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Infrastructural insurgency: Constructing situated data at Brazil's urban periphery

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This paper focuses on how insurgencies are continually recast in parallel to State-led redevelopment or 'upgrading'. It brings attention to communities that shape and are reshaped by inclusion of data in processes through which citizens participate in city-making. Drawing on a comparative case study of intensively upgraded informal settlements in São Paulo, Brazil, findings show that data-based insurgencies have been forged from prior collective action. The resultant co-created or *situated* data challenge the State's legitimacy as sole arbiter of informal settlement representation and infrastructure transformation in cities. In this context, the term infrastructural insurgency is proposed as a way that socio-material agencies iterate over time and in space, and to stimulate discourse about the future of upgrading. It reflects on which interactions between data and redevelopment can inform planning in post-redevelopment conditions across global south.

Keywords: insurgency, infrastructure, redevelopment, situated data, Brazil

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Introduction

Insurgent planning has sought to recognize contexts of socio-spatial injustice in cities, focusing on how formal and informal planning frameworks interact and reinforce one another in poor neighborhoods (Sandercock, 1999; Friedmann, 2011). However, there is a lack of concrete, empirical data about what differentiates these spaces (Watson, 2003) and the panorama of socio-spatial inequalities shaped by ongoing cycles of urban redevelopment, particularly recent 'smart' data-based versions (Moser, 2014). This epistemic gap has motivated collective efforts to co-construct counter data networks that merge public, macro data with micro sources collected through fieldwork, a synthesis that I define as *situated data*. Situated data reveals the lived impacts of redevelopment in informal settlements, and it is evidence against the proposals that redevelopment makes. Related research has focused on informal home building's vital role in shaping broader spaces of internet-based resistance (Holston, 2019). This article argues that amid this shift, local data-based insurgencies have been overlooked.

To illuminate these data-based insurgencies, this paper focuses on residents who built housing through processes of autoconstruction in the settlements of Heliópolis and Jardim São Francisco in São Paulo; have long participated in municipal planning processes; and, in the wake of ongoing cycles of redevelopment, have co-constructed their own data about the formal and informal housing interactions in their neighborhoods.[1] Their work dialogs with a global data-based planning turn and through Brazil's post-democracy environment, in which a right to the city inspired the legal inclusion of all citizens in urban development and guaranteed poor residents a provisional right to the land where they built their own homes (Fernandes, 2007). Although not initially referred to in these terms, residents' right to the city has evolved as they cope with unjust dynamics between democracy and exclusion (Holston, 2008) and tensions between the social use of urban space and private property rights (Friendly, 2013). These coping mechanisms initially entailed land retention and infrastructure but expanded to encompass broader redevelopment processes and projects. Although the expectations for redevelopment to improve informal settlements progressively—even 'formalize' them—were significant, failed or unfinished projects led to more informalization and degradation (Roy, 2009; Perlman, 2010). At Brazil's economic peak during the latter half of the 2000s, the municipality of São Paulo took steps to improve redevelopment by using GIS-based technologies that prioritized high-risk areas for tailor-made interventions (SEHAB, 2008). However, greater data precision did not alleviate the most widespread risk: settlements that were already intensively redeveloped were redeveloped more, and those most at risk were ignored (Stiphany et al., 2021). The disconnect between data and effective informal settlement redevelopment is evolving, but two early studies suggest alternatives that would today be called citizen science: residents documented their housing assets in favelas to make claims for improvements (Sampaio, 1991; Taschner, 1999). This history reveals that citizens have used local data sources to generate strategies of self-reliance and to reveal phenomena that city planners may not otherwise see.

Thus, there are manifold interconnections between the process of urban redevelopment and data co-creation about redevelopment's lived outcomes, protracted nature, and material transformations. This paper demonstrates that the production of situated data signals forms of community representation that have emerged from past insurgencies but operate to reveal

[1] Autoconstruction (Holston, 1991) and self-help (Ward, 1982) describe the process of incremental home construction, whereby people build their dwellings over time and as their resources permit. I will use autoconstruction in this article, as this is the term that people who live in informal settlements use to describe their contributions to home and community building.

redevelopment's hidden aftereffects. Beyond this empirical contribution, these emerging planning spaces are embedded within local knowledge infrastructures that resist subjectivity to externally-defined planning processes (Haraway, 1988; Sletto, 2012). Although much has been written about insurgency before redevelopment, there is a poverty of terms for differentiating between what data permit planning to see and the responsibility planners can take for urban informality.

To contribute to this special issue's focus on planning from a southern perspective, I use empirical case material to consider four dimensions of insurgency. First, insurgency is often conceptualized in terms of social life and mobilizations *for* infrastructure. This overlooks how the built environment, trunk networks, and communal spaces are bound up in insurgent cultures and agencies (Amin, 2014). Second, the relationship between the right to the city's constitutional provisions and disperse socio-materialities that distribute resources and reshape cities is understudied. Third, insurgency builds reciprocities between diverse planning agents, but there are epistemological gaps related to how citizens learn insurgency and co-construct supportive resources. Finally, insurgent action that creates resources (in this case data) raises important questions about the ethics and moral dilemmas of 'making the invisible visible' (Sandercock, 1995). Broadly, this study discourses with many studies that grapple with the empirics of actually existing insurgencies and the reality of how cities are structured and territorialized through processes of redevelopment (Meth, 2010).

These findings stem from my doctoral (2011 – 2015) study about the spatial politics of redevelopment and displacement in Heliópolis, Jardim São Francisco, and another community (Bamburral), and postdoctoral study (2015 – 2017) about the role of situated data for revealing how the historical impacts of redevelopment impact future growth alternatives. I also bring to this study my professional experience as a planner for the city of São Paulo on a redevelopment project in Bamburral (2008 – 2009). While most of the data presented here draw from 2015 – onward, historical references are carried forward from the doctoral fieldwork period; in contrast, my understanding of redevelopment logistics comes from practice.[2]

Redevelopment, insurgency, and planning

Redevelopment, a system of planned interventions in the existing urban fabric, first gained traction in the global south through what was referred to as 'upgrading' in informal settlements (Perlman, 2010). Governments strategically intervened to add 'first world' infrastructure to these areas (Caldeira, 2017). As Brazilian urbanist Erminia Maricato suggests, such interventions were frequently rationalized by 'ideas out of place', or external standards and practices that are imposed from the outside, resulting in the suppression of endemic versions inside of poor neighborhoods (Maricato, 2000).[3] Over time, these processes have structured Brazilian cities around three main types of development: formal development, informal settlements, and redeveloped informal settlements, each shaped by a nexus of formal and informal housing types (Stiphany et al., 2014).

Initially, exogenous codes and standards offered a benchmark for how people could

[2] I defined 'situated data' as 'data that is co-created by residents about change that happens in their own communities' (Stiphany et al., 2014). This term has been used in the area of digital humanities (see: Havens, 2020 and Rettberg, 2020), although I find no studies that have used 'situated data' in relation to data and informal settlement redevelopment in the global south.

[3] Maricato's use of this term draws from Roberto Schwartz (1992), who used the term 'misplaced ideas' to describe Brazil's post-colonial condition.

participate in urban transformation (Ben Joseph, 2005). By building their own homes to fit formal housing models and ready-to-hand infrastructures, working-class populations demonstrated to governments that they could successfully adapt to virtually any hardship. However, many communities soon recognized that their practices of self-reliance were no match for increasingly unjust redevelopment processes, and the need for 'soft' infrastructures of social networks and human capital to regulate urban policy (Simone, 2004; Amin, 2014). Increasingly, residents' everyday efforts to build hard and soft infrastructures have attracted attention to incremental housing production as a mode of urbanization (Roy, 2005). In Brazil, local material agencies that destabilized the State were considered evidence of 'insurgent citizenship' that formed spatialities of 'insurgent urbanism' (Holston, 1998).

In response to globalization in other planning contexts, Leonie Sandercock (1995) extended definitions of insurgency to encompass issues of multiculturalism, reorienting the axis of binary State-community relationships to the differentiated social spaces where people share concerns but adopt dissimilar approaches to reshaping the city. The diversification of bottom-up practices has continued throughout the global south, where people challenge power frameworks in a variety of ways (Sandercock, 1999). Insurgency thus provides a name for violent (Meth, 2013) and nonviolent collective action; highly variegated (Sweet, 2011) forms of resistance in planning theory; and 'something oppositional, a mobilizing against one of the many faces of the state, the market, or both' (Sandercock, 1999: 41).

The association of insurgency with rapid urbanization initially led scholars to view it as an aftereffect of rural-to-urban migration, linked to collective land settlement and autoconstruction (Holston, 1991). Yet, with persistent and 'peripheral urbanization' (Caldeira, 2017), insurgencies began to rise outside of the home building process and in response to emerging social injustices (Holston, 2019). These extra-housing insurgencies have shaped new epistemic dimensions of planning based on contextual knowledge and resistance conditions (Knorr-Cetina, 1999; Sandercock, 2003). Rooted in concerns for how hegemony inculcates the fabric of everyday life, emergent insurgencies are associated with new tools, resources, and methods that unravel old ties that have been tightened by 'scientific notions and philosophical opinions that have entered into common circulation and continue to oppress vulnerable populations (Gramsci, 1985: 421). Yet, rather than wholesale revolution, such place-based resistance aims to reach *collective* awareness or a 'counter-hegemony' that can be reapplied and thus co-produced across other contexts (Miraftab, 2009). For example, recent work in the area of insurgent planning operates within a larger discursive field but also in concert with dialogic approaches to learning and engaged, *in situ* research (Sletto, 2012). The overlap between knowledge *about* and *by* urbanization-marginalized populations signals the extent to which urban development is at once a research activity, a suite of material interventions, and resultant morphologies that constitute a local spatial politics (Freire, 1993; Arratia, 1992).

Beginning in the mid-2000s, the process of redevelopment also changed. Municipalities across the world built urban databases of informal settlements to more precisely intervene in particular places, while civic and academic actors saw data-based planning as an opportunity for greater participation in urban transformation (Odendaal, 2006). One area of local data work focused on a 'science of slums' (Brelsford et al., 2018) that physically 'reblocked' informal settlements using data collected by community residents (SDI, 2015a,b; Chakraborty et al., 2015). Other data-based planning was more nebulous and organized around various urban problems and leading to highly contingent 'democratic research' infrastructures (Science Communication Unit, 2013) and 'data action methods' (Williams, 2020:42). In a variety of contexts, such citizen science from below began to highlight how marginalized populations

use technology to become the primary translators of subjective socio-spatialities (Hachmann et al., 2018; Shelton, 2018). However, rarely do these data flows specifically focus on how redevelopment transforms community morphology over time.

Despite the expansion of data sources across the global south, there are concerns that persistent 'wicked problems' will be overlooked (Goodspeed, 2015). For example, planners Glasmeier and Christopherson (2015) argued that the success of 'the smart city' will be measured in places where infrastructure is non-existent and governance is minimal. From a similar perspective, one digital scholar-activist refers to the redistribution of digital resources to poor neighborhoods as the 'actually existing smart city' (Shelton et al., 2015). Others observe such grounded 'street science' as critical cartography for revealing sociospatial injustice, but not necessarily transforming its material dimensions (Corburn, 2003). Thus, what may have been considered a minor form of 'smart' urbanism is now a dynamic area of community based research to source, sense, monitor, and mine data to potentially invert the unidirectionality of conventional data-based planning (Joseph and Chambers, 2020).

There may be a tendency to think of the data actions described above as insurgency. All detect an order within the seemingly disordered and ungovernable places that underlie insurgent praxis (Trovalla and Trovalla, 2015). Yet scholars have increasingly echoed Sandercock's early arguments that not all collective action is insurgent (Sandercock, 1995; Sweet, 2011). As concerns redevelopment, the insurgency of an action depends on whether those who are revealing social injustice in informal environments have done so with the intent of confronting a threat to amend an injustice. There are legitimate reasons for acting in an everyday manner or as a 'quiet rebel,' particularly when acting out may draw substantial repercussions (Bayat, 2000). However, to be clear, mapping informality or documenting informal urban morphology, in themselves, are not insurgent. Absent intentional resistance to State power and direct exposure of injustices, these descriptive modes of data collection do not deepen engagement with emergent territorializations of power in urban peripheries (Holston, 2009).

Insurgency requires data to effectively confront redevelopment processes. Without resources and methods that generate needed raw information, or data, insurgency cannot act on a range of issues that residents of informal settlements currently face. One issue is that many informal dwellings have become slum tenements (cortiços) whose residents have been removed from redevelopment sites but have been provided no housing alternative (Santoro, 2016). Another issue is that more informal housing creates new infrastructural demands that strain community systems and decrease urban livability (Scheba and Turok, 2020). The lack of post-occupancy evaluation for social housing may also reinforce the State's culture of building and leaving (or not building and leaving, as the case may be) (Abiko and Ornstein, 2002). Where low-income communities wish to compensate, and co-create data, many face difficulty accessing the technical or software equipment necessary for collection and visualization because they lack the education, resources, and internet connections that people in wealthier parts of the city enjoy (Wamuyayu, 2017). Difficulties collecting data at micro, household, and dwelling scales about ad-hoc additions, internal subdivisions, and spaces that are difficult to access also contribute to this disconnect (Varley, 1994). These challenges impact how data insurgencies promote concrete outcomes and navigate broader arenas of data-based planning.

The long term aftereffects of redevelopment in the global south are rarely referenced in urban policy or discussion. How these concrete conditions are assessed is also frequently absent from theorizing about insurgency (Watson, 2012). Given increasing state withdrawal and the potential for insurgent actions to operate at broader scales, it may not be obvious to scholars or activists what power to trace and confront inside of informal settlements. Building upon the

aforementioned case studies, in the next section, I describe the methods for observing how insurgency in two communities resulted in the co-creation of data about diverse dimensions of urban informality.

Methods for constructing situated data in two intensively redeveloped communities

This study's data were collected as part of two projects undertaken in São Paulo between 2015 and 2020 about redeveloped informal settlements on the city's industrial east side.[4] The first project investigated the role of data in urban redevelopment. [5] Building on the findings of the first project, the second project involved follow-up studies about the specific drivers of changes in building type and urban morphology, undertaken during the summer of 2018, the summer and fall of 2019, and the summer of 2020. Both projects collected data in Heliópolis and Jardim São Francisco, settlements that were established in the late 1960s and have been subject to extensive State-led redevelopment processes since the 1980s.

Guided by the principles of Participatory Action Research (PAR), the first project involved two phases and used a range of quantitative and qualitative methods to investigate how the impacts of redevelopment vary across the two case communities (Park, 2006; Stiphany et al., 2014). In phase one, focus groups and interviews with residents provided a broad understanding of how redevelopment was experienced, guided the collective identification of research questions, and led to the development of an intensive post-occupancy and household survey about individual dwelling change, household transformation, and community character. During the second phase of fieldwork, one field team composed of researchers and collaborators in each community applied the survey across a weighted sample of 1,032 dwellings (formal and informal) in the two case studies. For each dwelling (one respondent per dwelling), photography, field drawings, field notes of follow-up interviews, and 3D digital modeling were used to understand the intersection between redevelopment and individual house and household transformation. The project was facilitated by the construction of a community data visualization tool, ComuniDADOS, that offered public access to the project and data as the study was unfolding.[6] Once it was clear that the data captured residual and hidden impacts of redevelopment, a series of follow-up studies were undertaken in the areas of informal rental and environmental degradation.

I have previously outlined why São Paulo and these two communities are good cases for understanding urban redevelopment, but it is important to briefly note my reasons for re-engaging Heliópolis and Jardim São Francisco for postdoctoral research. When São Paulo's 'smart' upgrading program (Moser, 2016) came to a halt in 2013 amid political and economic decline, residents and community activists sought continuity to their housing needs and, in some places, this activism led to the co-creation of data. In the meantime, the fate of the small favela for which I was a planner on a redevelopment project was unknown. During the 2010 rainy season a treacherous mudslide accelerated the redevelopment project's initiation and broadened the footprint of displacement. What was not demolished by water and mud was taken down by bulldozers and men with sledgehammers. As I listened to resident stories about being displaced, a common problem cited was their lack of data to fight the city's data. The problem of data arose again after my doctoral study of how people built educational spaces in another settlement, Heliópolis, to resist displacement. A young resident of Heliópolis who

[4] For a detailed account of São Paulo's east side and the two case studies presented here see Stiphany, 2015a; Stiphany et al., 2021.

[5] This work was supported by the National Science Foundation under Grant #1513395.

[6] The ComuniDADOS data visualization tool can be accessed at www.chapa.io.

attended my dissertation defense cited the need for data to not only resist displacement, but to improve community participation in urban redevelopment (Resident of Heliópolis, doctoral dissertation defense, August 15, 2015). These experiences motivated me to establish the Chapa Civic Data Lab in the context of my postdoctoral research, and this lab remains active and in construction today.[7] It is from this embedded yet outsider position that I trace how insurgencies in the case communities morphed in response to cycles of redevelopment and catalyse, as I suggest in the next section, infrastructural insurgency.

Three insurgencies

The Heliópolis and São Francisco favelas have been substantially shaped by three insurgencies spanning almost fifty years. While early insurgencies that stemmed from acts of land occupation are typical in Brazil (Holston, 2008), those that arose in response to post-redevelopment conditions in these communities are new. Add to this trajectory the use of geospatial data for redevelopment, which municipalities have used to more precisely subdivide Heliópolis, São Francisco, and other 'upgraded' favelas into enclaves of new social housing or swathes of autoconstructed dwellings. These data-driven fragments are literally the 'interstices' of planning (Sandercock, 1999) because they redefine concepts of rights, housing, and home as residents are displaced from autoconstructed to formal housing environments. Despite ongoing cycles of uneven development and urban 'splintering,' informal settlements do become places where people challenge sociospatial injustices (Graham and Marvin, 2001). As described below, these insurgencies are increasingly facilitated by data co-creation among residents, sometimes in partnership with academics (Sletto, 2012).[8]

Insurgency 1: foundations

Heliópolis and São Francisco share an active history of insurgency. Heliópolis was settled in 1967 when municipal authorities evicted approximately one-hundred families from a *favela* beneath a viaduct in Vila Prudente, an industrial neighborhood east of São Paulo's historical center. These families were temporarily relocated to a large land tract owned by the Federal Instituto de Aposentaria e Pensões dos Industriários (IAPI) and promised new housing. The social housing was never built, and over the next three decades, Heliópolis grew to be one of the largest settlements in the city. In the late 1970s, illegal land bosses called *grileiros* moved in, dividing up the land and controlling infrastructure access. The 1980s were marked by violence as fighting broke out between the *grileiros* and a vigilante group called the *matadores*. At this time, Brazil was emerging from a twenty-year military dictatorship and grassroots movements were building a progressive urban reform movement (Rolnik, 2011). Thus, favelas became sites where residents actively negotiated their rights on the streets, learned political activism in spaces established by the Catholic church, and where different, often antagonistic, actors made claims for the same land (Friendly, 2017).[9] A former resident of Heliópolis, who now holds State office, describes the clashes:

> At the time, we (residents) were fighting off two opponents—the IAPI and the municipality who

[7] See the Chapa Civic Data Lab website: www.chapa.io
[8] Data may be accessed through a range of media and publications at www.chapa.io.
[9] Community organization in favelas was deeply influenced by Catholic neighborhood movements, which became embedded in communities through pastoral spaces called Comunidades Eclesiais de Base (CEBs). In these spaces, residents learned to mobilize for housing and infrastructural improvements, and to understand their rights to these resources. Most residents understand this history and refer to these spaces as '*o pastoral*'. See Singer & Brandt, 1980; and Sader, 1988.

> wanted to evict everyone—and the *grileiros* who wanted to kill us because we were trying to get the city to buy the land from the feds that would displace them of their livelihood. When the city did buy the land, it brought us together in a powerful way (interview, August 02, 2014).

In 1984, the municipal housing agency COHAB assumed the management of Heliópolis, and residents were permitted to stay on the land, except without claim to tenure, and under a ninety-nine-year concessional use contract. At the time, the first census was undertaken in Heliópolis and accounted for 20,104 people living in 4,774 houses—approximately half of which had already evolved from a wooden shack into a masonry structure (Sampaio, 1991). The educational deficit in Heliópolis was found to be 'very high' and low educational levels motivated residents to convert most of the Catholic CEBs, and some residential spaces, for educational purposes (Stiphany, 2015a). As a community leader stresses, residents 'wanted to get away from the Catholics, so we were partners in these shacks for a while, and after we appropriated them, then they (the educational spaces) were taken over by a municipal program'.[10] This educational infrastructure played a key role when, in 1986, there were attempts to redevelop Heliópolis with high-rise apartments instead of the adaptable, user-based 'sites and services' *mutirão* housing that residents had requested two years before in a statement dated February 2, 1984, and titled 'What we want' (Sampaio, 1991). A daily municipal press release of September 27, 1987 illustrates a gap between housing promises and results, with reference to the importance of the social cadaster:

> In parallel with high levels of real estate speculation, discrepancies in the number of people counted, and political tension, many challenges have blocked the project's progression. […] COHAB has opted to construct more apartments instead of upgrading existing lots. […]. 'in the midst of so much uncertainty, our struggle to realize the project previously elaborated will continue' affirmed Miguel Leao, resident and associate of the UNAS community organization (Sampaio, 1991).

At this time, Heliópolis was characterized by a fragmented pattern that was not unlike other growing informal settlements. Conglomerations of families radiated across a large land tract, and each, referred to as a *nucleo,* had a leader. The union of these nucleos into a community organization in 1988 provided a socio-material resistance against an attempt by the authoritarian mayor Jânio Quadros to remove Heliópolis '*nucleo* by *nucleo*.' As counterevidence, residents declared that they had already established schools *nucleo* by *nucleo*. Residents went even further, demanding that the placement of their desired *mutirão* housing should follow this same pattern, to create a network of integrated housing-educational centres. This integrated model was new to Heliópolis, but it facsimiled what was referred to as a 'school-park' strategy that was established in Salvador, Bahia in the 1940s and eventually became a widespread model for building schools in São Paulo's favelas (Freire, 1993). As a resident of Heliópolis describes:

> Through our struggle for land we learned to fight for our educational spaces. And that became a struggle for the housing we want, not the housing they [the municipality] wants to give us. When the municipality saw the schools we built, they could not just tear down those places where children were playing. And so they built the *mutirão* in those areas, that was our idea, to have schools and housing across the community […] then the community grew around them [the housing-educational centers] (interview, Heliópolis).

In prior work, I frame Heliópolis' housing-educational centres as what Star and Ruhleder

[10] The municipal program called CCAs—Centers for Children and Adolescents—was established when Paulo Freire was Secretary for Education between 1989 and 1993. Most of the CCAs are adaptations of former CEB, pastoral spaces (Stiphany, 2015a).

(1996) define as an *installed base* of infrastructure that 'does not grow de novo; it wrestles with the inertia of the installed base and inherits the strengths and limitations from that base,' stimulating new socio-material agencies (113).[11] In the case of community organizations in informal settlements, a key dimension of this wrestling involves a parallel dependency on the state for more interventions. Here, too, the insurgency stems from residents' position between their created sites of planning and those controlled by a State that 'is viewed both as a strong regulator and a failing provider' (Meth, 2010: 252 makes an identical argument).

Take for example Jardim São Francisco, where the same *mutirão* housing was constructed, but as a massive mat of dwellings – a giant suburb – for families removed from various favelas across the city. The community's peri-urban location with large vacant tracts was conducive to such expansive developments—which were placed, unbeknownst to these families, next to a landfill and in an area where two additional landfills were constructed in the following years, both near a petrochemical plant. During this period, members of São Francisco's 'community from zero' was divided up into work canteens composed of to-be residents and municipal engineers, each of which built starter housing that was serviced with infrastructural plenums, and as is typical with 'sites and services' developments elsewhere (Laquian, 1983; Felipe, 1997). Resident members of each work group subsequently adapted and expanded the starter house across a slightly larger lot (Stiphany, 2019a). As they did, the land surrounding São Francisco's *mutirão* was occupied by illegal invasions, which continues to be the case today. Unlike Heliópolis, if there was a census, it was not shared with residents; 'the emphasis was adding more and more housing and people, not counting them, not planning for the infrastructure needed to service them' (interview, São Francisco). Further, the resistance in São Francisco did not arise until 1999, ten years after residents had formed an association in Heliópolis, as the landfill and its stench grew. Residents demanded the landfill's closure, and with the passage of the 2001 Statute of the City, a plan to remediate the Sapopemba Landfill was inserted into a masterplan for the District of São Mateus. In 2002, the Sapopemba remediation was identified as one of two projects in the city that was eligible for a Clean Development Mechanism (CDM), a component of the Kyoto Protocol that permits developed countries to purchase carbon credits from underdeveloped ones, on the condition that the surplus be applied to improvements in areas that suffer direct environmental degradation (Brose, 2009). In 2006, two years after the City sold the credits and the stipulation for improvements were not met, São Francisco residents signed an *abaixo assinado* or public declaration demanding that the landfill be remediated into a park.

As the former Sapopemba Landfill was being remediated, its edges were further occupied by informal invasions. Residents explained that the municipality had removed these invasions previously, in 2009, yet had not provided replacement housing units. Thus, these areas were re-squatted by former residents and by new ones from elsewhere, and much like Heliópolis in the 1980s, these new occupations are today controlled by *grileiros* who divide the land and control new construction. These areas are not welcomed by original settlers, who believe they must defend their neighborhood and the Sapopemba park project against people who live in what they term a 're-invasion':

> Those people are not from here, they're renters from Africa…oh and Venezuela. The women all have disease, and that is why they live together under that bridge. There is prostitution. We don't go down there (interview, São Francisco).

The picture inside of São Francisco's re-invasions, however, is otherwise: some women form

[11] See Stiphany, 2015a.

communal spaces to share cooking and childcare duties, much as women in Heliópolis did decades ago. In distinction, these women in the 're-invasion' are not supported by higher-level social movements, nor are they embedded within the housing imaginaries and environmental extensions that original settlers construct over time. Far from trespassing, these women have adapted a displacement zone into a social infrastructure that, although substantially less developed than Heliópolis, is peripheral even to these unsanctioned and more familiar insurgent planning spaces. Although the comparison between Heliópolis and São Francisco suggests that what Amin (2014) terms human infrastructures in the latter could grow into a substantial organization later, the challenges of São Francisco's lived experiences limit the realization of such a scenario.

Insurgency 2: translations

Most collaborators in the study outlined above are original settlers or children of original settlers in Heliópolis or Jardim São Francisco. Directly or indirectly, they have lived the legacy of building their homes through autoconstruction, and have witnessed the trials of mobilizing for infrastructure and warding off displacement. These residents know their communities from the inside out, yet guessed that our study would find that about ten to fifteen percent 'max' of the community are renters, even though we found renting to occur in much higher numbers. The stigma of renting and rental in informal settlements is widespread, galvanized by the reality that before autoconstruction produced homes, it was an escape for working-class populations from the high rents of inner-city tenements (Bonduki, 1998). Some families have taken on renters from time to time, but to minimal extents. This narrative was unsettled over the course of the fieldwork.

Collaborators from Heliópolis or Jardim São Francisco also observed that despite many upgrading projects, not enough units were being constructed, and informal dwellings in some areas were rapidly densifying. As the municipal redevelopment cycle gained momentum there was more displacement, creating a 'chasm between the people kicked out of autoconstructed areas, the neighbors, and the housing units constructed in the enclaves' (interview, Heliópolis). At the same time, where informal buildings were densifying, micro-developers from outside of the favela began to move in and their investments have generated new informal land markets (Stiphany and Wegmann, 2020).

These on-the-ground observations were crystallized by a randomly-selected survey undertaken across 505 households in Heliópolis in 2016. Through the survey's focus on interactions between building transformation and household change, it became clear that families were dramatically recalibrating their living patterns to accommodate rent, either by downsizing within an existing dwelling or building substantial additions (Stiphany, 2019b). Indeed, while official census data reported that 26% of Heliópolis residents were renters (IBGE, 2010), this study's data showed that when measuring rental by buildings, over half of all individual properties had densified with some form of residential or commercial rental (Stiphany et al., 2021). Collaborators and respondents once again declared that the community was being 'taken over by renters,' and micro-developers:

> Those micro-developers who have always been operating behind the scenes are now out in the open, and they have a lot of power. They have cash on hand to buy entire buildings and make them into anything they want overnight. They build housing that residents have never seen and now, most cannot afford. We have to listen to them (interview, Heliópolis)

The intersection between redevelopment and greater rental housing densities is not a mystery.

External micro-developers and local landlords enjoy a unifying source of support from a municipal resettlement program that offers rental vouchers for people displaced from redevelopment sites (Stiphany, 2019b; Stiphany and Wegmann, 2020). As a local planner suggested to colleagues gathered at the recent symposium in São Paulo *Rent in Latin America: State, Finance, and Popular Markets*, 'informal rental is created by public policy, it is a purse that never stops paying' (Conference Panel: Rental in Favelas, September 15, 2020). Residents in Heliópolis are increasingly torn between the low-income housing that rental facilitates, and the exclusions its production deepens, as one leader expressed when visualizing the staggering rise in rental across São Paulo and in Heliópolis: 'we lack the time that we once did—ten, fifteen years—to address this rent issue' (interview, Heliópolis).

Renting has long been a dimension of informality that has been studied extensively in other Latin American cities (Ward, Jiménez, and DiVirgilio, 2015) and global south contexts (Gilbert and Varley, 1991; Gilbert *et al.* 1997; Gilbert, 2016). Nevertheless, because the housing deficit in Brazil, although improved, remains exceedingly high, the demands for low-income rental housing have soared, particularly amid Latin America's deep economic decline (Baqai and Ward, 2020; Ward and Wilson, 2018). Moreover, although renting is the principal mode of low-income rental globally, it remains absent from housing policy (Wegmann and Mawhorter, 2017). As Renato Cymbalista, Brazilian urbanist and rental housing activist, confirms, the policy gap is exacerbated because social movements 'won't touch rental – it compromises their agenda for land reform' (invited lecture, Texas Tech University, October 27, 2020). UNAS is now caught between the evidence of their own data, the problems rent engenders—evictions being one of many—and a lack of policy and movement support. In parallel, renters, particularly those provided municipal vouchers, are put in the vulnerable position of being permitted to live seemingly anywhere but ultimately nowhere. Even though rent, at one time, seemed to be helping the poor, 'once the entire community went up for rent, absentee landlords called *senhorios* are coming in droves' and changing community character (interview, Heliópolis).

Insurgency 3: disruptions

There is a lack of data about informality across the world and this pattern holds in Brazil (Perez and Bishoff, 2019). Informal settlements are mapped at national, urban, neighborhood scales, however these data are frequently unreliable (Samper, Shelby, Bahary, 2020). The greatest empirical gaps at micro (building) scales make it impossible for governments to accurately assess housing density to adequately allocate infrastructure and undertake successful title and land regularization. The lack of data is particularly problematic in Heliópolis and Jardim São Francisco for two additional reasons. First, without data residents cannot challenge the data that municipalities make and use to displace residents from redevelopment project sites. Second, an accurate measure of housing density is not possible because data are collected according to households, not housing units. As the global coronavirus pandemic clearly illustrated, little can be done to protect citizen health without understanding informal forms of housing and their densities.

In both Heliópolis and Jardim São Francisco, residents have taken measures to cope with housing densities that are rising in the wake of redevelopment projects. In São Francisco, they are improvising to manage the new squats in areas that were depopulated for projects that never materialized, testing soil contamination levels in these vast re-squatted areas, measuring water pollution along gullies, and forming resident groups that help squatters with trash management and childcare (Stiphany, 2015b; Weindorf, et al., 2019, unpublished dataset). These actions were dispersed, as activists traced new spontaneous densification

that formed beneath viaducts, along riparian zones, and at the edge of forests. The converse was true in Heliopolis, where the densification was an add-on to dwellings that have been consolidating for decades. Beginning in April of 2020, this stabilizing characteristic motivated COVID-19 relief efforts that were organized to target the densest and most vulnerable parts of Heliópolis. Youth members of an active community organization who had learned QGIS used this free geospatial software to make maps of where COVID-19 cases were high relative to high housing density, using data from the municipality and data collected by the Chapa project, respectively. These maps ensured that COVID-19 relief packages were distributed from high to low density areas. The youth also used municipal data to compare the concentration of cases in Heliópolis relative to neighboring areas, where people with higher incomes live. Their maps reinforced that, for a host of known reasons, the pandemic bore disproportional impacts on low-income communities, as was the case globally (Rossi, 2020). Overall, collective action in São Francisco and Heliópolis make it clear that communities are progressively constructing a multi-media data system based on the aftermath of redevelopment.

Infrastructural insurgency

In Heliópolis and São Francisco, three decades after the first insurgencies mobilized for infrastructure, the aggregate of citizen actions has become an infrastructure. The citizens who struggled to occupy land in Heliópolis and to close the Sapopemba landfill in Jardim São Francisco were fighting for the right to infrastructure, urban services, and better conditions in informal settlements. In the first (foundations) and third (disruptions) eras, when insurgency was high in both communities, State data resources were minimal, and residents orchestrated highly visible acts against State action and inaction. In the first era, citizen claims led to the establishment of interconnected hard and soft infrastructures, which were fortified through subsequent mobilizations for housing and improvements to communal spaces. Residents continued to assemble skills, build assets, and deploy tactics to bolster a foundation of socio-material resources that they adapted to emerging needs and threats. Alternatively, in the second era, State data resources about informal settlements were plentiful, and the insurgency in the case communities was mixed: some groups channeled their energy into collaborations with local government, while others opted to monitor past patterns of redevelopment and ascertain if the State met its stated promises.

Although rooted in common historical struggles for land and housing, data insurgencies today are united by life amid diverse, precarious conditions that unfold in the aftermath of redevelopment. Redeveloped communities have paved streets, sewerage connections, electricity networks, and piped water. Yet despite these improvements, residents see an irreconciliation between past achievements and future aspirations. Data become a rallying cry around which some citizens changed and are changing how the conditions they wish to transform are detected and represented. Early insurgencies mostly aligned with State interests, but later variations, as in Heliópolis and São Francisco, organized around the patterns that residents deem critical for future growth. In other poor neighborhoods, changing concepts of housing and household, what the right to the city looks like in ideology and on the ground, and how space is building up as the country's economic reality is spiraling down, remain ambiguous. São Paulo's big data may show informal settlements as never before, but it is limited for capturing the nuance between what planning can measure and what communities believe should be revealed.

If insurgency has shaped infrastructure, then planners should deploy planning in infrastructural terms. According to Star and Ruhleder's (1996) definition, insurgencies in Heliópolis and São

Francisco are an infrastructure because they constructed a system that transitions 'beyond a single event or a one-site practice' (113). Heliópolis' data infrastructure arises from an 'installed base' of hard and soft networks that years of self-organization have 'sunk into' existing structures and social arrangements over time and across space (113). Jardim São Francisco's mobilizations were dispersed but eventually led to targeted actions that could create robust reciprocities between environmental justice and new modalities of informality (Walker and Alcarón, 2018). The co-construction of data can be learned, with the lesson that the most powerful standards are those that adapt to change, as demonstrated by young data insurgents in Heliópolis. Looking across the infrastructural insurgencies in both cases, it is clear that collective action was inspired by Brazil's broader urban reform movement. That the trajectory of both cases recalibrated to encompass a range of urban problems signals the potential for data co-construction to continue in other contexts. In sum, infrastructural insurgency describes socio-material agencies that synthesize data into forms that reveal fractures when States proclaim cohesion, and distribute services where States fail to deliver.

The system builders (Hughes, 1987) of infrastructural insurgency in Heliópolis and Jardim São Francisco operate in an interregnum between time (census data years) and space (redevelopment projects). Their study of housing from the inside out and in places that most people cannot access makes the invisibility of informality visible, however the data they create underscore the State's persistent failure to deliver on its promise to improve vital urban services in favelas (Stiphany et al., 2021). For this situated system to endure, the upcoming decennial census data release will be an important input for reappraising another entire decade of redevelopment outcomes. There are undoubtedly thousands of neighborhoods where States have intensively intervened and withdrawn across the world. Situated data networks can foster a transgeographic debate about how citizens should mobilize data to confront the injustices that bear on modern informal cities.

Rethinking redevelopment through situated data infrastructures: concluding thoughts for planning in and beyond the Brazilian global south

This article has shown that the infrastructural insurgencies in Heliópolis and Jardim São Francisco recast prior collective action by inclusion of situated data. To progress planning and move situated studies of insurgencies forward, this study of infrastructural insurgency highlights several important themes for reappraising data and redevelopment in contexts of the global south.

The first theme concerns the nature of data streams that enable people to take action in different ways than they did before. The agency of urban transformation is often assigned to big buildings and massive data streams that governments use to make change more scientific and that communities cannot often affect. Indeed, the 'smart data' turn is valuable for distilling complex urban phenomena into quantified terms that can be easily evaluated. However, these distillations frequently omit the complex morphologies and insurgencies that characterize post-redeveloped environments. This blindness deepens injustice, as aftereffects build up and citizens are expected to manage more residual outcomes. From the cases presented here, one theme to carry forward is how planning interventions can also be subtractive, whereby planning can follow the lead of local insurgencies and calibrate plans to the findings they present. In such a scenario, planning may look back to insurgency's initial intention: to reject northern planning ideas and models that have been blindly applied in the global south (Watson, 2012). Doing so may entail moving beyond 'driving' data and toward civic data environments where citizens can make collective decisions about how redevelopment transforms the relationship between poor neighborhoods and cities.

Second, when thinking about how social and material change agents stimulate power asymmetries, the right to the city is broad in its provision that citizens are guaranteed participation in city-making. Yet, as the cases emphasize, while all data are situated and political, it is critical to understand the dynamism of data as neither remote nor local, qualitative nor quantitative. From this perspective, the focus is on how a data infrastructure's resources promote reciprocities between urban agents, each of whom have different data powers to measure cities, and thus change them. In the case of Chapa, the construction of ComuniDADOS made it clear that one-way data dissemination is useful during incipient phases of project development, but that it must eventually be upgraded to include two-way or crowdsourced data collection processes and tools that synthesize data into 3D forms that enable the public to visualize, and thus potentially change, urban transformation. Indeed, there are multiple digital platforms for translating situated data streams into future design scenarios. The extent to which these translations help data insurgencies to not only reveal inequality, but transform it, is an area of future planning theory and practice.

Third, studying insurgency from an up-close perspective in Latin America helps to inform the possibility of using data to solve problems associated with informal housing across the world. Yet this depends on municipal mainframes that look beneath the surface of cities, and a recognition of uneven municipality and administrative capacity to produce data about informality and engage situated sources when appropriate. As Sletto (2012) shows, local mapping is often categorized as community work, however there are tenuous links to municipal plans and planning processes. That said, studying how data insurgencies evolve provides the possibility of using data to solve problems of informality with data made *in* informal environments. Insurgencies that coalesce around data present the potential to regulate housing policy from the inside of housing environments outward. Co-created data streams can offer a useful corrective to housing policy that is often inflexible and, as is increasingly the case in Latin America, narrowly focused on housing products and single family homeownership (Rolnik, 2019). *In situ* analyses of informal dwellings can expand understanding about which housing elements and volumes matter to today's working-class populations, and increase relevance for planning with immigrant communities, who frequently bring housing concepts and material practices with them. Only by drilling down into the details of insurgency can planning respond to calls for a 'politics of methodology' from the south, focusing on how, and by whom, informal settlements are studied and represented (Watson, 2003).

Infrastructural insurgency can help planning see and subvert historical patterns of injustice. Data-driven planning has transformed redevelopment in São Paulo, but in the process it has dissolved public trust. The aftermath, and the insurgencies embedded within, will be important for clarifying how different rationalities are unsettling the pace, scope, scale, and location of social injustice in cities and beyond sanctioned planning spaces. Co-creation of situated data crystallizes evidence against what municipal agencies propose, yet is not driven by opposition alone; failure to synthesize into tangible outcomes can generate new injustices. Only with greater attention to communities that radically morph through urban transformation can planning engage the spaces that citizens reveal and collectively contest.

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References

Abiko, A.K., & Ornstein, S.W. (2002). *Inserção urbana e avaliação pós ocupação (APO) da habitação de interesse social*. São Paulo: FAUUSP.

Arratia, M.I. (1992). Participatory methodologies: Grounding the 'alternative paradigm.' *Nexus* 10.

Amin, A. (2014). Lively infrastructure. *Theory, Culture, and Society*, 31(7/8): 137 – 161.

Baqai, A., & P.M. Ward (2020). Renting and sharing in low-income informal settlements: Lacunae in research and policy challenges. *Current Urban Studies,* 8: 456 – 483. DOI: 10.4236/cus.2020.83026.

Bayat, A. (2000). From 'dangerous classes' to 'quiet rebels': Politics of the urban subaltern in the global south. *International Sociology*, 15(3): 533 – 557. DOI: https://doi.org/10.1177/026858000015003005.

Ben Joseph, E. (2005). *The code of the city*. Cambridge: The MIT Press.

Bonduki, N. (1998). *Origens da habitação social no brasil. Arquitetura moderna, lei do inquilinato e difusão da casa própria*. São Paulo: Estação Liberdade, FAAPSP.

Brelsford, C., Martin, T., Hand, J., & Bettencourt, L.M.A. (2018). Toward cities without slums: Topology and the spatial evolution of neighborhoods. *Science Advances,* 4(8). Retrieved from https://advances.sciencemag.org/content/4/8/eaar4644

Brose, M. (2009). *O pagamento por serviços socioambentais: o mercado do carbono promove inclusão social?* Goiania: Universidade Católica de Goiás.

Caldeira, T. (2017). Peripheral urbanization: Autoconstruction, transversal logics, and politics in cities of the global south. *Environment and Planning D: Society and Space*, 35(1): 3 – 20. DOI: https://doi.org/10.1177/0263775816658479.

Chakraborty, A, Wilson, B.K., Sarraf, S., & Jana, A. (2015). Open data for informal settlements: Toward a user's guide for urban managers and planners. *Journal of Urban Management*, 4(2): 74 – 91. DOI: https://doi.org/10.1016/j.jum.2015.12.001.

Chambers, J., & Evans, J. (2020). Informal urbanism and the internet of things: reliability, trust, and the reconfiguration of infrastructure. *Urban Studies*, 57(14): 2918 – 2935.

Corburn, J. (2003). Bringing local knowledge into environmental decision-making: Improving urban planning for communities at risk. *Journal of Planning Education and Research*, 22: 420 – 433.

Edwards, P. (2002). Infrastructure and modernity: Force, time, and social organizations in the time of sociotechnical systems. In T.J. Misa, P. Brey, & A. Feenberg (eds.) Modernity and technology (pp. 185-225). Cambridge, MA: MIT Press.

Felipe, J.P. (1997). *Mutirão e autogestão no Jardim São Francisco (1989 - 1992): Movimento de moradia lugar do arquiteto.* Unpublished Master's Thesis, Universidade de São Paulo, São Carlos.

Fernandes, E. (2007). Constructing a right to the city in Brazil. *Social Legal Studies,* 16: 212.

Freire, P. (1993). *Pedagogy of the city*. New York: Continuum.

Friedmann, J. (2011). *Insurgencies*. Hoboken: Taylor and Francis.

Friendly, A. (2013). The right to the city: Theory and practice in Brazil. Planning Theory and Practice*,* 14(2): 158 – 179.

Friendly, A. (2017). Urban policy, social movements, and a right to the city. *Latin American Perspectives*, 44(2): 132 – 148.

Gilbert, A.G. (2016). Rental Housing: The international experience. *Habitat International*, 54(3): 173 – 181.

Gilbert, A.G., Mabin, A., McCarthy, M. , & Watson, V. (1997). Low-income rental housing: are SA cities different? *Environment and Urbanization*, 9(1): 133 – 148.
Gilbert, A.G., & Varley, A. (1991). *Landlord and tenant: Housing the poor in urban Mexico*. London, Routledge.
Glasmeier, A., & Christopherson, S. (2015). Thinking about smart cities, *Cambridge Journal of Regions, Economy, and Society,* 8(1): 3 – 12.
Goodspeed, R. (2015). Smart cities: moving beyond urban cybernetics to tackle wicked problems, *Cambridge Journal of Regions, Economy, and Society,* 8(1): 79 – 92.
Graham, S. & Marvin, S. (2001). *Splintering urbanism: Networked infrastructures, technological mobilities, and the urban condition*. London: Routledge.
Gramsci, A. (1985). *Selections from cultural writings.* London: Lawrence and Wishart.
Hachmann, S., Arsanjani, J.J., & Vaz, E. (2018). Spatial data for slum upgrading: Volunteered geographic information and the role of citizen science. *Habitat International,* 72: 18 – 26.
Haraway, D. (1988). Situated knowledges: The science question in feminism and the privilege of the partial perspective, *Feminist Studies*, 14(3): 575 – 599.
Holston, J. (1991). Autoconstruction in working class Brazil. *Cultural Anthropology*, 6(4): 447 – 465.
Holston, J. (1998). Spaces of insurgent citizenship, in: L. Sandercock (Ed.) *Making the invisible visible: A multicultural planning history*. Berkeley: University of California Press. (pp. 37 – 56).
Holston, J. (2008). *Insurgent citizenship: Disjunctions of democracy and modernity in Brazil*. Princeton: Princeton University Press.
Holston, J. (2019). Metropolitan rebellions and the politics of commoning the city. *Anthropological City*, 19 (1): 120 – 142.
Hughes, T. (1987). The evolution of large technological systems. In W.E. Bijker, T.P. Hughes & T.J. Pinch (eds.) *The Social Construction of Technological Systems* (pp. 51 – 82) Cambridge: MIT Press.
IBGE (2010). Instituto Brasileiro de Geografia e Estatística (Brazilian Institute of Geography and Statistics).
Knorr-Cetina, K. (1999). *Epistemic Cultures: How the Sciences Make Knowledge,* Cambridge: Harvard University Press.
Laquian, A. (1984). *Basic Housing Policies for Urban Sites, Services, and Shelter in Developing Countries*. Ottawa: International Development Research.
Maricato, E. (2000). As Ideias Fora Do Lugar E O Lugar Fora Das Ideias: Planejamento Urbano No Brasil. In O Arantes, C., Vainer, C., & Maricato, E. (eds.) *A Cidade Do Pensamento Unico: Desmanchando Consensos* (pp. 121 – 92). São Paulo: Editora Vozes.
Meth, P. (2010). Unsettling insurgency: Reflections on women's insurgent practices in South Africa. *Planning Theory and Practice,* 11(2): 241 – 263.
Meth, P. (2013). Millennium Development Goals and urban informal settlements: Unintended consequences, *International Development Planning*, 35(1).
Miraftab, F. (2009). Insurgent planning: Situating planning in the global south. *Planning Theory*, 8(32): 32 – 50.
Moser, H. (2016). Transformative innovation for international development. Washington, D.C.: CSIS Project on Prosperity and Development and the JICA Research Institute.
Odendaal, N. (2006). Toward the digital city in South Africa: issues and constraints. *Journal of Urban Technology*, 13(3): 29 – 48. DOI: https://doi.org/10.1080/10630730601145997.
Park, P. (2006). Knowledge and participatory research, in P. Reason & H. Bradbury (eds.) (pp. 83-93) *Handbook of Action Research*, Thousand Oaks: Sage Publications.

Perez, L.P. & Bischof dos Santos, G.M.J.A. (2017). Spatial data in the global south: A case study of alternative land management tools for cities with limited resources. Paper presented at the IEEE Global Humanitarian Technology Conference.

Perlman, J. (2010). *Favela: Four decades of living on the edge in Rio de Janeiro*. New York: Oxford University Press.

Rolnik, R. (2011). Democracy on the edge: limits and possibilities in the implementation of an urban reform agenda in Brazil. *International Journal of Urban and Regional Research,* 35(2): 239 – 255. DOI: 10.1111/j.1468-2427.2010.01036.x.

Rolnik, R. (2019). *Urban warfare: Housing under the empire of finance*. New York: Verso.

Rossi, M. (2020). Periferia lidera as mortes por coronavírus na cidade de São Paulo, e as mulheres adultas são as mais infectadas. El Pais. April 18, 2020. Retrieved July 7,2020, from https://brasil.elpais.com/brasil/2020-04-18/no-mapa-do-coronavirus-na-cidade-de-sao-paulo-a-periferia-lidera-as-mortes-e-as-mulheres-adultas-sao-as-mais-infectadas.html

Roy, A. (2005). Urban informality: Toward an epistemology of planning, *Journal of the American Planning Association,* 71(2): 147 – 158. DOI: https://doi.org/10.1080/01944360508976689

Roy, A. (2009). Why India cannot plan its cities: Informality, insurgence and the idiom of urbanization. *Planning theory*, 8(1): 76 – 87. DOI: https://doi.org/10.1177/1473095208099299.

Sader, E. (1988). *Quando novos personagens entraram na cena*. São Paulo: Paz e Terra.

Sampaio, M.R.A. (1991). *Heliópolis: O Percurso de Uma Invasão.* Unpublished tenure thesis. The University of São Paulo, São Paulo.

Samper, J. Shelby, J.A. & Behary, D. (2020). The paradox of informal settlements revealed in an ATLAS of informality: Findings from mapping growth in the most common yet unmapped forms of urbanization. *Sustainability*, 12: 9510.

Sandercock, L. (1995). Making the invisible visible: new historiographies for planning, *Planning Theory*, 13,10 – 33.

Sandercock, L. (1999). Introduction: Translations: from insurgent planning practices to radical planning discourses, *Plurimondi*, 1(2):37 – 46.

Sandercock, L. (2003). Cosmopolis II: Mongrel cities in the 21st century (London, Continuum).

Santoro, P. (2016). Levantamento das situações de moradia precária na Operação Urbana Consorciada Bairros do Tamanduateí (Final Report). The University of São Paulo, São Paulo.

Schwarz, R. (1992). *Ao vencedor as batatas*. São Paulo: Duas Cidades.

Science Communication Unit (2013). Science for environment policy (In-depth report). Bristol, UK: Environmental Citizen Science. Retrieved March 16, 2020 from https://ec.europa.eu/environment/integration/research/newsalert/pdf/IR9_en.pdf

SEHAB (2008). Habisp: Mapeando a habitação na cidade de São Paulo. São Paulo: Boldarini Arquitetura e Urbanismo.

Shelton, T. (2018). Mapping dispossession: Eviction: foreclosure, and the multiple geographies of housing instability in Lexington, Kentucky. *Geoforum*, 97: 281 – 291.

Shelton, T., Zook, M.A, & Wiig, A. (2015). The actually existing smart city, *Cambridge Journal of Regions, Economy, and Society,* 8(1): 13 – 25.

Simone, A.M. (2004). People as infrastructure: Intersecting fragments in Johannesburg. *Public Culture,* 16(3): 407 – 429.

Singer, P., & Brandt, V.C. (1980). *São Paulo: O povo em movimento*. Petropolis: Vozes /CEBRAP.

Sletto, B. (2012). Insurgent planning and its interlocutors: Studio pedagogy as unsanctioned practice in Santo Domingo, Dominican Republic, *Journal of Planning Education and Research,* 33(2): 228 – 240. DOI: https://doi.org/10.1177/0739456X12467375

Slum Dwellers International, SDI (2015a). Profiling and mapping for alternative slum upgrading solutions. Retrieved March 28, 2020 from http://knowyourcity.info/2015/11/profiling-and-mapping-for-alternative-slum-upgrading-solutions-in-kiandutu-kenya/

Slum Dwellers International, SDI (2015b). In Short, Mapping is Important. Retrieved March 28, 2020 from http://knowyourcity.info/2015/11/in-short-mapping-is-important/

Star, S., & Ruhleder, K. (1996). Steps toward an ecology of infrastructure design and access for large information spaces. *Information Systems Research,* 7(1): 111 – 134. DOI: https://doi.org/10.1287/isre.7.1.111.

Stiphany, K. (2015a). Learning Displacement: Self-Building, Educational Infrastructure, and the Politics of Redevelopment in Brazilian Informal Settlements, Unpublished dissertation, The University of Texas at Austin, Austin.

Stiphany, K. (2015b). Aligning Disconnected Frames in Action: The Case of São Paulo's Zeladoria Ambiental Environmental Caretakers. In S. A. Moore (ed.) *Pragmatic Sustainability* (pp.191 – 206). New York: Routledge.

Stiphany, K., Ward, P.M., & Moore, S.A. (2014). Situated Data: Constructing Empirical Decision-Making for Assessing Upgraded Informal Settlements (Proposal #1513395). National Science Foundation.

Stiphany, K. (2019a). *Mutirão*: The Architecture of Agency. *Journal of Architectural Education*, 73(2): 258 – 260. DOI: https://doi.org/10.1080/10464883.2019.1633207.

Stiphany, K. (2019b, November). Rentscapes: Emerging patterns of informal housing markets in São Paulo. Paper presented at The Association of Collegiate Schools of Planning Annual Conference.

Stiphany, K., & Wegmann, J. (2020, November). From Self-Builder to Senhorio: The Microeconomics of Rentrification in São Paulo. Paper presented at The Association of Collegiate Schools of Planning Annual Conference.

Stiphany, K., Ward, P.M., & Perez, L.P. (under review). Informal settlement upgrading and the rise of rental in São Paulo. *Journal of Planning Education and Research*.

Sweet, E. (2011). Response to 'Letter to the Editors': Action and Planning – Where To We Draw The Line? *Journal of Planning Education and Research,* 31(2): 221 – 22. DOI: https://doi.org/10.1177/0739456X11403903.

Taschner, S.P.(1999). Favelas em São Paulo - censos, consensos e contra-sensos. *Cadernos Metrópole*, 5. 11 – 3.

Trovalla, E., & Trovalla, U. (2015). Infrastructure as a divination tool: Whispers from the grid of a Nigerian City. *City,* 19(2-3): 332 – 343. DOI: https://doi.org/10.1080/13604813.2015.1018061.

Vale, L.J. (2014). *Purging the poorest: Public housing and the design politics of twice-cleared communities*. Chicago, University of Chicago Press.

Vale, L. (2017). *After the projects*. Cambridge: MIT Press.

Varley, A. (1994). Housing the household, holding the house. In G.A. Jones & P.M. Ward, (eds.) Methodology for Land and Housing Market Analysis. London: UCL Press.

Walker, A.M.P. & Alcarón, M. (2018). The competing social and environmental functions of private urban land: The case of an informal land occupation in São Paulo's south periphery. *Sustainability*, 10(11): 4160. DOI: https://doi.org/10.3390/su10114160.

Wamuyu, P.K. (2017). Bridging the digital divide among low income communities: Leveraging use of community technology centers. *Telematics and Informatics,* 34(8): 1709 – 1720. DOI: 10.1016/j.tele.2017.08.004.

Ward, P.M. (1982). *Self-help housing: A critique*. London: Mansell Publishing Company.

Open Access Journal

Ward, P.M., Jiménez, E., & Di Virgilio, M. (2015). *Housing policy in Latin American cities: A new generation of strategies and approaches*, New York: Routledge.

Ward, P.M., & Wilson, R. (2018). Latin America's future public policy challenges: A ten-year time horizon. *Latin American Policy*, 9(2):183 – 207. DOI: https://doi.org/10.1111/lamp.12150

Watson, V. (2003). Conflicting rationalities: implications for planning theory and ethics. *Planning Theory and Practice*, 4: 395 – 408. DOI: https://doi.org/10.1080/1464935032000146318.

Watson, V. (2012). Planning and the stubborn realities of global south-east cities: Some emerging ideas. *Planning Theory*, 12(1): 81 – 100. DOI: 10.1177/1473095212446301.

Wegmann, J., & Mawhorter, S. (2017). Measuring informal housing production in California Cities. *Journal of the American Planning Association,* 83(2): 119 – 130. DOI: https://doi.org/10.1080/01944363.2017.1288162.

Weindorf, D. & Stiphany, K. (2019). Soil health in Perus and São Mateus Districts, São Paulo. Unpublished dataset.

Williams, S. (2020). *Data Action*. Cambridge: MIT Press.