

Advancing equitable ‘resilience imaginaries’ in the Global South through dialogical participatory mapping: Experiences from informal communities in Brazil

Vangelis Pitidis^{a,*}, Jon Coaffee^b, Fernanda Lima-Silva^c

^a Institute for Global Sustainable Development, University of Warwick, CV4 7AL Coventry, UK

^b Department of Politics and International Studies, University of Warwick, CV4 7AL Coventry, UK

^c Getúlio Vargas Foundation School of Business Administration of Sao Paulo

ARTICLE INFO

Keywords:

Resilience imaginaries
Counter-cities
Co-production
Dialogical methods
Participatory mapping

ABSTRACT

Over recent years, and as a result of the recent global health pandemic, resilience has become increasingly central to contemporary policy discourses in urban planning and development in both the Global North and Global South. Drawing from ongoing empirical studies of community resilience and everyday practices that have been co-designed and co-produced alongside Brazilian marginalised communities which are highly vulnerable to a range of natural hazards, this paper highlights the growing importance of dialogical stakeholder engagement methodologies in designing alternative urban visions – so-called resilience imaginaries or counter-cities – across the Global South based on social diversity, equity and spatial justice. More specifically, the dialogical participatory mapping approach outlined in this paper utilises citizen science approaches to develop local resilience imaginaries, building on the pedagogical work of Brazilian educator Paulo Freire and the conceptualisation of dialogue as a comprehensive and progressively unfolding methodological approach. Practically, we adopted a range of community engagement approaches that allowed local citizens to become more aware of their own risk context and embed this tacit knowledge into the operation of civil protection programmes. Our empirical results highlight the potential of such dialogical participatory approaches to capture lay knowledge from local citizens and contribute to the development of enhanced resilience approaches. The paper concludes by reflecting on the role of formerly marginalised voices in the advancement of local urban policy and on the novelty and promise of critical pedagogical approaches to co-production within existing regimes of urban governance and the imagining of radically independent counter-cities.

1. Introduction

1.1. Resilience thinking and counter-cities

In the twenty-first century, the ‘century of the city’, resilience has emerged in policy discourses surrounding urban planning and design as a pre-emptive and holistic concept that challenges conventional regimes of governance (Huck et al., 2020; Pitidis & Coaffee, 2020; Spaans & Waterhout, 2017) and promotes ‘new’ transformative practices (Bixler et al., 2020; Chelleri & Baravikova, 2021; Iturriza et al., 2020). However, as they are often arranged at the municipal level, resilience policies usually adopt framings of risk which are not sensitive to the local reality of low-income, marginalised urban neighbourhoods, and thus are not

able to capture highly localised aspects of such localities that are crucial for effective reduction of the socio-economic, material and human costs of external shocks or internal pressures.

Recently, however, increased focus has been placed upon the uneven deployment of such city-based resilience policies with a view towards enhancing future inclusivity and equity within urban planning processes (Matin et al., 2018; Meerow et al., 2019) and placing further attention on the impact of everyday risks in hazard-prone communities. This growing canon of work in critical resilience studies has urged greater consideration of who implements resilience on the ground and for whose benefit (Coaffee & Lee, 2016; Meerow & Newell, 2019; White & O’Hare, 2014). Moreover, it has notably exposed the implementation of resilience initiatives as privileging existing powerful stakeholders and

* Corresponding author.

E-mail addresses: Evangelos.Pitidis@warwick.ac.uk (V. Pitidis), J.Coaffee@warwick.ac.uk (J. Coaffee).

<https://doi.org/10.1016/j.cities.2024.105015>

Received 23 November 2022; Received in revised form 30 March 2024; Accepted 31 March 2024

Available online 16 April 2024

0264-2751/© 2024 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Western-centric understandings of resilience which are later deliberately imported into the Global South. Increasingly, with talk of resilience offering radical and transformative change, there are coinciding calls to reflect upon issues of social justice in the implementation of resilience policies (Ziervogel et al., 2017). As the UN Habitat (2014, p.2) dialogue note *Raising Standards of Urban Resilience* highlighted, it is imperative to advance tools and methodologies aimed at providing a measurement of urban resilience that contributes to the advancement of equitable urban development. Martín et al. (2018), for example, specifically called for an approach to resilience that ‘takes into account issues of social vulnerability and differentiated access to power, knowledge, and resources’ which importantly ‘starts from people’s own perception of their position within their human-environmental system, and accounts for their realities’ (p.198).

In urban policy terms, there is a pressing need to rethink the ways current strategic city visions - what we might refer to as socio-spatial urban imaginaries - are developed in hazard-prone locations (Said, 1977; Watkins, 2015; see Section 2). Here we are concerned with how different future visions of resilience planning can be developed (Jessop et al., 2008; Pham, 2020) and how ‘resilience imaginaries’ have emerged as a result of the increasing vulnerability felt by urban leaders and communities from an array of existential shocks and everyday stresses.

The production of these alternative visions of resilience increasingly focus on how existing systems of governance can capture marginalised voices in decision-making and construct alternative resilient futures. Here, the drawing in of local voices to decision-making processes, can play a fundamental role in radically re-thinking contemporary cities (Robinson, 2013) and mainstreaming theorisations from southern based urbanism (Chakrabarti, 2023). Such approaches can help reshape existing top-down narratives of urban planning and development by rectifying historic socio-spatial inequalities embedded in processes of imagining, planning and designing of future cities (Hodgson & Schroeder, 2002). Notably, one intended outcome of the urban resilience agenda is the envisioning and development of radically interdependent ‘counter-cities’, constructed upon the lived realities and collective visions of local citizens based on the ideas of equity, participation, and co-production. Counter-cities in this sense, should be viewed as spaces that contest dominant power structures and challenge urban inequities deriving from socio-economic injustices or political disputes (Alam & Houston, 2020; Anguelovski et al., 2016). Here, space represents the physical arena where traditional, rigid and often exclusive top-down approaches to urban planning and development clash with more equitable, flexible and inclusive bottom-up ideas, emphasising the importance of individuals and local communities instead of established formal institutions and authorities (Lam et al., 2020; Syme, 2020).

1.2. Towards a resilient and co-produced city

The recent global pandemic as well as the increasing impact of extreme weather events induced by climate change, has demonstrated the vulnerability of contemporary cities to an increasing array of existential risks for which long-term solutions must be found. Moreover, it has also spawned a rich and diverse literature in post-pandemic and climate resilience planning that draws attention to the necessity of counter-cities to manage complex and evolving urban conditions (Batty, 2020; Leach et al., 2021; Parnell, 2020). This work particularly draws attention to the crucial role of local citizens in decision-making for enhancing community resilience (Allen et al., 2022; Lam et al., 2020; Vasileiou et al., 2022), as well as the potential of digital data tools to transform approaches to community engagement with regard to improving protection and preparation to a variety of natural hazards (Coaffee et al., 2021; Porto de Albuquerque et al., 2021; Wolff et al., 2021). Such calls have been especially strong in the cities of the Global South that have long adopted city planning strategies with minimal civic engagement and face growing inequalities, and where urban resilience conventionally constitutes a top-down narrative around which different

- and often conflicting - planning agendas revolve.

Bringing together existing scholarship on urban resilience and counter-cities, where citizen voice is privileged, helps us develop novel methodologies to assist the development of local resilience imaginaries. Here citizens and local communities become the principal actors in the re-spatialisation of their imagined urban futures, thus reversing traditional urban planning and governance delivery pathways (Pitidis et al., 2023). The novelty of our approach lies in the focus of our research, which emphasises the importance of community voices and community empowerment in generating collective future visions and nurturing increased levels of community resilience. Our approach is conducted within a context where, to date, scholarship has focused almost entirely on the production of Western-style resilience plans by municipal authorities and civil protection actors, working with an array of national government, private sector stakeholders and international philanthropic organisations (Joseph, 2018; Martín et al., 2018). Underlying our focus on the everyday lives and lived experiences of local people as they seek to cope with the reality of living with risk from natural hazards, are attempts to join-up the actions and knowledge of local citizens with that of municipal actors responsible for risk management to develop more holistic and locally-informed risk management systems and strategic plans. More specifically, drawing from our ongoing empirical studies of community resilience and everyday practices that have been co-designed and co-produced alongside Brazilian marginalised communities which are highly vulnerable to a range of natural hazards, this paper illuminates the growing importance of dialogical stakeholder engagement in rethinking urban realities across the Global South based on social diversity, equity and spatial justice.

Methodologically, our novel dialogical co-production approach utilises citizen science tools and methods to help develop local resilience imaginaries. This builds on the pedagogical work of the Brazilian educator Paulo Freire, especially his iconic work, *Pedagogy of the Oppressed* (Freire, 1970; Coaffee et al., 2021; Porto de Albuquerque & de Almeida, 2020) in emphasising the key role of dialogue and other inclusive governance practices in bringing together strategic planning objectives and community-focused urban priorities. Our objective was to combine novel community engagement approaches with the Freirean notion of *dialogue* and develop a methodological approach that would enable local citizens, and especially more marginalised voices, to become increasingly influential - the ‘chief imagineers’ - of community-based resilience planning (Pitidis et al., 2023). How we view dialogue here is important. In our research we see dialogue as ‘a methodological approach for learning and knowing, i.e., a mode of engaging with other human beings and their situations that is indispensable to the act of cognition which unveils reality’ (Porto de Albuquerque et al., 2023, p.3). This further echoes the Freirean concept ‘conscientização’ and the development of critical consciousness, within a community, which we explore later in this paper. Practically, we developed a range of community engagement approaches drawing on citizen generated data and Volunteered Geographic Information (VGI) in order to allow local citizens to become more aware of their risk context and, through engagement with civic actors, embed this tacit knowledge into the operation of city-wide civil protection programmes. Our methodological approach to dialogical participatory mapping is detailed in the following sections.

In advancing an approach and methodology for developing equitable ‘resilience imaginaries’ in the Global South through dialogical participatory mapping, the remainder of the paper is structured into five sections. *First*, we conceptually frame the paper through the lens of emerging work on socio-spatial imaginaries, and specifically ‘resilience imaginaries’, that seek to evolve a more equitable and just vision for urban development. We also draw out the potential of utilising new forms of citizen generated data and VGI to inform this process and reflect upon the possibilities of data generation to enhance community resilience through social learning and empowered active citizenship. *Second*, we introduce the dialogical participatory mapping methodological approach and highlight how it can be utilised in the construction of

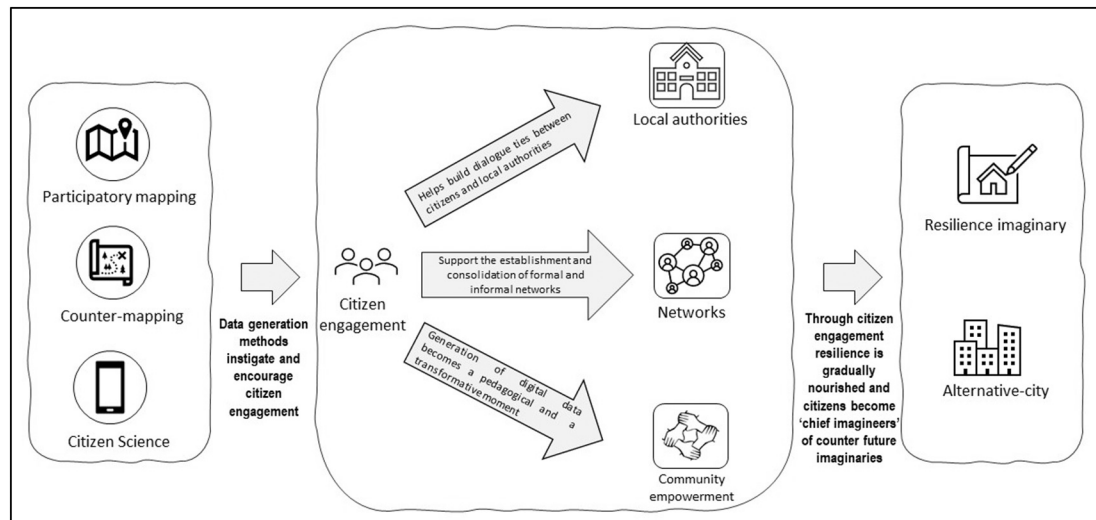


Fig. 1. Visual representation of our adopted conceptual framework.

alterative resilience visions of the future. *Third*, we present our empirical studies of how dialogical participatory mapping was operationalised across a range of marginalised urban settings in Brazil. This is presented in a number of temporal phases, reflecting the evolution of our co-produced approach in situ. Brazilian marginalised communities represent very challenging, urban settings, as they collectively combine housing precarity, vulnerability to natural hazards, poor environmental conditions and absence of meaningful local government. Such lived urban realities can represent relatively familiar sites for similar communities in the Global South, while they can provide a solid basis for the generalisation of the outcomes of our empirical research. *Fourth*, we reflect upon the prospective use of maps and mapping practices as a means for shaping alterative resilience imaginaries and counter cities of the future, as well as the potential transferability of such approaches from the Global South to the Global North. This later reflection attempts to reverse existing knowledge-transfer orthodoxies which suggest that resilience as a concept, is embedded within the Western tradition of scholarship and policymaking, with its ideas dominating disaster management in the Global South and flowing into the discourse of sustainable development in poorer regions *without* meeting local needs and expectations. *Fifth*, we conclude the paper by focusing upon both the potential of dialogical and participatory methods to reshape existing urban imaginaries and develop new future visions and discuss the barriers to the methodology's effective implementation on the ground. We further reflect upon the potential of mainstreaming critical pedagogical approaches to co-production, as a means for advancing a truly transformative and inclusive cross-sectoral dialogue between different urban stakeholders that can ultimately contribute to the imagining of radically independent counter-cities.

2. Conceptual framework

2.1. Resilience imaginaries and citizen-generated data

In this paper, the concept of resilience imaginaries is inspired by ideas surrounding the social construction of reality (Anderson, 1983; Berger & Luckmann, 1966) and how such social visions are manifested in space. Such 'spatial imaginaries' (Watkins, 2015), depending on their scale, reflect the collectively shaped visions of nations, cities, or communities (Jasanoff & Kim, 2013). From a city governance perspective, as Pitidis et al. (2023, p.4) have recently argued, resilience imaginaries are not static ideas but are 'continuously renegotiated and reshaped collective visions, facilitated by the establishment of cross-sectoral communication and interconnectedness among urban stakeholders'. The importance placed on

such collaborative and inclusive governance for enabling the consolidation of a future city or neighbourhood vision, brings with it a requirement to develop new methods and tools to document the lay knowledge of local citizens so that their 'voice' may be heard and included within any place-based visioning process. Here, the rise of digital technologies and knowledge infrastructures has advanced the capacity to capture citizen generated data as a key component in this process (Chroust & Aumayr, 2017; Kaufmann, 2016).

At the municipal level, the gradual digitisation of urban life has elevated the importance of digital information for modern urban operations, giving birth to novel urban concepts such as 'urban science' (Batty, 2015; Kitchin, 2020), 'neogeography' (Haklay, 2013; Turner, 2006) and 'smart urbanism' (Kitchin, 2014; Luque-Ayala et al., 2014). In practice, the abundance and ubiquity of data has encouraged many municipalities to adopt and implement smart, data-driven approaches that take advantage of the new infrastructure of sensing, data collection and analysis (Bibri, 2018; Viale Pereira et al., 2017; Wang et al., 2018). Increasingly within such approaches, citizen generated data holds a central position, representing a progressive shift from traditional top-down command-and-control approaches to urban operations and emergency management, towards a more integrated and collaborative method that is sensitive different socio-spatial particularities and vulnerabilities. Such approaches have the potential to increasingly assist in making marginalised voices more visible within a raft of disaster-related and non-disaster related policy areas (Goodchild, 2007; Horita et al., 2013; See et al., 2016).

In parallel with this rise of data-intensive methods for citizen data production, counter mapping has emerged as another methodological approach for capturing citizen data, and allowing local communities to 'create and govern their own representations of themselves' (Syme, 2020: p.1106). Yet, while citizen-generated data approaches are usually seen as a means of enabling greater community participation, counter mapping represents a more critical form of geospatial data generation that seeks to challenge existing power relations, reclaim colonised territory (Hodgson & Schroeder, 2002) and contest hegemonic cartographic representations of reality (Butts & Jones, 2021).¹ As with citizen generated data approaches, counter-mapping is seen as a potential community empowerment tool as it is based on the introduction of bottom-up techniques and methods that challenge existent modes of top-down governance delivery (Leszczynski, 2012). As Rundstrom (2009)

¹ Counter-mapping scholarship has many similarities with critical cartography work (see for example, Crampton & Krygier, 2006; Presti, 2020).

noted ‘counter-mapping is the use of conventional mapmaking techniques by people in local communities, primarily indigenous peoples, to represent their lands and lives in an effort to reduce the threats posed by governments and industries to them’ (p.314).

2.2. Data generation as a method for constructing resilience imaginaries

In accordance with the ascent of citizen-generated data and digital participation as an instrument for enabling the empowerment of local communities, instead of focusing on the applicability of citizen-generated data as essential digital information for supporting urban operation and disaster response, in this paper we take a step back and consider the data generation process as a transformative moment itself (see also Porto de Albuquerque et al., 2021). In our view, the process of data generation is capable of gradually establishing a community resilience ‘spirit’, enabling the formation of stronger social ties through social learning, mutual trust, the empowerment of alienated citizens.

Although data generation in many situations can be viewed as a resilience building process in and of itself, such a process is not always transformative. Critiques of such approaches have focused on the inherent dangers involved in the progression of digital engagement, arguing that the use of inappropriate citizen engagement methods can hinder the uncovering of underlying lay knowledge and can create a ‘delusion of democratisation’ (Haklay, 2013), instead of equitably promoting resilience principles, such as holistic visioning (Hynes et al., 2013), mutual trust (Bourgon, 2009), co-production (Turnhout et al., 2020) or collaborative planning (Coaffee & Lee, 2016; Healey, 1998). Therefore, our goal in this paper is to showcase that methodological approaches based on the utilisation of digital technologies can encourage citizen engagement and progressively nurture a resilience spirit which ultimately can lead to the development of resilience imaginaries and alternative urban futures. Fig. 1 provides a visual representation of the connections between the different conceptual discourses upon which this paper builds.

2.3. The dialogical participatory mapping methodology

In order to generate and empower citizens and their data, we utilised place-based participatory research principles and developed a dialogical participatory mapping approach. Inspired by the work of Paulo Freire, our method focuses on transforming how risk factors from natural hazards were viewed and actioned in community and disaster planning responses. Our methodology, was conceived as a systematised approach for engaging with local citizens and capturing their perceptions of risk, simultaneously attempting to strengthen situational awareness and enhance community resilience through the generation of geospatial data.² In practice, our dialogical participatory mapping methodology consisted of several steps, which varied depending on socio-spatial, political and other contextual particularities of the communities where they are applied, and was based upon a meaningful interaction between researchers and the citizens participating in the mapping process. The ultimate goal was the accurate cartographic depiction of existent and emerging themes of interest within the community alongside the generation of relevant geospatial data. Such ‘generative themes’ (Pitidis et al., 2022; Souza et al., 2019) - the starting points of the dialogical participatory mapping process - were extracted from popular knowledge and the experiences of everyday life of local citizens. This meant that such data were distinguished and defined by the community members themselves and represented underlying shared culture and values and locally-important past and existing issues.

² The approach described below evolved through several research projects co-produced with local citizens in Latin America and Europe, as well as the input of a large number of other researchers (see acknowledgments for further details).

In our co-produced research, by exploring generative themes, we attempted to comprehend the reality of community groups and individuals and activate a dialogical process for community engagement. Our principal goal was to document local perceptions of risk and knowledge of the physical and built environment and allow community members to frame their understanding of resilience transformations, while helping activate local communities to produce change in their everyday living conditions (Coaffee et al., 2021). This approach was based on the Freirean concept of ‘conscientização’ or conscientisation, a concept that seeks to establish a new critical consciousness in local citizens through, which they can ‘learn how to perceive social, political, and economic contradictions, and to take action’ (Freire, 1970 p.17)³. Through this process, citizens can become transformative agents in their community and commit to co-creating their ambient physical and built environment (Souza et al., 2019). Citizen engagement in this case is not merely a means to facilitate the data collection process, but an opportunity for social learning for both citizens and researchers, through which they acquire greater awareness of the components undergoing change (Pitidis et al., 2022).

Viewed through a Freirean lens, our approach to participatory mapping was utilised as a counter-mapping method to collect existing understandings of traditionally marginalised citizen groups and was divided into four phases (see Fig. 2). The *first phase (diagnostic phase)* aimed at identifying local perceptions and understandings of risk through performing a risk perception and mapping exercise. Starting with an exploration of different ‘generative themes’ related to the realities of different local communities, and through developing and applying a dialogical community engagement approach, the objective here was to record bottom-up voices and needs of community members, and document them on existing maps of their areas. Later, the *second phase (data-production phase)* attempted to transform the outcomes of the diagnostic phase into geospatial data through participatory mapping. Here community members, with the initial support and guidance of more experienced mappers, started generating new locally relevant geospatial data, as identified through the generative themes presented in the risk perception maps. This newly-produced data was then added to the OpenStreetMap (OSM) platform (OpenStreetMap, 2021), a free online geospatial platform used by thousands of mappers around the world to enable the generation of detailed community maps. The dialogical participatory mapping method was expected to not only create a sense of collective ownership for local citizens (Liu et al., 2018) but also to instigate a process of consciously and critically exploring their wider environment and gradually cultivate a community resilience spirit. The *third phase* of our dialogical participatory mapping approach (*map-upgrading phase*) involved the improvement and upgrading of previously produced maps during the data-production phase. Finally, the *fourth phase (feedback phase)* included the presentation of the mapping results to the community members and a detailed documenting of feedback and reflections on the dialogical participatory mapping process. This was undertaken not only with community members but also with external stakeholders, such as representatives of local and hyper-local authorities and urban practitioners.

For this study, the methodological approach outlined above was empirically applied in three marginalised communities across Brazil: 06 de Agosto in Rio Branco, Acre (AC), Guarani Kaiowá in Contagem, Minas Gerais (MG) and M’Boi Mirim in São Paulo (SP). In the remainder of this paper, we present the outcomes of the implementation of our methodological approach in these communities, exploring experiences and outputs from the areas interchangeably. Fig. 2, below, summarises the different phases and specific practices of our methodological approach

³ Critical consciousness is a term frequently used in the context of the critical pedagogical process Freire proposed in illiterate marginalised communities across Brazil (see also Pitidis et al., 2022; Porto de Albuquerque et al., 2023; Porto de Albuquerque & de Almeida, 2020; Souza et al., 2019).

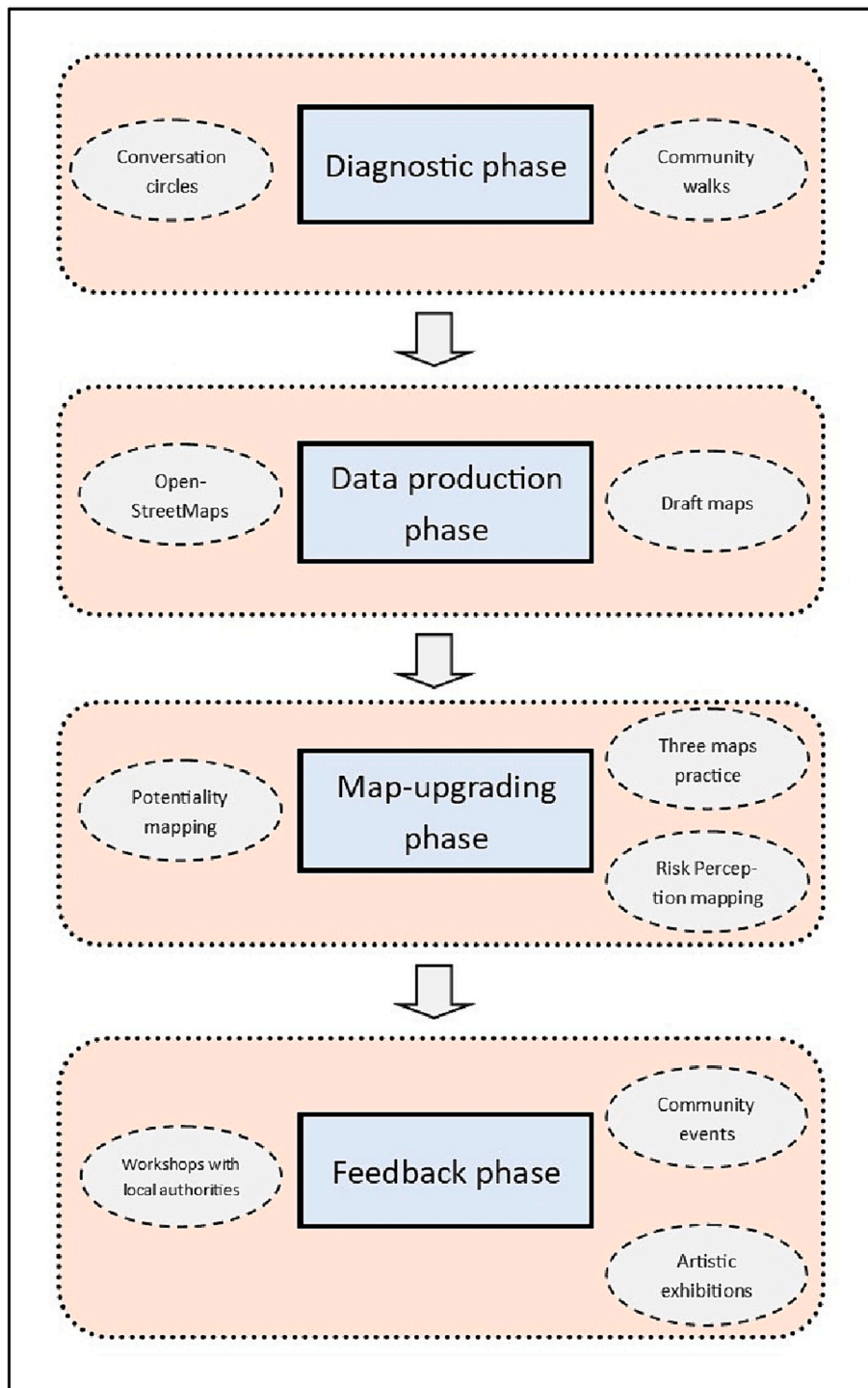


Fig. 2. Different phases and practices of dialogical participatory mapping.

of dialogical participatory mapping that are detailed in the remainder of the paper.⁴

3. Implementation of dialogical participatory mapping in Brazilian marginalised communities

The operationalisation of our co-produced dialogical participatory mapping methodology was initially implemented in M'Boi Mirim in 2021, a marginalised flood-prone urban district located within the metropolitan area of São Paulo, Brazil. This was in response to the urgent need of both local authorities and communities for granular and locally relevant geospatial data to enable more comprehensive and targeted disaster risk management. This first pilot implementation of the methodology provided particularly useful insights regarding the gaps and challenges embedded within the methodological steps, ultimately leading to a refining and re-implementation of our methodology in Acre and Minas Gerais.⁵ Such communities were chosen for the development and implementation of the methodological approach as they reflected the inherent hitches of Brazilian marginalised communities (precarity, lack of housing tenure, poverty, limited access to resources etc.), while their diverse geographic sizes and spatial extents allowed for a more wide and representative depiction of the methodology's practical impact on the ground.

In more detail, whilst sharing similar traits of Brazilian marginalised communities, the three empirical case studies have fundamental differences among them, not only regarding the composition of the so called 'communities', but also in terms of the different risk priorities and emerging themes identified, rendering the outcomes of this research applicable to a wider variety of Brazilian marginalised groups. For example, M'Boi Mirim is a larger geographic area incorporating several internal communities, with conflicting urban priorities spanning from urban flooding to lack of security and access to education. By contrast, the Guarani Kaiowá community in Contagem, Minas Gerais is located in a very small geographic area (approximately two building blocks), with housing quality and refuse accumulation constituting the major local issues. Finally, in the 06 de Agosto community, as in most communities in Rio Branco and Acre in general, pluvial and fluvial flooding is the principal risks marginalised communities and local authorities need to prepare for and confront.

Community mappers played a fundamental role in the implementation of the dialogical participatory mapping approach across all case studies. Community mappers were either citizens of the communities being studied (or adjacent areas) or members of collaborating institutions with local influence, both from within and outside academia.⁶ The involvement of community mappers went far beyond the implementation of a static methodological approach, enabling them to embed themselves within the local communities and encourage self-learning, capacity building and development of critical consciousness. In other words, community mappers were instrumental for the dialogical

⁴ All practices as well as other specific methodological techniques are thoroughly explored and detailed in (Souza Vargas et al., 2022), a manual created by researchers and practitioners who have co-designed, developed and implemented the dialogical participatory mapping on the ground across all case study areas in Brazil.

⁵ These methodological practices have been developed through a co-productive exercise including local citizens and researchers and have been reiterated back the communities academics and other institutions working in marginalised community development, and have generated two research manuals that can be used by communities and researchers (Souza Vargas et al., 2022).

⁶ Academic institutions involved in the development and application of the participatory mapping methodology included the Getulio Vargas Foundation and the Federal University of Acre, while the NGO 'TETO Brasil' also played a pivotal role in implementing dialogical participatory mapping on the ground, particularly in Minas Gerais.

participatory mapping methodology, as both implementers and participants across the four different phases.

3.1. Diagnostic phase

The main objective of the diagnostic phase is the identification of the existent and emerging 'generative themes' within the studied urban communities. Although several different methods and practices were employed across the study areas during this phase, below we discuss two practices that were particularly successful in their implementation, namely community walks and conversation circles.

3.1.1. Community walks

Drawing on established ideas of 'walkthroughs', 'go alongs' or street phenomenology (Kusenbach, 2003), walking within the local areas aimed to provide a better understanding of how local community members comprehend the areas they live in and how they engage with their physical environment. Here community mappers follow a pre-selected route within the study area with a map in hand and systematically documented everything they considered important and worthy of representation on the map using specific icons or signs.⁷ The information collected at this stage could be geographic, qualitative or both so long as they depict important lay knowledge regarding the community. Mapped information was supplemented by the capturing of photographs along the walk⁸. Walks across the study area were also essential for introducing community mappers to local citizenry, helping them familiarise themselves with the local built environment, introduce the methodology to local citizens and communicate the significance of producing maps with and for their own community. Community walks also led to informal meetings on the street that often proved capable of increasing the interest of local citizens in engaging with the map generation process. Such meetings further assisted mappers to better understand the socio-spatial dynamics and information flows within the different areas, unveiling vital information regarding the community's identity. These walks also provided mappers with the opportunity to establish mutual-trust relations with influential people within the community, eventually securing a strong presence within the area. Such consolidation of a presence is fundamental in Brazilian marginalised communities, as tenure is often illegal and local citizens are understandably sceptical and defensive towards external and unknown visitors (Marchezini, 2019; Wolff et al., 2021).

3.1.2. Conversation circles

Alongside community walks, another method utilised in the diagnostic phase of the dialogical participatory mapping methodology was conversation circles. Conversation circles were often established through mediations and provocations to understand the root causes of existing community problems and to explore possible solutions in a collaborative and dialogical way. Our conversation circles sought to ensure a meaningful dialogue with the residents of the community and have proven to be fundamental both for maximising community's interest and subsequent engagement with the methodology. The conversation circles also helped in enhancing communication and dialogue, not only between community members and researchers, but among local community members themselves.

Our experience from the field has shown that conversation circles can become a vehicle for in-depth analysis of ongoing environmental and community problems, focusing on identifying the causes that

⁷ In our experience, community walks are usually more effective when a specific route is agreed and followed by the mappers and accompanying community members.

⁸ Photographs were only taken with the explicit permission by the accompanying residents and only in places where researchers and residents felt safe (Souza Vargas et al., 2022).

generate and prolong them, as well as the consequences and overall impact on the everyday lives of local citizens. Conversation circles also facilitated the process of co-producing pathways to solve the identified issues of concern by identifying a series of potential activities that could be developed in response to existing problems, and the subsequent evaluation of their outcomes. For instance, in Acre three conversation circles with local citizens and civic authorities took place leading to the systematic mapping of locations with excessive refuse accumulation. This was identified by local citizens as a matter of primary importance for their everyday wellbeing, constituting a significant ‘generative theme’ for the local community, extending beyond initial hypotheses of community risk that was primarily concerned with high vulnerability and exposure of the study area to pluvial and fluvial flooding.

While community walks and conversation circles are not the only practices undertaken during the diagnostic phase, in our studies to date they have been the most effective ones in terms of establishing and consolidating effective relationships with the local communities. Apart from providing underlying information regarding the studied areas, these practices acted as a medium for introducing the particularities and different identities of places to the community mappers in the studied areas, while also constituting a means for ‘recruiting’ local citizens to actively participate in the next phase of the proposed methodology.

3.2. Data production phase

The second phase of our methodology was concerned with data production from citizens and researchers and using the OpenStreetMap platform⁹ (OpenStreetMap, 2021). This generative data production process was followed in all three case studies, often being undertaken in educational facilities, such as schools or university buildings, to further catalyse civic engagement.

For instance, in M’boi Mirim, four local schools were mobilised to support the data-production phase. In all cases, data production began with an initial presentation of the chosen mapping platforms and tools to the prospective mappers (in the M’boi Mirim case this was students), a series of workshops and participatory mapping sessions, also known as ‘mapathons’ were undertaken. After this introductory stage, residents of the M’Boi Mirim community as well as local Civil Protection Authority representatives became actively involved in mapping buildings, streets and other features with geospatial footprint across neighbourhood in the OpenStreetMap platform, taking advantage of their local knowledge of the area to add more relational features and information to the newly-created data. Later, the geometrical and spatial accuracy of the newly-created data was digitally validated by more experienced OSM mappers, leading to the identification and categorisation of similar patterns of mapping mistakes. Such patterns were later presented back to the mappers in a short feedback session that highlighted the correct ways of mapping and helping the mappers avoid similar mistakes in future efforts. In summary, the data production phase aimed to improve the spatio-temporal coverage of existing authoritative datasets, as well as providing a methodological platform and a practical tool for local citizens to familiarise themselves with their ambient environment and map the areas and features that are vitally important for them (see also, Pitidis et al., 2022). Fig. 3 shows one example of where local mappers were able to significantly enhance previous held datasets. Similar activities took place in the Acre and Minas Gerais leading to the generation of new geospatial datasets. It should be noted that this phase focuses on the generation of draft geospatial datasets and not complete maps.

⁹ OpenStreetMap is an open digital platform used for the production and sharing of geospatial information. Anyone can contribute to OSM, and thousands of people add to the project every day. Users create geospatial data and upload it on the digital platform. Anyone can contribute to the OpenStreetMap platform, while anyone also has access to the created geospatial data at any time.

These draft maps were enhanced and finalised during the next phase of our approach.

3.3. Map-upgrading phase

After the production and validation of the digital information, the next phase of the dialogical participatory mapping method attempted to upgrade the draft maps created in the previous phase. Here, a variety of different techniques and methods were employed to improve the quality of spatial and relational information of the newly-created data, and to uncover potential themes not identified during the diagnostic and data production phases. This is often performed through the generation of physical maps and their subsequent digitisation (Fig. 4).

For example, a practice employed during the map-upgrading phase in Acre and Minas Gerais was the *three maps* practice. This practice involved the presentation of three printed maps of the area with targeted objectives, each one focusing on a different problem identified within the neighbourhood. In Acre, for instance, one of the maps depicted locations with excessive refuse accumulation, the second local streets affected by flooding, and the third, the areas vulnerable to landslides. Through the provision of these three already completed maps, residents were invited to validate the existing data and intervene by indicating potential omissions, mistakes or improvements that could be made. The outputs of this exercise are co-produced maps of risk perception, some examples of which from Acre and Minas Gerais are presented in Fig. 5.

A further method employed in Acre was *potentiality mapping* which, mapped the strengths of and opportunities for, the examined community, according to the citizens’ ideas. The main objective of this activity in our study was the gradual extension of community dialogues beyond existing and easily identifiable issues. Here community members designated existing physical spaces and areas of positive affect related to their everyday lives. The principal objective was to stimulate a collective discussion between community members so as to co-develop solutions to their emerging difficulties through exploiting the advantages of the physical space where they reside. In addition to this, local residents were encouraged to identify and mark on the map material and immaterial advantages and opportunities of existing infrastructures or networks with a spatial footprint within their neighbourhood (i.e., highways, extant solidarity networks, etc) (Souza Vargas et al., 2022). Resultantly, citizens and mappers revisited the geospatial data and maps they had previously generated, providing them with an initial opportunity to reflect on the processes followed and the physical outcome connected to the visual representation of their areas on the map. This, and similar activities paved the way for the final phase of our methodology - the feedback phase.

3.4. Feedback phase

Feedback is the last, and arguably the most important, phase of the dialogical participatory mapping methodology. The feedback phase constitutes a reflective moment where the newly created maps and other outcomes of the three previous stages are presented back to local citizens, along with suggestions for future mapping campaigns and other capacity-building activities, such as peer-to-peer dialogues with community members or mapping exhibitions. In our approach, feedback plays a fundamental role, not as a mere formality or a ‘moral’ obligation, but as an instrumental moment of sharing and giving more visibility to the knowledge acquired by the citizens during the implementation of the previous phases. Moreover, the data created by citizens and the maps produced during the data-production and map upgrading phases, contained invaluable information about the different study areas, including personal reflections, community aspirations, risk perceptions, collective memories and feelings of the local citizens.

In practice, there were several activities we utilised to collect feedback that varied from one community to another. For instance, in Acre further conversation circles with residents about the outcomes of the

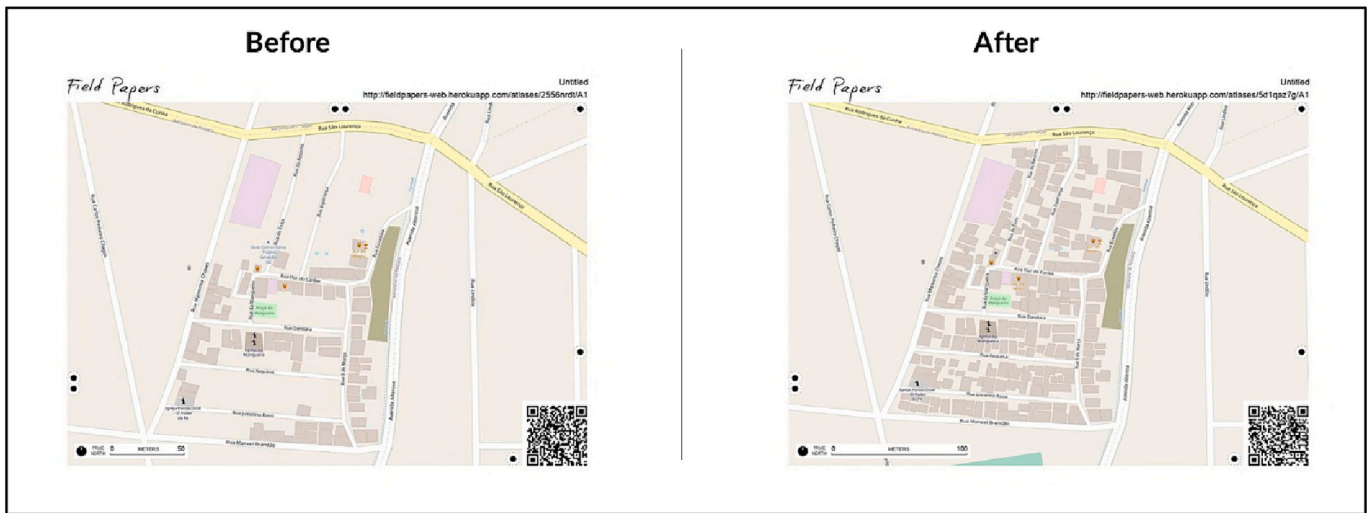


Fig. 3. Geospatial information before and after the data production phase in Minas Gerais.

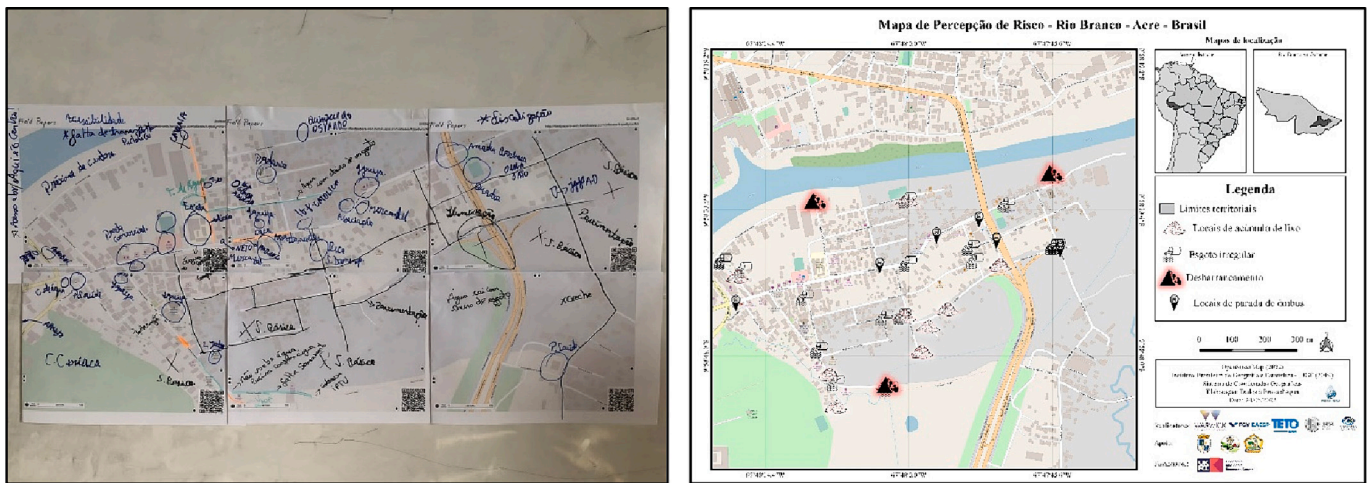


Fig. 4. Initial physical map created with citizen participation and its subsequent digital representation in Rio Branco.

mapping activities took place, including artistic exhibitions with the maps of the study areas before and after the mapping process (Fig. 6.1) Alternatively, in Minas Gerais representatives of the local municipal authorities participated in a wide discussion with residents and NGOs about utilising the newly-created maps for improving the everyday lives of local citizens, discussing how they might inform existing decision-making practices, as well as reflecting upon the potential for dialogical participatory mapping activities to become a mainstream community engagement practice in other marginalised communities in the city beyond Guarani Kaiowá (Fig. 6.2).

4. Shaping resilience imaginaries as counter-cities of the future

As highlighted, dialogical participatory mapping aspires to capture and empower local knowledge from frequently marginalised voices and advance collective future aspirations, employing community mapping as a medium. The approach can be understood as an emerging community-based research methodology that seeks to capture and utilise local/indigenous lay -and often hidden- knowledge towards the promotion of local development (Kelman et al., 2012; Šakić Trogrlić et al., 2022) and/or the enhancement of community resilience (Norris et al., 2008; Wisner & Kelman, 2015).

In practice, dialogical participatory mapping constitutes a novel

methodological approach that we have piloted and applied in a Global South context, partially echoing ideas in contemporary post-colonial southern urban theory (McFarlane, 2008; Porter, 2006; Robinson, 2013), social constructivism and social construction of reality (Anderson, 1983; Berger & Luckmann, 1966). Our goal here was to support the equitable construction of future resilience imaginaries for marginalised urban communities. While dialogical-participatory mapping draws on emerging literature on counter-mapping and capturing of indigenous knowledge through maps, it represents a less aggressive and more integrated and inclusive form of understanding urban realities, which, while considering community members as the ‘chief imagineers’, is not exclusive of dialogue and input from other formal urban institutions and stakeholders (i.e. civil authorities, NGOs).

Whilst dialogue is the fundamental component of the dialogical participatory mapping process, dialogue in this context is conceptualised as a methodological approach, manifested through the implementation of mapping activities. In other words, although the material outputs of the process (maps and geospatial datasets), are invaluable assets for urban planning and disaster risk management (Marchezini et al., 2022), citizen engagement, trust-building and mutual learning systematically developed through the four different phases can potentially constitute the most substantial outcomes of the methodology’s implementation. This has demonstrated that citizen generated

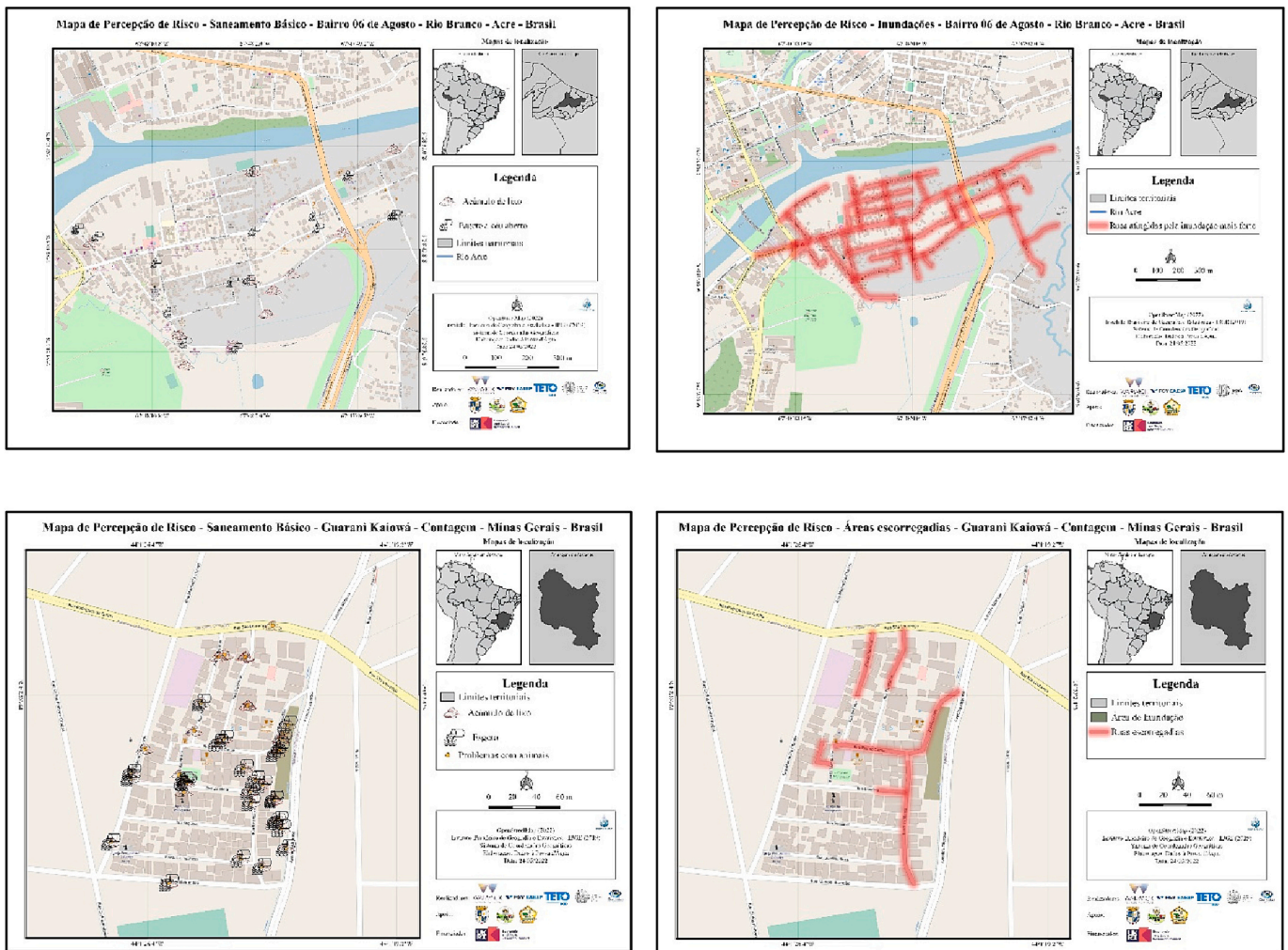


Fig. 5. Risk perception maps from Rio Branco, Acre (5.1 and 5.2) and Minas Gerais (5.3 and 5.4), focusing on generative things that emerged during the previous stages of the dialogical participatory mapping methodology.



Fig. 6.1 and 6.2. Map exhibition in Acre (6.1) and Community feedback meeting in Minas Gerais (6.2).

data can significantly improve and inform disaster risk management and eventually enhance community resilience through data generation, which is understood here as a community resilience building process in

itself (see Fig. 1).

Experiences from our case studies in Brazil show that the implementation of dialogical participatory mapping has not only assisted in

the process of building trust between citizens and local authorities but has also contributed in consolidating relations among previously alienated community members; a process vividly encountered during conversation circles in Minas Gerais and Acre. Here, citizens argued that they had the chance at last to meet and engage into fruitful peer-to-peer conversations with other community members in an equitable manner where they could collectively advance a place-based plan/imaginary for the future of their neighbourhoods. Such a construction has not explicitly taken place during the implementation of the methodology, but the foundations for its future fruition have been actively laid, taking advantage of existing communication practices and even technologies that communities utilise daily (Wolff et al., 2021).

Through bringing together previously isolated urban stakeholders, dialogical participatory mapping illuminates a novel pathway for enhancing urban resilience and developing equitable resilience imaginaries in Global South: *data generation*. Specifically, while citizen generated data is a key component of the methodological approach, the focus is shifted from data as outputs, to the outcomes of the data generation process. Here mapping becomes a transformative moment contributing to the nourishing of a resilience spirit or collective consciousness among community members, while also acting as an instrument for the development of future local plans and resilience imaginaries. Similarly, although newly created maps constitute the material outcomes of the co-production process, their figurative value transcends their material nature, as they symbolise tokens of dialogue, community empowerment and trust building between citizens and local authorities – a process that has been significantly eroded in recent years, particularly in hazard-prone communities, not only in the Global South but also in the Global North, with the retreating of the formal local state (Fornale et al., 2023).

Promoting Freirian methodologies, such as dialogical participatory mapping, has the potential to represent the next phase in the ongoing process of democratizing scientific knowledge through citizen science (Haklay et al., 2018). Building upon work undertaken in disaster risk management both with early warning systems with the promotion of intergenerational dialogues (Marchezini et al., 2017) or the exploration of crowdsourced disaster data in smart cities and the use of citizen science for flood monitoring in urban informal settlements (Wolff et al., 2021; Wolff & Muñoz, 2021), dialogical participatory mapping emerges as a methodology capable of advancing current predominantly reflective approaches to participatory mapping, by emphasising on promoting intra-citizen and citizen-authority relations as well as trust and informing existing planning and governance practices, not only related thematic topics and research areas beyond disaster risk. In the context of the Brazilian communities investigated during this research, although the application of the methodology has been successful in terms of building direct and indirect social ties through physical and digital mapping (Zuo et al., 2016), improving local risk knowledge and enhancing community resilience, the degree that its material and immaterial outputs are contributing to upgrading living conditions for local communities will take a number of years to properly evaluate. Yet, as a methodological approach, its application has showcased the capacity to support co-investigation, while also stimulating the co-creation and the co-development of collective local visions for the future based on lived experiences and everyday lives of community members (Kniveton et al., 2015; Wisner et al., 2012). In other words, our approach is helping the gradual construction of local ‘resilience imaginaries’ or ‘counter-cities’ of the future, transposing existing strategic planning orthodoxies by being more bottom-up and community-driven rather than plans produced at the dictation of municipal authorities.

Although the application of dialogical participatory mapping in Brazilian marginalised communities has generated valuable insights in the context of southern urbanism discourses, a wider generalisation of the outcomes to other urban contexts should be viewed cautiously. Here reflecting ideas on ‘ordinary cities’ (Robinson, 2011) for generalising and comparing our outcomes with similar methodological endeavours in

other Global South contexts is not necessary an appropriate extrapolation technique (Tang & d’Auria, 2023). However, dialogical participatory mapping, as a methodological approach, attempts to challenge urban theories from the South by creating a pathway to decolonising traditional knowledge-exchange pathways and reversing knowledge-exchange trajectories through presenting a method that is designed, developed and implemented in the Global South whilst being transferable, albeit critically, to a Global North context. Here as Randolph and Storper (2022) have noted in their call for comparative urban policy analysis for the 21st century, ‘*analysing how the fundamental dynamics of urbanisation recombine and interact with one another in different contexts offers insight into policy challenges that cut across cities, both within and between the Global South and North, as well as context-specific policy issues that arise through the interaction of global urbanisation forces and local specificities*’.

More generally, methodological approaches such as dialogical participatory mapping need to be flexible enough to accommodate changes before, during and after their implementation in order to allow resilience imaginaries and counter-cities to be seen as dynamic representations of a world in constant motion and change (Coaffee, 2019; Pitidis et al., 2023). Exemplifying the ability to remain attuned to external pressures and adapt plans when required to account for community need, were experienced through the COVID-19 pandemic in the Brazilian marginalised communities we worked with. In these cases, previously developed resilience imaginaries were adjusted to reflect this new reality with the social ties and critical consciousness advanced during the process of community mapping proving vital for maintaining community resilience under conditions of extreme stress and lockdown conditions.¹⁰ Finally, methodological approaches such as dialogical participatory mapping can also have significant planning and policy implications in the development of future city visions, and as intermediary mechanisms for enabling the feeding of local voices into traditional decision-making practices. Here, by the process of transforming lay knowledge into data and later combining such data with authoritative datasets, urban planning and disaster risk planning and management can become more tailored to the needs of local communities and ultimately more effective in preparing for, confronting and recovering from external shocks and internal pressures, ultimately promoting further the democratisation of scientific knowledge that citizen science generally evangelises (Haklay et al., 2018).

5. Conclusions

Dialogical participatory mapping is presented in this paper as a methodological approach that can be employed in the development of radical counter-cities of the future where community voices are privileged and empowered within planning decision making processes – in our cases related to disaster risk management. Our work has highlighted that socio-digital engagement can, if effectively deployed, enhance local adaptive capacity and community resilience, with local people becoming the ‘chief imagineers’ of resilience plans and drivers of community transformation. Our evidence also supports the view that whilst such approaches can develop deep and long-lasting collaborations between communities and multiple urban stakeholders, it is not uncommon for underlying power relations and rigid municipal authority working practices to resist such a change to the status quo that can, in some instances counterbalance the benefits of such participatory planning efforts.

Resilience imaginaries in these communities were further advanced through the implementation of a series of ‘civic conferences’ that took place. ‘Civic conferences’ were a series of dialogical meetings between

¹⁰ In our case, the investigation of the three Brazilian communities took place between January 2022–July 2023 and thus it has been only marginally affected by pandemic-related measures and restrictions.

local authorities and community members aimed at building on the resilience building process instigated and promoted through data generation process. Despite organised and implemented in all three communities, their outreach and impact differed, partially reflecting the three different resilience imaginaries beginning to emerge. For instance, in Acre Civil Protection Authorities and local communities entered a fruitful discussion about specific needs that need to be addressed in designated locations to limit the impact of flooding, based on the documented citizen risk perceptions. Similarly in Minas Gerais, the office of local Mayor in Contagem attended the civic conference and engaged with the everyday problems of the community and attempted to begin a dialogue to address them, as vividly presented through the newly-created maps, while in M'Boi Mirim the local authorities consolidated a better understanding of the diverse composition of different communities within the spatial extent of the area. Yet, it needs to be argued that all three resilience imaginaries are in their infancy and future work is needed to track their development and assess their final consolidation and impact.

Overall, without disregarding the necessity to produce timely and accurate data, particularly in data-scarce urban environments, or in areas with ongoing humanitarian crises, we would argue that engaging local citizens in the data generation process is a crucial transformative moment aimed at mobilising existing social capital, empowering under-represented citizen groups and cultivating a spirit of awareness through data ownership that all contribute to the production of alternative 'counter city' visions. Such envisioning should be driven by flexible and inclusive co-productive ideas, emphasising the importance of citizen dialogue in contributing to and reshaping established procedures and plans imagined by formal institutions and city-wide authorities.

Here, it should also be noted that the different phases and practices including in the dialogical participatory mapping methodology have been predominantly developed by local citizens and community-based research assistants with very minimal guidance and direction by external actors and researchers. Hence, the methodological approach itself constitutes an almost entirely bottom-up endeavour to challenge existing mapping and urban development traditions and lead to the development of conventional place-based counter-city imaginaries. Where our participatory approach has been adopted in the Global South it has challenged existing planning and mapping orthodoxies and given a more robust voice to local communities to determine their own needs and priorities about enhancing resilience. As illuminated through our empirical examples from Brazil, this is much needed in the Global South given the virtual absence of local state functions and the reliance on community generated forms of resilience and self-organisation to help prepare local communities for the impacts of natural hazards as well as ongoing crises.

Our next goal is to reverse conventional knowledge exchange trajectories by implementing this methodological approach in the Global North, and notably and across six separate case studies in Europe.¹¹ Here, certain modifications to the dialogical participatory mapping methodology have been required in order to reflect the contextual particularities of each case study, ultimately leading to the application of a less data-intensive version of dialogical participatory mapping - *participatory mapping lite*. For example, in one of our ongoing case studies in Greece, where traditionally rates of citizen engagement in planning processes are low, we are working with local citizen groups and civil protection authorities to better understand and document community risk perception to wildfires with the overall aim of improving disaster risk planning and management. Through intensive

dialogue and mapping processes, the views of community groups are being amalgamated with the traditional views and working assumptions of firefighters to produce a more locally applicable resilience plan. Initial outcomes from this methodological knowledge exchange process show that cities of the Global North have a lot to learn from these methodological approaches developed in the Global South in constructing their own equitable resilience imaginaries of the future as well as illuminating how global urbanisation trajectories combined with local need in designing place-specific policy through greater dialogue.

Author statement

We declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere.

We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

CRediT authorship contribution statement

Vangelis Pitidis: Conceptualization, Methodology, Validation, Investigation, Resources, Writing - Original draft preparation, Writing - Reviewing and Editing, Supervision, Visualisation, Project administration, Funding acquisition. **Jon Coaffee:** Conceptualization, Writing - Original draft preparation, Formal Analysis, Writing - Reviewing and Editing, Supervision, Project administration, Funding acquisition. **Fernanda Lima-Silva:** Methodology, Project administration, Funding acquisition.

Data availability

Data will be made available on request.

Acknowledgments

This article is an outcome of collaborative work that took part across a variety of research projects. The work undertaken has been supported by 'Waterproofing Data' project, which was financially supported by the Belmont Forum and NORFACE Joint Research Programme on Transformations to Sustainability (<https://www.norface.net/program/transformations-to-sustainability/>), co-funded by DLR/BMBF (Federal Ministry of Education and Research) as part of its Social-Ecological Research funding priority, the United Kingdom Research and Innovation (UKRI) Economic and Social Science Research Council (ESRC), State of Sao Paulo Research Foundation/FAPESP, and the European Commission through Horizon 2020, under grant agreement No. 730211. Additional financial support was also provided to the by University of Warwick through two funding schemes, namely, ESRC Impact Acceleration Account grant (ES/T502054/1) and the Research England Policy Support Fund Award (No. 75530). Finally, the paper has been also supported through the HORIZON 2020-funded project 'RiskPACC - Integrating Risk Perception and Action to enhance Civil protection and Citizen interaction' - (under grant agreement No. 101019707). The authors would particularly like to express huge gratitude to Guilherme Prado de Abreu, Ana Laura Souza Vargas, André Duarte Massahud, Anieli Araujo Porto, Gabriel Brandão Xavier for their immense contribution on the inception, consolidation and implementation of the dialogical participatory mapping methodology on the ground, through their active leadership in the three case studies presented in this paper. We would also like to thank all project participants from communities in M'Boi Mirim, Guarani Kaiowá and 06 de Agosto neighbourhood as well as research assistants the Federal University of Acre and TETO Brasil for their contribution to the activities discussed in this paper.

¹¹ In 2022 and 2023 we tested this method in six case studies across Europe through the EU-funded project RiskPACC (<https://www.riskpacc.eu/>), in an attempt to adjust a methodology developed in the Global South to a Global North context.

References

- Alam, A., & Houston, D. (2020). Rethinking care as alternate infrastructure. *Cities*, 100 (March), Article 102662. <https://doi.org/10.1016/j.cities.2020.102662>
- Allen, A., Wesely, J., Blanes, P., Brandolini, F., Enet, M., Iacovini, R. F. G., ... Xavier, J. (2022). Crafting urban equality through grassroots critical pedagogies: reverberate, emancipate. *Environment and Urbanization*, 1–19. <https://doi.org/10.1177/09562478221115334>
- Anderson, B. (1983). *Imagined communities: Reflections on the origin and spread of nationalism (verso)*.
- Anguelovski, I., Shi, L., Chu, E., Gallagher, D., Goh, K., Lamb, Z., ... Teicher, H. (2016). Equity impacts of urban land use planning for climate adaptation: Critical perspectives from the global north and south. *Journal of Planning Education and Research*, 36(3), 333–348. <https://doi.org/10.1177/0739456X16645166>
- Batty, M. (2015). *The new science of cities*. MIT Press.
- Batty, M. (2020). The coronavirus crisis: What will the post-pandemic city look like? *Environment and Planning B: Urban Analytics and City Science*, 47(4), 547–552. <https://doi.org/10.1177/2399808320926912>
- Berger, P., & Luckmann, T. (1966). *The social construction of reality*. Penguin Books Ltd.
- Bibri, S. E. (2018). Unprecedented innovations in sustainable urban planning: Novel analytical solutions and data-driven decision-making processes. In *Urban book series* (pp. 247–296). https://doi.org/10.1007/978-3-319-73981-6_5
- Bixler, R. P., Lieberknecht, K., Atshan, S., Zutz, C. P., Richter, S. M., & Belaire, J. A. (2020). Reframing urban governance for resilience implementation: The role of network closure and other insights from a network approach. *Cities*, 103, Article 102726. <https://doi.org/10.1016/j.cities.2020.102726>
- Bourgon, J. (2009). New directions in public administration: Serving beyond the predictable. *Public Policy and Administration*, 24(3), 309–330. <https://doi.org/10.1177/0952076709103813>
- Butts, S., & Jones, M. (2021). Deep mapping for environmental communication design. *Commun. Des. Q. Rev.* 9(1), 4–19. <https://doi.org/10.1145/3437000.3437001>
- Chakrabarti, D. (2023). Urban theory of/from the global south: A systematic review of issues, challenges, and pathways of decolonization. *Frontiers in Sustainable Cities*, 5. <https://doi.org/10.3389/frsc.2023.1163534>
- Chelleri, L., & Baravikova, A. (2021). Understandings of urban resilience meanings and principles across Europe. *Cities*, 108, Article 102985. <https://doi.org/10.1016/j.cities.2020.102985>
- Chroust, G., & Aumayr, G. (2017). Resilience 2.0: Computer-aided disaster management. *Journal of Systems Science and Systems Engineering*, 26(3), 321–335. <https://doi.org/10.1007/s11518-017-5335-7>
- Coaffee, J. (2019). *Future proof: How to build resilience in an uncertain world (first)*. Yale University Press.
- Coaffee, J., & Lee, P. (2016). *Urban resilience: Planning for risk, crisis and uncertainty*. PALGRAVE.
- Coaffee, J., Porto de Albuquerque, J., & Pitidis, V. (2021). Risk and resilience Management in co-production. In E. Loeffler, & T. Bovaird (Eds.), *Th Palgrave handbook of co-production of public services and outcomes* (pp. 541–558). Palgrave Macmillan UK.
- Crampton, J. W., & Krygier, J. (2006). An introduction to critical cartography. *Acme*, 4 (1), 11–33.
- Fornale, E., Armiero, M., & Odasso, L. (2023). Trust in disaster resilience resilience. *Disaster Prevention and Management*, 32(2), 253–267. <https://doi.org/10.1108/DPM-04-2022-0082>
- Freire, P. (1970). *Pedagogy of the oppressed*. Herder and Herder.
- Goodchild, M. F. (2007). Citizens as sensors: The world of volunteered geography. *GeoJournal*, 69(4), 211–221. <https://doi.org/10.1007/s10708-007-9111-y>
- Habitat, U. (2014). *Raising standards of urban resilience*.
- Haklay, M.(M.) (2013). Neogeography and the delusion of democratisation. *Environment and Planning A: Economy and Space*, 45(1), 55–69. <https://doi.org/10.1068/a45184>
- Haklay, M. M., Mazumdar, S., & Wardlaw, J. (2018). Citizen science for observing and understanding the earth BT - earth observation Open Science and innovation. In P. P. Mathieu, & C. Aubrecht (Eds.), *Earth observation open science and innovation* (pp. 69–88). Springer International Publishing. https://doi.org/10.1007/978-3-319-65633-5_4
- Healey, P. (1998). Building institutional capacity through collaborative approaches to urban planning. *Environment and Planning A*, 30(9), 1531–1546. <https://doi.org/10.1068/a301531>
- Hodgson, D. L., & Schroeder, R. A. (2002). Dilemmas of counter-mapping community resources in Tanzania. *Development and Change*, 33(1), 79–100. <https://doi.org/10.1111/1467-7660.00241>
- Horita, F. E. A., Degrossi, L. C., Assis, L. F. F. G., Zipf, A., & Porto de Albuquerque, J. (2013). The use of volunteered geographic information and crowdsourcing in disaster management: A systematic literature review. In *Proceedings of the Nineteenth Americas Conference on Information Systems, Chicago Illinois, August 15–17* (pp. 1–10).
- Huck, A., Monstadt, J., & Driessen, P. (2020). Mainstreaming resilience in urban policy making? Insights from Christchurch and Rotterdam. *Geoforum*, 117, 194–205. <https://doi.org/10.1016/j.geoforum.2020.10.001>
- Hynes, W., Coaffee, J., Murtonen, M., Davis, P., & Fiedrich, F. (2013). *The Drive for Holistic Urban Resilience*. 2(September) pp. 1–8. <http://harmonise.eu/wp-content/uploads/2015/03/Future-Security-Paper-2014.pdf>.
- Ituriza, M., Labaka, L., Hernantes, J., & Abdelgawad, A. (2020). Shifting to climate change aware cities to facilitate the city resilience implementation. *Cities*, 101, Article 102688. <https://doi.org/10.1016/j.cities.2020.102688>
- Jasanoff, S., & Kim, S. H. (2013). Sociotechnical imaginaries and national energy policies. *Science as Culture*, 22(2), 189–196. <https://doi.org/10.1080/09505431.2013.786990>
- Jessop, B., Brenner, N., & Jones, M. (2008). Theorizing sociospatial relations. *Environment and Planning D: Society and Space*, 26(3), 389–401. <https://doi.org/10.1068/d9107>
- Joseph, J. (2018). Varieties of resilience. In J. Joseph (Ed.), *Varieties of Resilience: Studies in Governmentality*. Cambridge University Press. doi: undefined.
- Kaufmann, M. (2016). The digitization of resilience. In D. Chandler, & J. Coaffee (Eds.), *The Routledge Handbook of International Resilience* (pp. 106–118).
- Kelman, I., Mercer, J., & Gaillard, J. (2012). Indigenous knowledge and disaster risk reduction. *Geography*, 97(1), 12–21. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84857075034&partnerID=40&md5=6fb99a210c98ba69ec5d462b0f52716f>
- Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal*, 79(1), 1–14. <https://doi.org/10.1007/s10708-013-9516-8>
- Kitchin, R. (2020). Urban science: Prospect and critique. In K. S. Willis, & A. Aurigi (Eds.), *The Routledge companion to smart cities* (pp. 42–50). Routledge. <https://doi.org/10.4324/9781315178387>
- Kniveton, D., Visman, E., Tall, A., Diop, M., Ewbank, R., Njoroge, E., & Pearson, L. (2015). Dealing with uncertainty: Integrating local and scientific knowledge of the climate and weather. *Disasters*, 39(s1), s35–s53. <https://doi.org/10.1111/disa.12108>
- Kusenbach, M. (2003). Street phenomenology: The go-along as ethnographic research tool. *Ethnography*, 4(3), 455–485. <https://doi.org/10.1177/146613810343007>
- Lam, D. P. M., Hinz, E., Lang, D. J., Tengö, M., von Wehrden, H., & Martín-López, B. (2020). Indigenous and local knowledge in sustainability transformations research: A literature review. *Ecology and Society*, 25(1). <https://doi.org/10.5751/ES-11305-250103>
- Leach, M., MacGregor, H., Scoones, I., & Wilkinson, A. (2021). Post-pandemic transformations: How and why COVID-19 requires us to rethink development. *World Development*, 138, Article 105233. <https://doi.org/10.1016/j.worlddev.2020.105233>
- Leszczynski, A. (2012). Situating the geoweb in political economy. *Progress in Human Geography*, 36(1), 72–89. <https://doi.org/10.1177/0309132511411231>
- Liu, W., Dugar, S., McCallum, I., Thapa, G., See, L., Khadka, P., ... Shakya, P. (2018). Integrated participatory and collaborative risk mapping for enhancing disaster resilience. *ISPRS International Journal of Geo-Information*, 7(2), 68. <https://doi.org/10.3390/ijgi7020068>
- Luque-Ayala, A., McFarlane, C., & Marvin, S. (2014). Smart urbanism: Cities, grids and alternatives? In M. Hodson, & S. Marvin (Eds.), *After sustainable cities?* (1st ed.). Routledge. <https://doi.org/10.4324/9780203074602>
- Marchezini, V. (2019). The power of localism during the long-term disaster recovery process. *Disaster Prevention and Management: An International Journal*, 28(1), 143–152. <https://doi.org/10.1108/DPM-05-2018-0150>
- Marchezini, V., Porto de Albuquerque, J., Pitidis, V., Rudorff, C.d. M., Lima-Silva, F., Klonner, C., & Martins, M. H.d. M. (2022). Flood risk governance in Brazil and the UK: Facilitating knowledge exchange through research gaps and the potential of citizen-generated data. *Disaster Prevention and Management: An International Journal*, 31(6), 30–44. <https://doi.org/10.1108/DPM-01-2022-0016>
- Marchezini, V., Trajber, R., Olivato, D., Muñoz, V. A., de Oliveira Pereira, F., & Oliveira Luz, A. E. (2017). Participatory early warning systems: Youth, citizen science, and intergenerational dialogues on disaster risk reduction in Brazil. *International Journal of Disaster Risk Science*, 8(4), 390–401. <https://doi.org/10.1007/s13753-017-0150-9>
- Martin, C., Mctarnaghan, S., Malik, A., Gerken, M., Bastomski, S., Rajasekaran, P., Burnstein, E., Gilbert, B., Levy, D., Meixell, B., Rakotondrazaka, F., Diby, S., Arena, O., Gourevitch, R., Pollock, J., López, M., Ramos, A., Zaidi, H., Perks, J., ... Demilew, A. (2018). Institutionalizing Urban Resilience: A Midterm Monitoring and Evaluation Report of 100 Resilient Cities. December, 122. www.rockefellerfoundation.org.
- Matin, N., Forrester, J., & Ensor, J. (2018). What is equitable resilience? *World Development*, 109, 197–205. <https://doi.org/10.1016/j.worlddev.2018.04.020>
- McFarlane, C. (2008). Urban shadows: Materiality, the “southern city” and urban theory. *Geography Compass*, 2(2), 340–358. <https://doi.org/10.1111/j.1749-8198.2007.00073.x>
- Meerow, S., & Newell, J. P. (2019). Urban resilience for whom, what, when, where, and why? *Urban Geography*, 40(3), 309–329. <https://doi.org/10.1080/02723638.2016.1206395>
- Meerow, S., Pajouhesh, P., & Miller, T. R. (2019). Social equity in urban resilience planning. *Local Environment*, 24(9), 793–808. <https://doi.org/10.1080/13549839.2019.164510>
- Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology*, 41(1–2), 127–150. <https://doi.org/10.1007/s10464-007-9156-6>
- OpenStreetMap. (2021). OpenStreetMap. <https://www.openstreetmap.org>.
- Parnell, S. (2020). The enabling conditions of post-pandemic city government. *Environment and Planning B: Urban Analytics and City Science*, 47(7), 1143–1145. <https://doi.org/10.1177/2399808320950041>
- Pham, K. (2020). Beyond borders: Steering metropolitan growth priorities through spatial imaginaries. *Australian Planner*, 56(2), 103–113. <https://doi.org/10.1080/07293682.2020.1739094>
- Pitidis, V., & Coaffee, J. (2020). Catalysing governance transformations through urban resilience implementation: The case of Thessaloniki, Greece. *Cities*, 107. <https://doi.org/10.1016/j.cities.2020.102934>
- Pitidis, V., Coaffee, J., & Bouikidis, A. (2023). Creating ‘resilience imaginaries’ for city-regional planning. *Regional Studies*, 57(4), 698–711. <https://doi.org/10.1080/00343404.2022.2047916>
- Pitidis, V., Porto de Albuquerque, J., Coaffee, J., & Lima-Silva, F. (2022). Enhancing Community Resilience through Dialogical Participatory Mapping. In R. Grace, &

- H. Baharmand (Eds.), *ISCRAM 2022 Conference Proceedings – 19th International Conference on Information Systems for Crisis Response and Management* (pp. 495–503).
- Porter, L. (2006). Planning in (post) colonial settings: Challenges for theory and practice. *Planning Theory and Practice*, 7(4), 383–396. <https://doi.org/10.1080/14649350600984709>
- Porto de Albuquerque, J., Anderson, L., Calvillo, N., Cattino, M., Clarke, A., Cunha, M. A., ... Trajber, R. (2023). Dialogic data innovations for sustainability transformations and flood resilience: The case for waterproofing data. *Global Environmental Change*, 82(July). <https://doi.org/10.2139/ssrn.4240075>
- Porto de Albuquerque, J., Anderson, L., Calvillo, N., Coaffee, J., Cunha, M. A., Degrossi, L. C., ... Zipf, A. (2021). The role of data in transformations to sustainability: A critical research agenda. *Current Opinion in Environmental Sustainability*, 49, 153–163. <https://doi.org/10.1016/j.cosust.2021.06.009>
- Porto de Albuquerque, J., & de Almeida, A. A. (2020). Modes of engagement: Reframing ‘sensing’ and data generation in citizen science for empowering relationships. In T. Davies, & A. Mah (Eds.), *Toxic truths: Environmental justice and citizen science in a post truth age*. Manchester University Press.
- Presti, L. L. (2020). The migrancies of maps: Complicating the critical cartography and migration nexus in ‘migro-mobility’ thinking. *Mobilities*, 15(6), 911–929. <https://doi.org/10.1080/17450101.2020.1799660>
- Randolph, G. F., & Storper, M. (2022). Is urbanisation in the global south fundamentally different? Comparative global urban analysis for the 21st century. *Urban Studies*, 60(1), 3–25. <https://doi.org/10.1177/00420980211067926>
- Robinson, J. (2011). Cities in a world of cities: The comparative gesture. *International Journal of Urban and Regional Research*, 35(1), 1–23. <https://doi.org/10.1111/j.1468-2427.2010.00982.x>
- Robinson, J. (2013). The urban now: Theorising cities beyond the new. *European Journal of Cultural Studies*, 16(6), 659–677. <https://doi.org/10.1177/1367549413497696>
- Rundstrom, R. (2009). In R. Kitchin, & N. B. T.-I. E. of H. G. Thrift (Eds.), *Counter-mapping* (pp. 314–318). Elsevier. <https://doi.org/10.1016/B978-008044910-4.00017-1>.
- Said, E. W. (1977). Orientalism. *The Georgia Review*, 31(1), 162–206. <http://www.jstor.org/stable/41397448>.
- Šakić Trogrlić, R., Duncan, M., Wright, G., van den Homberg, M., Adeloje, A., & Mwale, F. (2022). Why does community-based disaster risk reduction fail to learn from local knowledge? Experiences from Malawi. *International Journal of Disaster Risk Reduction*. <https://doi.org/10.1016/j.ijdrr.2022.103405>
- See, L., Mooney, P., Foody, G., Bastin, L., Comber, A., Estima, J., ... Rutzing, M. (2016). Crowdsourcing, citizen science or volunteered geographic information? The current state of crowdsourced geographic information. *ISPRS International Journal of Geo-Information*, 5(5). <https://doi.org/10.3390/ijgi5050055>
- Souza, D. T., Wals, A. E. J., & Jacobi, P. R. (2019). Learning-based transformations towards sustainability: A relational approach based on Humberto Maturana and Paulo Freire. *Environmental Education Research*, 25(11), 1605–1619. <https://doi.org/10.1080/13504622.2019.1641183>
- Souza Vargas, A. L., Duarte Massahud, A., Araujo Porto, A., Brandão Xavier, G., Lima-Silva, F., Prado de Abreu, G., & Pitidis, V. (2022). *Dialogical-Participatory Mapping Application: Academic Manual*. <https://doi.org/10.31273/978-1-911675-07-5>
- Spaans, M., & Waterhout, B. (2017). Building up resilience in cities worldwide – Rotterdam as participant in the 100 resilient cities programme. *Cities*, 61, 109–116. <https://doi.org/10.1016/j.cities.2016.05.011>
- Syme, T. (2020). Localizing landscapes: A call for respectful design in indigenous counter mapping. *Information Communication and Society*, 23(8), 1106–1122. <https://doi.org/10.1080/1369118X.2019.1701695>
- Tang, M., & d’Auria, V. (2023). Popular cartography: Collaboratively mapping the territorial practices of/with the urban margin in Mumbai. *City*, 27(3–4), 321–346. <https://doi.org/10.1080/13604813.2023.2219172>
- Turner, A. (2006). *Introduction to Neogeography*. O’Reilly.
- Turnhout, E., Metze, T., Wyborn, C., Klenk, N., & Louder, E. (2020). The politics of co-production: Participation, power, and transformation. *Current Opinion in Environmental Sustainability*, 42(2018), 15–21. <https://doi.org/10.1016/j.cosust.2019.11.009>
- Vasileiou, K., Barnett, J., & Fraser, D. S. (2022). Integrating local and scientific knowledge in disaster risk reduction: A systematic review of motivations, processes, and outcomes. *International Journal of Disaster Risk Reduction*, 81(March). <https://doi.org/10.1016/j.ijdrr.2022.103255>
- Viale Pereira, G., Cunha, M. A., Lampoltshammer, T. J., Parycek, P., & Testa, M. G. (2017). Increasing collaboration and participation in smart city governance: A cross-case analysis of smart city initiatives. *Information Technology for Development*, 23(3), 526–553. <https://doi.org/10.1080/02681102.2017.1353946>
- Wang, Z., Deng, X., Wong, C., Li, Z., & Chen, J. (2018). Learning urban resilience from a social-economic-ecological system perspective: A case study of Beijing from 1978 to 2015. *Journal of Cleaner Production*, 183, 343–357. <https://doi.org/10.1016/j.jclepro.2018.02.128>
- Watkins, J. (2015). Spatial imaginaries research in geography: Synergies, tensions, and new directions. *Geography Compass*, 9(9), 508–522. <https://doi.org/10.1111/gec3.12228>
- White, I., & O’Hare, P. (2014). From rhetoric to reality: Which resilience, why resilience, and whose resilience in spatial planning? *Environment and Planning C: Government and Policy*, 32(5), 934–950. <https://doi.org/10.1068/c12117>
- Wisner, B., Gaillard, J. C., & Kelman, I. (2012). Framing disaster: Theories and stories seeking to understand hazards, vulnerability and risk. In *Handbook of hazards and disaster risk reduction* (pp. 18–34).
- Wisner, B., & Kelman, I. (2015). Community resilience to disasters. In J. D. Wright (Ed.), *Second International encyclopedia of the Social & Behavioral Sciences* (pp. 354–360). Elsevier. <https://doi.org/10.1016/B978-0-08-097086-8.28019-7>.
- Wolff, E., French, M., Ilhamsyah, N., Sawailau, M. J., & Ramirez-lovering, D. (2021). Collaborating with communities: Citizen science flood monitoring in urban informal settlements. *Urban Planning*, 6(4), 351–364. <https://doi.org/10.17645/up.v6i4.4648>
- Wolff, E., & Muñoz, F. (2021). The techno-politics of crowdsourced disaster data in the Smart City. *Frontiers in Sustainable Cities*, 3(July), 1–5. <https://doi.org/10.3389/frsc.2021.695329>
- Ziervogel, G., Pelling, M., Cartwright, A., Chu, E., Deshpande, T., Harris, L., ... Zweig, P. (2017). Inserting rights and justice into urban resilience: A focus on everyday risk. *Environment and Urbanization*, 29(1), 123–138. <https://doi.org/10.1177/0956247816686905>
- Zuo, X., Blackburn, J., Kourtellis, N., Skvoretz, J., & Iamnitche, A. (2016). The power of indirect ties. *Computer Communications*, 73, 188–199. <https://doi.org/10.1016/j.comcom.2015.07.013>