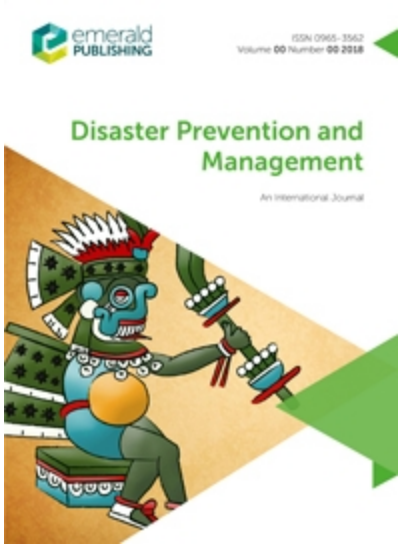

Assessing equity in disaster risk governance in Brazil and Colombia

Journal:	*Disaster Prevention and Management*
Manuscript ID	DPM-06-2023-0142.R1
Manuscript Type:	Research Paper
Keyword:	Disaster risk governance, equity, risk data, data governance, equitable resilience

Assessing equity in disaster risk governance in Brazil and Colombia

Abstract

Purpose – Disasters continue to be most prevalent and severe for marginalised communities. To reach those furthest behind first, as the global community pledges in the 2030 Agenda, a critical assessment of equity in disaster risk governance is necessary. Yet, the understanding of factors that mediate the capacity of the governance processes to achieve equity ambitions is limited. This paper addresses this gap by proposing and testing a conceptual framework to assess equity in disaster risk governance.

Study design – The framework analyses the extent to which *institutional relationships* and *data* in risk governance support inclusion and diversity of voice and enable the equitable engagement of communities. The study applied the framework to key risk policies across governance levels in Brazil and Colombia.

Findings – The study finds that institutional awareness of cross-sectoral and –scalar coordination clearly exists. Yet, the engagement of actors further down the governance scale is framed reactively at all scales in both countries. The analysis of the risk data practices indicates that although data integration and sharing are key policy priorities, the policies frame the relations of disaster risk data actors as hierarchical, with data needs determined from the top down.

Originality/value – A key contribution of this framework is that its equity view results in a nuanced analysis, thus pointing to the differences between the two countries concerning the factors that mediate these challenges and providing specific entry points for strengthening equity in risk governance policies.

Keywords – disaster risk governance – equity – risk data – data governance – equitable resilience

1. Introduction

The fact that disasters disproportionately affect historically marginalised communities is well established (see, for example, O'Keefe *et al.*, 1976; Jeffery, 1982; or Lavell and Maskrey, 2014). In recent history, landslides continue to have unequal impacts. The major landslide in Petrópolis (Brazil) in February 2022 that led to over 230 deaths (Ribeiro, 2022) had its worst impact on the *favela* Morro da Oficina. Although this was by far the worst geohazard-related tragedy in an underserved neighbourhood in Latin America in the early 2020s, it is not unique. For instance, in late October 2020, a powerful combination of rockfall and flash flood thundered down the hill in the *barrio popular* El Pacífico in Medellín (Colombia). It resulted in the authorities declaring a quarter of the buildings uninhabitable. The fact that no one was hurt was mainly due to the community's ability to mobilise quickly in response to a disaster.

Knowledge about the likelihood of such hazards to materialise existed, as both neighbourhoods had been categorised as high-risk areas in the respective municipal plans – yet in practice, these communities continued to be at risk. Residents often continue to live with family or in temporary shelters months and even years after the event that triggered the disaster (Valencio *et al.*, 2011). In other cases, such as Medellín's

Comuna 13 neighbourhood, residents returned to the affected plots where their homes stood before the landslide or started building in even more hazardous locations further up the hill. Questions of social justice, such as equity in access to housing, thus play a key role in explaining the limited effectiveness of disaster risk policies in self-constructed neighbourhoods. Despite the Sendai Framework for Disaster Risk Reduction (SFDRR) calling for a focus on the underlying drivers of disaster risk (UNDRR, 2015), the implementation of such declarations is limited (Lavell and Maskrey, 2014).

Analogous to McCandless (2020), inequity here refers to the lack of fairness in DRG, while equitable governance "gives historically marginalized populations a meaningful seat at the table" (ibid: 10). Inequities in disaster risk governance (DRG) thus perpetuate inequalities in the distribution of rights, such as safety from hazards.

In the examples above, inequities also relate to excluding so-called "informal" neighbourhoods from official municipal planning. This invisibility not only results in underinvestment in basic infrastructure. It also limits the ability to meaningfully build on community structures that emerged from the need for self-organisation, such as community mobilisation for disaster risk mitigation. Most tangibly, the invisibility of community-built infrastructure in official planning documents may render risk assessment inaccurate or lead to restrictive land use permissions, which in turn result in further underinvestment and marginalisation, for example, in case of an area being determined too high a risk for public infrastructure investment.

Recent global frameworks – such as the SFDRR – focus on reducing inequalities by enabling different populations to equally enjoy their right to access basic services and safety from hazards. Thus, a disconnect appears to exist between official DRG and development policy (Chmutina *et al.*, 2021) and the differential needs of marginalised communities. Moreover, in self-constructed neighbourhoods where state legitimacy and trust in government authorities tend to be low, this gap risks further disenfranchisement. With a call to "get beyond frameworks" in disaster risk reduction, Wisner (2020) pointed to the need for more attention to the interpretation of seemingly familiar concepts, such as risk and resilience. This requires a critical evaluation of the often-unreflective operationalisation of such concepts in global frameworks (Wisner, 2020), which resulted in superficial gestures at best and, at worst, in risk reduction and resilience being invoked for regressive policies (Coaffee, 2013). As a first step towards such a reflective view regarding the operationalisation of the above-mentioned concepts, this paper analyses the policy narratives that frame DRG. Therefore, the central question of this study concerns the extent to which disaster risk-related policies reflect equity in DRG and risk data. This is a key question for practice, as communities in not "formally" planned and self-constructed neighbourhoods in Latin American cities continue to experience socio-spatial inequalities that mediate their differential vulnerability factors and frame their resilience processes.

With disaster risk governance, we refer to the broader policies and measurement frameworks which shape the approach to managing disaster risks, including prevention and response (Bosher *et al.*, 2021). Conceptually, the analysis builds on recent debates regarding equitable resilience and is an empirical investigation into DRG policy narratives as mechanisms that mediate equity in the implementation of DRG. The paper addresses this reflective question with a comparative case study of disaster risk policies in Brazil and Colombia.

Section 2 presents the conceptual background and reviews debates in resilience and equity in DRG. With that conceptual base, section 3 presents the analytical approach and the methodology to assess equity in the DRG and measurement structures implicit in

the policy documents. Section 4 presents the results of the analyses in Brazil and Colombia at the national, subnational (Rio de Janeiro state; Antioquia department) and city (Niterói; Medellín) levels, followed by a comparative discussion in section 5. Section 6 closes with recommendations for global, national, and municipal policy and suggestions for further research.

2. Locating equity in resilience, risk, and transformation debates

Resilience performs a multiplicity of roles across scales and sectors, and, being presented as both process, trait, organising principle, or outcome (Chmutina *et al.*, 2016; Meerow and Newell, 2016; Moser *et al.*, 2019) its conceptualisations even encompass dimensions of time. An explicit and conscious reflection on the resilience concept's "politics that has to do with the way in which problems are framed", as it "can be many different things, imagine many different futures and inspire different interventions" (Simon and Randalls, 2016) (pp. 3, 6). The ubiquity and a perceived implicit, and often unquestioned, familiarity with the term 'resilience' represent a challenge, especially considering the ever-increasing trans-disciplinary nature of urban interventions and policies carried out under this label across different socio-spatial contexts. The concept's malleability (or vagueness) raises justified doubts regarding its usefulness (see, for example, Brand and Jax, 2007; or Davoudi *et al.*, 2012).

Several contributions already constructively and empirically deal with the tension between the multiple interpretations and the uncritical adoption of the term for regressive policies (see, for example, Bené *et al.*, 2012). With their emphasis on resilience trade-offs, Chelleri *et al.* (2015) argue that awareness of the temporal and spatial scales implicit in resilience strategies is vital for critically evaluating the proposed policies. While temporal trade-offs refer to differences in the extent to which policies aim at recovery, adaptation, or transformation – often implicitly and simultaneously – trade-offs in scale may be vertical and horizontal. Adaptation at a higher level may mean transformation (not necessarily always of positive nature) at a lower scale. At the same time, heterogeneous vulnerabilities may manifest in the differential effectiveness of interventions across neighbourhoods with similar appearances (ibid.).

As Muñoz-Erickson et al. (2021) argue in their discussion of resilience frames, "bouncing forward after a disaster may encourage 'doing it better' but not necessarily 'doing it differently', which is what is needed for transformation" (p.3). A contested concept like resilience, transformation has been framed as "fundamental changes in structural, functional, relational, and cognitive aspects of socio-technical-ecological systems that lead to new patterns of interactions and outcomes" (Patterson *et al.*, 2017) (p.2), driven by networks of actors able to bring about a radically different trajectory (Castán Broto et al., 2019; 2020). Scoones *et al.* (2020) argue that it is difficult to operationalise, as "it is often not clear what should be transformed, by and for whom, and through what processes" (p.65). With urban resilience critiques pointing to its limited ability to engage with equity considerations (Meerow and Newell, 2016; Muñoz-Erickson et al., 2021), these discussions lead to questions about the relational and procedural aspects between actors, which are essential when discussing equity in DRG. Kaika (2017) addressed this issue with a critical view of the tendency of resilience and DRG narratives to "focus on how to make citizens more resilient no matter what stresses they encounter" [original emphasis], and suggested for research and policy to "incorporate social

processes (including the complex role of communities, leadership, social learning, networks, institutions, etc.) into future methodology design and policy practices" (p.95).

The debate regarding the resilience multiple (Simon and Randalls, 2016) has additional significance for urban resilience frameworks when applied in contexts with a history of European colonisation, such as Brazil and Colombia. The Disaster Studies Manifesto and other contributions from critical disaster studies (e.g., Lizarralde, 2019; Gaillard, 2019) suggested that while countries in the so-called "global South" – a term often used "as a proxy for the former colonial and developing countries" (Alden *et al.*, 2010: 221) – are more severely affected by disasters, conceptualisations of risk, resilience and development are dominated by Eurocentric ideas and call for a decolonisation of disaster studies (Marchezini *et al.*, 2021). The consequences of this conceptual tension can be felt on the ground when official risk definitions prevent vulnerability-reducing interventions (Garcia Ferrari *et al.*, 2022). The result is limited investment in infrastructure and engagement with communities in "informal" urban areas classified as high-risk. This further exacerbates risk and vulnerability and ultimately leads to evictions of communities with histories of socially constructing their neighbourhoods (ibid.).

In the UK, Coaffee and Lee (2016) detected a lack of integration between scales in the form of the limited number of "attempts to link macro-level changes in society with micro-level resilience strategies" (p.67). Here, resilience discourses often encourage transformation towards horizontal integration and localised, socio-cultural understandings (ibid.), which, as White and O'Hare (2014) pointed out, result in heterogeneous approaches that "may be difficult to translate into practical outcomes" (p. 944). This observation explains why risk management roles assigned to the community level tend to be reactively framed, i.e., as part of response rather than risk reduction or prevention. In the Brazilian context, Costa Gonçalves *et al.* (2009) noted a limited "dialogicity" – that is, a limited dialogue among equals, between the municipal disaster risk agencies and the population.

The call for the inclusion of local and community knowledge for DRG has a long tradition in critical disaster literature, notably in Latin America (see, for example, Wilches-Chaux, 1993). It is a core element in the SFDRR's Priority 1, which calls on stakeholders to "focus on monitoring, assessing and understanding disaster risk and sharing such information and on how it [risk knowledge] is created" (UNDRR, 2015) (p.11). This raises the question regarding the extent to which data might promote equity in risk governance. Several commentators (e.g., Andrabi, 2022; Khan et al., 2022) point to inequities in scientific disaster risk knowledge production. In the Latin American context in particular, Macías (2022) points to the differences in concepts and framings that constitute knowledge systems for DRG. For these to be equitable, Wijsman and Feagan (2019) point to the need to rethink knowledge systems for urban resilience and "name and challenge the core material and discursive practices that stand as obstacles to reorganising the social relations of knowledge production" (p.74). The subsequent section introduces a framework for operationalising this emphasis on the relational aspects of resilience.

3. Analytical framework and methodological approach

The above paragraphs presented some of the key insights from the thriving debate regarding the politics of resilience conceptualisations used to justify and guide interventions in DRG. The mechanisms of operationalisation from conceptual framing of

DRG and risk knowledge creation to policy to intervention, however, still appear to be treated as an analytical black box, thus perpetuating the gap between the DRG policy and the differential needs of people in marginalised groups, especially in contexts with a history of European colonisation, as the Disaster Studies Manifesto argues.

How, then, to develop a conceptual approach to open that black box which would enable an assessment of the mechanisms driving the cycle of (in)equity in DRG? When analysing risk governance processes and data, what are the parameters for which to look? Given the process inherent in this question, an answer might be found by moving the focus from transformation discussed above to transformative capacity. Wolfram (2016) proposes a framework of *components and sources* of urban transformative capacity. These consist of *agency and forms of interaction*, addressing considerations of system integration with inclusiveness, empowerment, diversity of actors across sectors and scales, multiple modes of governance, and *relational dimensions* – with formal and informal spaces for cross-agency and cross-scalar modes of operation. Wolfram's (2016) *development processes* of transformative capacity, in turn, relate to system awareness in knowledge production, sense-making, and foresight.

To operationalise these concepts for an empirical analysis, we draw on Matin *et al.*'s (2018) definition of equitable resilience, as it aims at a "middle ground between science and practice" by identifying "critical issues for engaging with equity in resilience practice" (p.198). This approach emphasises the bottom-up view driven by people's own experiences of human-environmental interactions to address the implicit power imbalances in the understandings of resilience. Matin *et al.* (2018) call for "methods capable of revealing how actors and institutions support narratives, practices, or forms of regulation at different scales that subjugate or empower those whom 'resilience in practice' is intended to benefit" (ibid.: 203).

In combination, Wolfram's (2018) elements of urban transformative capacity and Matin et al.'s (2018) equitable, middle-ground approach to resilience in practice represent the theoretical base to analyse equity in DRG.

Here, risk data are not only understood in terms of their referential/"informative" value "but also as part of socio-material processes" (Porto de Albuquerque et al., 2021: 4) where actors play different roles in knowledge generation and where "the flow of data between different actors and scales that can lead to a change in governance arrangements and opening up new communication channels" and "data creation as a transformative opportunity in itself as a catalyst for mutual social learning" (p. 6). The analytical lens in Table I thus aims to identify evidence of *structural criteria for transformative capacity* and of *processes for enabling an equitable engagement of communities*, both in institutional relationships and risk data – thus ultimately "pinning down" the resilience multiples implicit in DRG frameworks.

Given the aim of identifying and analysing equity in DRG, i.e., the extent to which inequalities are likely to be accounted for in risk governance and risk data across scales, this study analysed policy documents relating to risk governance at the national, subnational (state/department), and municipal levels. The questions guiding the analysis of the coded sections from the policy texts in the two dimensions at the three governance levels for disaster risk governance and risk data are indicated in Table I.

[TABLE I]

The selection of policies for the analysis was based on the co-authors' expertise in risk governance in Brazil and Colombia (see Table II). These represent the legal and

political background which frames risk governance at each level. At the national level, the policies are statutory laws with validity across administrative periods. For Colombia, the analysis also included the National Plan for Disaster Risk Management, which is updated between legislative periods. All texts are in the respective country's official language, i.e., Brazilian Portuguese in Brazil and Spanish in Colombia.

[TABLE II]

While the scalar approach to the analysis enabled a comparison of the framings of relations between governance levels, the two-country comparison relates to both municipalities facing rain-related hazards, significant socio-spatial intra-urban inequalities with high levels of informality and communities with histories of self-organisation and which had been affected by disasters. In the following, section 4 presents the results.

4. Results

The paragraphs in the following subsections are structured along the questions for the two dimensions. The headings reflect the coding scheme with the questions indicated in Table I.

4.1 Brazil

4.1.1 Institutional relationships

Inclusion and diversity of voice: Diversity of actors and *cross-scalar interactions*

In the Brazilian national-level policy, the central government acts cross-level orchestrator, providing overall guidance in weak institutional arrangements (except for major incident response). Integration at the national level policy takes the shape of the National Protection and Civil Defence Council, which comprises "the relevant government, private and civil society representatives", including the 'affected communities', and is tasked with drafting the National Plan for Protection and Civil Defence to guide implementation across scales. Inclusion and diversity here refer to the need to encourage actors at all levels to promote the participation of civil society and the private sector. In this regard, the policy suggests that risk-awareness raising is central to the federal-level government's mandate, mainly to prevent communities from settling in areas identified as high-risk and to support relocation if needed.

At the sub-national level, the Rio de Janeiro State Contingency Plan focuses on bringing State's municipalities back to their 'social normality' as quickly as possible after a disaster. The responsibility matrix on the Rio de Janeiro Contingency Plan 2021/2022 primarily attributes responsibility to the National Agency for Disaster Risk Management (CEMADEN) for the 'pre-impact' stages. In the response and recovery stages, the sub-national level civil defence secretariat is the coordinating agency. In contrast, other state-level agencies are called upon only if needed during response and recovery.

Cross-sectoral coordination is most evident in the municipal-level policy. The Municipal Plan for Protection and Civil Defence of the city of Niterói is guided by the principle that the policies therein should be integrated into "territorial planning, urban development, health, environment, climate change, water resources management, geology, infrastructure, education, science and technology, and to other sectorial policies,

aiming at the promotion of sustainable development" (np). This principle is operationalised with the composition of the executive body for the Niterói Municipal System for Protection and Civil Defence. The policy lists 14 municipal agencies ranging from Urban Planning and Mobility to Housing, Health, and Human Rights. Analogous to the national level, a steering Council for Protection and Civil Defence comprises 35 representatives from various government agencies, utility and infrastructure providers, civil society, and community.

The national and subnational policy texts refer to the national government as a coordinating entity, particularly the National Protection and Civil Defence Council and the National Agency for Disaster Risk Management. The state-level policy also indicates that state government acts as a mediator between federal and municipal levels in response and recovery.

The role of and processes for engaging communities: Building on local experience

Although everyone is encouraged to contribute, the framing of communities in the national DRG policy is passive. Apart from volunteers who receive civil defence training, the policy suggests that communities must be informed to "adopt adequate behaviour for prevention and response to a disaster event and promote self-protection". According to the policy, the communities are to be prevented from living in environmentally fragile areas and, if necessary, 'removed' (a literal translation of a contested term), to be "relocated" into social housing provided by the municipal, state, or federal government. There is no evidence regarding the subnational policy's view of the role of communities in DRG. The same applies to the municipal level, which lists civil society and community as two of 35 representatives at the Municipal Council for Protection and Civil Defence.

4.1.2 Data

Inclusion and diversity of voice: Diversity of conceptualisations in data and *data scales and temporalities*

Regarding data, the national level policy envisions the central government to provide and manage the disaster information and management system with a database which can be accessed by the cross-sectoral and -scalar representatives of the national civil defence system. Regarding the role of non-governmental actors, the policy suggests that university research centres and community actors should be part of a broader 'risk-knowledge ecosystem'. However, except for the collaboration with universities and other research centres, the national policy frames data generation and provision of information regarding risk and vulnerability as the government's responsibility, ranging from the National Protection and Civil Defence System to municipal-level risk maps and inventories of at-risk building structures.

Regarding scalar data interactions, the state (subnational) entities are expected to support the federal level with identifying hazards, share that information with the municipalities, and support the latter with disaster response. For the national policy, the role of municipalities is to generate local risk maps, which include locally generated data, such as the quality of building structures, to support the municipal-level interventions (awareness-raising and training, and 'relocation', and disaster response) the policy envisions for the municipal actors as described above. The subnational policy only mentions data practices concerning the National Disaster Risk Agency's mandate for risk monitoring in the 'pre-impact stage', while the municipal policy echoes the national level

narrative in that its main task primarily relates to providing enhanced granularity regarding hazards.

Accounting for local realities

Although the national policy mentions other hazards, such as biological or nuclear events, the type of risk data mentioned relates to weather forecasting and geohazards, such as a registry of municipalities in areas susceptible to landslides, with the state-level government tasked to provide granularity. In addition to feeding micro-level data concerning geophysical hazards and physical vulnerability up the governance scale, the national level policy calls on the municipal government to feed the information to the community level as part of their awareness-raising mandate and establishing the zoning guidelines. These mandates and the thematic focus of risk data on hydro-geological events and risks are echoed at the sub-national and municipal level policies.

4.2 Colombia

4.2.1 Institutional relationships

Inclusion and diversity of voice: Diversity of actors and *cross-scalar interactions*

With its *Systems Principle*, Colombia's National Disaster Risk Management (DRM) Policy points to the need for the coordinated and synergistic horizontal and vertical integration of actors. Linking DRG to sustainable development across the scale, it operationalises the integrative approach manifests with the cross-ministerial National Council for DRM, chaired by the National DR Unit (UNGRD) and led by the Colombian presidential office. The 2022 Updated National DRM Plan 2015 – 2030 echoes these integrative and systemic principles. Its menu of budgeted programmatic interventions identifies specific measures for integrating policies across policy silos and scales by integrating disaster risk considerations into the respective policy areas – such as housing, mining, agriculture, transport planning and healthcare – and cascading it down the scale to the household level.

The sub-national (*Departamento*) DRM plan also emphasises risk reduction, primarily by supporting entities at the same governance level with the integration efforts mandated at the national level. The plan understands risk mitigation as the reduction of physical vulnerability, specifically by relocating communities whose territories the municipal government classified as 'high-risk areas'.

At the municipal level policy, the principle of cross-sector integration for DRG underpins its proposed risk reduction activities. Mitigation, however, receives the highest budget allocation in the programme of interventions. These relate to construction works, 'relocation' of communities, reforestation to reduce physical vulnerability – primarily due to exposure to hydro-geological hazards – and financial protection in case of loss. Disaster response and recovery are managed mainly at the municipal level, with Municipal DRM Agency (DAGRD) as the coordinating actor.

The national policy addresses scalar relations with the Principle of Subsidiarity to indicate that higher-level governance actors should only intervene in lower governance-level DRG in the case of insufficient funding, particularly for mitigation and response. Membership of the three national-level committees has some scalar element, with national-level actors deemed relevant for each purpose and delegates from subnational government associations, such as the Colombian Association of Municipalities. The

Principle of Subsidiarity also frames the subnational policy's view of inter-scalar interactions. According to the policy, the *Departamento* will assist the municipal governments with disaster response and recovery if needed.

The role of and processes for engaging communities: Building on local experience

From a national level point of view, the relationship between civil society and the state is at arm's length. The national policy suggests that academia and civil society are invited to join the meetings of the three national-level committees on a needs basis only. The 2022 Updated National DRM Plan 2015 – 2030 frames the role of communities with the *Principle of Self-Preservation*, for which it proposes community training in risk reduction and mitigation. Beyond training and risk awareness raising, government interactions with communities relate to discouraging and 'controlling' settlements the government deems illegal. In the municipal DRM plan, the communities' roles primarily relate to early warning, response, and recovery, with a specific budget allocated to community capacity building for these three stages.

4.2.2 Data

Inclusion and diversity of voice: Diversity of conceptualisations in data and *data scales and temporalities*

Regarding the diversity of conceptualisations in data, the national DRM policy indicates that the national DR council enables a cross-sectoral representation of views. Operationally, the policy frames system integration in data governance as data interoperability and encourages ministry-level stakeholders to ensure risk-relevant data can be shared among the national DR council members and across the governance scale.

Temporally, the national policy suggests that the responsibility of data and information needs for all five DRM stages lies at the subnational and municipal levels. Here, the policy emphasises system integration by encouraging the municipal stakeholders to include utility companies, civil society, and emergency services in the risk data governance framework. This also applies to the municipal DR policy with its emphasis on integrating early-warning-related data from across the policy siloes and an independent university-led project (the Integrated Aburrá Valley Early Warning System, SIATA) brokering data from across the scale – including community involvement for reporting back data for early warning at the neighbourhood level.

Regarding data types, the National Plan for DRM focuses on data categories defined in the Plan as natural (e.g., tsunamis), socio-natural (e.g., flooding, landslides), and technological (e.g., contamination). The identification and assessment of risks related to natural and socio-natural hazards receive the second highest budget allocation of the total national DRM budget.

The subnational DR Plan suggests that risk data primarily relate to physical vulnerability and hydrometeorological, seismic and geological phenomena. Similarly, risk data generation at the municipal level refers to data on hydrological, geological, and anthropogenic hazards.

Accounting for local realities

Beyond encouraging stakeholders at all levels to generate data and community involvement for early warning data, the policies at all three governance levels provide limited guidance regarding the role of community-generated data.

5. Discussion and contributions

Having analysed the policy texts, what can we say about the extent to which they reflect equity? Responding to the research question (see the Discussion Summary Table III below), the results showed that equity in DRG is a core principle at all three governance levels in both countries. However, the risk of inequitable implementation of disaster risk governance is still significant. The analytical framework proposed in this paper enabled a differentiated view of the governance factors which mediate that risk.

The analysis of the institutional relationships suggested that the potential for integrating policy sectors (i.e., horizontal integration) is high in both countries. However, the potential for equity is emerging but is still limited when looking at cross-scalar interactions and community engagement. Here the framework brought to light the nuanced differences between Brazil and Colombia, with the former placing a stronger emphasis on civil society engagement (though still mostly reactive in the case of communities) and the latter encouraging cross-scalar coordination of government agencies.

On the Brazilian side, the potential for thematic diversity is high because the policies encourage including government stakeholders across the policy spectrum. However, with actors closer to the local context being primarily assigned reactive roles, that diversity of actors is only applied horizontally. Prevention mainly lies within the domain of the national government, while community engagement happens at a later stage – for early warning and response. The involvement of community volunteers in identifying structural and physical risk factors and early warning aligns with the aim of creating community risk awareness set out in the national policy. This supports equity, but the focus on hazard-specific characteristics in the policy framework provides limited conceptual ground to enable opportunities for reflection on the drivers of vulnerability at the community level. Communities are also framed as being accountable for settling in areas defined as high-risk.

The results of the Colombian disaster risk policies pointed to a strong potential for integration across policy sectors and government scales, which supports the diversity element of equity in DRG. As in Brazil, cross-sectoral integration is a key principle in the Colombian disaster risk policy frameworks. This thematic diversity in the policy guidance was observed in the form of institutional mechanisms for cross-ministerial coordination at the national level and the integration of DRG into departmental and municipal planning. This is supported by a clear mandate to account for differentials in factors of vulnerability at the municipal level. In contrast to the observations regarding the Brazilian disaster risk policies, non-governmental, civil society and academic actors did not appear to be included routinely in formalised governance structures at national and subnational levels and are called upon for specific inputs on a needs basis only.

Given the guiding principle of subsidiarity, scale plays a more important role in the Colombian disaster risk frameworks than in the Brazilian case, with varying impacts on equity. On the one hand, that principle requires cross-scalar coordination to identify resource needs at lower levels. This is addressed with the routine mechanism of the formalised representation of the municipal governments at the national level. Such a mechanism supports equity as it is likely to bring the voices of actors closer to the ground to national-level discussions. On the other hand, interactions between actors across scales primarily appear in the policy context of the reactive disaster risk management stages of response and recovery, mirroring the findings in Brazil. A similar tension applies to the policies' framing of the communities' role. The policies encourage proactive

and empowered community involvement, reflected in the calls for municipal actors to count on community capacities and promote community self-organisation. Yet – again mirroring the case of the Brazilian policies – community engagement is primarily mentioned in the context of addressing physical vulnerabilities for risk reduction and in the reactive stages.

With the conceptual framework enabling a comparison of (in)equity in institutional relationships and risk data practices, the results suggest that the risk of inequitable practices is higher in risk data. While this observation applies to both countries and indeed might be observed in other geographies, the framework also brings to light the differences between the two countries' policies regarding the factors mediating equity in risk data. Data integration is a key mandate at the national level in both countries, which is conducive to system integration and the need for multiple and diverse relations for equity in DRG. However, the hierarchical data practices enshrine a passive to at most reactive role for the communities. Thus, the extent to which people's differential experiences of human-environmental interactions might be made visible in the risk data, which would reflect an equitable approach to resilience governance, is questionable in both countries but more so in Brazil than in Colombia.

With the national level in Brazil converting the data provided by subnational entities and other national agencies into information and feeding it back down, the hierarchical approach relates to the mandate for maintaining oversight and DRG being orchestrated at the national level. However, it also limits the potential for collaboration and active use of and engagement with data to understand local vulnerability factors. Inequity in risk data is further likely due to an emphasis on hazard data. Despite awareness of interlinkages between sectors, consideration of socio-spatial factors of vulnerability appears to be limited. This thematic focus on data relating to natural hazards, in turn, risks perpetuating the problematic view that 'disasters are natural', relate to 'extreme weather events', and are thus 'inevitable' (for a recent critique, see, for example, Kelman, 2020). On a positive note, the proposed inclusion of civil society and private sector data promotes horizontal diversity and cross-level integration.

Equity in disaster risk data governance is significantly higher in Colombian policy narratives. While there are similar challenges regarding the thematic and temporal focus of the data identified in the Brazilian frameworks, the Colombian policy narratives emphasise data integration across scales. However, despite the (equitable) call for data that enables an understanding of social vulnerability differentials, the inequitable characteristics here relate to data integration being framed as a function of technical interoperability. This framing reduces the potential for actors at lower government levels and civil society to contribute with data that reflects their experiences of differential vulnerability.

[TABLE III]

With its analytical approach and coding scheme, the paper proposed and tested an analytical tool for assessing equity in DRG and risk data. The tool allows to unpack the factors inherent in the policies at the national, subnational, and municipal levels that drive the tensions between risk governance policy and persisting differences in historically marginalised communities' ability to enjoy their right to safety from hazards. This is important because, despite global policy frameworks such as the SFDRR and the SDGs calling on actors at all governance levels to create equitable policies, outcomes in

terms of risk seem unchanged, as recent events such as the landslide in Morro do Oficina and El Pacífico continue to show.

Empirically, with the analysis of the risk governance policies at three governance levels in Brazil and Colombia, the paper, therefore, comparatively illustrated these multiple tensions inherent in the policies. It showed how these tensions relate to inequities in the involvement of actors along scale and temporality, within and between governance levels. Relatedly, the conceptual distinction between risk governance and risk data provided additional insights into power differentials among risk data actors in the policies as a key factor of equity in DRG.

6. Conclusions and further work

The analysis suggested that, in principle, awareness of cross-sectoral and -scalar coordination exists in both countries. However, in the policies, these principles appear operationalised in a way that limits equity in the implementation of disaster risk governance at best and, at worst, perpetuates unequal effectiveness of interventions in the name of resilience. Questions for policymakers in this regard are as follows:

1) how to build on the needs-based collaborations between government and civil society, including universities,
2) what are the challenges to moving from community involvement at the reactive stages to a routine process of government-community collaboration to identify and address the underlying social factors of vulnerability and build on community capacity and knowledge?

For 1), a first step might be a systematisation of applied university-led community risk research initiatives that act as intermediaries between communities and government (Rivera-Flórez *et al.*, 2020; Smith *et al.*, 2022). The challenges for establishing such institutional routines (question 2)) might initially be identified with government stakeholder interviews. The questions for further research emerging from the analysis relating to risk data are:

3) how to routinise existing practices to measure the social factors of risk in Brazil and Colombia, and
4) what are the factors driving the scalar hierarchy in disaster risk data governance?

The Colombian National Statistics Office has already created a geospatial vulnerability index, which is informed by data from administrative records. A next step here might be a systematic review of citizen-generated risk data about social factors of vulnerability complemented by government stakeholder interviews regarding the challenges of routinely integrating these data for risk reduction beyond early warning and response. For example, a systematic co-production of such data by marginalised communities and civil defence might lead to joint reflection and negotiation of initiatives to address social and physical vulnerability. Such an approach addresses the simplistic approach of *favelas* being blanket-labelled as "high-risk areas", which shifts the responsibility to the residents (cf. Kaika, 2017), ultimately leading to eviction being offered as the main "solution" for risk reduction. At the same, procedural equity is

enhanced as it empowers communities to work with the municipal government to address social and physical vulnerability in the neighbourhood by building on community knowledge and existing socio-organisational community assets.

Regarding question 4), it is likely that the institutional need for statistical data quality is a key driver for the scalar hierarchy in disaster risk data governance. What might a 'negotiated' approach look like which reflectively addresses the tension between the need for data quality and citizen-data generation as a transformative opportunity (Porto de Albuquerque *et al.*, 2021)?

This paper hopefully brings the discussion one step closer to bridging, or at least making visible the gaps between varying understandings of equitable resilience, especially in the context of marginalised yet self-empowered urban communities, and points to institutional windows of opportunity for methodological innovation in DRG processes and disaster risk data governance.

7. References

Alden, C., Morphet, S. & Vieira, M. A. (2010). Conclusion: One South, Many Souths. *In:* Alden, C., Morphet, S. & Vieira, M. A. (eds.) *The South in World Politics.* London: Palgrave Macmillan UK.

Andrabi, S. (2022). Decolonising knowledge production in disaster management: a feminist perspective. *Disaster Prevention and Management: An International Journal,* 31**,** (3)**,** 202-214.

Brand, F. S. & Jax, K. (2007). Focusing the Meaning(s) of Resilience

Resilience as a Descriptive Concept and a Boundary Object. *Ecology and Society,* 12**,** (1).

Béné, C., Wood, R. G., Newsham, A. & Davies, M. (2012). Resilience: New Utopia or New Tyranny? Reflection about the Potentials and Limits of the Concept of Resilience in Relation to Vulnerability Reduction Programmes. *IDS Working Papers,* 2012**,** (405)**,** 1-61.

Castán Broto, V., Trencher, G., Iwaszuk, E. & Westman, L. (2019). Transformative capacity and local action for urban sustainability. *Ambio,* 48**,** (5)**,** 449-462.

Chelleri, L., Waters, J. J., Olazabal, M. & Minucci, G. (2015). Resilience trade-offs: addressing multiple scales and temporal aspects of urban resilience. *Environment and Urbanization,* 27**,** (1)**,** 181-198.

Chmutina, K., Lizarralde, G., Dainty, A. & Bosher, L. (2016). Unpacking resilience policy discourse. *Cities,* 58**,** 70-79.

Chmutina, K., von Meding, J., Sandoval, V., Boyland, M., Forino, G., Cheek, W., Williams, D. A., Gonzalez-Muzzio, C., Tomassi, I., Páez, H. & Marchezini, V. (2021). What We Measure Matters: The Case of the Missing Development Data in Sendai Framework for Disaster Risk Reduction Monitoring. *International Journal of Disaster Risk Science,* 12**,** (6)**,** 779-789.

Coaffee, J. (2013). Rescaling and Responsibilising the Politics of Urban Resilience: From National Security to Local Place-Making. *Politics,* 33**,** (4)**,** 240-252.

Coaffee, J. & Lee, P. (2016). *Urban resilience : planning for risk, crisis and uncertainty,* London: Palgrave.

Costa Gonçalves, J., Marchezini, V. & Valencio, N. (2009). Colapso de Barragens: Aspectos Sócio-Políticos da Ineficiência da Gestão dos Desastres no Brasil. *In:* Valencio, N., Siena, M., Marchezini, V. & Gonçalves, J. C. (eds.) *Sociologia dos Desastres: Construção, Interfaces e Perspectivas no Brasil* São Carlos, SP: RiMa Editora.

Davoudi, S., Shaw, K., Haider, L. J., Quinlan, A. E., Peterson, G. D., Wilkinson, C., Fünfgeld, H., McEvoy, D. & Porter, L. (2012). Resilience: A Bridging Concept or a Dead End? "Reframing" Resilience: Challenges for Planning Theory and Practice Interacting Traps: Resilience Assessment of a Pasture Management System in Northern Afghanistan Urban Resilience: What Does it Mean in Planning Practice? Resilience as a Useful Concept for Climate Change Adaptation? The Politics of Resilience for Planning: A Cautionary Note. *Planning Theory & Practice,* 13**,** (2)**,** 299-333.

Gaillard, J. (2019). Reply to Is disaster-related research and practice in the Global South unfavorably guided by northern ideas? *Vulnerability, Resilience and Post-Disaster Reconstruction International Debates* [Online]. Available from: https://oddebates.com/9th-debate [Accessed Sep 2019].

Garcia Ferrari, S., Crane De Narváez, S., Castro Mera, W. E., Velásquez, C. & Bain, A. A. (2022). Collective Action Towards Risk Management in Informal Urban Areas in Medellín: COVID-19 Lessons for Reducing Vulnerability and Inequality. *Frontiers in Environmental Science,* 9.

Kaika, M. (2017). Don't call me resilient again!'- the New Urban Agenda as immunology ... or ... what happens when communities refuse to be vaccinated with 'smart cities' and indicators. *Environment & Urbanization,* 29**,** (1)**,** 89-102.

Kelman, I. (2020). *Disaster by choice : how our actions turn natural hazards into catastrophes,* Oxford: Oxford University Press.

Khan, M., Ruszczyk, H. A., Rahman, M. F. & Huq, S. (2022). Epistemological freedom: activating co-learning and co-production to decolonise knowledge production. *Disaster Prevention and Management: An International Journal,* 31**,** (3)**,** 182-192.

Lavell, A. & Maskrey, A. (2014). The future of disaster risk management. *Environmental Hazards,* 13**,** (4)**,** 267-280.

Lizarralde, G. (2019). Opening Statement to Is disaster-related research and practice in the Global South unfavorably guided by northern ideas? *Vulnerability, Resilience and Post-Disaster Reconstruction International Debates* [Online]. Available from: https://oddebates.com/9th-debate [Accessed Sep 2019].

Macías M., J. M. (2022). "Neo Colonialidad" y gestión del riesgo de desastres en América Latina. *Revista de Estudios Latinoamericanos sobre Reducción del Riesgo de Desastres REDER,* 6**,** (1)**,** 9-24.

Marchezini, V., González-Muzzio, C. & Martínez-Roda, A. (2021). Descolonización de la ciencia de los desastres: Enfoques desde Latinoamérica y Caribe. *Revista de Estudios Latinoamericanos sobre Reducción del Riesgo de Desastres,* 5**,** (2).

Matin, N., Forrester, J. & Ensor, J. (2018). What is equitable resilience? *World Development,* 109**,** 197-205.

McCandless, S. (2020). Social Equity. *The Palgrave Handbook of Global Sustainability.* Cham: Springer International Publishing.

Meerow, S. & Newell, J. P. (2016). Urban resilience for whom, what, when, where, and why? *Urban Geography,* 40**,** (3)**,** 309-329.

Moser, S., Meerow, S., Arnott, J. & Jack-Scott, E. (2019). The turbulent world of resilience: interpretations and themes for transdisciplinary dialogue. *Climatic Change,* 153**,** (1)**,** 21-40.

Muñoz-Erickson, T. A., Meerow, S., Hobbins, R., Cook, E., Iwaniec, D. M., Berbés-Blázquez, M., Grimm, N. B., Barnett, A., Cordero, J., Gim, C., Miller, T. R., Tandazo-Bustamante, F. & Robles-Morua, A. (2021). Beyond bouncing back? Comparing and contesting urban resilience frames in US and Latin American contexts. *Landscape and Urban Planning,* 214**,** 104173.

Patterson, J., Schulz, K., Vervoort, J., van der Hel, S., Widerberg, O., Adler, C., Hurlbert, M., Anderton, K., Sethi, M. & Barau, A. (2017). Exploring the governance and politics of transformations towards sustainability. *Environmental Innovation and Societal Transitions,* 24**,** 1-16.

Porto de Albuquerque, J., Anderson, L., Calvillo, N., Coaffee, J., Cunha, M. A., Degrossi, L. C., Dolif, G., Horita, F., Klonner, C., Lima-Silva, F., Marchezini, V., Martins, M. H. d. M., Pajarito-Grajales, D., Pitidis, V., Rudorff, C., Tkacz, N., Traijber, R. & Zipf, A. (2021). The role of data in transformations to sustainability: a critical research agenda. *Current Opinion in Environmental Sustainability,* 49**,** 153-163.

Ribeiro, J. (2022). Seis meses depois, Perópolis tem desaparecidos e vítimas aguardando auxílio. *O Globo*.

Rivera-Flórez, L., Rodríguez-Gaviria, E., Velasquez-Castañeda, C. & Guzmán, -. T., Hendys (2020). La Gestión Comunitaria del Riesgo. *Bitácora Urbano Territorial,* III**,** (30)**,** 205-218.

Scoones, I., Stirling, A., Abrol, D., Atela, J., Charli-Joseph, L., Eakin, H., Ely, A., Olsson, P., Pereira, L., Priya, R., van Zwanenberg, P. & Yang, L. (2020). Transformations to sustainability: combining structural, systemic and enabling approaches. *Current Opinion in Environmental Sustainability,* 42**,** 65-75.

Simon, S. & Randalls, S. (2016). Geography, ontological politics and the resilient future. *Dialogues in Human Geography,* 6**, (**1)**,** 3-18.

Smith, H., Garcia Ferrari, S., Medero, G. M., Rivera, H., Coupé, F., Mejía Escalante, M. E., Castro Mera, W., Montoya Correa, C. A., Abiko, A. & Marinho, F. A. M. (2022). Exploring appropriate socio-technical arrangements for the co-production of landslide risk management strategies in informal neighbourhoods in Colombia and Brazil. *International Journal of Urban Sustainable Development,* 14**, (**1)**,** 242-263.

UNDRR (2015). Sendai Framework for Disaster Risk Reduction 2015 - 2030. Geneva: United Nations Office for Disaster Risk Reduction.

Valencio, N., Siena, M. & Marchezini, V. (2011). *Abandonados nos desastres: uma análise sociológica de dimensões objetivas e simbólicas de afetação de grupos sociais desabrigados e desalojados,* Brasília: Conselho Federal de Psicologia.

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.

Wijsman, K. & Feagan, M. (2019). Rethinking knowledge systems for urban resilience: Feminist and decolonial contributions to just transformations. *Environmental Science & Policy,* 98**,** 70-76.

Wilches-Chaux, G. (1993). La Vulnerabilidad Global. *In:* Maskrey, A. (ed.) *Los desastres no son naturales.* Red de Estudios Sociales en Prevención de Desastres en América Latina.

Wisner, B. (2020). Five Years Beyond Sendai—Can We Get Beyond Frameworks? *International Journal of Disaster Risk Science,* 11**, (**2)**,** 239-249.

Wolfram, M. (2016). Conceptualizing urban transformative capacity: A framework for research and policy. *Cities,* 51**,** 121-130.

TABLE I

An operationalised framework for assessing equity in DRG	
Institutional relationships	Data
1) Structural criteria of equity in DRG: Inclusion and diversity of voice	
Diversity of actors: - What does the text say about actors and their roles in disaster risk governance? Cross-scalar interactions: - What does the text say about the cross-scalar collaboration (who / what / how / when)?	Diversity of conceptualisations in data: - What does the text say about the actors and their roles in disaster risk data? - What does the text say about the type of data being generated/used (e.g., human-social, environmental, physical)? Temporal and scalar range of data: - What does the text say about the data scales and temporal characteristics?
2) Processes for equitable local engagement: The role of and processes for engaging communities	
Building on local experience: - What does the text say about the role of communities & local institutions?	Accounting for local realities: what does the text say about the role of locally generated data?

Table I: Coding scheme for the document analysis with Taguette

TABLE II

Governance level	**Brazil**	**Colombia**
Federal / national	- National Protection & Civil Defence Policy (*Lei 12608, 2012*) (Congresso Nacional, 2012)	- National Disaster Risk Management (DRM) Policy (*Ley 1523 de 2012*) (Congreso de Colombia, 2012) - National DRM Plan 2015 – 2030 (UNGRD, 2022)
State / departmental	- RJ State Protection & Civil Defence Plan 2021 – 2022 (SEDEC-RJ, 2021)	- Antioquia Departmental DRM Plan 2022 – 2032 (DAGRAN, 2022)
Municipal	- Niterói Municipal Protection & Civil Defence Policy 2020 (Câmara Municipal de Niterói, 2020)	- Medellín Municipal DRM Plan 2015 – 2030 (DAGRD, 2015)

Table II: Policies analysed at the respective governance level

TABLE III

Multi-governance-level analysis	Institutional relationships	Data
Similarities between BRA / COL	+ Integration of stakeholders across policy silos – Implicit framing of communities choosing at-risk locations	+ Data integration across scales – Hierarchical relations of data actors: DR data needs determined top-down – Communities mostly information receivers – Community data primarily for early warning and response – Data focus on the 'naturalness of disaster'
Specific observations in BRA	+ Routine civil society engagement – Reactive involvement of local government actors – Passive engagement of communities	+ Routine government-research-community data sharing – Data sharing framed hierarchical – limited equitable engagement
Specific observations in COL	+ Cross-scalar government agency coordination + Mandate to account for differentials in vulnerability – Civil society involved on needs basis only (non-routine) – Communities only involved for physical vulnerability, social vulnerability not mentioned	+ Strong emphasis of cross-scalar and -sector data integration + Mandate to develop shared risk data governance – potential for diversity – Hierarchical framing of data integration as data interoperability

Table III: Discussion Summary Table: Potentials (+) and challenges (-) for equity in disaster risk governance in Brazil and Colombia at the three governance levels

Additional notes for the paper

Acknowledgements
This article is part of the UKRI Global Challenges Research Fund Project URBE Latam: Understanding Risks and Building Enhanced Capabilities in Latin American cities (2019 – 2022) (GCRF grant: ES/T003294/1, PI João Porto de Albuquerque). The authors are grateful to the entire project team from the University of Glasgow, the University of Warwick, Institución Universitaria Colegio Mayor de Antioquia, the Universidad de Antioquia, the Universidade Federal de Rio de Janeiro, CEMADEN Brazil, the British Geological Survey, and the Banco Comunitário do Preventório. The authors are also grateful to participants of the UK Alliance for Disaster Research 2022 conference for their feedback on a presentation of the preliminary results and to the anonymous peer reviewers for their comments.

Data Access Statement
The data supporting the findings reported in this paper are available from the Enlighten: Research Data repository at https://doi.org/10.5525/gla.researchdata.1512.

TABLE I

An operationalised framework for assessing equity in DRG	
Institutional relationships	Data
1) Structural criteria of equity in DRG: Inclusion and diversity of voice	
Diversity of actors: - What does the text say about actors and their roles in disaster risk governance? Cross-scalar interactions: - What does the text say about the cross-scalar collaboration (who / what / how / when)?	Diversity of conceptualisations in data: - What does the text say about the actors and their roles in disaster risk data? - What does the text say about the type of data being generated/used (e.g., human-social, environmental, physical)? Temporal and scalar range of data: - What does the text say about the data scales and temporal characteristics?
2) Processes for equitable local engagement: The role of and processes for engaging communities	
Building on local experience: - What does the text say about the role of communities & local institutions?	Accounting for local realities: what does the text say about the role of locally generated data?

Table I: Coding scheme for the document analysis with Taguette (table by authors)

TABLE II

Governance level	Brazil	Colombia
Federal / national	- National Protection & Civil Defence Policy (*Lei 12608, 2012*) (Congresso Nacional, 2012)	- National Disaster Risk Management (DRM) Policy (*Ley 1523 de 2012*) (Congreso de Colombia, 2012) - National DRM Plan 2015 – 2030 (UNGRD, 2022)
State / departmental	- RJ State Protection & Civil Defence Plan 2021 – 2022 (SEDEC-RJ, 2021)	- Antioquia Departmental DRM Plan 2022 – 2032 (DAGRAN, 2022)
Municipal	- Niterói Municipal Protection & Civil Defence Policy 2020 (Câmara Municipal de Niterói, 2020)	- Medellín Municipal DRM Plan 2015 – 2030 (DAGRD, 2015)

Table II: Policies analysed at the respective governance level (table by authors)

TABLE III

Multi-governance-level analysis	Institutional relationships	Data
Similarities between BRA / COL	+ Integration of stakeholders across policy silos	+ Data integration across scales

	– Implicit framing of communities choosing at-risk locations	– Hierarchical relations of data actors: DR data needs determined top-down – Communities mostly information receivers – Community data primarily for early warning and response – Data focus on the 'naturalness of disaster'
Specific observations in BRA	+ Routine civil society engagement – Reactive involvement of local government actors – Passive engagement of communities	+ Routine government-research-community data sharing – Data sharing framed hierarchical – limited equitable engagement
Specific observations in COL	+ Cross-scalar government agency coordination + Mandate to account for differentials in vulnerability – Civil society involved on needs basis only (non-routine) – Communities only involved for physical vulnerability, social vulnerability not mentioned	+ Strong emphasis of cross-scalar and -sector data integration + Mandate to develop shared risk data governance – potential for diversity – Hierarchical framing of data integration as data interoperability

Table III: Discussion Summary Table: Potentials (+) and challenges (-) for equity in disaster risk governance in Brazil and Colombia at the three governance levels (table by authors)