility, and the social construction of urban space. Computers, environment and urban systems, v. 22, n. 5, p. 447-464, 1998. https://doi.org/10.1016/S0198-9715(98)00039-8

SIMÃO, Marcela de Moraes Batista; FIRMINO, Rodrigo José. A construção social de um sistema de mobilidade inteligente: mapeando controvérsias no caso do Swisspass. Cadernos Metrópole, v. 21, p. 331-354, 2019. https://doi.org/10.1590/2236-9996.2019-4414

SLEE, Tom. What's yours is mine: Against the sharing economy. Or Books, 2017.

SOCHOR, Jana et al. A topological approach to Mobility as a Service: A proposed tool for understanding requirements and effects, and for aiding the integration of societal goals. Research in Transportation Business & Management, v. 27, p. 3-14, 2018. https://doi.org/10.1016/j.rtbm.2018.12.003

SOUZA, Marcelo Lopes de. Which right to which city? In defence of political-strategic clarity. Interface, v. 2, n. 1, p. 315-333, 2010. https://www.researchgate.net/publication/265355078_Which_right_to_which_city_In_defence_of_political-strategic_clarity

SOUZA, Marcelo Lopes de et al. From the'right to the city'to the right to the planet. City, v. 19, n. 4, p. 408-443, 2015. https://doi.org/10.1080/13604813.2015.1051719

SUEL, Esra et al. Measuring social, environmental and health inequalities using deep learning and street imagery. Scientific reports, v. 9, n. 1, p. 1-10, 2019. https://doi.org/10.1038/s41598-019-42036-w

TALEAI, Mohammad; SLIUZAS, Richard; FLACKE, Johannes. An integrated framework to evaluate the equity of urban public facilities using spatial multi-criteria analysis. Cities, v. 40, p. 56-69, 2014. https://doi.org/10.1016/j.cities.2014.04.006

TOMANEK, Robert. Free-fare public transport in the concept of sustainable urban mobility. Transport Problems, v. 12, 2017. https://doi.org/10.20858/tp.2017.12.se.8

UTRIAINEN, Roni; PÖLLÄNEN, Markus. Review on mobility as a service in scientific publications. Research in Transportation Business & Management 27, 2018. https://doi.org/10.1016/j.rtbm.2018.10.005

VERLINGHIERI, Ersilia; VENTURINI, Federico. Exploring the right to mobility through the 2013 mobilizations in Rio de Janeiro. Journal of Transport Geography, v. 67, p. 126-136, 2018. https://doi.org/10.1016/j.jtrangeo.2017.09.008

WEE, Van Bert; GEURS, Karst. Discussing equity and social exclusion in accessibility evaluations. European journal of transport and infrastructure research 11, no. 4, 2011. https://doi.org/10.18757/ejtir.2011.11.4.2940

WEE, B. van, Geurs, K.; Chorus, C.. Information, communication, travel behaviour and accessibility. Journal of Transport and Land Use, 6(3), 1-16, 2013. https://doi.org/10.5198/jtlu.v6i3.282

WEE, Bert Van. Accessible accessibility research challenges. Journal of transport geography 51, 2016. https://doi.org/10.1016/j.jtrangeo.2015.10.018

WILLIS, Katharine S. Whose right to the smart city?. In: The right to the smart city. Emerald Publishing Limited, 2019. https://pearl.plymouth.ac.uk/bitstream/handle/10026.1/12729/Willis_%20Whose%20Right%20to%20the%20Smart%20City.pdf?sequence=1&isAllowed=y

XU, Yang; BELYI, Alexander; BOJIC, Iva; RATTI, Carlo. Human mobility and socioeconomic status: Analysis of Singapore and Boston. Computers, Environment and Urban Systems 72, 2018. https://doi.org/10.1016/j.compenvurbsys.2018.04.001