Article

The impact of urban inequalities on monitoring progress towards Sustainable Development Goal 11: methodological considerations

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Abstract: There is much discussion regarding the Sustainable Development Goals' (SDGs) capacity to promote inclusive development. While some argue that they represent an opportunity for collaborative goal-led and evidence-based governance, other voices express concerns as they perceive them as techno-managerial framework, that measures development according to quantitatively defined parameters and does not allow for local variation. We argue that the extent to which the positive or negative aspects of the SDGs prevail depends on the monitoring system's ability to account for multiple and intersecting inequalities. Attention to the role of inequalities for SDG monitoring is of particular importance for SDG 11 due to the additional methodological challenge posed by the need for sub-nationally (urban) representative indicators – especially in cities with intra-urban inequalities related to socio-spatial variations among neighbourhoods. Investigating the extent to which its representativeness is vulnerable to inequalities we systematically analyse the current methodological proposals for the SDG 11 indicator framework. The outcome is a call for 1) a more explicit attention to intra-urban inequalities, 2) the development of a methodological approach to "recalibrate" the city-level indicators to account for the degree of intra-urban inequalities, and 3) an alignment between methodologies and data practices applied for monitoring SDG 11 and the extent of the underlying inequalities within the city that is being assessed. This would enable an informed decision regarding the trade-off in indicator representativeness between conventional data sources, such as censuses and household surveys, and emerging methods, such as participatory geospatial methods and citizen-generated data practices.

Keywords: SDGs; urban inequality; urban governance; inclusive development; participatory geospatial methods; citizen-generated data; data practices; urban indicators;

1. Introduction

With the 17 Sustainable Development Goals (SDGs) and 196 targets over 15 years, there is no doubt that the member states of the United Nations have agreed to an ambitious plan with transformative potential for global development. Considering the 230 indicators to measure progress towards the targets, the challenge of coordinating the monitoring process in technologically and institutionally often very different national and sub-national contexts is a complex task.

Due to its subnational and spatial focus, Goal 11, to "make cities and human settlements inclusive, safe, resilient and sustainable"[1] (p.14) adds a further layer of complexity to the monitoring process. Variations in development among neighbourhoods pose a particular challenge to keeping the pledge "to leave no one behind" and "to reach the furthest behind first" At the city

level. Mediated by neighbourhood-specific socio-spatial factors, city dwellers' experiences of the issues SDG 11 aims to address (e.g. by measuring access to critical urban infrastructure) can vary significantly within the city. This raises the question regarding the extent to which the monitoring systems in their current form are able to account for these intra-urban differences. In other words, given the novelty of the urban goal, is localised implementation for SDG 11 reflected by sufficiently localised monitoring?

This question is of particular importance for cities with so-called slums and informal settlements. About a quarter of the global urban population and some 60% of city-dwellers in Sub-Saharan Africa live in neighbourhoods of this definition [2,3]. Yet, due to their legal and social status of being "informal", these communities are frequently invisible in the national statistical systems and geospatial databases the SDG monitoring framework relies on. The bias towards the formal embedded in conventional statistical methods may therefore negatively affect the representativeness of the SDG 11 indicators, especially in cities with so-called slums. This could lead to regressive policy outcomes which perpetuate multiple forms of intra-urban inequalities.

The question has not gone unnoticed in the international community. Given the pressing need for methodological innovation stemming from the new global urban focus, networks, projects and working groups consisting of scholars and practitioners are starting to explore and assess the use of emerging methods for data creation to fill these data gaps. This article aims to provide a conceptual frame to identify potential areas of vulnerability to intra-urban inequalities in the SDG 11 monitoring framework which could result in a reduction of indicators' representativeness. Awareness regarding these areas of vulnerability and their relation to the urban context is one of the first steps in the decision regarding the fitness-for-purpose of emerging methods for data creation to fill these gaps, such as public participatory geospatial methods and citizen-generated data practices.

As will be discussed in detail in the following section, this article also contributes to the debate regarding the effectiveness and potential of the SDGs in the context of the tension between localisation and global comparability. It also responds to the call for critical urban geography to engage with the most recent global development framework [4], and the special edition's invitation to critically de-construct the SDG goals, targets and indicators by questioning "which views are inscribed in a certain indicator?"[5].

The remainder of this paper is structured as follows: Section 2 provides the theoretical background and rationale for the analysis. It presents the latest scholarly discussions regarding the SDGs and provides an analytical framework to situate these. Section 2 also describes the mechanics through which the representativeness of the SDG 11 indicator framework could be affected by inequalities. Section 3 presents the research question which follows from the preceding discussion and the methodology for the analysis. Section 4 contains the analysis, followed by a discussion in section 5 and the conclusion with an outline of future work (section 6).

2. Background

2.1 The potential of the SDGs

The Sustainable Development Goals have a dual role as governance mechanism and monitoring framework. As governance mechanism, implementation refers to the establishment of institutional frameworks, strategies and budgetary provisions to achieve the targets the United Nations (UN) Member States propose to achieve by 2030. In their role as monitoring framework, the purpose of the SDG indicators is to assess the progress of equitable and inclusive development that "leaves no one behind" [1] (p.3). Localising the SDGs in their dual role implies "taking into account subnational [and in the case of SDG 11, urban] contexts when setting the goals and targets…and using indicators to

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measure and monitor progress." [6] (p.6). This triggered diverse reactions in policy and research that will be briefly analysed in the remainder of the section.

In its role as governance framework, some authors see an opportunity for improved governance through non-binding goals [7], although only if the implementation of the framework stimulates collaboration between civil society, government and the private sector for a just implementation of the SDGs [8]. Similarly, [9] perceive the SDGs as a policy window of opportunity for collective action for a just, fair and equitable translation of the SDG targets that is aware and explicit about the trade-offs (i.e. interlinkages) while ensuring accountability. Authors in this stream of SDG literature associate the success of this framework to the quality of governance arrangements at the national level. Some of the criteria of quality mentioned in the literature relate to sensitivity to interlinkages and co-benefits, accountability and flexibility to adapt the goals to the national context and a continuously changing operating environment.

In contrast, more critical voices raise concerns about the "top-down" character of the SDGs and their indicators. Pointing to the neoliberal notion of competitive performance measurement, they question the effectiveness of a target-driven development focus informed by quantitative data [10]; [11]. They argue that such an approach to development would lead to "progress [being] defined through quantitatively defined changes in incomes, and a supply-based view of urban services, education levels etc. This would be in contrast to a multi-dimensional rights-based view which accounts for the multiple identities of individuals, their collective actions, or the many other aspects of well-being and rights" [11] (p.172), thus overlooking the qualitative and often intangible aspects of development [10] [12]. At worst, they would be blind to the underpinning structural issues of political economy, thereby "saving the world without transforming it" [13] (p. 203). [14] makes a similar point in arguing that the four pillars of SDG 11 (inclusiveness, safety, resilience and sustainability) "can only be allocated/handed down: from those in power to those in need" (p.98) and do not address the root causes of social and environmental development challenges. Her view is that development should be driven by self-empowered communities acting as co-decision-makers in implementation. Attempts to reduce the proportion of slum dwellers through forced relocation or eviction, or the expansion of water supply without simultaneously addressing the multiple factors of that result in the area being more likely to suffer from droughts highlight the relevance of this argument [15] [11].

Regarding the SDGs' role as a monitoring framework, some authors argue that the general nature of the targets allows for freedom in interpretation from the bottom up [7], while others, such as [9], suggest that the lack of specificity reduces accountability. Relatedly, scholars are also concerned about the global Goals' need for aggregation as it dilutes the visibility of within-country variations in inequalities. Referring to the statistical problem of ecological fallacy, these authors point out that aggregated views may gloss over the needs of the most marginalised and vulnerable by celebrating average improvement at the national or city level [4] [10] [13].

The concerns regarding the undetected dynamics of political economy and the inequality-perpetuating effect of ecological fallacies lead to an issue directly related to localisation, which is the methodological challenge of measuring interdependencies among one-dimensional indicators to reflect the complexity of lived realities. An example is extreme poverty, currently defined as living on less than $1.90 a day, which, it is argued, may not accurately represent what *being poor* means in different geographical and social contexts. Critics call for multi-dimensional or even community-defined measures to complement the financial criterion of poverty [11]. Similar arguments apply to measuring access to improved sanitation, as the meaning of what constitutes "improved" varies according to the spatial context as well as gender-related, cultural, educational, and environmental factors and considerations [16] [17].

In the same vein, commentators criticise the lack of precise definitions of key concepts in the SDG framework, such as "resilient", "modern", "convenient" or "essential" [7],[11],[12],[18]. Interestingly, this call for precise definitions contradicts the aforementioned suggestions that the indicator parameters to measure progress (or lack thereof) should not exclude local variation by being too prescriptive.

Some scholars see a potential solution to this contradiction in obtaining disaggregated data by drawing on technology-enabled sources, including Big Data and social media analytics [7],[19], [20]. However, this view is not shared unequivocally. Taking a political view, [10] argue that such methodological approaches "enlist local citizens in a centralised national exercise of meeting preordained targets" (p. 584), and thus define inclusive practices as the range between passive data extraction and community consultation, where community input is restricted to choosing among a "set menu" of development options [14] (p.96). These approaches would again reinforce the techno-managerial view, overlooking, as [11] argues, the less quantifiable (and often context-specific) social needs.

Moreover, although there is significant progress in the use of remote sensing for generating urban data (see for example [21]), some authors (e.g. [22]) point to the presence of algorithmic bias and question the ability of algorithms used for the automated interpretation of satellite imagery to account for the local context. They, therefore, emphasise the need for contextual knowledge that is produced collaboratively to detect those location-specific and complex social needs, especially in marginalised urban communities.

2.2 Tensions inherent to the SDGs

The diverse scenarios commentators have painted regarding the potential of the SDGs point to an inherent tension in their role as governance and monitoring framework (see Table 1). Regarding governance, some authors suggest that the SDGs could lead to alignment among the horizontal and vertical levels of stakeholders involved in their localisation. More cautious voices refer to the lack of attention to power (and empowerment), as it may result in prescriptive structures with regressive outcomes. For the former stream of commentators, the effectiveness of SDG monitoring depends on institutional capacity and effective translation of the global goals and targets into the local policy context. However, questions related to *how* this happens (e.g. "which local priorities are emphasised?") and what determines the effectiveness of the global-to-local translation do not appear to have been investigated yet. Moreover, while sensitivity to power relations is undoubtedly a prerequisite as the more cautious stream of authors suggests, the potential of the latter affecting effective localisation has not been operationalised and systematically explored in the context of SDG implementation.

Table 1: Summary table: tensions within the SDG framework identified in the academic and grey literature

SDG framework dimensions	**Opportunities**	**Threats**
Governance approach	• opportunity for goal-led collective governance	• techno-managerial and prescriptive • no attention to power dynamics
Target definitions	• openness to bottom-up interpretation • potential for translation to the local context	• vague • lack of accountability

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Indicator parameters and methodology	• comparability among Member States due to the • application of the same criteria for measuring progress	• narrow, excluding local variation • quantitatively defined development, • ignoring qualitative, less tangible factors • potential for ecological fallacy
Data types and sources (conventional and emerging methods)	Opportunities arising from alternative, emerging methods • enhanced and efficient disaggregation that • facilitates the identification of interlinkages and trade-offs	Threats arising from alternative, emerging methods Alternative, emerging methods: • top-down, extractive data production ("enlisting citizens in data provision") • digital inequality perpetuating monitoring blind spots • based on centralised assumptions • excluding marginalised communities

The target definitions, which sit at the intersection between governance and monitoring, have similar characteristics. On the one hand, their often broad definitions enable a context-relevant translation. On the other, their general nature may result in an accountability (though not necessarily a power-) vacuum. Yet, targets and indicators with narrowly defined parameters, such as a financial or distance measure, may risk overlooking the multiple and locally differing dimensions of development. Similarly, while it may be useful for cross-Member State comparison, the need for consolidated averages hides potential tendencies of inequalities at the sub-national and intra-urban level.

In the face of these conflicting challenges at target and indicator level, technology-enabled disaggregated data promises to enhance representativeness. However, the critical response is that these technologies only increase the efficiency of "harvesting" data that are subsequently allocated into the pre-determined concepts. The latter may not necessarily coincide with local / neighbourhood-level definitions (for example, of what constitutes "basic", "improved" etc. urban infrastructure that [11] and [16] emphasised). Hence, the local interpretation of the SDG targets – and thus the needs of marginalised populations – may still be missed for monitoring if residents are enlisted into data provision, even if the data is citizen-generated and disaggregated.

The SDGs' inherent tensions in monitoring thus relate to the discrepancy between the vagueness [7] to allow local definitions to be applied, and the need for consistency and comparability in reporting as well as a pragmatic approach to use data sources which are within the current technological and institutional capacities of most 193 Member States. At the core of this observation is the question raised in the call for this special issue, which concerns the views that are built into the SDG monitoring framework – ranging from targets to the data.

Based on the observations in the paragraphs above we argue that the inherent tensions in the SDGs – whether they represent a framework with transformative opportunities or whether the potential of regressive threats prevails – depend on the effect of inequalities on monitoring. The latter result in variations in representativeness of local, context-specific experiences. In other words, whether the positive or negative aspects of the SDGs manifest depends on the extent to which inequalities are accounted for by the framework. However, as indicated above, although the critiques to date point in both directions, there does not yet seem to be any systematic attempt to understand the mechanics underpinning these inherent tensions in the SDGs.

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The overall aim of this paper, therefore, is to explore the extent to which the SDGs may be affected by inequalities. It will do so by assessing the current monitoring guidelines for localisation, answering the question whether (and under which circumstances) current localisation guidelines are "robust" against inequalities. The object of the case study is Goal 11 (make cities and human settlements, inclusive, safe, resilient and sustainable). The reasons for choosing this Goal will be explained in the following subsection.

2.3 SDG 11 in focus

With cities now being home to the majority of the global population [23], there is no doubt regarding their role in global development, especially considering the cross-sectoral character of urbanisation, which is reflected in the interlinkages of Goal 11 with all the other 16 SDGs [24]. However, what makes SDG 11 (see Table 2) particularly interesting as a case study for the purpose of this analysis is that it is the only Goal which focuses on development outcomes at the subnational (i.e. city) level. The drivers of the impact potential and mechanics of the above described tensions, therefore, need to be understood at the *intra*-city scale.

Regarding governance, for example, intra-urban inequalities mediate the effectiveness of localised implementation because in addition to the potential of priority regarding planning decisions being allocated according to economic power, the implications of informality (such as the lack of an official address) reduce the voice of the urban poor living in slums [25]. It also relates to differences in experiences among urban residents living in close distance to each other, such as gated communities with separate urban services in proximity of slum neighbourhoods with a more transient population (ibid.). Again, although the former can become "disconnected" from the rest of the city's collective concerns (ibid.), their discourse may still dominate the urban governance agenda and lead to interventions which overlook the ones furthest behind.

This is exacerbated by the tendency mentioned above of deprived urban communities to be under-represented in conventional data and relates to the degree to which the translation of definitions is context-relevant, the level of disaggregation and the residents' degree of visibility in the data. As already indicated above, much of the monitoring of the localised SDGs still depends on centralised data sources [26]. These include censuses, which may not provide the level of detailed questions required, or thematic surveys, such as Demographic and Health Surveys or Multiple Indicator Cluster Surveys, which for practical reasons (mostly cost) are not sufficiently large enough to leave no one behind (ibid.).

The following subsection will provide the theoretical background of inequalities. This will be followed by a more detailed discussion on the potential impacts of the inequalities on SDG 11 monitoring, which precedes the analytical part of the paper.

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Table 2: *SDG 11 targets and indicators [27] (p. 9)*

Targets	Current Indicators
SDG Target 11.1 By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums	**11.1.1** Proportion of urban population living in slums, informal settlements or inadequate housing. [Tier I]
SDG Target 11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.	**11.2.1** Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities. [Tier II]
SDG Target 11.3 By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries.	**11.3.1** Ratio of land consumption rate to population growth rate [Tier II] 11.3.2 Proportion of cities with a direct participation structure of civil society in urban planning and management that operate regularly and democratically [Tier III]
SDG Target 11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage	**11.4.1** Total expenditure (public and private) per capita spent on the preservation, protection and conservation of all cultural and natural heritage, by type of heritage (cultural, natural, mixed and World Heritage Centre designation), level of government (national, regional and local/municipal), type of expenditure (operating expenditure/investment) and type of private funding (donations in kind, private non-profit sector and sponsorship). [Tier III]
SDG Target 11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	**11.5.1** Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population [Tier II] **11.5.2** Direct disaster economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters [Tier I]
SDG Target 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	**11.6.1** Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities. [Tier II] **11.6.2** Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted). [Tier I]
SDG Target 11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities	**11.7.1** Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities. [Tier III] **11.7.2** Proportion of persons victim of physical or sexual harassment, by sex, age, disability status and place of occurrence, in the previous 12 months. [Tier III]
SDG Target 11.a Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning.	**11.a.1** Proportion of population living in cities that implement urban and regional development plans integrating population projections and resource needs, by size of city [Tier III]
SDG Target 11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels.	**11.b.1** Number of countries that adopt and implement national disaster in line with the Sendai Framework for Disaster Risk Reduction 2015-2030a. [Tier I] **11.b.2** Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies [Tier II]
SDG Target 11.c Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials.	**11. c.1** Proportion of financial support to the least developed countries that is allocated to the construction and retrofitting of sustainable, resilient and resource-efficient buildings utilizing local materials. [Tier III]

2.4 Inequalities

In development, inequalities have been conceptualised from several angles. The traditional framing of development indicators is based on income. If the level of well-being differs across income groups, they are referred to as vertical inequalities [28]. Horizontal inequalities cut across the economic categories and are related to social discrimination. These are based on group characteristics such as gender, race, ethnicity, or legal and migration status [29],[30] while spatial inequalities are differences in development associated with place-based characteristics, such as remoteness, high density or poor municipal infrastructure provision, and often coincide with intersecting inequalities [29] (Figure 1). Intersecting inequalities represent a particular challenge to development frameworks because they perpetuate unequal development trajectories among different groups in society. This means that even though the development indicator shows overall improvement, progress is slower for specific groups [28]). Intersecting inequalities are viewed as intensification (rather than grid) of two or more types of social, economic, demographic and spatial inequalities which exacerbate each other [29], [30]. Although a spatially equal city with intersecting inequalities is hypothetically possible [31] the groups who experience these inequalities simultaneously are the ones who are most persistently and furthest left behind [26].

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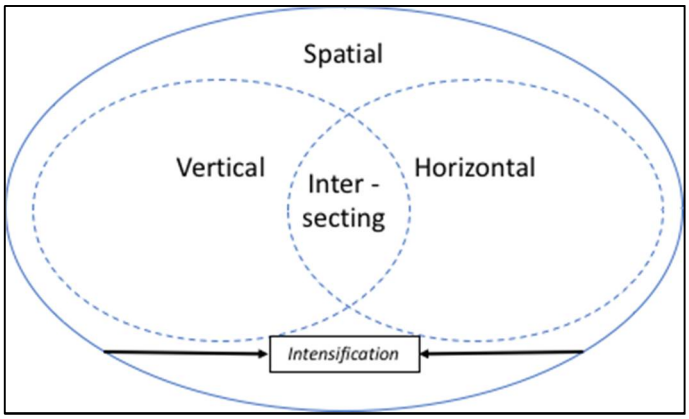

Figure 1: Conceptualising inequalities (own figure, based on Kabeer & Santos, 2017)

With their ability to open up and to enable active, and arguably more democratic, contributions to hitherto closed systems of knowledge [32]. Information and Communications Technologies (ICTs) are viewed as a levelling force [33]. Various forms of digital inequalities, however, prevent the development potential of the ICTs to be realised fully (ibid.). Scholars also argue that ICTs further intensify existing inequalities, specifically due to digital divides which limit access and effective use of ICT, such as ownership of hardware and software, connectivity, and lack of digital literacy and skills [33,34]. The latter result in secondary disparities between those who are able to contribute with data (e.g. through microblogging in social media), and those who are consumers or even entirely absent from the digital domain. Digital inequalities therefore often not only mirror but reinforce other forms of inequalities [33,35]).

An example of challenges arising from intersecting inequalities is mobility in Medellín. Although travel times were reduced at city level [36] residents living in the lower income neighbourhoods in the hills of the city, and especially female residents, still appear to be less mobile than people living in other areas as they struggle to pay for using the aerial cable car [37]. They, therefore, continue to be dependent on the informally provided buses which are less reliable, take longer to make their way through the hills and present a higher risk to personal safety for women. A spatio-temporal analysis of mobility of different social classes in Medellín indicated that the city's poorer residents face lower transport efficiency, i.e. they spend more time in transit for shorter distances than the wealthier sections who travel farther [38]).

This example shows that the combination of intersecting and spatial intra-urban inequalities results in differences in experiences among residents from different neighbourhoods of a city. The potential challenge this poses for representative implementation and monitoring will be discussed in the following subsection.

2.5 Inequalities and SDG 11

The western scholarly discussion on intra-urban inequalities goes back at least 2,500 years (arguably starting with Plato) [39]. Yet, with SDG 11 the global development focus on the city is only relatively recent. This Goal thus is the first globally coordinated commitment to establish institutional structures for the active promotion of governance- as well as monitoring systems to support and assess the multidimensional aspects of urbanisation, at a subnational level.

Given that it is being rolled out and adapted to heterogenous contexts, what ought to be considered when thinking about the potential impacts of intra-urban inequalities on the effectiveness and representativeness of this newly established framework? In terms of governance, institutional structures and processes for implementation at the city level have emerged already quite some time

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prior to the international community's decision to refocus on the city, albeit in a different policy context. From the 1980s onwards in large parts of the Global North, tendencies of decentralisation and (neoliberal) "responsibilisation" have resulted in governance structures and policy implementation increasingly being rescaled from the national to the regional and local levels [40,41]. These tendencies led to "responsibility for … general local-level governing practices [being shifted] to non-government subjects" [39] (p.247). This suggests that in countries where it has been applied, political decentralisation may have created precedents for localised implementation of SDG 11. The development outcomes of devolutionary policies are mixed and the subject of much discussion as they depend on a variety of factors (see, for example, [40],[42]) – not least the quality of the governance framework, which includes questions of voice and accountability, and agenda-setting by local elites ([43]).

Factors determining the extent to which SDG 11 governance outcomes are affected by inequalities, therefore, relate to the capacity to frame policy discourses and mobilise resources. [44] call for transformation in urban governance where "diverse residents of the different areas could get a real opportunity to articulate their views about what matters to them about their 'place', accompanied by real evidence of the *power* of their 'voices' to shape the [governance] discourses and practices" [emphasis added] (p. 1984). [14] has also pointed out that community participation should go beyond the expression of preferences among a predefined set of actions. In other words, with the goals representing agreement on the "what", such as the need for the provision of mobility in the form of convenient access to public transport, collective goal-led governance regarding the "how", i.e. the decisions about the mobilisation of resources to achieve these goals, can only be realised and prescriptive development paths avoided if governance processes are attuned to power imbalances derived from intersecting inequalities among the different areas within the city. Conversely, as [45] point out, polycentric governance approaches which are not explicit about power may still result in regressive policies: "…for polycentrism to meet its promise, its analysis and practice need to be much more explicit about power in order to …achieve better outcomes" (p. 2).

While the extent to which the potential of SDGs as *governance* framework is realised relates to the way intra-urban power balances manifest and are accounted for in the governance processes during localisation, the effectiveness of the SDGs as *monitoring* framework is mediated by its representativeness – its ability to make visible the different forms of inequalities.

Regarding the effect of inequalities on SDGs as monitoring framework, the lack of conceptual precision some authors had identified in the *target definitions* can be conducive to localisation – it may indeed be intentional – as it opens the framework up to local interpretations. [46] for example suggest that the framework should be understood as a "proxy" and guidance for localisation. Similar to other concepts with several definitions (such as resilience), the broadly defined targets could lead to reflective processes to arrive at localised definitions that encourage shared learning and act as horizontal (cross-sector) as well as vertical boundary spanner, in turn enhancing the effectiveness of the SDGs as governance framework.

However, conceptual openness to interpretation and uncritical operationalisation of the targets could also lead to regressive outcomes, as the concepts could be used to mobilise in favour of an undifferentiated and simplistic planning approach, which can increase vulnerability. This may especially be the case in cities with high intersecting inequalities, where intra-urban interpretations of the target definitions may be more diverse. As a result, the potential for interventions with clearly allocated accountability may be lower in this type of cities, and the likelihood of overlooking and perpetuating vulnerabilities higher.

The question regarding the extent to which inequalities could affect the representativeness of the *indicators* needs to be discussed in the context of the SDG indicator tier classification, which is as

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follows. The SDG indicators are categorised into three tiers, which are based on the indicators' conceptual clarity and data availability – both of which are assessed and defined by the Inter-agency Working Group on SDGs (IAEG-SDG), consisting of UN-agency, Member Countries' national statistical offices and other institutional stakeholder representatives, such as NGOs and academia. Tier III indicators are defined as indicators "with no internationally agreed established methodology or standards" [47] (p.4). A closer look suggests that this official definition refers to a lack of agreed definitions for the respective indicator, such as what constitutes public open space (indicator 11.7.1) – for example in some lower and middle-income countries "where satellite imagery [regarding public open space] does not match well with community-based mapping exercise" [47] (p. 78) –, sexual harassment (11.7.2), a city (11.3.2; 11.a.1), or small scale food producers (2.3.1 and 2.3.2). Other reasons for an indicator to be classified as Tier III appear to relate to the lack of an agreed methodology for data collection and for calculating the indicator, as in 1.4.1. Indicators in Tier II have defined parameters and established calculation methods, but limited data availability in the majority of member states. Tier I indicators have both, concepts that have been operationalised by the IAEG-SDG, and recent and periodically sourced data that is available from national statistical systems for at least half of the member states.

Some Tier, I and II indicators, are based on concepts which are at least as broad as the above-mentioned Tier III examples, and which also may vary across socio-spatial contexts. City dwellers' definitions of *convenience* in access to public transport (11.2.1) or *essential* health services (3.8.1) for example may vary according to horizontal, vertical, spatial and intersecting inequalities within the city. Yet, these indicator concepts are measured with comparatively narrowly defined parameters – a distance measure in the case of 11.2.1, and a set of 14 tracer indicators on healthcare provision for 3.8.1.

As already indicated further above, the narrow parameters may be due to practical considerations and the need for reaching a methodological compromise among 193 Member States with varying degrees of technical and institutional capacity and data availability – a conclusion which is similar to [46] suggestion that framework is understood as guidance for localisation. However, to reduce the width of a potential "implementation gap" [48], we argue that it is still important to investigate the monitoring framework's potential vulnerability to intra-urban inequalities.

Regarding *data* itself, [49]) remind us that inclusive development depends on the knowledge of marginalised groups being embedded into the data. Monitoring systems that do not reflect the "complex realities of people living at the margins of society" (p.1) risk reinforcing the multiple forms of inequalities. In the conventional data practices, such as census or household surveys this may be related to sampling frames being based on the formal constituents of a city, resulting in poor representativeness in cities where informal processes in housing, transport and other critical urban services play an important role of daily life [46]. Moreover, other surveys, which may be more inclusive and more frequent, such as the Demographic and Health Survey Program (DHS) (funded by USAID and implemented by ICF International) or the Multiple Indicator Cluster Surveys (MICS) (implemented nationally and developed by UNICEF) have a specific thematic focus and thus may have limited value for indicators outside their focus.

Monitoring challenges related to spatial inequalities may also be due to practical issues, for example in the case of physical barriers to access to conduct the survey, or outdated censuses – especially in slums which have a high proportion of transitory population. Undercounting the most vulnerable in the city may also be related to political reasons and "socially constructed census tracts" [11] (p. 177), as well as underreporting due to fear of stigmatisation which may bias household survey replies from respondents from marginalised communities [49] [50]. [50]) also highlight the problem of household surveys with sample sizes that are often too small (e.g. only distinguishing between urban/rural) to capture the development outcomes of the most marginalised urban residents as well

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as the lack of granularity, both of which compound the problem of ecological fallacy [11] and colleagues have referred to in the context of the aggregated indicators.

Referring to the data revolution [51] and echoing notions of the digital divide, [49] also warn against the assumption that data from digital repositories (e.g. social network data or Big Data) increase the visibility of marginalised communities and representativeness "if the way digital data is produced is exclusionary" (p. 2), as it depends on "who controls the new systems and determines what knowledge they produce, who has access to the data, who interprets them, and of course, what they are used to achieve" [46]: p. 96). These authors, therefore, call for participatory and open data practices which are both top-down and bottom-up, for the data to accurately reflect the multi-dimensional complexities of the lives of marginalised communities [46] [49].

This subsection has described the factors to consider when thinking about the degree to which the SDG monitoring framework could be affected by inequalities. The following section will present the refined research question for the analysis in the context of SDG 11 and the methodological approach for addressing it.

3. Research question and methodology

Section 2 has established that in the urban context, the inherent tensions in the SDG framework authors had pointed at from various angles depends on whether it is attuned to the underlying inequalities within the city. We also argued that SDG 11 monitoring faces particular challenges due to the need for subnational/city level data and the varying presence and types of intra-urban inequalities. The conceptual gap that follows from this is that although there has been an extensive debate regarding the development potential of the SDG framework, the question of how inequalities mediate the degree of effectiveness of the SDGs as monitoring framework, and specifically the indicator parameters and their data requirements and practices for representatively and meaningfully localising the SDGs has not been addressed yet.

Given the overall research aim described in subsection 2.2, the **research question** is – to which extent could the representativeness of the SDG 11 indicator and data framework be affected by intersecting intra-urban inequalities? In other words, how vulnerable to intersecting intra-urban inequalities are the current operational proposals for SDG 11 monitoring?

In terms of **methodology**, this question will be answered by a review of documentary evidence regarding the provisions to account for inequalities in the methodological and data proposals for monitoring SDG 11 addressed at Member State monitoring practitioners. Following UN-Habitat guidance (pers. comm.) these documents comprise the following:

- the SDG 11 metadata document [47]; this document comprises the main methodological issues and challenges, the proposed methodologies and data sources for measuring the SDG 11 indicators;
- the SDG 11 High Level Political Forum progress report [24]; this report was prepared for the 2018 United Nations Political Forum, which reviewed the latest global trends as well as methodological advances for monitoring SDG 11; and
- documentation used for training the National Statistics Offices and other stakeholders involved in monitoring in the Member States, such as the latest versions of the SDG 11 training manuals, including data collection checklists [52].

Adhering to the indicator sequence of SDG 11, the targets and indicators were categorised according to the degree to which they accounted for intra-urban inequalities in the target definition, the indicator definition and parameters, and the data sources and production methods to inform the indicator. The analysis focused on those indicators whose development outcomes directly affect the

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quality of life of urban residents and where intra-city variations are likely to occur in cities with high levels of inequalities. These are 11.1.1 (proportion of people living in slums, informal settlements and inadequate housing), 11.2.1 (convenient access to transport), 11.5.1 (number of deaths, missing persons and directly affected persons attributed to disasters), 11.6.1 (urban waste collected), 11.6.2 (annual mean levels of particulate matter), 11.7.1 (share of built-up area that is open space for public use for all), and 11.7.2 (proportion of persons victim of physical or sexual harassment). The other SDG 11 indicators either refer to administrative and financial interventions and denominators or only indirectly affect the residents' experienced quality of life.

The level of salience of intra-urban inequalities is assessed according to the following criteria:

1. For the target definition: level of reference to inequalities: universal (for example, "equal access" or "access for all"), targeted, mentioning specific vulnerable groups, or no reference; the question here is: "to which extent does the target definition refer to the potential existence of urban inequalities?"
2. For the indicator: disaggregation requirement indicating sensitivity to vertical, horizontal and/or spatial intra-urban inequalities; here the question is: "do the indicator definition and parameter disaggregation requirements reflect sensitivity to the three types of intra-urban inequalities?"
3. For the data sources and production methods: proposed degree of participation, ability to capture marginalised urban communities (currently and ideal case/future data sources and production methods, depending on institutional and technological capacities); referring to the observations regarding data in subsection 2.5, we asked, "are the proposed current, future and ideal data sources and production methods able to bring intra-urban inequalities into the picture?".

1., 2. and 3. represent an increasing scale of operationalisation in SDG 11 monitoring. Implementation gaps (see Table 3) may emerge in the form of a conceptual implementation gap, for example where the target definition accounts for inequalities but the indicator relies on narrowly defined parameters. There may also be a practical implementation gap, for example where parameters aim to capture intra-urban inequalities, but data practices do not yet exist to provide the required level of disaggregation. With an accepted monitoring methodology and data sources, only Tier I indicators may have both types. For Tier II indicators the analysis looked for conceptual implementation gaps and the *potential* of practical implementation gaps based on the *proposed* data sources, while the "inequality vulnerability assessments" of the two Tier III indicators was based on the theoretical discussions and proposals in the guidance documents for the monitoring stakeholders. It is possible that in some cases these implementation gaps are interdependent.

The categorisation thus also reflects the indicator Tier status by including the minimum/current and ideal case/future proposals regarding methodology and data, which allows for variations in local technological and institutional capacities. Table 3 summarises the methodological approach.

Table 3: The methodological approach

Operationalisation ↓

SDG 11 monitoring element	Criteria	
Target definition	• "Equal" / "access for all" etc.	Conceptual implementation gap?
Indicator parameters and methodology	• Aspects of inequality covered – indicating sensitivity to intra-urban inequalities (vertical, horizontal, spatial)	
Data sources and production methods	• Data disaggregation – ability to make intra-urban inequalities visible • Proposed degree of citizen participation • Sources' and production practices' ability to capture marginalised urban communities	Practical implementation gap?

For a systematic analysis the methodological approach has been operationalised with the following questions:

Table 4: The operationalised methodological approach for this study

A) Target definition	1. Does it refer to inequality?
B) Indicator parameter(s)	1. Does it propose to assess various forms of inequality? 2. Does it propose intra-urban spatial differentiation?
Data sources and production methods	1. Are the proposed data sources and production methods capable of reflecting multiple forms of inequality? 2. Do the proposals suggest data disaggregated at the neighbourhood level?
C) current	
D) ideal / future	

4. Analysis

4.1 Target 11.1 / Indicator 11.1.1 (Tier I)

Progress towards Target 11.1: *By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums* is measured by indicator 11.1.1 – the *proportion of urban population living in slums, informal settlements or inadequate housing* p.10). As this target by definition deals with intra-urban inequality, its representativeness can only be affected by implementation gaps.

Referring to housing deprivation in the form of "slums", "informal settlements" and "inadequate housing", this indicator reflects the relative nature of intra-urban inequalities regarding housing by operationalising the target along parameters for urban service accessibility, the character of the building structure, tenure, spatial context, affordability and cultural adequacy [47]. The possibility of intersecting inequalities, therefore, appears to be accounted for in the parameters of this indicator.

The Metadata specifically refers to spatial inequalities by calling for disaggregated data at intra-urban level. Intersecting inequalities are also addressed with household level data on gender, ethnicity, income and disability [47]. There, however, appears to be a practical implementation gap to inform housing adequacy (especially regarding affordability, accessibility and cultural adequacy). The HLPF Synthesis report indicates that there is currently limited technical capability to collect data in this regard [24].

The main data sources and practices currently proposed in the training documentation refer to census data, DHS, and MICS [52]. Representativeness regarding potential intra-urban inequalities, therefore, depends on the inclusivity of the census and thematic relevance of the complementary surveys (see replies to C1) and C2) in Table 5).

Future data production methods the HLPF Synthesis report refers to, such as the combination of satellite imagery analysis in combination with participatory slum mapping [24], are likely to enhance the indicators' ability to reflect bottom-up perceptions of multiple forms of inequality. Table 5 shows the assessment of indicator 11.1.1 in response to the corresponding questions listed in the operationalised methodological approach above.

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Table 5: Inequality vulnerability assessment of Indicator 11.1.1

Question	Assessment
A1)	Direct / universal
B1)	Yes
B2)	Yes
C1)	inclusivity of data practices
C2)	inclusivity of data practices
D1)	Yes
D2)	Yes

4.2 Target 11.2 / Indicator 11.2.1 (Tier II)

Target 11.2. aims to, "by 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons" [47] (p. 21). It calls for equity in access to transport, specifically refers to forms of intersecting inequalities (such as gender, often intensified by spatial inequality -resulting in a positive assessment for question A1) and is measured by the "proportion of population that has convenient access to public transport, by sex, age and persons with disabilities" [47] (p. 21). Convenience in access to transport currently is operationalised with a distance parameter (no more than 500 metres walking distance from a frequently visited reference point, such as a home, a place of employment, market or other commercial centres) [47]. Although distance is a spatial factor, it does not reflect spatial intra-urban inequalities, as the adequate distance may vary according to the density and other structural characteristics of a neighbourhood (see corresponding responses to question B1 and B2).

In its current version, this indicator is vulnerable to various forms of inequality, which is due to both, a conceptual and practical implementation gap. As already mentioned as an example in the background section, the distance parameter limits the representativeness of "convenience in access" in cities with multiple forms of intra-urban inequalities. Acknowledging this vulnerability, the HLPF Synthesis Report points to the challenges of intersecting inequalities in urban mobility [24]. Both metadata and HLPF Synthesis Report emphasise the need for further methodological refinement regarding the parameter for "convenient access" and relatedly, the technological capacity to produce data for informing it.

In terms of data, the current parameter relies on geospatial data for the location of public transport stops and population served, drawn from conventional sources, such as the city administration or service providers, or open data, such as OpenStreetMap [47]. The potential of the data sources currently proposed in the guidance material for national stakeholders [52] to generate representative data, therefore, depends on the inclusivity of the data practices for generating the data (response to C1). With the aim to establish buffer service areas, the indicator's focus is by definition intra-urban (C2). The positive assessments for D1 and D2 reflect the methodological proposals for enhancing representativeness regarding intersecting inequalities. These include origin-destination surveys to measure convenience in access to opportunities (as opposed to transport stops), the inclusion of informal transport systems in monitoring, as well as open-source trip planning platforms, which can increase the visibility of transport needs of marginalised communities.

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603 **Table 6:** Inequality vulnerability assessment of Indicator 11.2.1

Question	Assessment
A1)	Both universal and targeted
B1)	No
B2)	No
C1)	inclusivity of data practices
C2)	Yes
D1)	Yes
D2)	Yes

604

605 *4.3 Target 11.5 / Indicator 11.5.1 (Tier II)*

606 Target 11.5. focuses on preventing and reducing the impact of disasters. It proposes by 2030 to
607 "significantly reduce the number of deaths and the number of people affected and substantially
608 decrease the direct economic losses relative to global gross domestic product caused by disasters,
609 including water-related disasters, with a focus on protecting the poor and people in vulnerable
610 situations" [47] (p. 47). The number of casualties is monitored by indicator 11.5.1, which measures
611 the "number of deaths, missing persons and directly affected persons attributed to disasters per
612 100,000 population" (ibid.). This indicator definition reappears in two non-urban specific SDGs, in
613 the form of 1.5.1. and 13.1.1.
614
615 With the explicit focus on poor and vulnerable communities, inequalities feature indirectly in
616 the target definition (A1). The metadata also specifically mention the intersecting inequalities as
617 poorer communities often face a higher risk environment (e.g. due to spatial inequality) and tend to
618 have less ability (at least financial) to recover [47]. Yet, the element pointing at the heightened
619 exposure an increased impact burden due to inequalities is not translated into the indicator definition
620 (B1). This constitutes a conceptual implementation gap. There is also no reference to intra-urban
621 inequalities (B2), which may be due to the indicator being used for measuring progress towards non-
622 urban specific targets and the United Nations Office for Disaster Risk Reduction (UNISDR) carrying
623 the main responsibility for methodological development.
624
625 This is a Tier II indicator and thus still faces significant challenges regarding data availability.
626 The main data source to inform this indicator are the national disaster loss data bases [47] [24]. The
627 latter is a UNISDR platform for compiling data spread across national and municipal entities as well
628 as non-state stakeholders, such as emergency aid NGOs, and data from wider sources, such as media
629 and institutional reports.
630
631 Lack of accessibility and data sharing protocols among the various stakeholders play an
632 important role in the methodological challenges for this indicator. The question whether the
633 proposed data practices are able to reflect inequalities regarding the impacts of disasters at the intra-
634 urban level, as suggested in the target, depends on the data practices to populate the national disaster
635 loss databases promoted by UNISDR (C1, C2). The potential of future data practices envisaged for
636 this indicator to enhance representativeness regarding intra-urban inequalities related to the impacts
637 of disasters still requires further methodological discussion (D1). The metadata propose for the data
638 to ideally be disaggregated to municipality level, thus limiting insights into inequalities at intra-city
639 level (D2) and the attributes of the affected population "as relevant as possible" [47] (p.51), which
640 opens the data practices up to the potential of perpetuating the underrepresentation of marginalized
641 communities (D2). The HLPF Synthesis Report however refers to crowdsourced and community
642 generated data [24], which enhances the potential of enhanced representativeness (D2).

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643
644 **Table 7:** Inequality vulnerability assessment of Indicator 11.5.1

Question	Assessment
A1)	Targeted
B1)	No
B2)	No
C1)	inclusivity of data practices
C2)	inclusivity of data practices
D1)	not defined
D2)	mixed

645

646 *4.4 Target 11.6 / Indicator 11.6.1 (Tier II) and Indicator 11.6.2 (Tier I)*

647 Target 11.6 aims to reduce cities' adverse per capita environmental impact, specifically waste
648 and air pollution. Indicator 11.6.1 proposes to monitor urban waste management by measuring the
649 "proportion of urban solid waste regularly collected and with adequate final discharge out of total
650 urban solid waste generated by cities" [47]. Although target and indicator do not explicitly refer to
651 intra-urban inequalities regarding the production and collection of municipal solid waste (see
652 assessment for question A1), the HLPF Synthesis Report does emphasise the presence of intra-urban
653 inequalities related to informality, as currently only 10% of solid waste in poor settlements is being
654 collected [24].
655
656 To address the lack of data on the *demand* for waste management in slums in particular, the
657 metadata propose data collection with household surveys on waste generation in lower-and middle-
658 income countries. A differentiation along horizontal and vertical inequalities is therefore being
659 considered and possible (see B1 and B2 – first part of the assessment). Demand for waste management
660 in higher income countries will be estimated based on the average per capita waste generation (B1
661 and B2 – second part of the assessment).
662
663 Monitoring regarding service *provision* focuses on treatment/disposal capacities and a qualitative
664 assessment of the treatment facilities. "Adequacy" of waste collection thus is operationalised
665 regarding technological/environmental capacities of treatment and disposal. In contrast to waste
666 generation (demand), intra-urban spatial differentiation regarding service provision is not proposed,
667 even though the HLPF Synthesis Report refers to an increased incidence of children with respiratory
668 diseases in households located in neighbourhoods where waste is poorly managed ([24];) (B1 and
669 B2).
670
671 The current indicator parameters proposed for this indicator are likely to be affected by intra-
672 urban inequalities. In the case of the demand identified with household surveys, representativeness
673 depends on the degree of inclusivity (e.g. whether informal neighbourhoods are sampled) and
674 granularity of geospatial references (see reply to C1).
675
676 Considering this indicator's limited explicit conceptual attention to intra-urban inequalities no
677 further methodological development is proposed in this regard (D1, D2). Efforts to improve data
678 availability are focused on data regarding both demand for and supply of municipal waste collection,
679 which currently is limited, scattered amongst stakeholders and varied in spatial scale and typology
680 (e.g. related to seasonal variations, type of waste included).
681

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Indicator 11.6.2, measuring the annual mean levels of fine particulate matter in cities [47], is a Tier I indicator. However, even though methodology and data availability are defined, questions regarding intra-urban and spatially dependent differences in exposure are not raised (see assessment for A1, B1 and B2). Moreover, even though intra-urban monitoring is technically possible [47] [24], current proposals aim to report at city, not intra-urban level (see responses to questions C2, D2 in Table 7), which can lead to ecological fallacies. There is no current nor future explicit focus on the exposure of marginalised or vulnerable groups to fine particulate matter (see Table 7 – responses to questions C1 and D1).

Table 8: Inequality vulnerability assessment of Indicator 11.6.1 (municipal waste treatment and disposal)

Question	Assessment
A1)	No reference to inequalities
B1)	service demand - vertical and horizontal possible / supply no
B2)	no
C1)	depends on inclusivity/supply no
C2)	depends on inclusivity/supply no
D1)	None mentioned
D2)	None mentioned

Table 9: Inequality vulnerability assessment of Indicator 11.6.2 (annual mean levels of PM - air pollution)

Question	Assessment
A1)	No reference to inequality
B1)	No
B2)	No
C1)	No
C2)	No
D1)	No
D2)	No

4.5 Target 11.7 / Indicator 11.7.1 (Tier III) and Indicator 11.7.2 (Tier III)

Target 11.7 directly refers to aspects of horizontal (in)equality by aiming to "provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities, by 2030" [47] (p. 70) (see A1 in Table 10). Indicator 11.7.1, measuring the "average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities" (ibid.) operationalises this aim for monitoring by calling for data which is disaggregated along demographic attributes. Depending on the inclusiveness of the data sources, this enhances the indicator's sensitivity to horizontal inequalities regarding access to open space (B1). Spatial and vertical inequalities are not referred to in the parameter definition (B2), despite the HLPF Synthesis Report's suggestion that use of public space for leisure is higher for urban residents with lower incomes [24].

The data practices proposed for informing this indicator consist of satellite imagery digitisation, complemented with ground-truthing as well as community-based maps to establish ownership

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(public or private) and complement non-existent or outdated municipal inventory lists of public spaces. The ideal data practices proposed for this Tier III indicator are thus likely to capture inequality-related differences in access and interpretations of public space across neighbourhoods (D1 and D2). Where implemented, this indicator is therefore likely to accurately represent potential inequalities regarding access to public space in cities.

Table 10: Inequality vulnerability assessment of Indicator 11.7.1 (access to public open space)

Question	Assessment
A1)	Targeted
B1)	Yes - horizontal
B2)	No
C1)	n/a (Tier III)
C2)	n/a (Tier III)
D1)	Yes
D2)	Yes

Indicator 11.7.2 (Tier III) measures the "safe access" aspect of target 11.7 by monitoring the "proportion of persons victim of physical or sexual harassment, by sex, age, disability status and place of occurrence, in the previous 12 months" [47] (p. 81). While the indicator definition accounts for the possibility of horizontal inequalities, the documents mention that there is uncertainty regarding a universal agreement on the definition of "sexual harassment" [47]. "Place of occurrence" in the indicator definition represents a non-spatial typology (home, workplace, street). The indicator, therefore, does not account for spatial inequalities in its current version (see replies to B1 and B2 in Table 11).

The likelihood that physical and sexual violence is underreported due to gender inequality is compounded by the lack of disaggregated data, which currently mostly only report the type of crime, and consistent reporting methods (some countries have dedicated surveys, while others provide a specific module in the DHS (see replies to C1 and C2 in Table 11).

Future data practices mentioned in the SDG 11 guidance documents include participatory geo-spatial methods. It can, therefore, be expected that the practical implementation gap regarding the availability of data which can make visible horizontal, as well as intra-urban spatial inequalities, can be reduced (see replies to D1/D2).

Table 11: Inequality vulnerability assessment of Indicator 11.7.2 (victims of physical or sexual violence)

Question	Assessment
A1)	Targeted
B1)	Yes - horizontal
B2)	No
C1)	depends on inclusivity of data practices
C2)	depends on inclusivity of data practices
D1)	Yes
D2)	Yes

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5. Discussion

The seven SDG 11 indicators and their related targets chosen for the analysis of the SDG 11 monitoring framework's ability to account for intra-urban inequalities are characterised by the immediacy of their focus areas. Housing, access to public transport, impact of disasters, solid waste, air pollution, access to green and public spaces, and personal safety directly affect how people experience daily life in their neighbourhoods. However, the analysis suggests that not all of these indicators similarly account for the possibility of urban residents not being equally able to realise their rights to access or protection, which are at the core of Goal 11 (see Table 12 further below).

While four out of the five target definitions analysed provide some kind of consideration regarding vertical or horizontal inequalities, the possibility of spatial inequalities does not feature at the target level. Moreover, half of the targets assessed emphasise the possibility of specific horizontal inequalities, yet the relation between target definition and indicator parameters regarding attention to vertical and horizontal inequalities is not always direct. This suggests that there are conceptual implementation gaps – especially in the Tier II indicators that were analysed in this paper (see 11.2.1, 11.5.1, 11.6.1). Crucially, except for 11.1.1 (which by definition measures spatial intra-urban inequalities), the significance of the intra-urban spatial context does not appear to be considered in the indicator parameters. This is especially important considering that the HLPF Progress Report points to the impacts of intra-urban spatial inequalities in several indicators [24] (11.1.1, 11.6.1, 11.6.2, and 11.7.1).

The degree to which the representativeness regarding intra-urban inequalities of the two Tier I indicators is affected by practical implementation gaps is debatable, as indicator 11.1.1 currently relies on conventional sources, and 11.6.2 does not consider any types of intra-urban equalities in the first place. With most of the Tier II indicators proposing the use of conventional, centrally administered data sources as the basis for monitoring with the potential of undercounting informality due to limited sampling frames.

The conceptual and methodological openness of the two Tier III indicators provides an opportunity for enhanced representativeness. Their challenges relate to the lack existing conventional datasets and the need for emerging data practices that are able to result in disaggregated data at group level and provide spatial detail at neighbourhood level, incorporating local meaning of green and public space (11.7.1) and victims' perceptions of experiences and risk of physical and sexual violence (as opposed to top-down defined concepts).

Much of the indicators' robustness against the risk of perpetuating intra-urban inequalities therefore currently depends on the inclusiveness of the data practices used to inform them. Encouragingly, the guidance documents acknowledge the need for intra-urban differentiation regarding the multiple forms of inequalities, as the "ideal/future case scenario" of most of the indicators calls for data which is disaggregated at the intra-urban level.

Given the SDGs' mandate to "leave no-one behind" and "reach those furthest behind first", the response to the research question is the following:

1. The SDG 11 monitoring framework would benefit from a more prominent position and emphasis of intra-urban inequalities at the conceptual/definitional level across all targets and indicators. This would be essential for closing the conceptual implementation gaps in the short term and create awareness of the former among monitoring stakeholders.
2. In the medium term, a methodological approach to "recalibrate" the city-level indicators to describe the degree of intra-urban variances regarding the outcomes of the respective SDG 11 indicator, especially in cities with a high degree of inequalities (such as cities with slums), may be worth of further investigation.

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3. In the long term, the practical implementation gaps may be closed with the emergence of methodologies and data practices which allow for intra-urban perspectives and differences in experiences.

Table 12: Assessment summary table

	11.1.1 (T I)	11.2.1 (T II)	11.5.1 (T II)	11.6.1 (T II)	11.6.2 (T I)	11.7.1 (T III)	11.7.2 (T III)
A1)	Universal	Both universal and targeted	Targeted	No reference to inequalities	See 11.6.1	Targeted	See 11.7.1
B1)	Yes	No	No	11.6.1a: service demand - vertical and horizontal possible 11.6.1b: supply no	No	Yes - horizontal	Yes - horizontal
B2)	Yes	No (set distance criterion)	No (people affected – non-spatial context)	No (non-spatial demand and supply criteria)	No	No (city-level)	No (non-spatial categorisation of place)
C1)	depends on inclusivity of data practices	depends on inclusivity of data practices	depends on inclusivity of data practices	11.6.1a: depends on inclusivity 11.6.1b: supply no	No	not defined	depends on inclusivity of data practices
C2)	depends on inclusivity of data practices	Yes	depends on inclusivity of data practices	11.6.1a: depends on inclusivity 11.6.1b: supply no	No	not defined	depends on inclusivity of data practices
D1)	Yes	Yes	not defined	None mentioned	No	Yes	Yes
D2)	Yes	Yes	mixed	None mentioned	No	Yes	Yes

6. Conclusion and future work

In the context of the discussions regarding the SDGs' effectiveness and potential for progressive development, we have argued in this paper that the prevalence of opportunities or threats in the SDG 11 monitoring framework depends on the extent to which intra-urban inequalities are accounted for. We further suggested that this could be done by addressing two types of implementation gaps in the monitoring system, which, if left unaddressed, are likely to contribute to perpetuating the three types of inequalities scholars had identified. This specifically relates to spatial intra-urban inequalities, which are not reflected in most of the analysed indicator parameters. Moreover, with emerging participatory geospatial data practices being adopted, it will increasingly be possible to use them to complement the currently proposed conventional data sources and practices, such as census and household surveys.

Complementing the above with locally produced indicator samples that incorporate local meaning could become an important element for localisation as it can "recalibrate" the national or city-level indicator outcome, resulting in a more complete picture regarding intra-urban variations,

which is of particular importance of cities with so-called slum neighbourhoods. Extending UN-Habitat's National Sample of Cities methodology, which "takes into account sub-regional and city specific characteristics and variances can be used to monitor the dominant pattern in the country's cities in an aggregated manner" [53] (p. 4), such an approach could be in the form of an Urban Sample of Neighbourhoods. The purpose of such a sample would be to obtain insight regarding the intra-urban variances of a city's neighbourhoods, which in turn could be fed into the National Sample of Cities.

As suggested earlier, inequalities in cities have been the focus of scholarly discussion for over two millennia (at least in the "West"). SDG 11 is one of the first globally coordinated attempts to deal with them. It will take some time to adapt the monitoring and governance systems, and technological and institutional capabilities to be able to account for them systematically. This paper is one small contribution towards that direction and hopefully sparks further discussions among the stakeholders in urban policy, services provision and civil society who collectively can bring about these incremental changes.

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