Introduction

The 2030 global agenda for sustainable development stresses the importance of rapid urbanisation as both a challenge and solution to the most pressing global issues. International agreements such as the Sendai Framework for Disaster Risk Reduction (2015), the Addis Ababa Action Agenda (2015), the Paris Agreement (2015), the establishment of 17 universally applicable Sustainable Development Goals (SDGs) (2015), and more recently the New Urban Agenda (NUA) (2016) all highlight the role cities have to play in paving the way to more sustainable, inclusive and resilient futures. Many observers have, however, highlighted that city governments across the world lack even the most basic knowledge about the type of urban dynamics at play. This makes it difficult to design and implement adequate policy interventions in response to rapid urban growth, infrastructure development and housing needs, and to support basic services provision, etc. (Acuto and Parnell 2016; Barnett and Parnell 2016; McPhearson et al. 2016; Caprotti et al. 2017). In parallel, several scholars have called not only for producing more knowledge about cities and urban developments, but also for paying greater attention to the modes of production of urban knowledge itself. These scholars indeed argue that the politics and conditions underlying knowledge production should be examined critically, in order to facilitate the inclusion of non-technocratic – yet very much needed - types of knowledge in urban decision-making processes (Watson 2014; Simon et al. 2016). The following paper contributes to this debate, exploring the governance of urban knowledge production globally. Our study is based on the review of over twenty global urban data initiatives and a two-day workshop and interviews with 32 experts involved in the discussions on how science could better inform the implementation of the SDGs and the NUA. This research seeks to understand who gets to participate in urban knowledge production globally; and whose knowledge is recognised as legitimate in global urban knowledge structures. In doing so, it highlights current gaps and limitations of the existing

global urban knowledge base and provides avenues to inform the design of a more inclusive and policy relevant urban science. The paper proceeds as follows: the first part briefly contextualises the research by providing an overview of current debates on the politics of urban knowledge and its implications for the implementation and monitoring of the NUA. The second section presents our methodological approach. The third section discusses key findings from the workshop and the review of global urban databases. It highlights that the global urban knowledge architecture in its current form is ill-prepared to support cities' efforts towards the realisation of the NUA. The production of urban knowledge globally needs to be made more inclusive and relevant to local needs if it is ever to inform the design, implementation and monitoring of sustainable urban strategies. The concluding section elaborates on the implications of these findings going forward.

Whose knowledge matters? Unpacking the politics of urban knowledge production in the context of the NUA.

The Habitat III and New Urban Agenda (NUA) process recognised the need for greater horizontal and vertical collaboration between local and national governments, community groups, professional organisations, higher education institutions, research institutes and the private sector in UN-led decision-making processes related to urban matters (e.g. Hunziker 2015; UN Habitat 2015; Birch et al. 2016; Rode and Saiz 2016; Global Taskforce of Local and Regional Governments 2017). To address this need, the General Assembly of Partners and the World Urban Forum were created in an attempt to broaden the voices involved in the Habitat III conversation and the discussion of the NUA. This rise of new governance arrangements and platforms for multi-stakeholders collaboration, highlight the recognition of the importance of collaboration between diverse (governmental and non-governmental) actors at different levels for more effective policies and regulations (e.g.

Karkkainen 2004; Lobel 2004; Holley and Gunningham 2011). But it also raises questions at to how different, technical and non technical, ways of knowing the city can be included in decision making processes.

Research on the production of knowledge has indeed highlighted its central importance for urban decision-making. This centrality is evident in research on the production and dissemination of urban best practices and other blueprints guiding urban development across the world (e.g. McCann and Ward 2011; McFarlane 2011; Campbell 2012), as well as in research exploring and questioning the power structures underlying processes of inclusion and exclusion of specific types of knowledge in urban policy-making (e.g. Watson 2014; Patel et al. 2015; Barnett and Parnell 2016). Existing literature on policy mobility has explored in depth the dissemination of urban knowledge globally (McCann 2010; McCann and Ward 2012; McFarlane 2011; Peck and Theodore 2012), through international study tours to foreign cities (Cook et al. 2015), global conferences and events (Cook and Ward, 2012), global city networks (Acuto 2016), transnational policy networks (Legrand 2016; Stone 2004). Competition across places has created a vibrant market for urban expertise as a product in itself (Ward and Jonas 2004), contributing to the production of urban knowledge that is poorly sensitive to local specificities and that is predominantly informed by "accepted wisdom" (Kirby 2013). Indeed, global travelling elites have been shown to exert significant influence over the production of urban strategies (Prince 2012, 2016). For instance, Rapoport and Hult (2017, p.1780) highlight the role played by international engineering and planning consultancies (which they refer to as "global intelligence corps") in shaping "and standardizing norms and narratives about what constitutes 'sustainable' urban planning practices" worldwide.

The production of urban knowledge therefore needs to be understood as inherently embedded within formal and informal power structures, locally and globally. In a given

context, those in power have the ability to define what counts and does not count as valid knowledge (Stone 2002). Research on the rankings, indexes and indicators of cities has highlighted the power of such metrics in producing specific ways of seeing the 'urban' and isolating issues that are deemed relevant for policy intervention (Holden 2006; Innes and Booher 2000; Kitchin et al. 2015; Klopp and Petretta 2017). Many private companies such as consulting firms (e.g. McKinsey) or media groups (e.g. The Economist Intelligence Unit) have developed their own urban rankings and indexes (JLL and The Business of Cities 2017) which support a global urban knowledge base that is predominantly focusing on supporting competition between places for investment, tourism, and the attraction of the global 'creative' class. Indicators can, therefore, act as governmental technologies, delimiting what is governed and governable (Rydin 2007).

As research in other fields has shown, the values of actors also affect the production of knowledge for policy (Meuleman and Veld 2009; Jones et al. 2013), and often evidence is used for political ends. For instance, in their study of environmental sustainability policy, Juntti et al. (2009, p.212) highlight how "it is likely that the different actors involved in decision-making will try to influence decision-making through drawing on evidence that supports their respective interests or normative positions". Knowledge is thus a powerful political resource. Furthermore, in order for knowledge to be used in (or for it to influence) policy, this knowledge has to be produced and communicated in a format that speaks to those in a position of power. As a result, individuals and groups who are in a position to produce information that is recognised as relevant and legitimate when negotiating specific policies or decisions are themselves in a position of power. The production of information about specific urban issues is therefore rarely neutral, as it contributes to making these very same issues visible and hence turn them into legitimate objects of policy intervention.

The use of specific "knowledge techniques" or "ways of knowing" (surveys, maps, quantitative modelling, case studies, etc. …) is also inherently political. For instance, urban and spatial interventions are often informed by the use technical tools such as maps and statistics (Pickles 2004; Sibertin-Blanc 2010). By mapping, grouping and counting different groups, collectives and spaces become visible. Simultaneously, these process of mapping and counting can create new types of exclusion (Chatterji and Mehta 2007; Watson 2014) by relegating specific groups or issues to invisible spaces (which are not shown on a map or captured by any metric in national statistics). A large proportion of urban dwellers for instance are currently excluded from existing urban knowledge bases. The most obvious example is the lack of information about informal settlements. Despite informal settlements being home to about 70% of urban dwellers in Africa (UN-Habitat 2014) and informality [1] constituting the dominant form of contemporary urban living (Davis 2001), everyday living in these parts of cities is poorly recorded. This clearly makes it difficult to design interventions that address the needs of those living in informal settlements, if these needs are not even systematically recorded. Yet, knowledge is inherently dynamic and knowledge production techniques can always be reconfigured, questioned and used to rethink dominant understanding of urban dynamics. In their work on mapping as an urban assemblage, Dovey and Ristic (2017, 15) discuss how mapping technologies actively shape and repurpose space and space usage: "Professional mapping is a practice through which researchers and built environment professionals rethink, explore and gain a deeper understanding of how the city works, and how it might be transformed".

Knowledge tools can also be politically mobilised. Over the past ten years, new technologies have broadened the scope of what can be considered as an "expert", allowing normal citizens, civil society groups, or grassroots movements to interrogate traditional knowledge production techniques. The penetration of new technologies has changed the

purpose of mapping itself, from being a tool to control space - and especially those who inhabit space (Raffestin and Barampama, 1998) – to being a tool for community empowerment and advocacy. The work of Shack Dwellers International (SDI) represents an emblematic case of slum dwellers federations from across the world reclaiming their existence and rights to accessing basic infrastructures through mapping and self enumeration (it will be further explored in the next section). Therefore, data production can serve dynamics of group formation and recognition. Other technologies like open GIS software and wiki-based collaboration technologies for instance have allowed new types of *produsers* (both information producers and users) to generate new geographic information voluntarily (Goodchild 2007; Coleman et al. 2009). New technical capacities have also allowed for the production of large scale urban information in a more automated, less time consuming, fashion. Earth observation technologies have for instance allowed to gather spatial urban data at a very large scale, and on a wide range of issues: road networks, infrastructure provision (e.g. lighting), informal settlements, etc. (Xie et al. 2015; Sedlačko 2016).

Despite these technological advances, the extent to which urban data and information is made available to local actors, and whether or not these information respond to their needs remains under question (Caprotti et al., 2017). In addition, hard data only cannot account for the breath and depth of urban conditions, and a mix of both quantitative and qualitative data is needed to inform policy interventions. The design and implementation of local urban strategies (Simon et al. 2016) and national urban policy frameworks (Turok and Parnell 2009) that address the targets set up in the NUA and SDGs (McPhearson et al. 2016; Acuto and Parnell 2016) will need to be supported by knowledge that is locally relevant on the one hand, but that also allows to track and monitor progress in a harmonised way (globally) on the other hand. Several voices throughout the NUA process highlighted the lack of recognition that mayors, local organisations, civil society groups and grassroots movements will be the

principal agents for its implementation (Revi 2016; Satterthwaite 2016). These issues raise important questions as to how different types of "urban knowledge" are valued, ranked and integrated into urban policy at these various scales; but also as to how locally sensitive, yet globally relevant, urban knowledge, can be generated. In the context of the implementation of the NUA, understanding how existing urban knowledge is produced, and what can be done to ensure that it resonates with local needs is therefore crucial, if one is to design a more inclusive and policy relevant urban knowledge architecture.

Methods and material

This research adopts a three steps approach to understand the ways in which urban knowledge, and its production, is governed globally. First, we developed a framework to assess the governance of 23 global urban data initiatives (see Appendix 1 for a full list of the initiatives under study) [3], and more specifically to assess their degree of inclusivity. These databases were selected if they were global in scope, collecting urban information across countries in an attempt to standardise data collection process to facilitate comparison and knowledge exchanges between cities. The data initiatives under review collect a very wide range of data (qualitative, quantitative, GIS) – the nature of the data they collect (type of data, policy sectors covered, number of cities included and geographical spread) is further explored in Robin and Acuto 2018, forthcoming. City rankings and indexes were excluded from the analysis, as they have already been subject of an extensive review from Jones Lang Lasalle and the Business of Cities (2016). The research team acknowledges nonetheless that city rankings are often carefully looked at by city officials (for a discussion on the influence of city rankings and indexes on urban strategies see Giffinger et al. 2010). For the purposes of this research, governance [2] is understood in relation to organisational governance – that is the way by which the production of urban knowledge of each of these urban data initiatives is

organised (Institute on Governance 2003): who is involved, and how? We have developed a typology to assess who currently participates ('participant type') in the governance of these global urban data projects, and in what capacity ('participation type').

Organisations involved in the data initiatives were grouped into the following categories (participant types): not-for-profit organisations, private sector organisations, local government, international bodies, research institutions, civil society, and national government. These are ideal-types and there are limitations to this classification. According to some scholars for instance, not-for-profit covers a wide range of organisations, including city networks, community based organisations and grassroots organisations, and has no precise definition (Uphoff 1993; Vakil 1997; Lewis 2010), others argue on the contrary that some of these subsumed categories should be studied separately and therefore distinguished (Mercer 2002). Others categorise grassroots organisations as part of civil society (Appadurai 2000; Castells 2008), a category for which there is no clearly agreed definition either (Kohler-Koch and Quittkat 2009). Despite these issues, the terms not-for-profit and civil society are nonetheless adopted as these are the terms often used by urban data initiatives to describe the different organisations they involve. For the purpose of this research, not-for-profits include philanthropic foundations and city networks, while civil society includes grassroots organisations.

We used examples from the literature to distinguish seven 'participation types' or ways in which organizations can be involved in the governance of the urban data: administrator, data collector, decision-maker, founder, funder, member, and partner (Chaskin and Garg 1997; Weiss 2000; Woods and Narlika 2000; Esty 2006; Barnett and Parnell 2016). The questions asked to identify each of these types were: Who administers, that is maintains, the initiative (administrator)? Who contributes to data collection and analysis (data collector)? Who makes decisions on how the initiatives function (decision-maker)? Who developed the

idea for and started the data initiative (founder)? Who provides the financial resources for the operating of the initiative (funder)? Who is identified as a member? Who is identified as a partner? These types of participation are often explicitly identified by the initiatives themselves (i.e. initiatives will list their members, partners, and so on, if they have them, though it has to be noted that not all initiatives are membership-subscribed initiatives or are supported by partners).

These participant and participation typologies were used to analyse the governance structures of the selected urban databases. The analysis maps out how often each of the different categories of actors (participants types) is involved in the data initiative in one of the following capacity: administrator, data collector, decision-maker, founder, funder, member, and partner. The rationale for this approach is twofold. First, the precise number of certain participant types is not available for all data initiatives: for example, not all initiatives make their list of members publicly available, such as the Mobility in Cities Database. This results in not being able to apply weighting consistently across the initiatives (resulting in skewed data). Second, not all participant types are amenable to weighting. For example, if weighting were applied to the civil society type, then there would be questions of how many citizens is equivalent to the involvement of, for instance, one not-for-profit organisation or local government.

Second, we reviewed the ways in which data itself is managed in each initiative. On the one hand, we were interested in understanding whether or not the data initiatives had a clear mission statement highlighting the objectives of the data production exercise. This would allow to assess whether the data that is produced truly addresses the goals set out in the initiative. On the other hand, we sought to understand whether these initiatives had regular review mechanisms in place. These would ensure the data collected is accurate, relevant and regularly updated.

Third, we held a two-day workshop in London in September 2016, two weeks before the Habitat III conference held in Quito, with 23 key stakeholders involved in NUA and SDG discussions, spanning civil society, academia, philanthropic organizations, government, not-for-profit, etc. Most participants were from academic institutions but had also been involved in the Habitat III process in some capacity, for instance participating in the Policy Units or the General Assembly of Partners. The following most represented participants came from non-for-profit organizations also involved in the Habitat III discussions through the GAP and/or involved in the Urban SDG Campaign (see Appendix 2 for a list of stakeholders types participating in the workshop). The research project supported travel costs from participants from Africa (from civil society organizations) and living outside of the UK, to ensure key stakeholders would be able to attend. The purpose of this workshop was to develop our understanding of current shortcomings and opportunities in the global urban knowledge landscape. Workshop participants were asked to share insights on the following themes: who is currently excluded from urban knowledge production globally? How can urban science be made more inclusive and relevant to the needs of the various actors involved in urban management and policy? Which types of institutional arrangements would be needed to ensure the production of comparable urban data that would feed into the NUA review process? These insights were supplemented with information from semi-structured interviews with an additional 9 key stakeholders (also listed in Appendix 2) who were unable to attend the workshop. This data is used to complement the findings of the review of existing databases by providing insight on the effects and impacts of the inclusion, or lack thereof, of particular stakeholders in global efforts to produce urban data. It is particularly insightful to understand key stakeholders' perception of the current limitations of the global urban knowledge base, and how these could be overcome.

Assessing the governance structures of global urban databases

This section sets out and discusses our research findings. First, we present an overview of the participants involved in urban knowledge production globally, paying particular attention to the nature of this engagement. Second, we explore some avenues to overcome existing shortcomings, building primarily on the insights from the workshop and interviews.

A poorly inclusive global urban data landscape

Our review reveals that not-for-profit organisations are the most common type of stakeholder involved in the urban databases, in any participation capacity, followed by the private sector, local governments and international bodies. Research institutes, civil society and national governments are the least represented across all types of participation. Not-for-profit organisations identified cover city networks (including The Global Network of Cities, Local and Regional Governments (UCLG), CITYNET, ICLEI, and C40), philanthropic organizations (including Bill and Melinda Gates, Bloomberg Philanthropies, and Rockefeller Foundation) and organisations that do not fall within either of these categorisations but are non-governmental and not-for-profit. Not-for-profit organisations overall have the best representation across all types of participation; they are often identified as partners, funders, decision-makers, data collectors and founders of the initiative, though not often as a member. Membership in fact does indicate very little involvement in knowledge production efforts, as the purpose of membership is largely to get access to the data produced by the initiative – and sometimes (but rarely) to support data collection efforts (e.g. C40 data portal). This tends to indicate that not-for-profits are often involved in the key operational and managerial functions of data initiatives.

City networks have increasingly gained prominence in global politics over the past decades (Acuto and Rayner 2016). Their role is varied, but they often act as platforms for local governments to share best practices in a wide range of policy areas, and some more prominent city networks have been pushing for policy reforms, especially in the field of climate change with C40 or ICLEI. It is therefore not surprising to see they also act as key drivers of urban knowledge production efforts worldwide. Our research also sheds light on the key role played by philanthropic organizations in funding (and shaping) urban research globally. The Rockefeller Foundation has for instance supported the generation of new knowledge on issues of resilience and adaptation in cities from all around the world through the 100 Resilient Cities network. The Bill and Melinda Gates foundation has provided financial support to the work of Shack Dwellers International (SDI) and the Santa Fe Institute through *Know your city* project, which aims to map informal settlements across Asia, Africa and Latin America. When thinking about knowledge production, the question of who funds – and therefore arguably shapes – research agendas is a crucial one. Indeed, the lack of public research funding in many countries (in both the global North and the global South) presents a key challenge to the production of freely accessible urban knowledge.

Private actors are also driving the production of global urban knowledge. Arup, a large international engineering and planning consultancy, is involved as a key partner in the Rockefeller 100 Resilient Cities initiative. McKinsey regularly publishes a *Global Cities of the Future* report that compares to performance of major urban areas using a wide range of economic indicators. In addition to generating urban data, these large multidisciplinary consultancy firms have been providing advice on urban issues (ranging from regeneration to infrastructure planning) to local governments worldwide, contributing to shaping urban strategies globally. Workshop participants and interviewees highlighted some of the potential problems that might arise when relying on data (and analysis) provided by the private sector.

Data sharing in that case is a crucial issue. If workshop participants unanimously recognised the need for open-access, standardised urban data worldwide, they also admitted that the private sector is rarely keen to share its data openly. Private consultancies often provide advice or are commissioned to produce data for cities "but no one has any idea about what kind of data repositories they have" (Interviewee 1 2016). In addition, local governments get access to final reports in a PDF format, but consultants are generally reluctant to share the raw data in a format that can easily be updated by local authorities (though in some cases this is available for a fee) (Workshop Participant, 2016). The commodification of urban data – and its relative abundance as a result - is perceived as a challenge. This is particularly the case when local decision makers are provided with a lot of quantitative information but there is no critical interrogation of the methods used for data collection, the relevance of this data to local policy issues and its use for implementation. One interviewee emphasised the need

> "not [to] monitor too much or too many things so that in the end you also just have a bunch of information, [as the need is] to understand what the key areas are, what you're really trying to get at… it is not just a reporting function but something that feeds back into implementation and management" (Interviewee 2).

In fact, the involvement of the private sector spans beyond traditional, knowledge generating, consultancy firms. GIS software companies like ESRi for instance are providing analytical solutions to help process urban data (the firm is involved in two data initiatives reviewed). The question of technico-analytical capacities – especially when it comes to producing, generating, processing and analysing GIS information or big data for instance - is a fundamental one in many rapidly urbanising parts of the world. The lack of technical expertise in many African cities means that this expertise is either completely absent from

decision making processes, or it has to be outsourced to private firms which can provide technical and analytical solutions.

The consensus in the workshop (2016) was that local governments are rarely involved in the production of urban information. This is an interesting point as our data review shows that actually cities themselves, through the intermediation of city networks, are well embedded in global urban knowledge production circuits. However, the tension between producing globally comparable data, using localities as data providers, and the need to develop a locally sensitive knowledge base (through capacity building and co-production) was often highlighted. On the one hand, the need for comparable data to follow the implementation of the NUA calls for the standardisation of data collection efforts at a global scale. On the other hand, the need to design context-sensitive and adaptive urban policies calls for the development of knowledge capacities which go beyond the mere collection and provision of quantitative information (Caprotti et al., 2017). The production of relevant urban information does indeed require "a deep understanding of the local context and the local political economy" (Interviewee 3 2016) which local governments, alongside with community organisations, citizens, are often best placed to provide.

Stemming from the previous point, it appears that international bodies, such as UN-Habitat, the World Bank and the World Health Organisation (WHO), when involved in data initiatives, do so as founders, funders or partners. This is not surprising as these institutions have been engaged in the development of a cities agenda within their own organisations through, for example, the promotion of SDG11 (focusing on making cities and human settlements inclusive, safe, resilient and sustainable) and the NUA. In addition, UN-Habitat and the World Bank have funded several platforms aiming to support the monitoring and implementation of local policies addressing the objectives set out in these two agreements. The emergence of a global city agenda has allowed to raise awareness on the impact of

urbanisation processes on a wide range of socio-economic and ecological issues. But when it comes to designing evidence-based urban strategies, the extent to which the data needs identified locally do match the targets/indicators developed to compare cities' trajectories at a global scale and to monitor progress towards the implementation of global commitments remains unclear.

Academic and non-academic research institutions are often involved as partners and data collectors in the data initiatives. Universities were identified by interview and workshop participants as being strongly embedded in some cities, but with much scope for greater involvement in the production of empirical knowledge, especially in rapidly growing cities in Africa where urban data is sorely lacking. Strengthening the links between universities and their direct urban environment has been presented as key by workshop participants (2016) and among urban scientists more broadly (Larigauderie and Mooney 2010; McPhearson et al. 2016; Addie 2017).

Across the data initiatives reviewed, and as emphasised in the workshop and interviews, civil society groups are rarely included in data production efforts. Yet, participants highlighted that the needs of civil society need to be understood and engaged with, so that data collection strategies can be designed in a way that reflects the needs of vulnerable urban groups, and to ensure that what we know about urban phenomenon reflects the lived experience of the city. As highlighted by one of the interviewees

> "in many countries, particularly in rapidly urbanising countries, where there may be people in cities that are already a bit behind the curve and will become increasingly so, [the governance] challenge [of urban data initiatives] among others, is for cities to capture within their data the people who are living in informal settlements or in slums -

people who are not perhaps as visible or vocal as many living within the formal economy and the formal city*"* (Interviewee 6 2016).

Another interviewee stated that "[m]ajor steps [to involve civil society] have been taken, but the pace at which steps are taken is questionable" as citizens and civil society generally need to become "embedded" in the process of data collection, curation and management. The SDI/Santa Fe Institute *Know Your City* initiative represents a very promising attempt to empower citizens living in informal settlements, but this example represents more the exception than the rule. Therefore "a much stronger bottom-up approach" (Interviewee 4 2016) is needed, to avoid reactive monitoring but also truly engage in the co-production of urban knowledge and related urban interventions.

National governments are very little involved in urban data production despite their strong involvement in global decision making processes, as the UN is first and foremost a State-led institution. Yet, national governments have a strong role to play when it comes to harmonising data collection efforts at the city level (building on national statistical agencies for instance), but not only. National urban policy frameworks, taxation and resource allocation, planning and economic regulation, to name only a few, are policy instruments that will affect urban trajectories but remain the prerogative of national States in many parts of the world (Turok and Parnell 2009). "Challeng[ing] the monopoly of national government" is still very difficult for localities (Workshop Participant 2016) but a greater involvement of national governments in the production of urban data would allow for the production of harmonized and comparable national data, which can then feed into the SDGs and NUA review processes.

Beyond the stakeholders identified in reviewing existing databases, interviewees and workshop highlighted that other relevant actors have been – and still are – constantly side-lined in knowledge production processes. Trade unions were identified as such actors, whose

involvement in urban data production has been judged insufficient and too inconsistent (Interviewee 4 2016). Trade unions can provide relevant information on workers rights, working conditions and workers living standards in urban areas (International Labour Office 2015). Equally, professional organisations often bring together practitioners who actively contribute to shaping and making cities, including: planners, architects, transport engineers, and construction companies. These are, however, little involved in urban knowledge production processes (with the exception of the International Organisation for Public Transport Authorities which is managing the Mobility in Cities Database). The lack of integration of professionals in global knowledge structures can undermine the translation of research into actual interventions. Urban trajectories are shaped by a very wide and diverse set of actors, but these rarely act in a coordinated fashion. Better linkages between knowledge production and practice are necessary; and there was consensus across our workshop participants that an effective knowledge-policy-practice interface should include the scientific community, policy makers, grassroots movements and practitioners alike (Workshop Participants 2016).

Weak governance frameworks undermine the policy relevance of existing urban data

Wider participation in data production is necessary to fill existing knowledge gaps (Eveland and Schefele 200; Wei 2009). Indeed, data "has to be co-created … [For example,] if it is just the private sector then they are profit-driven and have their own agendas" (Interviewee 5 2016). At the same time, widening participation implies that "there's always a risk [that] everybody has different agendas, [and the questions are] how do you synthesise, how do you bring forward what people can together agree on" (Interviewee 3 2016). There is a "need to develop and monitor the same things and same objectives" (Interviewee 1 2016).

Few of the examined data initiatives however reflected a truly multi-stakeholder approach to knowledge production, for instance through partnering with institutions from a wide range of sectors. Only one initiative, the World Council on City Data (WCCD), explicitly involves international bodies, the private sector, research institutes, not-for-profit organisations, national governments, and local governments, such as the University of Toronto, Siemens, Tata Trusts, and the Government of Mexico. Their aim is to be a hub for "creative learning partnerships" and to harmonise urban data collection processes across cities, for the implementation of the NUA and SDGs but also to help local governments build knowledge production capacity more broadly (WCCD 2016). The 100 Resilient Cities initiative also brings together non for profit, private and government actors to tackle resilience challenges at the local level. The number of cities enrolling in the program has grown from 32 to 100 since its inception in 2013. Through that initiative, the foundation is providing financial support to the hiring of an in-house resilience expert in each participating city, in charge of designing the municipality's resilience strategy. Despite these examples, the current global urban knowledge base remains poorly representative of the vast array of actors affected by urban issues. This will require multi-level, multi-stakeholder and cross-sectorial approaches to data production, which itself requires the design of adequate governance structures for data generation, curation and use.

This lack of inclusivity in global urban knowledge production in turn affects the content, relevance and quality of the data that is currently being generated. Even where data is collected, "data in and of itself does nothing" (Interviewee 5 2016) if not linked to governance structures and institutions that will use these to inform effective action on the ground. Data need to be collected and supported by strategic governance structures that facilitate knowledge uptake into strategy:

> "You can capture data, and get lots of data points, but unless you have a coherent strategy, vision or plan … it seems to me that the data has to serve the advancing of a shared plan" (Interviewee 1 2016).

Articulating a clear vision on the purpose of data generation processes is also key. Only a handful of the initiatives under review had clear vision statements reflecting on the relevance and use of the data produced. UrbanData2Decide is an example where there are clear objectives that also focus on data relevance for policy use. Without these formulations, accountability is limited as there is then no benchmark against which to measure progress and achievements of urban data.

Related to that, in addition to this lack of strategic objectives, the initiatives under study also suffer from a lack of regular updating and review mechanisms. Only four initiatives report or update data annually (or in one case triennially). This low number is due to the inclusion of a few one-off data initiative projects, such as the UrbanData2Decide. For the remaining, and thus vast majority, of initiatives the frequency of reporting is not specified. This may be because new data is included as and when it becomes available, or as a result of large, web-based data portals often lacking continuing funding and human resources to ensure the database is frequently updated. Finally, another challenge identified throughout the workshop and the data review is that where data is collected, it is collected along the line of policy silos. This approach needs to be revised for data to inform the design and implementation of comprehensive and locally sensitive urban visions up to holistic national urban strategies.

This infrequent and piecemeal reporting results in insufficient evidence to track how urban patterns are changing over time. It is problematic as urbanisation is unfolding very fast,

and thus the need for timely, reliable data to measure its pace and impact, and to guide decision-making at various policy levels is crucial.

Implications for the global governance of urban data going forward

As it currently stands, the global urban data landscape is not able to support the implementation and monitoring of the NUA. This is particularly critical in the fastest urbanising parts of the world, where urban data are still desperately needed. Expanding our knowledge base of urban issues is necessary as existing data offer a rather narrow, and deeply incomplete, understanding of urban life and of the transformation of our rapidly urbanising planet (Kitchin et al 2015, Klopp and Petretta 2017). This knowledge is not only partial, but its policy relevance and use is also generally unclear (Daviter 2015). Research has been undertaken on policy relevance of knowledge in other contexts (e.g. Almeida and Báscolo 2006; Holmes and Clark 2008; Carden 2009; Bandola-Gill and Lyall 2017; Fraussen and Halpin 2017), but this should be replicated within the wider context of global ambitions to transition to more sustainable, inclusive and resilient urban futures. The generation of comparable longitudinal data has been presented as a fundamental need to assess urban change and evaluate polices in the long run, even beyond the 2030 agenda (Workshop Participants 2016). Lacking adequate governance and funding structures supporting regular reporting, global urban databases therefore run the risk of being obsolete from the onset, and will be hard-pushed to feed into long-term visions. Having this strategic vision should therefore also go hand in hand with regular review mechanisms, to assess the impact and relevance of data produced against stated objectives. These data review and governance mechanisms should also allow to assess data initiatives' complementarity/overlap with each other and/or even methodological divergences.

Creating a structure where urban scientists (from both the public and private sector), local and national governments, regional entities (EU, African Union, Mercosur, etc), civil society groups, major funders, international organisations, as well as professional bodies can meet regularly was often presented as critically needed (McPhearsons et al. 2016). Moreover, such platforms may result in "national governments [to] listen more to multiple voices" (Interviewee 3 2016), and galvanise local governments interests, as "many cities would be excited and want to participate" (Interviewee 4 2016), through city networks or else. This is very much needed to avoid replicating data collection efforts and/or build synergies between existing knowledge bases. An often touted strategy to address some of these limitations is to introduce an intergovernmental panel (IP) on cities, that is an Intergovernmental Panel on Climate Change (IPCC) equivalent for cities (e.g. **Acuto and Parnell 2016**). Indeed, intergovernmental panels, such as the IPCC or the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), remain important models with ongoing research into how these can apply in other contexts (Beck et al. 2014). While a number of benefits were identified by interviewees and workshop participants for creating an IP on cities, it was also flagged that the complexity, diversity and cross-sectorial nature of urban issues would make it difficult, if not irrelevant, to simply transpose the IPCC model to urbanisation. In addition, one might wonder, would all types of human settlements be represented? Or would such a platform only focus on the usual suspects (i.e. global cities), neglecting rapidly growing middle size cities emerging in data-poor contexts? This has been a past criticism of the IPCC as well, in that it is not always sensitive to geographies (see Hulme 2010; Hulme and Mahony 2010) and to non technical knowledge.

> "IPCC-like focus might be attractive to 'elite actors', from natural scientists to national governments, but it omits many other important stakeholders and knowledge-holders,

including indigenous people, businesses, farmers, community partnerships and fishers. What counts as legitimate knowledge, and how it is generated, influences its practical effectiveness" (Turnhout et al. 2012, p.454).

At a time where the urban question is gaining traction across the board, from international institutions to the private sector, philanthropic organisations, city networks (Author 2016) and many more, building on what already exists and foster integration and complementarity across initiatives appears critical. A lot of the urban knowledge currently generated poorly address issues of inclusion and policy relevance (Innes and Booher 2000). Yet, they constitute valuable efforts to generate urban information that is global, comparable, and can be used as a basis to compare progress towards the realisation of the 2030 agenda. If these are not perfect, they still should be leveraged on and connected to more holistic, inclusive urban science structures at the global level, potentially building on local examples of participatory approaches to urban data creation (see Holden 2006 on the co-creation of urban indicators in the Vancouver Region). Ongoing discussions around the future of UN-Habitat raise questions as to whether the UN system is actually able to provide such a platform. Recent proposals to create a UN-Urban (High Level Panel Independent Panel 2017) that would streamline the "urban question" across the work of all UN agencies (similar to what is being done with UN-Water or UN-Energy) was discarded almost unanimously by member states at the last General Assembly High Level Meeting (UN, September 2017). The UN's recent announcement of the creation of Local 2030, a multi-stakeholder platform supporting knowledge sharing for the local implementation of the SDGs might be one step on that direction; but it remains unclear how existing urban data initiatives will feed into this.

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Notes

[1] The term *informality* here is in itself contentious … can we really talk about *informal* living when it becomes the dominant form of existence in the city? For the scope of this paper, we will not get into these debates but for a discussion of the usefulness (or lack thereof) of the formal/informal dichotomy to understand urban phenomenon, Hansen and Vaa (2004) offer very interesting insights building on examples from African cities.

[2] Governance can be defined in different ways (e.g. Rhodes 1996, Marinetto 2003), but discussions of the various definitions and interpretations of the term, and its evolution, is beyond the scope of this research.

[3] Note that the databases were selected and reviewed between June and September 2016, before the Habitat III conference (which took place in October 2016). New data might have been added and new partners might have been involved in some data initiatives since the Habitat III conference but this falls out of the scope of this research.

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Appendix 1: urban data initiatives investigated

Urban data initiative	*Website*

100 Resilient Cities	www.100resilientcities.org
Big Cities Health Inventory	www.bchi.bigcitieshealth.org
C40 Open Data Portal	www.c40.org/research/open_data
Euromonitor Cities Reports	www.euromonitor.com/cities
Cities100	www.sustainia.me/cities
Global Human Settlement Layer	www.ghsl.jrc.ec.europa.eu
Global Observatory on Local Democracy and Decentralisation	www.gold.uclg.org
How Cities are Governed	www.urbangovernance.net
Inclusive Cities Observatory	www.uclg-cisdp.org/en/observatory
International Observatory on Participatory Democracy	www.oidp.net
Knowledge Centre on Cities and Climate Change (K4C)	www.citiesandclimatechange.org/page-home-1.html
Mobility in Cities	www.uitp.org/MCD

Database	
Shack/SDI Know Your City	www.knowyourcity.tv
UrbanData2Decide	www.worldcitiesscultureforum.com
Urban Data	http://urbandata.unhabitat.org
Urban Health Index	www.who.int/kobe_centre/measuring/innovations/urban_health_index/en
Urban Lex	www.urbanlex.unhabitat.org
Urban Observatory	www.urbanobservatory.org
Urban World / Global Cities of the Future	www.mckinsey.com/global-themes/urbanization/global-cities-of-the-future-an-interactive-map
World Bank Urban Development Indicators	www.data.worldbank.org/topic/urban-development
World Cities Culture Forum	www.worldcitiesscultureforum.com
World Council on City Data	www.dataforcities.org
World Urban Database	www.wudapt.org

Appendix 2: workshop and interview participants

Participant type	**Workshop**	**Interview**	**Total**
Academic research institution	10	2	12

Global partnership	2	1	3
Intergovernmental organisation	0	1	1
Not-for-profit organisation	4	5	9
Private sector	1	0	1
Public policy consultant	3	0	3
Research institution	2	0	2
Social movement	1	0	1
Total	23	9	32