UNIVERSITY OF BRASILIA

FACULTY OF ARCHITECTURE AND URBANISM

POSTGRADUATE PROGRAM IN

ARCHITECTURE AND URBANISM

TOBIAS KÜHNER

DEVELOPMENT OF INDICATOR SET FOR IMPLEMENTATION OF INTERNATIONAL URBAN AGENDAS IN CITIES OF THE GLOBAL SOUTH

DOCTORAL THESIS

SUPERVISOR: CLÁUDIA NAVES DAVID AMORIM

CO-SUPERVISOR: JOHANNES HAMHABER

BRASILIA/DF: 2023

TOBIAS KÜHNER

DEVELOPMENT OF INDICATOR SET FOR IMPLEMENTATION OF INTERNATIONAL URBAN AGENDAS IN CITIES OF THE GLOBAL SOUTH

> Doctoral Thesis submitted to the Postgraduate Program of the University of Brasília, as part of the necessary requirements for obtaining the Degree Doctor in Architecture and Urbanism.
> Area of Concentration/ Field of Study: Technology, Environment, and Sustainability

APPROVED BY:

_____
Prof. Dr. Cláudia Naves David Amorim (PPG-FAU, UnB/Brazil)
(Supervisor)

_____
Prof. Dr. Johannes Hamhaber (ITT, TH-Köln/Germany)
(Co-Supervisor)

_____
Prof. Dr. Maria do Carmo de Lima Bezerra (PPG-FAU, UnB/Brazil)
(Internal Examiner)

_____
Dr. Ana Paula Bruno (SPU-MGISP/Brazil)
(External Examiner)

_____
Prof. Dr. Joseph Kedogo Fredrick (TU-K, Nairobi/Kenya)
(External Examiner)

BRASILIA/DF: 2023

Catalog sheet:

ABSTRACT

The international community faces a broad variety of challenges due to the rapid and unrestrained growth of global urbanization since the latter half of the twentieth century. As a result, demand for more sustainable cities has developed in recent decades, and international urban agendas have emerged in the public policy process to mitigate the negative effects of this development. However, the fundamental strategies for implementing and monitoring urban development differ significantly across distinct local contexts. In the global north, where the majority of agendas are developed, typically proposed implementation and management tools can be adequate. Though, emerging economies in the global south often face challenges in implementing similar strategies, particularly in the identification of suitable indicators and the acquisition of reliable monitoring data. In addition, the diversity of developing countries must also be acknowledged and considered accordingly. To tackle the issue, this thesis aims to create a contextual applicable set of existing indicators for emerging economies of the global south and propose development strategies to support cities and municipalities in evaluating the effectiveness of international urban agendas. The methodology consists of an analysis and critical assessment of instruments of non-binding doctrinaire documents for implementation, followed by a selection process to determine feasible and effective indicators to benchmark and measure sustainable urban development. The derived pilot indicator spectrum spans four distinct sectors (Energy, Solid Waste, Transportation, and Water). The spectrum is assessed by conducting a global survey, polling international municipal experts of developing cities and municipalities in the global south. A trial application of the indicator spectrum is then conducted. The literature review confirmed already a lack of effective local governance, preparedness, and management tools in developing countries. This indicates a request for new sets of indicators designed specifically for the global south, although a fixed common "southern" indicator set can only be partially generated and determined. Therefore, the thesis recommends using an adaptive proxy approach for new indicator sets, reflecting three levels of urban development and an embracing mix of up to seven indicators per sector. This adaptive approach enables local municipalities and regional organizations of the global south to compare data from before, during, and after the implementation of local urban agendas to assist on-site policy making. It would also facilitate the comparison of southern municipalities at different developmental levels with similar urban agendas, who may

want to collaborate to identify best practices together or compete for international funding.

KEYWORDS

Urban Agendas; Indicators; Global South; Urban Development; Sustainability

RESUMO (EM PORTUGUÊS)

A comunidade internacional enfrenta uma ampla variedade de desafios devido ao crescimento rápido e desenfreado da urbanização global desde a segunda metade do século XX. Como resultado, a demanda por cidades mais sustentáveis se desenvolveu nas últimas décadas, e "agendas urbanas" internacionais surgiram no processo de políticas públicas para mitigar os efeitos negativos desse desenvolvimento. Toda via, as estratégias fundamentais para a implementação e o monitoramento do desenvolvimento urbano diferem significativamente em contextos locais distintos. No norte global, onde a maioria das agendas é desenvolvida, as ferramentas de implementação e gerenciamento normalmente propostas podem ser adequadas. No entanto, as economias emergentes do sul global geralmente enfrentam desafios na implementação de estratégias semelhantes, especialmente na identificação de indicadores adequados e na aquisição de dados de monitoramento confiáveis. Além disso, a diversidade dos países em desenvolvimento também deve ser reconhecida e considerada adequadamente. Para enfrentar esse problema, esta tese tem como objetivo criar um espectro de indicadores contextualmente apropriado para as comunidades do sul global e propor estratégias de desenvolvimento para apoiar as cidades e os municípios na avaliação da eficácia das agendas urbanas internacionais. A metodologia consiste em uma análise e avaliação crítica de instrumentos de documentos doutrinários não vinculantes para implementação, seguida de um processo de seleção para determinar indicadores viáveis e eficazes para avaliar e medir o desenvolvimento urbano sustentável. O espectro de indicadores-piloto derivado abrange quatro setores distintos (energia, resíduos sólidos, transporte e água). O espectro é avaliado por meio da realização de uma pesquisa global, entrevistando especialistas municipais internacionais de cidades em desenvolvimento e municípios do sul global. Em seguida, é realizada uma aplicação experimental do espectro de indicadores. A revisão da literatura já confirmou uma falta de ferramentas eficazes de governança local, preparação e gerenciamento nos países em desenvolvimento. Isso indica a necessidade de novos conjuntos de indicadores projetados especificamente para o hemisfério sul, embora um conjunto de indicadores comuns fixo do "sul" só possa ser parcialmente gerado e determinado. Portanto, a tese recomenda o uso de uma abordagem modular e adaptativa para novos conjuntos de indicadores, refletindo três níveis de desenvolvimento urbano e uma combinação abrangente de até sete indicadores por setor. Essa abordagem adaptativa permite que as prefeituras locais e as organizações regionais do hemisfério sul comparem dados de antes, durante e depois da implementação das agendas urbanas locais para auxiliar na elaboração de políticas no local. Ela também facilitaria a comparação de municípios do sul em diferentes níveis de desenvolvimento com agendas urbanas

semelhantes, que podem querer colaborar para identificar as melhores práticas em conjunto ou competir por financiamento internacional.

TÍTULO DA TESE (EM PORTUGUÊS):
DESENVOLVIMENTO DE UM CONJUNTO DE INDICADORES PARA A IMPLEMENTAÇÃO DE AGENDAS URBANAS INTERNACIONAIS EM CIDADES DO SUL GLOBAL

PALAVRAS-CHAVE (EM PORTUGUÊS)

Agendas Urbanas; Indicadores; Sul Global; Desenvolvimento Urbano; Sustentabilidade

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

ADB   Asian Development Bank
ANEEL   Brazilian Electricity Regulatory Agency *(Agência Nacional de Energia Elétrica)*
AUD   Architecture, Urbanism & Design *(Arquitetura, Urbanismo & Design)*
BPS   Central Statistics Agency *(Badan Pusat Statistik)*
BREEAM   Building Research Establishment Environmental Assessment Method
BRT   Bus Rapid Transit
CASBEE   Comprehensive Assessment System for Built Environment Efficiency
CD   Capacity Development
CDB   City Data Book
CDI   City Development Index
CI   Core Indicator
COP   Conference of the Parties
COPEL   Paraná Energy Company *(Companhia Paranaense de Energia)*
CP&RI   Political Science and International Relations *(Ciência Política e Relações Internacionais)*
DEC   Equivalent Interruption Duration per Consumer Unit *(Duração Equivalente de Interrupção por Unidade Consumidora)*
DGNB   German Certification for Sustainable Buildings
ECI   European Common Indicator
EI   Extensive Indicator
EPE   Energy Research Company *(Empresa de Pesquisa Energética)*
ESDM   Indonesian Ministry of Energy and Mineral Resources *(Energi dan Sumber Daya Mineral)*
ETE   Estimate-Talk-Estimate
ETH   Swiss Federal Institute of Technology in Zürich *(Eidgenössische Technische Hochschule)*
FEC   Equivalent Interruption Frequency per Consumer Units *(Frequência Equivalente de Interrupção por Unidade Consumidora)*
FKPW   Experts for Municipal Partnerships Worldwide *(Fachkräfte für kommunale Partnerschaften weltweit)*
FUA   Functional Urban Area
GIS   Geographic Information System
GIZ   German Corporation for International Cooperation GmbH *(Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH)*
GUO   Global Urban Observatory
GUID1   First Global Urban Indicators Database
GUMF   Global Urban Monitoring Framework
HDI   Human Development Index
HLPF   High-level Political Forum
HQE   High Quality Environmental standard
IBGE   Brazilian Institute of Geography and Statistics *(Instituto Brasileiro de Geografia e Estatística)*
ICLEI   Local Governments for Sustainability (originally International Council for Local Environmental Initiatives)
ICS   Sustainable Cities Institute *(Instituto Cidades Sustentaveis)*
ICT   Information and Communications Technology
IPARDES   Paraná Institute of Economic and Social Development *(Instituto Paranaense de Desenvolvimento Econômico e Social)*

IPP	Perreira Pessoa Institute *(Instituto Perreira Pessoa)*
ISO	International Organization for Standardization
KI	Key Indicator
KPI	Key Performance Indicator
KfW	Credit Institute for Reconstruction *(Kreditanstalt für Wiederaufbau)*
LEED	Leadership in Energy and Environmental Design
LGBTI	Lesbian, Gay, Bisexual, Transgender, and Intersex
MME	Brazilian Ministry of Mines and Energy *(Ministério de Minas e Energia)*
MOHURD	Chinese Ministry of Housing and Urban-Rural Development *(Zhōnghuá Rénmín Gònghéguó Zhùfáng Hé Chéngxiāng Jiànshèbù)*
NA	Not applicable
NGO	Nongovernment Organizations
NUA	New Urban Agenda
ODUS	Sustainable Urban Development Goals *(Objetivos do Desenvolvimento Urbanos Sustentável)*
OECD	Organisation for Economic Co-operation and Development
O&M	Operation & Maintenance
PCRS	Pearl Community Rating System
PI	Profile Indicator
PNDU	National Urban Development Policy *(Política Nacional de Desenvolvimento Urbano)*
PPP	Purchasing Power Parity
PURD	Urban & Regional Planning / Demography *(Planejamento Urbano e Regional / Demografia)*
RAP	Regional Action Plan for the Implementation of the New Urban Agenda in Latin America and the Caribbean
SA	South Africa
SDG	Sustainable Development Goal
SETKAB	Cabinet Secretariat of the Republic of Indonesia
SI	Supporting Indicator
SSP	Province Sectorial Statistics *(Statistik Sektoral Provinsi)*
UCI	Urban China Initiative
UCLG	United Cities and Local Governments
UMF	Urban Monitoring Framework
UN	United Nations
UNCHS	United Nations Centre for Human Settlements
UNDP	United Nations Development Program (UN-Habitat)
UNECA	United Nations Economic Commission for Africa
UNSD	United Nations Statistics Division
USC	Urban Sustainability Certification
US$	United States Dollar
WCCD	World Council of City Data
WOE	Weight-Of-Evidence
WUF	World Urban Forum

"You can't manage what you don't measure

You can't measure what you don't define

You can't define what you don't understand

And there is no success when you don't manage"

(William Edwards Deming *apud* Godoy and Bessas 2020)

0   INTRODUCTION

0.1   Contextualization

According to the World Cities Database, there are about 4.3 million populated places, and about 1.9 million cities and towns (Simple Maps 2022). Other sources, like the mapping research executed by the OECD, concluded that there are around 10,000 cities with high-density places of at least 50.000 inhabitants worldwide (OECD 2020). Precise figures depend very much on the chosen definition of functional urban areas (FUAs) of each source. Due to the rapid and uncontrolled growth of global urbanization in the second half of the twentieth century (Day and Day 1973; Vidal and Scruton 2007; Gobbi 2016) (Figure 1) and the consequent degradation of the quality of life, especially in large urban centers, the global community was confronted with broad new challenges. This raised several issues, including housing, infrastructure, basic sanitation, and environment, among others. This fact alerted a group of 30 people (scientists, educators, economists, and civil servants) who, representing 10 countries, met at the *Accademia dei Lincei* in Rome, originating in 1968 in the Club of Rome (Club of Rome 2015).

Figure 1 - World urbanization graphic

Source: (Vidal and Scruton 2007)

1

The concerns of the Club of Rome, especially by Meadows, Meadows, Randers, and Behrens III (1972)[1], were then expressed in the United Nations General Conferences and Forums, which confirmed a need to reflect on these changes and new challenges on a global platform. Thus, a conference dedicated exclusively to human settlements was created: the Habitat I Conference on Housing and Sustainable Urban Development in Vancouver (1976). Subsequently, the new United Nations Human Settlements Program (UN-Habitat), a specialized United Nations (UN) agency dedicated to promoting more socially and environmentally sustainable cities and urban agendas, was founded in 1978.

In 1983, the United Nations General Assembly created the World Commission on Environment and Development (WCED) to examine the global environment and development to the year 2000 and beyond. The commission sought to reassess critical problems, formulate realistic proposals for solving them, and raise the level of understanding and commitment to the issues of environment and development. The work culminated in the report 'Our Common Future'[2], offering an agenda advocating "the growth of human progress through development without bankrupting the resources of future generations", based on "policies that do not harm, and can even enhance the environment" (World Commission on Environment and Development 1987).

The following Habitat II conferences in Istanbul (1996) and Habitat III in Quito (2016), in addition to the World Urban Forums (WUF), which were set up in 2001 by the UN and have been held every two years, focused on the sustainable development, rapid urbanization and its impact in communities, cities, economies, climate change, and politics (UN-Habitat 2014). Former Secretary-General Ban Ki-Moon emphasized in 2012 the importance of a structured urbanization process and highlighted that "the battle for sustainable development will be won or lost in cities" (United Nations 2017).

The evolution in the international community led to a successively increased focus on urban-related challenges such as sprawl, gridlocks, disaster risk prevention, and environmental hazards, as cities gained attention as an area of focus to tackle these challenges by building more sustainable and resilient communities. Consequently, in 2015, the UN decided to expand and diversify the former eight Millennium Development Goals (MDGs) with its Agenda 2030 and dedicate one single own development goal Nº

---

[1] The publication "The limits to growth." *A Report for The Club of Rome's Project on the Predicament of Mankind* (Meadows et al. 1972) led subsequently 20 years later to the sequel "Beyond the limits: global collapse or a sustainable future" (Meadows, Meadows, and Randers 1992)

[2] Also know as the Brundtland Report in recognition of former Norwegian Prime Minister Gro Harlem Brundtland's role as Chair of the Commission

11 to "Sustainable Cities and Communities". The ten targets of this development goal aim to make cities and human settlements inclusive, safe, resilient, and sustainable, including the topics of (11.1) housing, (11.2) transport, (11.3) settlement planning, (11.4) cultural and natural heritage, (11.5) disaster management, (11.6) environmental impacts, (11.7) public impacts, (11.a) development planning, (11.b) policy-making, and (11.c) financial and technical assistance.

In the year following the Agenda 2030 declaration, and as preparation for the Habitat III conference in late 2016, the UN member countries created national and regional reports to provide evidence-based knowledge on the implementation of the current global state of urbanization and the Habitat Agenda. These reports presented good practices and tools, both at the policy and intervention levels. Additionally, 22 issue papers were created through a collaborative exercise of over 100 urban experts, coordinated by the Habitat III Secretariat, to address research areas and highlight general findings (UN-Habitat 2016c). The issue papers spanned six thematic areas: 1. Social Cohesion and Equity – Livable Cities, 2. Urban Framework, 3. Spatial Development, 4. Urban Economy, 5. Urban Ecology and Environment, and 6. Urban Housing and Basic Services. The papers were then compiled into a summary report to provide background and knowledge, as well as highlight key challenges and recommendations on the most significant urban topics taken into consideration within the Habitat III preparatory process. The report served as a background paper for the discussions of the conference and was a starting point for the work of the Habitat III Policy Units to create a "New Urban Agenda".

According to Clos, the Secretary-General of the Habitat III Conference, the symposium was "a unique opportunity for rethinking the Urban Agenda in which governments can respond by promoting a new model of urban development able to integrate all facets of sustainable development to promote equity, welfare, and shared prosperity" (UN-Habitat 2016a). The first objective and result of the conference in Quito was the agreement of all UN members on the recently elaborated New Urban Agenda (NUA), which should serve as a standard for urbanization in the subsequent years 2016-2036, as well as a guideline for spatial and social organization, working and in hand with the Sustainable Development Goal (SDG) 11. It was adopted on 20 October 2016 during the conference and endorsed by the United Nations General Assembly at its 68th plenary meeting of the 71st session on 23 December 2016. According to the committee, the NUA represents a shared vision for a better and more sustainable future. "If well-planned and

well-managed, urbanization can be a powerful tool for sustainable development for both developing and developed countries" (UN-Habitat 2017).

The formulation of non-binding doctrinaire declarations was already attempted during Habitat I & II, leading to declarations, action plans, and reports of the conference[3] as well as consecutive national reports and recommendations[4]. However, these efforts never achieved the magnitude, consensus, and outreach of the NUA as a common agenda (Figure 2).

Figure 2 - Knowledge transfer and urban equality in Habitat I, II, and III
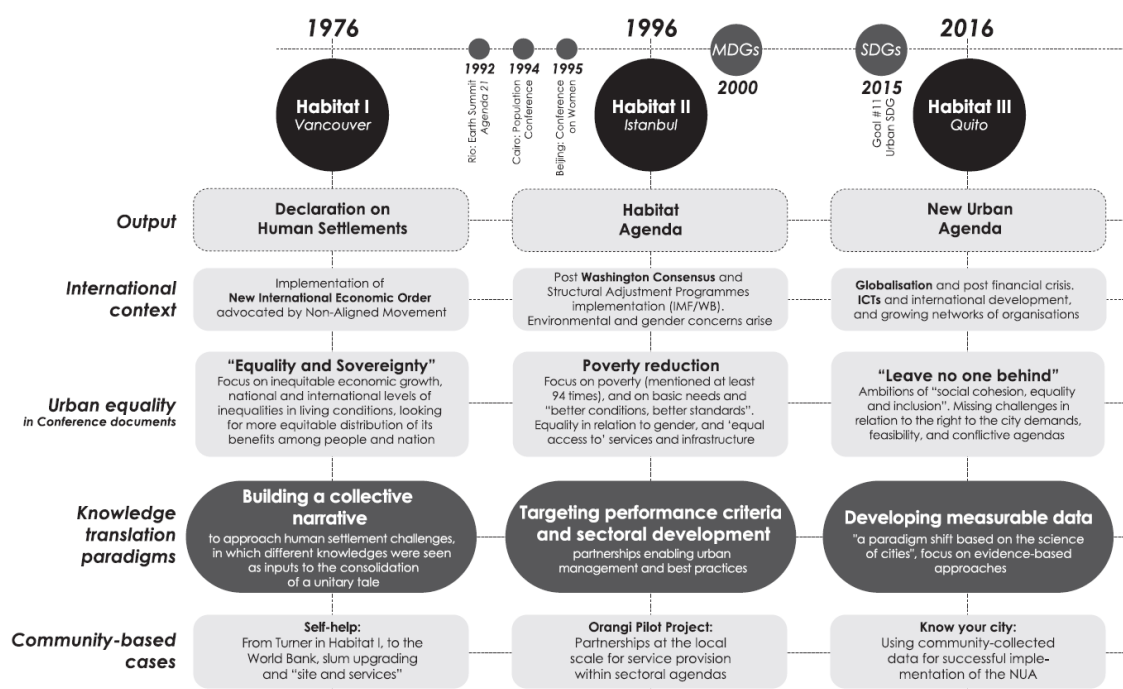
Source: (Cociña et al. 2019)

During the Habitat I conference, the knowledge transfer model was limited to building a collective narrative to approach human settlement challenges, in which different pieces of knowledge were seen as inputs to the consolidation of a common narrative. The Habitat II conference targeted performance criteria and sectorial development to better enable urban management and the development of best practices. Only with the resolution of Agenda 2030 in 2015 and Habitat III in 2016 occurred a

---

[3] Report of Habitat: United Nations Conference on Human Settlements – Vancouver (UN-Habitat 1976), including the "Vancouver Declaration on Human Settlements and Action Plan" and "The Vancouver Action Plan: 64 Recommendations for National Action Approved at Habitat";
Report of the United Nations Conference on Human Settlements (Habitat II) – Istanbul (UN-Habitat 1996), including "The Istanbul Declaration of Principles" and "The Habitat Agenda" global plan of action

[4] E.g. Brazilian National Report (Relatório Nacional Brasileiro) – Brasília (República Federativa do Brasil 1996)

paradigm shift based on the science of cities, focused on evidence-based approaches, to develop measurable data (Cociña et al. 2019), including an "additional set of indicators to complete the coverage of the NUA targets" (UN-Habitat 2021).

The Agenda 2030 and the NUA are very much influenced by globalization, post-financial crises, information and communications technology (ICTs), international development, and growing networks of organizations. These agendas have several references and milestones related to international agreements, such as the Rio Summit Declaration Agenda 21 on Environment and Development (1992), the Millennium Development Goals Adaption (2000), the Sendai Framework for Disaster Risk Reduction (2015), the COP 21 Paris Agreement on Climate Change (2015), among others.

The 9th edition of the WUF in Kuala Lumpur (2018) 'Cities 2030, Cities for All: Implementing the New Urban Agenda' sought to contribute to the implementation of concrete solutions for the commitments made in the NUA and the SDG 11. The forum highlighted the document as a crucial instrument for sustainable urban development, as it was endorsed by the United Nations General Assembly and therefore acknowledged by all UN member states. The meeting focused its discussion on strategies for the implementation of the NUA, SDG 11, and other international urban agendas at the global, regional, national, and local levels which were derived from the ten policy papers[5], national reports[6], and regional declarations[7].

However, global institutions like the World Economic Forum, urban experts, and researchers around the globe quickly revealed possible issues with successful implementation, noting significant differences between countries and regions implementing these agendas. Galal (2018) highlights several areas needing improvement, such as the lack of measurable indicators, the need for capacity building, the request for strengthened institutional frameworks, the enhancement of local ownership, and the improvement of still limited private sector engagement. Another summary of challenges

---

[5] (1) The Right to the City and Cities for All; (2) Socio-cultural Urban Framework. (3) National Urban Policies; (4) Urban Governance, Capacity and Institutional Development; (5) Municipal Finance and Local Fiscal Systems; (6) Urban Spatial Strategies: Land Market and Segregation; (7) Urban Economic Development Strategies; (8) Urban Ecology and Resilience; (9) Urban Services and Technology; (10) Housing Policies. See also: https://habitat3.org/documents-and-archive/preparatory-documents/policy-papers/ (accessed 08.03.2021)

[6] See also: https://habitat3.org/documents-and-archive/preparatory-documents/national-reports/ (accessed 08.03.2021)

[7] Jakarta, Abuja, Prague and Toluca Declaration. See also: https://habitat3.org/documents-and-archive/preparatory-documents/regional-declarations/ (accessed 08.03.2021)

for urban agendas comes from the Davos Forum directly, as referenced by Iberdrola (2020):

> The World Economic Forum pointed out the main challenges facing the new sustainable town planning roadmap:
> • The New Urban Agenda lacks predefined indicators to measure its progress and leaves the choice and monitoring of results to local governments.
> • It takes time, training, specialisation and concerted effort to monitor and correctly evaluate the progress attributable to the agenda.
> • Favourable institutional frameworks are needed with adequate regulation, coordination mechanisms at all levels and a clear, accountable government structure.
> • Greater participation by local governments is appropriate, assuming more weight, control and power when making decisions."
> • The transformation of cities requires greater cooperation and dialogue between public authorities and the private sector, educational bodies and civil society. (Iberdrola 2020)

All of the above-mentioned challenges indicate an implementation gap and a discrepancy between the ambitions and reality of these international agendas. **As a key element to benchmark and measure development, respective urban indicators related to these agendas are required to be able to monitor the successful or unsuccessful implementation** (Kotz 2006; Smith, Blanchet, and Frison 2018)**.** These indicators have an explicit connection with policy (Hall et al. 2001). If they are selected and employed adequately, they can break down the complex correlations between the public policy processes and the urban agenda settings into manageable and measurable pieces, to work through the implementation challenges in a structured manner.

0.2 Justification: problem formulation and relevance

As well as a gap in implementation, there also exists a gap in the current state of knowledge. "Linking the physical to the social city is the challenge of our times" (Batty 2016). As Dahiya and Das (2020) outline, this knowledge gap is becoming "increasingly relevant in the global development community", especially in developing countries and emerging economies, as they "urbanize at a significant pace". According to Walton (1982), "interest in comparative urban studies dates at least from the time of the early Greek philosophers who endeavored to explain the contrasts between the civil society of Athens and the militaristic society of Sparta", though most work is not really comparative and has its geographical focus on the developed countries of Europe and North America. In addition, urban studies often "analytically divided the world of cities into, for example, wealthier and poorer, capitalist and socialist, or into different regional groupings of cities, with subsequently very little comparative research across these divides" (Robinson 2011).

According to Caprotti *et al.* (2017), there is an imminent "need to critically engage with the role of experts, data, measurement and their implications for the production, performance and promotion of specific visions of what could be described as the 'new urban citizen'", to widen the debate and shaping of urban agendas as did the Agenda 2030 with its SDG 11 or the NUA, especially in regards to how they are "operationalized in urban practice as well as theory".

Decision-makers in cities around the world are forced to take immediate actions to mitigate and adapt to the urban challenges of our era, among others by virtue of environmental overburdening and climate change (Calthorpe 2010; J. A. P. de Oliveira et al. 2015; Lee and Hughes 2017), but also due to overpopulation (Day and Day 1973; Vidal and Scruton 2007; Gobbi 2016) and the limitation of resources (Hansen 1959; Meadows et al. 1972; Neuman 2005). The merits of growth are still questioned while the "long-term future is becoming operational" (I. Sachs 1974) and part of current reality. However, the need for such a rapid transition to sustainability requires an understanding of "the necessity and general direction of the transition [, as it] is a precondition for mustering the political will" (Goodland 1991). Politics serves as a main "conveyer" for the channelized transition and development of society (Edelman 1964). But without a solid base of information and sufficient data, decisionmakers might come to false conclusions (Jervis 2010). The culture of urban transformation is not usurped by technological innovation but rather thrives with it and requires appropriate methods, whereas "method demands personal experience and observation" (Mumford 1961).

Therefore, to narrow the knowledge gap about the global south, provide information about monitoring indicators, enhance participation, and endorse the dialogue between institutions, this research intends to present current data and reflect on urban agendas and their indicators (Figure 3). The work then intends to analyze existing tools and assess new instruments through field studies in developing countries and emerging economies to finally synthesize recommendations and suggest mechanisms for the improvement of future urban agendas.

Figure 3 - Why a new tailor-made set of indicators is necessary for the global south
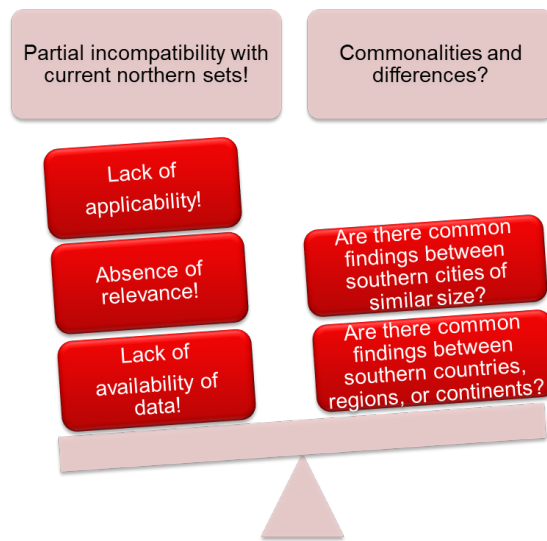
Source: Own elaboration

In this research, the following questions are discussed:

- To what extent are international standards for city performance indicators regarding "sustainable urban development" (like the "Global Urban Indicator Database - GUID1" or "ISO 37120") known in municipalities of the global south?

- Standards claim to be "applicable to any city, municipality or local government". Do these global standards (like the ones developed by UN-Habitat and ISO) also reflect the needs and reality of cities and municipalities in the global south and measure their performance adequately?

- Key characteristics for successful indicators seem to be "simple" and "inexpensive to collect". What other characteristics could be identified for workable indicators in southern municipalities?

0.3   Hypothesis

Global meetings at the highest international level such as the UN-Habitat Conferences every 20 years are essential to discuss current urban needs and benchmark via indicators the urbanization process around the world. The closing papers and recommendations produced are a valuable contribution to urban development worldwide. These global meetings attempt to foster local agendas and enhance public policies on the regional level. However, very often, there is a lack of local governance and ownership of society on the national level. In addition, there are no structured plans for implementation and

monitoring at the municipal level. International agendas and territorial planning instruments may never be entirely implemented on-site if these shortages remain.

The Habitat II conference in 1996 demonstrated the desire and commitment of countries to adopt the agreed upon recommendations. On the other hand, developing countries and emerging economies very often struggle with the implementation and monitoring of agendas. There are still many gaps left and the current planning and monitoring tools face several unsolved challenges. Cities and municipalities in many developing countries lack management tools and reliable indicators for the successful implementation and monitoring of progress. Therefore, the transformation process of previous agendas is far from finished and the new recommendations of the most recent Habitat III conference in 2016 might face the same lack of governance and oversight. International urban agendas, for example, the NUA, should serve as a basis for politicians and decision-makers on-site, but they continue to have little measurable influence on local agendas.

Based on the experiences of previous international agendas, such as the Millennium Development Goals (2000) or the closing papers of former habitat conferences (1976 and 1996), the Sustainable Development Goals (2015), NUA (2016), and other current and future agendas might face the same challenges to successful implementation as other previous well-intended yet poorly executed recommendations. Especially in the global south, there is a lack of preparedness and acceptance of agendas and indicators to monitor development. The past experiences lead towards the following hypothesis: **There are global sets of indicators partly incompatible with the global south situation.** Due to the research and knowledge gap in developing countries regarding successful southern implementations, lessons of the past were not learned adequately yet, seeing as current agendas are still mainly focused on the global north, although they have got regularly revised throughout the last decades by several multilateral and bilateral development agencies, like the World Bank (Görgens and Kusek 2009b) and United Nations bodies (UNSD 2021). In particular, because of the partial incompatibility with current northern monitoring tools and indicator sets (e.g., lack of applicability, absence of relevance, lack of availability of data) and certain commonalities and differences between the spheres, a new tailor-made set of indicators might be necessary for the global south to answer the research question: **Is a fixed common "southern" indicator set possible? And if yes, what kind of set would it be?** This

question will be investigated and reviewed, based on a case study of past and current settings as well as experiences in developing countries and emerging economies.

0.4 Objectives

As a general objective, this study aims to **improve, develop, suggest, and/or create a contextual applicable set of existing indicators for emerging economies of the global south**. This research intends to syncretize the current debate, analyze consistent development techniques to support cities and municipalities concerning the state of knowledge of the implementation of international urban agendas, and increase awareness of the challenges of sustainable urban development in national and municipal management in the global south.

As specific objectives, this research intends to:

(1) analyze existing urban agenda applications in developing cities at the municipal level to improve preparedness, action, and acceptance for successful implementation,

(2) examine and critically review monitoring instruments and indicators of non-binding doctrinaire documents for implementation on the national, federal, and local municipal levels, as well as reflect on their feasibility and usefulness in the global south,

(3) a) introduce a selection of quality indicators specifically for cities that already have an approach to sustainability but have a lower capacity to benchmark and measure sustainable urban development,

(3) b) assess this new indicator spectrum through case studies with international municipal experts from developing cities and municipalities, to extend the reach and success of urban agendas in the future and improve (although not solve) the ability to evaluate their results; and finally

(4) create recommendations, suggestions, and mechanisms based on the outcome and new indicator set. (Figure 4).

Figure 4 - Contextualization and objectives
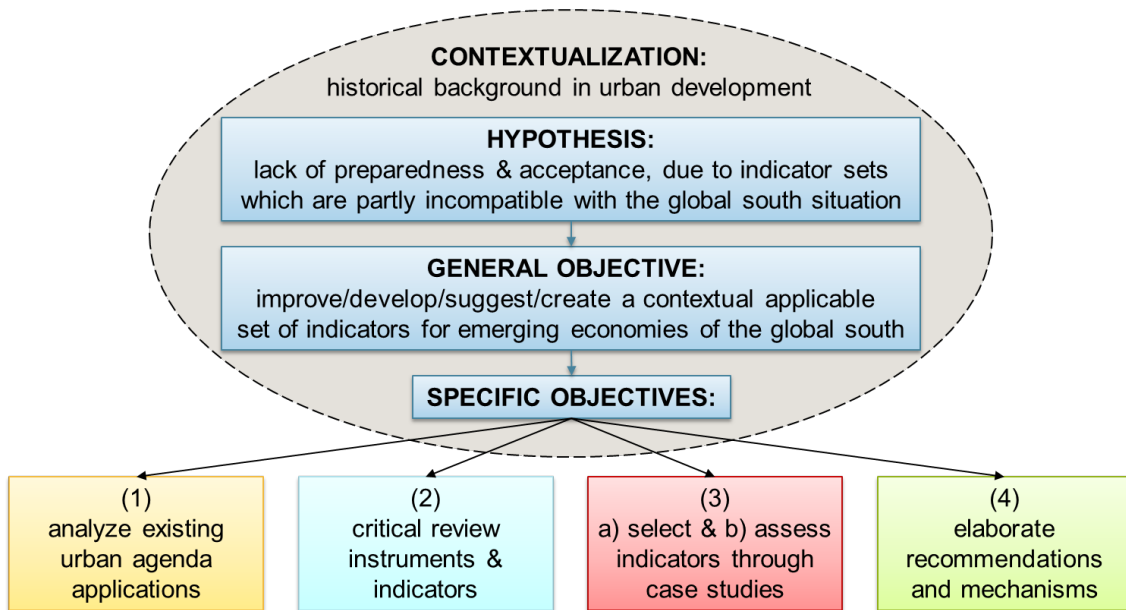
Source: Own elaboration

The applied work does not claim a deep theoretical reflection but wants to critically review the practical application and support the successful implementation of urban agendas. The scope of the research therefore contains, on the one hand, the goal to support the impact of international guidelines on a local scale. It is intended to propose possible recommendations to improve and adapt existing urban indicator sets, which will be more suitable in developing cities and local administrations of the global south, in order to broaden the scope of international urban agendas in local agendas. On the other hand, the study intends to also encourage international governments at the national level to critically scrutinize their own indicator sets, improve their monitoring systems as well as implementation measures, and provide suggestions to enhance public policy. The goal of the subsequent exercise is therefore not to produce another new globally applicable indicator set or index, but rather to illustrate the practicability (or impracticability) of existing indicators, and to illustrate the advantage and viability of an embracing spectrum mix. This study will analyze the impacts of public policies and implantation, to be able to learn from the past, extrapolate for future scenarios, and then synthesize sustainable and successful implementations of urban agendas.

Nonetheless, this study won't be able to heal or solve the uneven quality of international agendas, applied indicators, and local data situations. This work also does not claim to be conclusive. There will be several untouched or underexplored fields of research in the context of urban indicators, such as the topic of informalities and their respective challenges, social & environmental indicators which could be further explored,

dynamic elements e.g., regarding urban growth and specifically the speed of growth, reliability, and trustworthiness of the processed data, or a deeper debate about how, or to whom this data is made available, and rules for data accessibility and disclosure. Also, in this specific case of the research, the results presented in Chapter 4 and recommendations in Chapter 5 could be further validated and looped back to the engaged municipalities of the global south to enhance the findings and increase applicability. But due to time constraints and working economics, the scope of this work was limited to the current size. However, this thesis will hopefully inspire other scholars and leave its readers with the desire to take up the baton, build upon its findings, and continue with the research on related topics and subsequent interfaces.

0.5   Structure of the thesis

After this introduction, Chapter 1 comprises a bibliographic review and a summary of the current practice-oriented status, with an emphasis on how urban agendas approach urban challenges and international experiences in implementing urban agendas. This is done in order to address the (1.) specific objective and expand the understanding of urban agenda applications. Chapter 2 will present the methodology applied to the desk study (literature review), field study (global survey), and overall research.

Following this, Chapter 3 encompasses the analysis and critical review of existing indicators and instruments as well as the horizon-scanning of potential new indicators for urban sustainability to measure the implementation of urban agendas in the four key dimensions of integration, in response to the (2.) specific objective. The section concludes with a brief reflection on existing indicators and urban agendas, and a summary analysis of the main findings which influenced the subsequent research.

Chapter 4 contains an analysis of globally recognized indicator sets, the selection of a new indicator spectrum, and an investigation and interaction with case city administrations to analyze the knowledge gap and capacity needs in municipalities of developing countries and emerging economies, as well as to assess the introduced indicators with international municipal experts and review the conformability of the selected indicators with existing planning instruments, as planned in the (3.) specific objective.

Chapter 5 compiles the results, provides final recommendations, and suggests mechanisms to improve future implementations, responding to the (4.) specific objective

of the thesis. The final Chapter 6 summarizes the conclusions and outlines work limitations and suggestions for future work (Figure 5).

Figure 5 - Overall chapter overview

Chapter 0
- **Introduction**
  ➤ contextualization, justification, hypotheses and objectives

Chapter 1
- **Urban agendas and urban challenges:** *(1. specific objective)*
  ➤ analyze urban agenda applications

Chapter 2
- **Methodology and research design**
  ➤ present methodologies applied for the research

Chapter 3
- **Critically reviewing existing indicators:** *(2. specific objective)*
  ➤ critically review instruments and indicators, provide brief reflection

Chapter 4
- **Deriving suggested spectrum of indicators:** *(3. specific objective)*
  ➤ select and assess indicators through case studies

Chapter 5
- **Recommendations and outcomes:** *(4. specific objective)*
  ➤ elaborate recommendations & suggest mechanisms for global south

Chapter 6
- **Conclusion**
  ➤ provide summary, highlight work limitations, and suggest future work

Source: Own elaboration

Finally, the last section of this work comprises the bibliographic references, followed by the annexes, *inter alia* two published articles, the list of main relevant journals to the topic, further insights of the NUA, the results of the desk study concerning capacity development institutions, the matrix of globally recognized and applied indicators, the qualitative questionnaires applied during the global overview survey, and the compiled responses of the case study assessment.

1   THE ROLE OF INDICATORS IN INTERNATIONAL URBAN AGENDAS

1.1   The approach of urban agendas

As already highlighted in the introduction, the first international urban agendas date back to 1968 and the formation of the Club of Rome. However, the modern origins of urban planning actually lay in a social movement for urban reform that arose in the latter part of the 19th century as a reaction against the disorder of industrial cities (Encyclopedia Britannica 2015).

To get a better understanding of how modern urban agendas influence our current habitats and how urban challenges can be overcome, especially in the global south, there must be a better understanding at the analytical level. Specifically, the definition of sustainable urban agendas and the concept of city models. The theoretical background of urbanization and its implications, as well as a common definition of sustainable urban agendas, is necessary to understand the conception and intentions that go alongside the desired successful implementation. To illustrate current approaches, the scrutinized and deconstructed NUA can serve as a useful example, and on its basis, the link between urban agendas and urban challenges can be exemplified.

1.1.1   Definition of developing countries of the global south

The first use of 'global south' in a contemporary political sense was in 1969 by Carl Oglesby, writing in the Catholic journal Commonwealth in a special issue on the Vietnam War. Oglesby argued that centuries of northern "dominance over the global south […] [have] converged […] to produce an intolerable social order." (Oglesby 1969). The phrase 'Global South' refers broadly to the regions of Latin America, Asia, Africa, and Oceania. It is one of a family of terms, including 'Third World', 'Developing World' and 'Periphery', that, according to Dados and Connell (2012) developed to "denote regions outside Europe and North America, mostly (though not all) low-income and often politically or culturally marginalized" (Figure 6).

Figure 6 - The world perspective from the global south
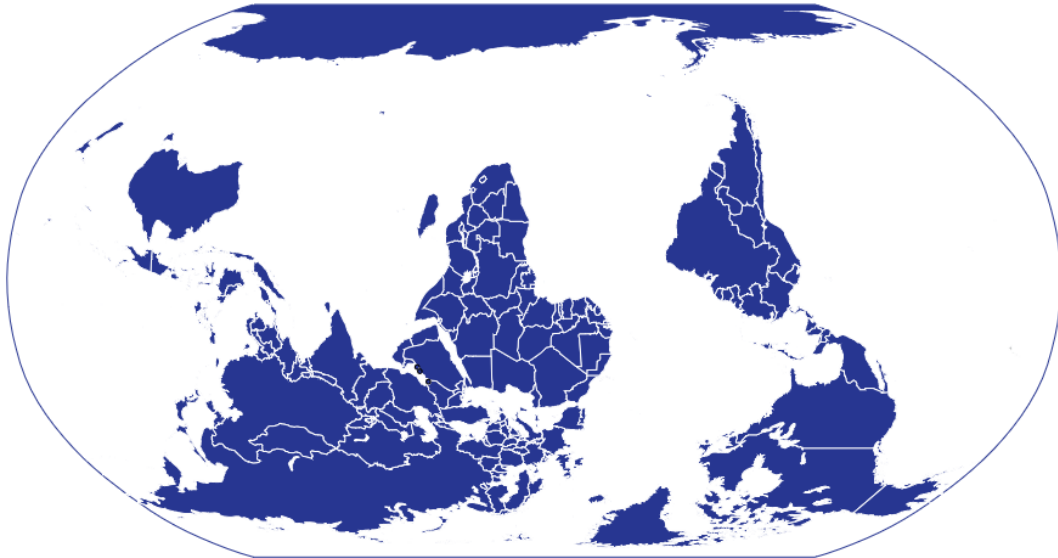
Source: (Dados and Connell 2012)

The term 'Global South' gained prominence throughout the second half of the 20th century and rapidly increased in use in the early 21st century. It emerged in fewer than two dozen publications in 2004 but was used in hundreds of publications by 2013 (Pagel et al. 2014). The concept of classifying countries by their developmental and economic status began during the Cold War with the groupings of East and West. The Soviet Union and China represented the East, and the United States, Western Europe, and their allies represented the West.

The term 'Third World' came into use in the second half of the 20th century. It originated in a 1952 article by Alfred Sauvy and Jean Daniel titled "*Trois Mondes, Une Planète*" (Sauvy 1986). Early definitions of the 'Third World' underscored its exclusion from the east–west tension of the Cold War and referenced the ex-colonial status and general poverty of these countries (Tomlinson 2003). The latter characteristics of these countries were also attributed to the term 'Developing World'. Contemporaneously, a model of economic criticism that separated the world economy into 'Core' and 'Periphery' was developed and given expression in a project for political reform which "moved the terms 'North' and 'South' into the international political lexicon" (Dados and Connell 2012).

The rise of the new term 'Global South' meant confronting the troubled realities of its predecessors, like 'Third World', 'Developing World' or 'Periphery', and the term is intended to be less hierarchical, paternal, or evolutionary than its predecessors (Hollington et al. 2015). However, the term itself has no strict relation to the actual

geographical location, as e.g., Australia and New Zealand in the southern hemisphere are usually attributed to the 'Global North', or Mexico, although geographically situated in North America, is rather related to the 'Global South' (Figure 7).

Figure 7 - The Brandt line, division of world on rich north and poor south
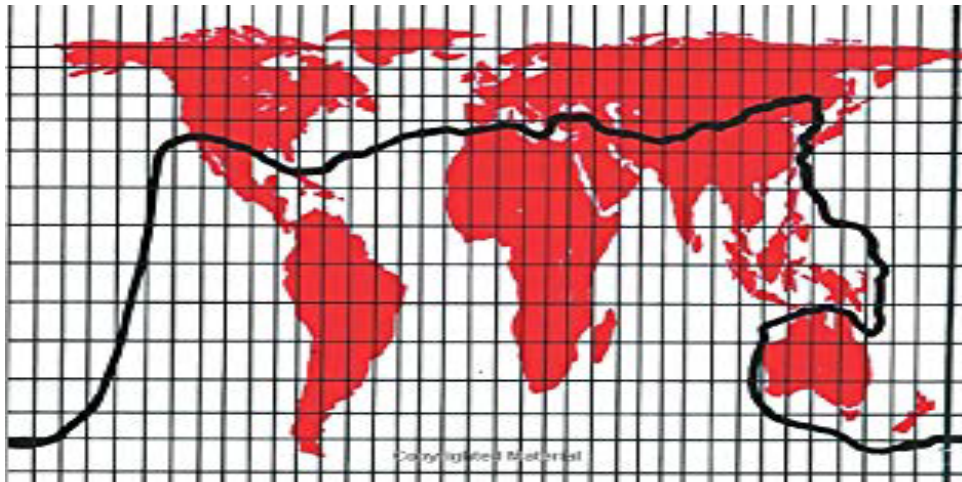
Source: (Brandt 1980)

The quest for a new international economic order which was to be negotiated between countries of the North and South and pursued with the backing of the United Nations was initiated at the Non-Aligned Summit held in Algiers in 1973 (Cox 1979). Another incident in 1973, the oil embargo initiated by Arab OPEC countries as a result of the Yom Kippur War, caused according to the Brandt Commission Report[8] an increase in world oil prices, with crude oil rates continuing to rise throughout the decade and leading to a worldwide recession (Brandt 1980). Consecutively, this allowed industrialized nations to increase their economically protectionist policies and contributed to a reduced amount of aid to the less developed countries of the South (Stettner 1982). Western (especially American) banks then found themselves drowning in petrodollars, allowing them to provide substantial loans to Third World countries.

By the early 1980s, it was clear that Third World/Global South countries would not be able to pay back their loans, and would instead default and declare bankruptcy, which led the IMF to extend further loans on the condition that they undertake certain liberalizing reforms (Litonjua 2012). This policy, which came to be known as structural adjustment and was institutionalized by International Financial Institutions (IFIs) and Western governments, represented a break from the Keynesian[9] approach to foreign aid

---

[8] The Brand Report was written by the Independent Commission for International Developmental Issues and first chaired by Willy Brandt in 1980. The Independent Commission for International Developmental Issues was established in 1977 with the aim to review international development issues (Lees 2021).
[9] Named after British economist John Maynard Keynes

which had been the norm from the end of the Second World War (Litonjua 2012) and deeply influenced the definition of developing countries of the global south.

The principal differences between the traditional North-South approach, the Bretton Woods paradigm, and the UN paradigm are condensed in Table 1 by Thérien (1999) and distinguish the worldview, geography, political platforms, and determinants of poverty. He argues that poverty is a social construction, one whose definition is constantly evolving as changes occur within the world order.

Table 1 - Three approaches to world poverty

	Traditional North-South approach	Bretton Woods paradigm	UN paradigm
Worldview	Bipolar division between rich and poor countries	Inclusive globalization Economic integration	Two-tiered globalization Social exclusion
Geography of poverty	Developing countries	Least-developed countries	Developed countries and developing countries
Determinants of poverty	External factors (economic environment dominated by developed countries)	Internal factors (non 'market-friendly' economic policies)	Internal and external factors (conflict between economic objectives and social needs)
Political platform	New international economic order	Liberalization of markets Competitiveness of firms	Sustainable human development Inter-generational equity

Source: (Thérien 1999)

Based on the definitions from the UN paradigm, the IMF developed a country classification, distinguishing between 'advanced economies', 'emerging & developing economies', and 'least emerging & developing economies' (Figure 8). This classification is based on the gross domestic product[10] (GDP) of each respective country and is used to measure a country's economic health, utilized as a global reference for the assignation of grants (e.g., for development aid) or credit lines (in regard of a country's creditworthiness), and the latter classifications also apply as a common definition of developing countries of the global south.

The target countries of this research on international urban agendas and sustainable urban development in developing cities are the emerging and developing economies in the global south. Economies at each end of the spectrum (advanced

---

[10] Gross domestic product is the most commonly used single measure of a country's overall economic activity. It represents the total value of final goods and services produced within a country during a specified time period, such as one year (IMF 2022).

economies and the least emerging and developing economies or crisis-stricken countries) are disregarded. From this point, the classification displayed in Figure 8 (orange and red) will be adopted for the terminology of the global south.

Figure 8 - Country classifications by the IMF (2021) and the UN

▌Advanced economies

▌Emerging and developing economies (not least developed)

▌Emerging and developing economies (least developed)

▌Unavailable data
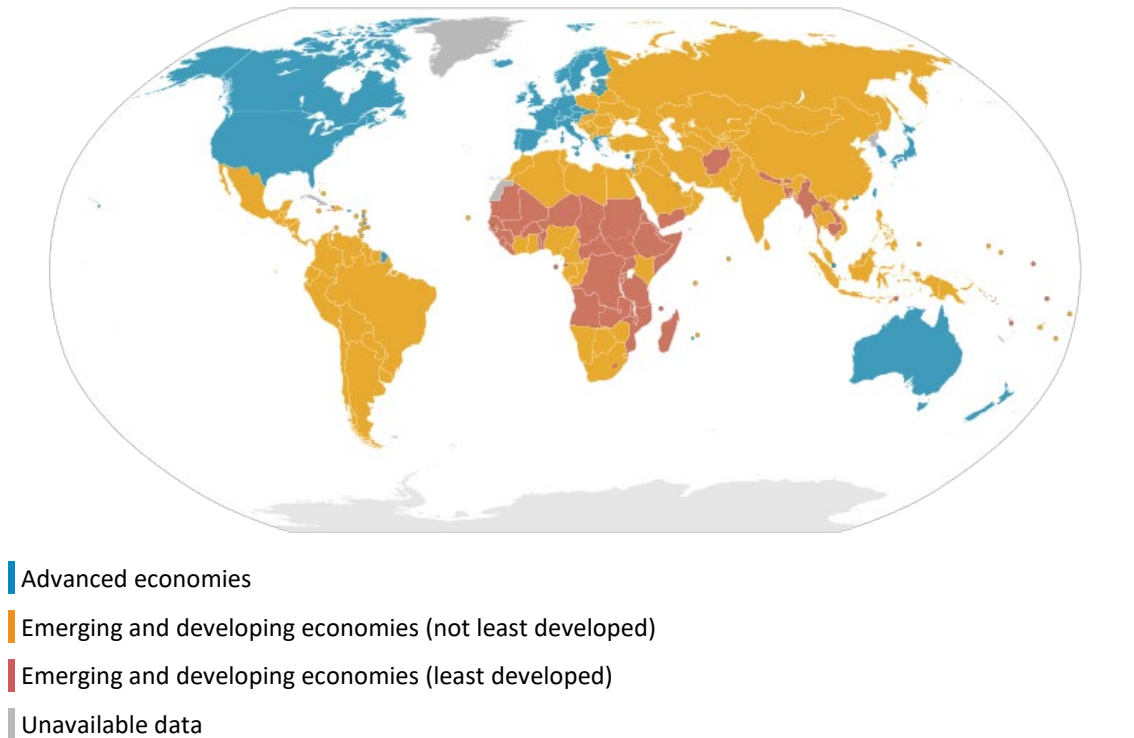
Source: (Weblio 2022)

1.1.2 Definition of sustainable urban agendas

In recent years, the term "sustainable" has become quite inflationary and has seen distinguished use in politics, science, economics, literature, and news all over the world. Especially international agendas, such as the Agenda 2030 comprising the SDGs and the NUA[11], make extensive use of the term. Sustainability seems to be key for the successful implementation of international guidelines at the national and regional levels. However, to better understand the terms sustainability and sustainable development, it requires, first of all, a common definition. In the New Encyclopaedia Britannica, Meadowcroft (2007) states the following in an article about sustainability:

> Sustainability, the long-term viability of a community, set of social institutions, or societal practice. In general, sustainability is understood as a form of intergenerational ethics in which the environmental and economic actions taken by present persons do not diminish the opportunities of future persons to enjoy similar levels of wealth, utility, or welfare.

---

[11] E.g. the words "sustainable" and "sustainability" are mentioned 162 times in the NUA (UN-Habitat 2017)

The idea of sustainability rose to prominence with the modern environmental movement, which rebuked the unsustainable character of contemporary societies where patterns of resource use, growth, and consumption threatened the integrity of ecosystems and the well-being of future generations. Sustainability is presented as an alternative to short-term, myopic, and wasteful behaviours. It can serve as a standard against which existing institutions are to be judged and as an objective toward which society should move. Sustainability also implies an interrogation of existing modes of social organization to determine the extent to which they encourage destructive practices as well as a conscious effort to transform the status quo so as to promote the development of more sustainable activities.

According to Meadowcroft, in the contemporary debate about the term, "sustainability often serves as a synonym for sustainable development"; on further occasions, the definition is associated more exclusively with "environmental constraints or environmental performance".

Sachs (1974), as one of the first eco-socioeconomists, observes that "environment is a dimension of development, and must therefore be internalized at every decision-making level". His attempt to consolidate a new theory about the possibility of a different development model has led to the idea of sustainable development. The most famous cornerstone in regard to sustainable development was published in 1987, the Brundtland Report. This introduced environmental concerns to the formal political development sphere and discussed environment and development as one single issue (World Commission on Environment and Development 1987). Nonetheless, some authors identified contradictions in the sustainable development thesis of the Brundtland Report (Haavelmo and Hansen 1991; Goodland 1991).

Several possible compositions illustrate the dimensions of sustainability, as Laura (2004) (Table 2), Mensah (2019), and others have suggested.

Table 2 - Selection of possible sustainability dimensions

DIMENSIONS OF SUSTAINABILITY	AUTHORS
Environmental, social, economic	LT *et al.* Consortium (1998) *apud* Dobrovolski (2001)
Environmental, social, economic, institutional	IBGE (2000); Sepúlveda (2002)
Social, economic, cultural, ecological, spatial	Sachs (1993)
Planetary, ecological, environmental, demographic, cultural, social, cultural, political, institutional	Guimarães e Maia (1997)
Social, economic, environmental, physical, human, psychological, cultural, political	Ribeiro (1998)

Source: (Laura 2004, own translation)

However, most sustainable urban agendas, including the Agenda 2030 and the NUA, include at least the five dimensions indicated by Sachs (1993), by promoting mutual urban development in the social, economic, cultural, ecological, and spatial fields

of intervention. Therefore, this definition is reflected in this work as well, and the five dimensions (social, economic, cultural, ecological, and spatial) are scrutinized in order to foster recommendations and suggest alternative mechanisms for the successful implementation of international urban agendas.

Filho (1993) further extends the term sustainable development and the five sustainability dimensions by Sachs into their respective main components and objectives (Table 3).

Table 3 - Components and Objectives of Each of the Five Pillars of Ecodevelopment

DIMENSION	MAIN COMPONENTS	OBJECTIVE
SOCIAL SUSTAINABILITY	- Creation of jobs that allow for adequate individual income and better living conditions and better professional qualification. - Production of goods directed primarily to basic social needs.	REDUCING SOCIAL DISEQUALITY
ECONOMIC SUSTAINABILITY	- Permanent flow of public and private investments (the latter with special emphasis on cooperativism). - Efficient management of resources. - Absorption by the company of environmental costs. - Endogenization: rely on your own strengths.	INCREASED PRODUCTION AND SOCIAL WEALTH, WITHOUT EXTERNAL DEPENDENCE
ECOLOGICAL SUSTAINABILITY	- Produce respecting the ecological cycles of ecosystems. - Prudence in the use of non-renewable resources. - Priority to the production of biomass and the industrialization of renewable natural inputs. - Reduction of energy intensity and energy conservation. - Technologies and production processes with a low waste rate. - Environmental care.	QUALITY OF THE ENVIRONMENT AND PRESERVATION OF SOURCES OF ENERGY AND NATURAL RESOURCES FOR NEXT GENERATIONS
SPATIAL OR GEOGRAPHIC SUSTAINABILITY	- Spatial decentralization (of activity, population). - Deconcentration - local and regional democratization of power. - Balanced city-country relationship (centripetal benefits).	AVOID EXCESS OF AGGLOMERATIONS
CULTURAL SUSTAINABILITY	- Solutions adapted to each ecosystem. - Respect for community cultural formation.	AVOID CULTURAL CONFLICTS WITH POTENTIAL REGRESSIVE

Source: (Filho 1993), own translation

Though additional concerns must also be considered; collaboration within intergenerational ethics and the creation of diverse regenerative cultures adapted to the unique biocultural conditions of an area. Wahl (2016) argues that there is a level beyond sustainability when it comes to designing regenerative cultures. He highlights the spectrum of human development in a gradual process, starting with conventional habits by staying within the law, green actions with less negative impacts on environmental

aspects, and sustainable rules of conduct in the center of the range by trying to avoid additional harm to society. On the other side of the spectrum come restorative measures, where "humans do things to nature", and at the far end the regenerative culture, where "humans do things as nature" (Figure 9). He questions "how we will have to change individually and collectively to create this future" and proclaims that "we need a collective narrative about who we are and why we are worth sustaining".

Figure 9 - Beyond Sustainability: Designing Regenerative Cultures
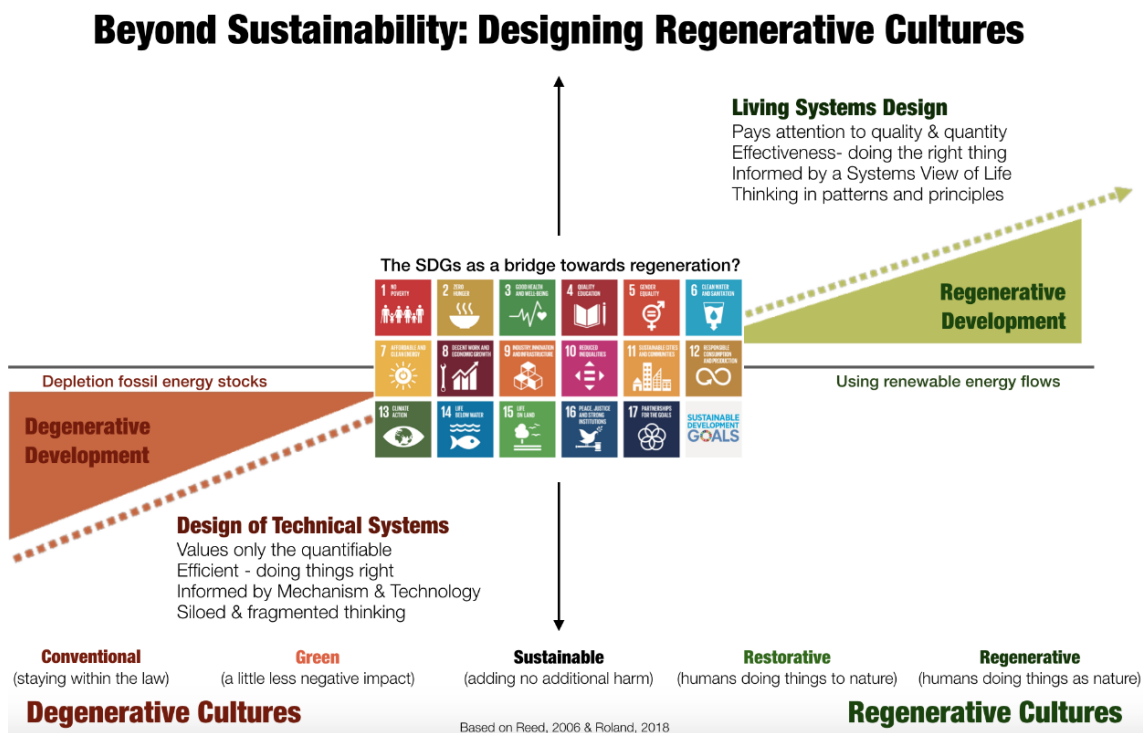
Source: (Wahl 2016)

In this context, Wahl challenges international agendas like the SDGs as a bridge toward regeneration. In fact, looking at the ten exemplary targets of SDG 11 and their aim to make cities and human settlements inclusive, safe, resilient, and sustainable, the goal conceivably runs into its own limits and remains at the level of sustainable rules of conduct.

In summary, the word sustainability underwent a process of development in the last decades. The definition of sustainable urban agendas is not always consistent and depends very much on the context in which it is applied. In light of the research question regarding the implementation of international guidelines on a local scale, sustainability reflects the intention to outlast short-term intervention and policies, which are often created by short-sighted political activities, concerned only with the next legislative

period. In contrast, sustainable urban agendas rather aim to shape urban development based on long-term considerations and align with overarching common social, economic, cultural, ecological, and spatial values. This view is also adopted in this further study.

1.1.3   The concept of city models

To enhance the understanding of urban agendas, their state of knowledge and their implications, an analysis of academic literature is conducted. The concept of international agendas in general and appeals for action, in particular, are well represented and articulated in the academic and non-academic space. The concept depends on a reflection on the city in the diachrony of transformations that shape it and in the synchrony with which citizens see and live urbanity (Fernandes and Meirinhos 2008). The practices of city modeling are not neutral, but rather "conceived in economic, political and cultural contexts that are completely different from the cities to which the concepts and theories are disseminated, packed up as 'tool boxes' and action models" (Vainer 2014), such as the 17 SDGs. Following de Andrade & Franceschini (2017) there exists a variety of different urban agenda "city models" for achieving urban sustainability and addressing urban development, of which some are led by international organizations, but not all are represented globally (Table 4).

Table 4 - City models

Agenda	Experiences in Brazil in 2017	Addresses urban development	Has methodological material	Is led by an international organization	Has guiding material on the web
Educating City	x	x	x	x	x
Smart City	x	x	x	x	x
Wise City		x			x
Healthy City	x	x	x	x	x
Sustainable City	x	x	x	x	x
Green City	x	x			
Compact City		x			x
Creative City	x	x		x	
Caring City	x	x			
Fair City	x	x			
Resilient City		x	x	x	x
Cities for Peace		x	x		x

Source: (de Andrade and Franceschini 2017)

Along with the concept of city models, various new descriptions, definitions, and neologisms emerged, such as: "Educating City" for strategic spaces which proposes

education as a motor for personal and collective development, and for improving coexistence and social cohesion; "Smart City" regarding the use of technology and innovation for city planning and management, the development of urban infrastructure, sustainable economic growth and the improvement of quality of life; "Healthy City" based on the chain of health promotion that prioritizes socio-political actions with actors beyond the health sector, integrated experiences, and multi-sector dialogue; or the all-encompassing "Sustainable City" to promote a wide range of sustainable development strategies based on Sustainable Development Goals (SDGs); etc. (de Andrade and Franceschini 2017).

These descriptions are very often reproduced and used by local politicians to differentiate their cities' agenda and emphasize the respective regional priorities in regard to its urban development pathways and goals. For example, in Brazil, the "smart city approach" is very valued and frequently applied as a pillar of recent municipal agendas. E.g. Rio de Janeiro, Porto Alegre, Belo Horizonte (Viale Pereira et al. 2017), Curitiba (Macke et al. 2018) or Búzios (Batista and Fariniuk 2017). However, the definitions of the above-mentioned city models are very vague, lack quality labels, and are neither sufficiently differentiated from each other nor legally protected.

But on the other side of the same coin, pliable definitions also have advantages. On the one hand, this can help increase the ownership of citizens and public servants, who actively shape the deployment of their city and local urban agenda and can unite under a catchword slogan. On the other hand, too strict definitions might hamper the process of holistic city development, as falling into one or two categories can overeagerly narrow the city's problems, which are multiple and varied. Therefore, the classification into "city models" has to be applied with caution in the implementing process at national and regional levels to avoid impeding an integral and overarching approach of international guidelines for urban agendas. "City models and rehabilitation plans should [also] be subject to sustainability assessments and should consider the active participation of the city inhabitants […] [as] a city can only be sustainable if its population is in harmony with the city model" (Barbosa, Bragança, and Mateus 2014). Or in other words, the best order of the city lies in the thoughtful care of man (Mumford 1961).

Thus, for this work, a single definition or city model will not be determined-rather, the keyword "sustainability" will be used as an overarching concept for urban development agendas. There are already many debates and analyses on the principles and practices of urban policy and sustainable urbanization in general. A kaleidoscope of

bibliographies from the new century has already reflected and analyzed these current themes. Some of them were presented in the previous chapter, others will be presented in subsequent sections.

1.1.4 The New Urban Agenda exemplified

As a recently developed international urban guideline, the NUA serves as a good example to scrutinize how current urban agendas are structured, what the principal appeals for action concerning urban challenges are, and what the interconnections with other international guidelines are. Although it admittedly has certain methodological loopholes, especially when compared to the SDGs with its well-refined structure of goals, targets, and indicators, it nonetheless exemplifies how agendas might be implemented on regional and national levels as well as the goals of guidelines from international agencies such as the UN-Habitat. This is important to understand the link between global urban challenges and the intentions of international agendas to overcome urban deficiencies and shortcomings.

The official document of the NUA is structured in 175 paragraphs. Its first part contains a contextualization and the NUA's objective, vision, principles, commitments, and call to action. It provides the background of the NUA and highlights the main challenges for the future: housing, infrastructure, basic services, food security, health, education, decent jobs, safety, and natural resources, among others. The main objectives of the NUA are: to end poverty and hunger in all its forms and dimensions; reduce inequalities; promote sustained, inclusive, and sustainable economic growth; achieve gender equality and the empowerment of all women and girls in order to fully harness their vital contribution to sustainable development; improve human health and wellbeing; foster resilience; and protect the environment.

The vision of the agenda is to provide just, safe, healthy, accessible, affordable, resilient, and sustainable cities and human settlements, or in other words, "cities for all". This implies the right of each citizen to adequate housing, water and sanitation, public goods and services, food security and nutrition, health, education, infrastructure, mobility and transport, energy, air quality, and livelihoods. The commitment of the agenda comprises an urban paradigm shift regarding planning, finance, development, government, and management of cities and human settlements, including developing and implementing urban policies, strengthening urban governance, reinvigorating long-term

and integrated urban and territorial planning and design, and supporting effective, innovative and sustainable financing frameworks and instruments. The call to action invokes all countries with their national, subnational, and local governments to implement the agenda at the regional and global levels, considering different national realities, capacities, and levels of development, and respecting national legislation and practices, as well as policies and priorities (UN-Habitat 2017). Further details on the NUA, its principal appeals for action, its implementation on the regional level, and the goals that UN-Habitat wants to achieve with the agenda are summarized in Annex 4.

Interconnections with other international guidelines

The NUA accounts for previous milestone achievements up to 2015. In particular, the 2030 Agenda for Sustainable Development[12], including the Sustainable Development Goals (SDG), the Addis Ababa Action Agenda of the Third International Conference on Financing for Development[13], the Paris Agreement adopted under the United Nations Framework Convention on Climate Change[14], the Sendai Framework for Disaster Risk Reduction 2015-2030[15], the Vienna Programme of Action for Landlocked Developing Countries for the Decade 2014-2024[16], the Small Island Developing States Accelerated Modalities of Action Pathway[17] and the Istanbul Programme of Action for the Least Developed Countries for the Decade 2011-2020[18]. The NUA also takes into account the Rio Declaration on Environment and Development [19], the World Summit on Sustainable Development, the World Summit for Social Development, the Programme of Action of the International Conference on Population and Development [20], the Beijing Platform for Action [21], the United Nations Conference on Sustainable Development and the follow-up to these conferences, as highlighted in the introduction (Figure 2).

---

[12] Resolution 70/1
[13] Resolution 69/313, annex
[14] FCCC/CP/2015/10/Add.1, decision 1/CP.21, annex
[15] Resolution 69/283, annex II
[16] Resolution 69/137, annex II
[17] Resolution 69/15, annex
[18] Report of the Fourth United Nations Conference on the Least Developed Countries, Istanbul, Turkey, 9-13 May 2011 (A/CONF.219/7), chap. II
[19] Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3 14 June 1992, vol. I, Resolutions Adopted by the Conference (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex I
[20] Report of the International Conference on Population and Development, Cairo, 5-13 September 1994 (United Nations publication, Sales No. E.95.XIII.18), chap. I, resolution 1, annex.
[21] Report of the Fourth World Conference on Women, Beijing, 4-15 September 1995 (United Nations publication, Sales No. E.96.IV.13), chap. I, resolution 1, annex II.

The agenda specifically stresses and reaffirms twice the commitments on means, and links with the follow-up to and review of the 2030 Agenda for Sustainable Development to ensure coordination and coherence in their implementation. In total, there are 178 topic links and overlaps of the 22 issue papers covered by the NUA and the 17 SDGs (Table 5).

Table 5 - Congruence between NUA and SDG in urban issues

HABITAT III		Sustainable Development Goals (SDG)														
AREAS	ISSUE PAPERS	1	2	3	4	5	6	7	8	9	10	11	12	13	15	16
1. Social Cohesion and Equity – Livable Cities	Inclusive cities	X			X	X	X		X	X	X	X				X
	Migration and Refugees in Urban Areas	X	X	X	X	X				X	X	X				X
	Safer Cities			X		X	X					X				X
	Urban Culture and Heritage	X			X	X				X	X	X			X	X
2. Urban Framework	Urban Rules and Legislation	X										X	X	X	X	X
	Urban Governance	X					X					X	X	X	X	
	Municipal Finance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3. Spatial Develop-ment	Urban and Spatial Planning and Design	X	X	X			X			X	X	X	X	X	X	X
	Urban Land											X	X	X	X	
	Urban-rural linkages	X	X	X						X	X	X		X	X	
	Public Space			X		X				X		X		X		X
4. Urban Economy	Local Economic Development	X	X		X			X	X	X		X	X	X		
	Jobs and Livelihoods	X	X		X	X				X	X	X	X	X		X
	Informal Sector	X	X		X	X				X	X	X	X	X		X
5. Urban Ecology and Environ-ment	Urban Resilience		X				X			X	X	X	X	X	X	
	Urban Ecosystems and Resource Management											X	X	X	X	
	Cities and Climate Change and Disaster Risk Management			X			X	X			X	X	X	X	X	X
6. Urban Housing and Basic Services	Urban Infrastructure and Basic Services, including energy						X	X		X	X	X	X	X		
	Transport and Mobility			X	X	X	X			X		X		X		
	Housing			X	X	X	X	X				X	X	X	X	
	Smart Cities				X					X	X	X	X	X	X	X
	Informal Settlements		X		X	X	X					X	X		X	X
Number of overlapping topics.		10	9	9	11	12	9	6	5	14	15	22	13	18	13	12

Source: (Santos 2018)

The correlation is not only confined to the urban SDG Goal #11, which merely highlights the strong connection between the two international agendas. There are several other topic links, such as the green development goals, e.g. SDG 13 and its Climate Action, which is reflected in almost all areas of the NUA. Or the area of municipal

finance, which is relevant to almost all of the SDG targets. In short, the NUA and the Agenda 2030 are deeply and intentionally intertwined with each other.

The link between urban challenges and the New Urban Agenda

The trends of global urbanization and the magnificent scale and rapid pace of urbanization, especially in developing countries, have led to huge problems and challenges, such as "urban sprawl, urban poverty, higher urban unemployment rates, higher urban costs, housing affordability issues, lack of urban investment, weak urban financial and governance capacities, rising inequality and urban crimes, environmental degradation, etc.", as Zhang (2016) asserts. According to the World Economic Forum, the five major challenges facing cities of the future are (1) Environmental threats, (2) Resources, (3) Inequality, (4) Technology, and (5) Governance (Chee and Neo 2018). The NUA attempts to mitigate these urban challenges by addressing diverse topics.

The NUA actually uses the headings and key aspects of the previous chapters in its outline. For example, the NUA also mentions city models such as the "Smart City" explicitly with its own dedicated paragraphs[22], as well as others such as the "Sustainable City", both indirectly and in a general approach. In paragraph 11, the NUA names specifically

> [...] a vision of cities for all, referring to the equal use and enjoyment of cities and human settlements, seeking to promote inclusivity and ensure that all inhabitants [...] are able to inhabit and produce just, safe, healthy, accessible, affordable, resilient and sustainable cities and human settlements to foster prosperity and quality of life for all. (UN-Habitat 2017)

The NUA also shares the same vision of cities for all, including a more socially balanced society, and reinforces in paragraph 11 "the efforts of some national and local governments to enshrine this vision, referred to as "right to the city", in their legislation, political declarations and charters" (UN-Habitat 2017).

In the context of architectural capital and planning instruments, the NUA attempts to promote and preserve socio-spatial structures, as stated in paragraph 124f., by including

> [...] culture as a priority component of urban plans and strategies in the adoption of planning instruments. [...] support the leveraging of cultural heritage for sustainable urban development and [...] promote innovative and sustainable use of architectural monuments and sites, with the intention of value creation, through respectful restoration and adaptation. (UN-Habitat 2017)

---

[22] See paragraph 66 of the NUA (UN-Habitat 2017)

The NUA attempts to link and mitigate the new urbanization challenges that emerged from global growth, catalogs previous urban agendas as well as current effective international policies, and compiles these recommendations into one universal document, intending to bundle the efforts of achieving sustainable urban development on a global scale. The NUA focuses on "shared knowledge, local solutions, and best practices that respond to pressing urban challenges" (Papagni 2017). However, as the new urban agenda develops, Barnett and Parnell (2016) argue that "the adequacy of these forms of urban theory will become more and more contested, not least by traditions of research that seek to develop theoretical ideas and models drawn more directly from Southern experiences of urbanization and urban living". Therefore, epistemologies of the post-2015 urban agenda will have to be evaluated in the future to determine how adequate the proposed measures by the NUA actually mitigate the linked urban challenges of our times.

1.2   International experiences in implementing urban agendas

The implementation of urban agendas is a worldwide challenge, especially considering the knowledge shared (Cociña et al. 2019). International agendas have to be adjusted and, in some cases, "tropicalized" on a national level, especially in developing cities of the global south (e.g. Valencia et al. 2019; Lee and Hughes 2017; Altenhain 2016), as the international agenda setting occurs and is still mainly driven by countries in the global north, due to their financial and political influence in the world "with subsequently very little comparative research across these divides" (Robinson 2011). The lack of ample urban data, adequate indicators, and the absence of baseline studies are in many cases additional obstacles to the process for successful implementation. To provide an overview of the current situation and state of the art regarding already implemented and ongoing implementation experiences of urban agendas worldwide, a qualitative document review was undertaken[23]. In addition, the cases of six global cities with prominent urban agendas (including one 'Best Practice' case) were scrutinized to provide examples of international experiences in implementing urban agendas.

---

[23] Concerning the approach adapted for the document review, see Chapter 2 Methodology and Research Design

1.2.1 Implementation through knowledge transfer

According to Cociña *et al.* (2019), Parnell (2016), and others, the existence of serious "global urban agendas" initiated by international agencies like the UN gets attention and support in all parts of the world. They base their assumption on international guidelines, charters, and directives developed since the turn of the century, especially the creation of the SDGs and the inclusion of an explicit urban goal (Goal 11 - sustainable cities and communities), but also through the NUA and other internationally recognized urban agendas. On the other hand, "local and global planning practices are in constant interaction" and the knowledge shared in global urban agendas play a key factor in success. Cociña *et al.* (2019) furthermore note that community-based actors located on the 'margins' of global processes have a central role in this process. They argue that "there is a growing field of inquiry catalyzing around the dynamics of 'global' urban governance" and "different forms of knowledge circulate and influence each other". Perception guides the experience, which needs to then be systematized (KANT *apud* BORGES; MOREIRA; MARTINS, 1990).

The urban knowledge transfer process started with the Club of Rome in the 1960s and the formation of the Habitat I Conference in the 1970s, and is still ongoing, with a recent peak in the perception and visibility due to the alignment with other sustainability agendas and environmental movements, such as climate change mitigation and adaptation programs or global warming awareness-raising campaigns. The mentioned intrinsic knowledge transfer affects all global citizens on multiple levels and scales and is a nonlinear process. Therefore, knowledge transfer should focus on methodologies that "involve encounters between various forms of planning research and planning practice". One example would be the research-practice dialogues of the Habitat III preparation policy units and their 22 issue papers which paved the road for the later accepted NUA. The agenda itself enhances explicitly the "knowledge-sharing on mutually agreed terms". To do so, it calls in paragraph 157 for

> […] robust science-policy interfaces in urban and territorial planning and policy formulation and institutionalized mechanisms for sharing and exchanging information, knowledge and expertise, including the collection, analysis, standardization and dissemination of geographically based, community-collected, high-quality, timely and reliable data. (UN-Habitat 2017)

However, the classic top-down process is no longer the only or the best method for knowledge transfer. Rodríguez & Sugranyes (2017) even accused the NUA of being "wishful thinking based neither on the present nor the past" as almost half of the world

population still live in other kinds of human settlements, a challenge that requires a different set of knowledge and tools to those that emerged from the Summit's exchange. Harrison (2006) observed in this context that different regions in the South exemplify differentiated definitions of modernity. He mentions "a growing body of work that shows how the recovery and deployment of subalternised knowledge and practices materially impact on the local outcome of global forces". Watson (2012) complemented this by saying that "planning ideas no longer move only from global North to global South and that there are many cross and counter currents, yet it seems likely that traditional north-south flow is still dominant". In addition, Parnell (2016) states that "the clarion call of major southern nations led by Brazil and other Latin American nations, who are now much more prominent and powerful within the UN system than in its early years when northern powers dominated".

Bearing this in mind, community-based actors and grass root level movements have also been recognized as cornerstones for successful implementations of international urban agendas. Localization, "the achievement of the global agendas from the bottom-up" is intrinsic (UCLG 2021). Particularly, Southern urban theories have emerged as explicitly relevant to the international discussion and development of new urban concepts (Robinson and Parnell 2011). They are often currently supported not only by international government institutions like World Bank, Development Aid agencies, or UN-Organizations but also by a wide range of corporate non-governmental, philanthropic organizations, and private actors like the Melinda & Bill Gates Foundation or Habitat for Humanity. Cociña *et al.* (2019) "understand knowledge translation as a space of negotiation and unveils the mechanisms through which these processes can become vehicles for challenging inequalities" and "the growing presence of the urban agenda in multilateral and global forums […] is particularly challenging as the definitions of 'who is a planner' in local contexts becomes less clear". Therefore, "in the context of growing complexities in the international setting, at the local level the of implementing 'global' agendas that pursue social justice needs to recognize the variety of existing knowledges".

In summary, knowledge transfer can't be seen as a mere top-down or north-south process, but rather as knowledge transfer and exchange of good practices, regardless of its origin. Global urban agendas should be shaped accordingly; internationally agreed indicators and explicitly including indicators from the global south can help to benchmark, monitor, and follow the progress of implementation.

1.2.2 Implemented experiences and ongoing implementations

During the bibliographic review and the search for international examples of urban agenda implementations, recurrent topics, and overarching themes were identified. Classic infrastructure agendas promote, for instance, confined issues like Energy, Solid Waste, Transportation, and Water. Other recurrent topics center on Environment, Economic Development, Good Governance, and Urban Planning, however, these are less restricted to single issues and encompass several neighboring aspects. New 'trendy' agendas like the Smart City approaches, Sustainable City concerns, and resilience topics such as Climate Change came into vogue in recent decades, which are multi-disciplinary. Less common urban subjects comprise Education, Health, or Safety agendas[24].

However, it was observed that few scientific sources and articles were identified in the global south, particularly narrowing the search to journals with high-impact factors[25]. Several articles focus on European cities and their agendas. However, relatively few comparative researches were publicized which stretch across the global North-South divide and through contexts of poorer cities. In this respect, it must be noted, that the scientific production evaluation system itself is guided and designed by the global north, and therefore favors very much the focus and publication in European and North American countries. Also, the average national expenditure on research and development from 2005 to 2014 was 1.44% of GDP in Northern countries but only 0.38% of GDP in Southern countries (Blicharska et al. 2017). According to a World Bank study on Science and Technology Indicators, this divide is respectively manifest in scientific outputs. "In 2018, global North countries produced an average of more than 35,000 scientific and technical journal articles per country while global South countries produced an average of 9700, or 4000 if China and India are excluded" (Albanna, Handl, and Heeks 2021). Walton (1982) observed in his review of comparative urban research:

> In the short space of the last decade urban social science has undergone a revolution. Great strides are now being made in the elaboration of a new paradigm. Most of this work, however, is not really comparative and its geographical focus has been on the advanced countries of Europe and North America.

Robinson (2011) identified in her position paper this division phenomenon in research in urban studies and appeals "for an international and post-colonial approach".

---

[24] See also Chapter 1.1.3 for further concepts of city models
[25] The methodological approach of the undertaken desk study on the state of the art and selection of journals is further explained in chapter 2.1.

According to her, contrary to other fields of study, urbanist researchers are still reluctant to perform comparative studies, although there are existing strategies and methodologies for comparing cities. She bases her theory on the privileged sites for invention in "advanced industrial, wealthier countries" and the "movement of developmentalism" that withdrew on theories of modernization. It was previously assumed that the experiences of wealthy and poorer cities held little relevance for one another and that wealthier cities claimed universal knowledge about all cities.

However, several examples prove this assumption wrong. Research on urban participatory budget planning, which had its origin in the global south, is now being explored worldwide, especially in the northern hemisphere (e.g. CAROLINI, 2017; CROT, 2010; PIMENTEL WALKER, 2016). New urban transportation trends are under investigation as well, from cable car technologies developed in the alps and now connecting informal settlements in Bolivia and Colombia, to vehicle fleet technology changes such as new Chinese e-transport alternatives (scooters, drones, etc.), dispersed in cities all over the globe, irrespective of their location or current development status (e.g. ÁLVAREZ RIVADULLA; BOCAREJO, 2014; NAMDEO et al., 2019; WEY; HUANG, 2018). As globalization progresses and cities, new urban sprawls, and emerging megalopolises all over the world become more interconnected, the barriers and boundaries between underdeveloped and technologically advanced urban agglomerations fade.

In conclusion, Robinson (2011) prompts for a "revitalized and experimental international comparativism", to diminish the research gap between the global north and global south, which is also the aim of this study. In this regard, the NUA attempts to promote in paragraph 146 specifically

> […] opportunities for North-South, South-South and triangular regional and international cooperation, as well as subnational, decentralized and city-to-city cooperation, as appropriate, to contribute to sustainable urban development, developing capacities and fostering exchanges of urban solutions and mutual learning at all levels and by all relevant actors. (UN-Habitat 2017)

This research claims therefore to contribute to narrowing the research gap of the global south and promote alternative mechanisms for the implementation of international urban agendas in the global south.

1.2.3 Six sample cases of urban city agendas and their link to indicators

For the first brief exemplary overview of local urban agendas, six sample cases were disaggregated and reviewed (Table 6). All six cases deal with current problems in urban development and were previously discussed in articles with high-impact factors. The selection also reflects and embraces the spatial distribution and diversity of topics around the globe, notwithstanding the unequal distribution in academic analyses and research, which usually focuses rather on the global north. Despite their disparity in approaches and impact magnitude, the city agendas commonly claim to implement sustainable urban development on a local level, facing different and diverse, however common, international challenges.

Table 6 - Six sample cases of urban city agendas

City/Municipality	Local urban agendas and city focus
Amsterdam, Netherlands	Innovative Urban Development agenda: Symbolic landmark interventions in spatial planning
Milan, Italy	Smart City agenda: New spatial practices and patterns in residence buildings via contemporary urban production
Cairo, Egypt	Urban Sustainability agenda: Certification tools stimulating sustainable neighborhood development projects
Rio de Janeiro, Brazil	Urban Infrastructure agenda: Local public services development through sports mega-events
Bogota, Colombia	Urban Transportation agenda: The social dimension implementing BRT system
Silang, Philippines	Climate Change Mitigation and Adaptation agenda: Participatory land-use planning approach in urban sub watershed

Source: Own elaboration

All six cases relate, in one way or another, to indicators and gauges. Either to identify, benchmark, and examine through specific indicators certain local challenges, provide comparative data to categorize and determine the development status, evaluate sustainability and relationships between peers, measure and enhance social and environmental effects, or follow up on progress. The cases reveal however the challenge of selecting adequate indicators in order to avoid misinterpretations, as each background setting requires its own distinct approach and consideration.

Case Amsterdam/Netherlands, using symbolic landmark interventions

To start with the comparative research, the Amsterdam case from the global north and its urban agenda can serve as a good reference, which Peck (2012), Savini & Dembski (2016), and Savini (2016) analyzed recently. Especially in western Europe, urban

innovation has become in recent decades a central reference for local politicians and policymakers, due to the high socio-political impacts. In particular, Hemel (2010) certifies the Netherlands a tradition of proactive planning, which "changed the traditional roles of planners". In this context, the researchers examined through specific indicators, how symbols are used to carry out post-industrial urban development. They chose the city of Amsterdam as it shows, according to them, "how creativity policies actually work" (Peck 2012) and displays a "living laboratory for liberal-progressive parties" (Savini and Dembski 2016), which actively advocate new urban agendas to enhance creative urbanism and entrepreneurialism.

The city tries to go beyond simply managing and mitigating the social and environmental effects of rapid economic growth, which Raco & Street (2012) claim to be undermined by some of the core assumptions on which such policies were based, after the credit crunch of 2008 and the subsequent recession. It supports the positive role of the innovation, creativity, and political engagement of citizens in urban planning processes and leaves behind the "theme park development on the urban fabric" as Fainstein (1994) names the impact of urban development in the last two decades of the 20th century, which was driven by powerful and growing development industries, with "less democratic and more elite–driven priorities", according to Swyngedouw, Moulaert, & Rodriguez (2002). According to Savini, Boterman, van Gent, & Majoor, (2016), political and spatial changes have shaped Amsterdam in the last decade. Alike other modern western cities, it uses softer and lighter urban planning instruments (Savini 2013), with governance through integration (Uitermark 2014), to avoid resistance after unpopular measures [26]. Savini & Dembski (2016) identify symbols, evocative narratives, and images as a key to bridging different views of the city and reaching a broad consensus aligning and implementing agendas. In their view, "while building on concrete spatial practices, symbols can be used to communicate new forms of urbanity and alternative city futures to a broader public".

The use of symbolic manifestations is an old and proven tool, used by politicians and planners, to persuade the general public (Edelman 1964). However, particularly in spatial interventions, symbols, and visual analyses play a key role in transmitting ideas and needs of encroachment and help to mitigate between driving forces. Evocative narratives and symbols as instruments to mark transformative agendas also played an

---

[26] E.g. "Stuttgart 21" railway station project in Germany and the consecutive riots in 2010, https://www.spiegel.de/international/germany/the-world-from-berlin-germany-shocked-by-disproportionate-police-action-in-stuttgart-a-720735.html (01.10.2010, accessed 24.10.2019)

important role in the continual transformation of the Northern IJ Bank in Amsterdam, considering a reference to the industrial past of the area. The former location of shipbuilding and other heavy industries undertook an urban redevelopment in the last two decades, with substantial physical, social, and political transformation by means of "symbolic language, acts, and objects that have been mobilized to change the meaning of North" (Savini and Dembski 2016). They state, that with these interventions, "manufacture is linked to creativity, knowledge and innovation, and the future is associated to the idea of spatial production and place making", following the argumentation of Peck (2012), that "urban creativity represents a largely symbolic, but nevertheless consequential, 'meta-policy'".

The first example of such a symbolic act was a series of participatory public meetings in the late 1990s called *Noordwaarts!* (Northwards!), wherein the future of the district was discussed. The meeting served as a platform for residents, squatters, architects, and urban planners to debate the future development of the district and was already aligned with the NUA, which developed two decades later. The agenda promotes specifically in paragraph 97

> […] planned urban extensions and infill, prioritizing renewal, regeneration and retrofitting of urban areas, as appropriate, including the upgrading of slums and informal settlements, providing high-quality buildings and public spaces, promoting integrated and participatory approaches involving all relevant stakeholders and inhabitants and avoiding spatial and socioeconomic segregation and gentrification, while preserving cultural heritage and preventing and containing urban sprawl. (UN-Habitat 2017)

According to Terhorst & Van de Ven (1995), several Dutch cities formed "national urban growth coalitions" in the early 1990s in response to the urban crises in the previous decades. The city of Amsterdam, like other cities, tried to attract businesses and retain middle-class households by settling creative industries and a highly-skilled economy, offering inventive incubators, ateliers, and offices for small and medium enterprises like start-ups (Peck 2012). To slow down gentrification and assuage social consequences caused by the process of neo-liberalization within the housing system, a state-led gentrification strategy, involving institutional conversion and rearrangements in place, was undertaken (van Gent 2013).

Local symbolic projects (Figure 10) reused existent landmarks, representing the value of industrial heritage for investors, local stakeholders, and tourists alike. The 'IJ Canteen', a former canteen of the shipyard near the river IJ was transformed into a restaurant open to the public in 2001. 'Kraanspoor', a 10,000 square meter office building

built on an existing crane rail was inaugurated in 2007. The landmark 'EYE Film Museum', which opened in 2012, is a political and symbolic investment that pays tribute to the cultural value of the area. 'Faralda Hotel', a luxury three-room hotel, was built on a crane in 2014. 'Overhoeks tower', rebranded as A'DAM Toren ('Amsterdam Dance And Music'), was an old office headquarters that was transformed into a culture-based hotel with a 24-hour discotheque in 2016. Its surrounding 'Overhoeks area' composes a new mixed-use neighborhood, including office, retail, and cultural space as well as 2200 luxury housing units.

Figure 10 - Collage of selected Amsterdam North projects and symbolic markers

a) The Kraanspoor (ndsm) b) NDSM Loods c) Faralda Hotel (ndsm)

d) Film Museul and Overhoeks (shell) tower e) Symbol self-built lots (Buiksloterham) f) The A-Lab Incubator Center (Overhoeks)

Source: (Savini and Dembski 2016)

The spatial interventions also attracted new types of companies to settle in the restructured area. MTV Europe was one of the first in 2006, fertilizing and promoting the new spirit of the neighborhood. Another example is the A-Lab, a 5000m² hothouse for bleeding edge experimentation and a breeding place for creative start-ups related to high-end 3D printing and design. A giant shovel installed by the district government around new housing developments symbolizes this narrative of self-organized and manufactured urban change.

According to Savini & Dembski (2016), "experimentation and creative innovation, […] triggering urban change in times of austerity and weak real-estate investment in the discourses of politicians". They argue, that "construction, use, and mobilization of symbolic elements are key drivers in this dialectic between politics and place making", achieving acceptance around transformative urban agendas, using "internationalism, individualism, and entrepreneurialism". In addition, rituals like public hearings or town meetings, are choreographically used to mobilize consensus around policies. All these tools were successfully applied in the case of Amsterdam North, to convert and shape a neighborhood toward a creative economy and implement an innovative urban development agenda. Also, the NUA gives kudos to the promotion of cultural and creative industries, advocating in paragraph 60 activities for

> […] sustaining and supporting urban economies to transition progressively to higher productivity through high-value-added sectors, by promoting diversification, technological upgrading, research, and innovation, including the creation of quality, decent and productive jobs, including through the promotion of cultural and creative industries, sustainable tourism, performing arts and heritage conservation activities, among others. (UN-Habitat 2017)

In a nutshell, the Amsterdam case displays exemplarily how symbols and symbolic projects can be employed as indicators to measure and enhance certain social and environmental effects and urban socio-economic development in city quarters and districts.

Case Milan/Italy, promoting contemporary urban production

A second case and reference from the global north serves the city of Milan, the economic capital of Italy, recently analyzed by Armondi & Bruzzese (2017) in specific, and Pietrapertosa *et al.* (2019) in a broader sense. They investigated, how new sites of production and workplaces, and specific indicators namely "new spatial practices and patterns", relate to the making of urban change, especially regarding public policy framework and the local economy. To better understand the concept, Armondi &

Bruzzese (2017) take a closer look at place-making effects in marginal areas through smart city urban policies and pioneer projects related to creative and cultural production promoted by private actors. They tackle the following three questions:

> (1) How do specific typologies of production and workspaces engender "urban change," such as new productive centralities through the reuse of vacant spaces in Milan today? (2) How is the smart city policy understood and re-envisioned/remade through different lenses? (3) Are privately driven processes able, and if so how, to provoke urban innovation—via new production—and eventually also to interact with public policies?

The trendy term "smart city" is critically analyzed in the literature (e.g. GREENFIELD, 2013; KITCHIN, 2014; SENNETT, 2012; VANOLO, 2014; WIIG; WYLY, 2016), as it refers in most cases merely to fast technical solutions of social problems or promotes neoliberal agendas, without considering the collateral side effects to society. Since the new millennium, it labels inflationary approaches to urban agendas. Hollands (2008) condemns the 'urban labeling' phenomenon due to its "lack of definitional precision" and "underlying self-congratulatory tendency". He promotes a conceptualization of the term beyond the technological label. In Milan, a closer look at public actions relating to a multilayered policy under the smart city urban agenda is necessary.

Regarding the spatial concentration of creative and cultural production, Pratt (2011) critically examines notions of liberalism and creativity as they underpin the creative city and highlight many of the negative and regressive elements of policies that promote creative cities. He locates the creative city within the discourse of place marketing. For Cooke & Lazzaretti (2007), 'cultural economy' and 'creative industry' are two pairs of shoes, related but distinct segments of contemporary city economies. Also, the clustering processes into so-called creative and cultural milieus or quarters might differ according to the criteria used to recognize them (EVANS, 2004, p.71-92 *apud* BELL; JAYNE, 2004). By all means, innovations, and creativity imply a major change in the fields of work, workplaces, and in the field of production and consumption, as Armondi & Bruzzese (2017) observe. Therefore, the settling of creative activities by the public policy has to be carefully evaluated regarding its localization, as in the case of Milan, to avoid risks of artistic gentrification and economic disparity, as alerted by Atkinson & Bridge (2005) and discussed concerning the Italian sphere by Semi (2015).

In recent years, the city has been the target of specific public policies, to support social inclusion and the development of new jobs, with its biggest leverage potential, the

availability of underused and abandoned public and private spaces, like vacant ground floors of public buildings including shops, workshops, warehouses, offices, artisanal spaces or collective and recreational spaces. Apart from public space, also a substantial number of underused spaces concern previous industrial areas. Similar to other industrial cities in the north of Italy, Milan was previously the base of several medium-sized and big companies, which closed or migrated from peripheral urban areas and neighborhoods just outside the city center to cheaper production locations. Also the economy's restructuring process and shift from an industrial hub towards a center of tertiary advanced services since the 1980s tribute to the abandonment processes. This left Milan five million square meters of former industrial abandoned areas, representing approximately 4 percent of the urbanized area (LOMBARDY REGION'S GEOPORTALE, 2014 *apud* ARMONDI; BRUZZESE, 2017). It gave the city a major spatial opportunity for private renewal interventions, like creative industries, fab labs, maker spaces, and co-working facilities, reusing existing spaces, and filling urban voids with new production activities, promoting new urban images.

The global phenomena of shrinking cities and its challenges, opportunities, and varying impacts faced along the transition are analyzed by Martinez-Fernandez, C. *et al,* (2012). Armondi, (2012), Lanzani, Merlini & Zanfi (2014), and Romero (2016) contextualize this knowledge into the sphere of Italy, discuss the dynamics that affect the relationship between productive settlements and their geographical and spatial contexts at different scales, and show, how the contemporary "shrinking era" is an opportunity to redesign sustainability and habitability for contemporary "no-go zones". Also, the NUA picks up the management topic of urban shrinking processes and the opportunities for the local economy in paragraph 14 (b), where it recommends:

> Ensure sustainable and inclusive urban economies by leveraging the agglomeration benefits of well-planned urbanization, including high productivity, competitiveness and innovation, by promoting full and productive employment and decent work for all, by ensuring the creation of decent jobs and equal access for all to economic and productive resources and opportunities and by preventing land speculation, promoting secure land tenure and managing urban shrinking, where appropriate. (UN-Habitat 2017)

As an innovative example, the "Container Social Community" concept at Piazzale Accursio can be named (Figure 11). The program introduces a co-housing concept, in which residents are clustered with very small individual dwellings and a large community space, where people work together to provide a better environment for each other. As for the creation of workplaces, green roofs are adopted for the production of vegetables for

the individual dwelling and retrial. The production and market functions are followed by the adoption of workshops, where people can manipulate and reuse materials from the ground areas and can make objects to use in their houses, sell in their markets, and exhibit in the exhibition areas (Tsoukala 2016).

Figure 11 - Container Social Community, Piazzale Accursio, Milan

Source: (Tsoukala 2016)

There are several other public actions aimed at occupying vacant public properties and unused industrial buildings, like the Co-Hub[27] in Vicolo Calusca, a new micro-district that opened in 2015 in the historic center of Milan or the Mhuma Milan Hub Makers[28] in

---

[27] See also: https://www.desisnetwork.org/events/cohub/ (accessed 30.10.2019)
[28] See also: https://www.makershub.it/ (accessed 30.10.2019)

the Bovisa neighborhood, founded in 2016 and owned by the municipality. These new incubators for social economy, makers, and digital manufacturing correspond to the requests for mixed-use space in the region and Milan shows a strong degree of innovation in production activities and new workplaces.

The city administration tries additionally to fertilize these tendencies with urban transformation projects, like the mobilization of Expo 2015 and new smart urban policies. In 2011, Milan developed a smart city approach, when the city council voted for a Local Government Plan focusing on issues of greening, infrastructures, and public services. The plan both required citizens' participation from the early stages of the process and promoted the contribution of private actors to public interest objectives.

In 2012, the municipality developed a strategy for its smart city agenda based on coordination rather than implementation (Gascó, Trivellato, and Cavenago 2016). In 2015, 60 meetings were organized throughout the city to collect suggestions and proposals from citizens, managing 9 million euros of its budget through a participatory approach, and processed by nine working groups, supported by the municipality's technical staff (Bonduel 2018). As a result, Milan has also been ranked 1st Italian smart city for the fifth consecutive year by the ICity Rate 2018 report[29]. According to Gascó, Trivellato, & Cavenago (2016), this model of participatory governance based on coordination, facilitation of co-creation, and shared decision processes, shows the specificity of Milan's approach to the smart city. The unusual Milanese approach to smartness is "between the social and the spatial" (DE BOISER *et al.*, 2016 *apud* ARMONDI; BRUZZESE, 2017), as it is based on the use of new technologies, while also combining economic development with social inclusion, infrastructures and human capital, innovation and training, and research and participation. Armondi & Bruzzese (2017) come to a similar conclusion and claim, that "the 'Milan model' of smart city policy has the potential to contest the existing neoliberal smart city framings criticized in literature". Also, the NUA refers to smart city policies and commits itself in paragraph 66

> […] to adopting a smart-city approach that makes use of opportunities from digitalization, clean energy and technologies, as well as innovative transport technologies, thus providing options for inhabitants to make more environmentally friendly choices and boost sustainable economic growth and enabling cities to improve their service delivery. (UN-Habitat 2017)

---

[29] See also: https://www.forumpa.it/citta-territori/icity-rate-2018-la-classifica-delle-citta-intelligenti-italiane-settima-edizione/ (accessed 30.10.2019)

Summing up, Milan successfully transformed its previous image, a merely industrial focus, employing contemporary production and a clever and creative urban policy approach into an innovating hub, triggering movements of inhabitants to revive other neighborhood images and social inclusion. As shown in the case, through the shared vision of local government and a network of nonprofit, quasi-public, and private actors, inclusive socioeconomic development patterns are possible, and sustainable urban change can be realized. The identification of new spatial practices and patterns as comparative indicators helped to categorize and determine the development status and success of the local urban agenda in Milan, allowed to benchmark the progress compared to the previous situation and relate to the making of urban change, especially regarding public policy framework and the local economy.

Case Cairo/Egypt, analyzed via Urban Sustainability Certification tools

Leaving the belly button of Europe and shifting the focus towards not the geographical south, but the global south, Cairo has shown an impressive urban change in recent times, as analyzed and evaluated by Gouda & Masoumi (2018). They screened the city with neighborhood sustainability assessment tools and indicators, better known as Urban Sustainability Certifications (USCs) as planning and policy support tools to evaluate the sustainability of neighborhoods, regarding components for sustainable mobility like compactness, street connectivity, and walking accessibility. USCs, e.g. Leadership in Energy and Environmental Design for Neighborhood Development (LEED-ND) in the United States, Building Research Establishment Environmental Assessment Method Communities (BREEAM-C) in the United Kingdom, German Certification for Sustainable Buildings for Urban Districts (DGNB-UD) in Germany, High Quality Environmental standard for Green Building (HQE-GB) in France and Comprehensive Assessment System for Built Environment Efficiency for Urban Development (CASBEE-UD) in Japan are just a few examples of international introduced standards to encourage urban developers to outreach regulatory requirements and local norms. Säynäjoki *et al.* (2012) state, that "these schemes, or rating tools, provide a convenient way to benchmark the eco-efficiency of buildings and, more recently, neighborhood developments".

The rating system's assets and weaknesses, as well as the policy implications of using it, are analyzed by Garde (2009). He recommends, that planners should develop suitable local approaches for encouraging and stimulating sustainable neighborhood

development projects, considering local conditions as well as the strengths and the limitations of the rating systems. Several scholars have undertaken comparable studies about USCs and neighborhood sustainability assessment tools (e.g. ALI-TOUDERT; JI, 2017; HAAPIO, 2012; REITH; OROVA, 2015; SHARIFI; MURAYAMA, 2013), considering different contexts. However, the results of these studies indicate, that most of the tools are not doing well regarding the coverage of social, economic, and institutional aspects of sustainability, showing only average results in the main aspects. Sharifi & Murayama (2013) summarize:

> There are ambiguities and shortcomings in the weighting, scoring, and rating; in most cases, there is no mechanism for local adaptability and participation; and, only those tools which are embedded within the broader planning framework are doing well with regard to applicability.

The major critics of the global USC tools are their limited sensitives in regard to the local circumstances and the need for an adaptation process to accommodate different conditions and contexts. Therefore, Säynäjoki *et al.* (2012) suggest adopting merely the criteria that are "deemed suitable for the local sustainability goals". In the case of Cairo, there exists neither a local nor a national USC. According to Gouda & Masoumi (Gouda and Masoumi 2018), "compactness, connectivity and walking accessibility" are the crucial criteria and "act as proxy and facilitators within other criteria and themes". These criteria and concepts are in line with the NUA, which promotes in paragraph 98

> […] integrated urban and territorial planning, including planned urban extensions based on the principles of equitable, efficient and sustainable use of land and natural resources, compactness, polycentrism, appropriate density and connectivity, and multiple use of space, as well as mixed social and economic uses in built-up areas, in order to prevent urban sprawl, reduce mobility challenges and needs and service delivery costs per capita and harness density and economies of scale and agglomeration, as appropriate. (UN-Habitat 2017)

However, Neuman (2005) points out the fallacy, that "the compact city is neither a necessary or sufficient condition for a city to be sustainable and that the attempt to make cities more sustainable only by using urban form strategies is counterproductive". According to him, "conceiving the city in terms of process holds more promise in attaining the elusive goal of a sustainable city". As stated by the American Planning Association (2006) "connectivity can be defined as the quantity and quality of connections in the […] network" and has therefore to consider direct as well as indirect connections and their social value. Besides, neighborhoods are social and geographic entities whose creation and development involve complex social processes (Chaskin 1997; Galster 2001). Compactness and connectivity have both impacts on walking

accessibility, encouraging transportation efficiency, though with controversy, which might have a greater influence (Panter et al. 2010). Hansen (1959) was the first to define accessibility as a potential opportunity for interaction and Geurs & Östh (2016) adds, that "accessibility is a key concept in both transport and urban planning".

Gouda & Masoumi (2018) came to the result, after analyzing the city of Cairo in regards to compactness, connectivity, and walking accessibility with four different USC tools (LEEDND V4, BREEAM-C 2012, CASBEE-UD 2014, and PCRS version1), that "all the USCs encompass many indicators with a Western genesis, which were tailored to respond to Western phenomena and problems" (Figure 12). Their actual relevance and sensitivity have to come under scrutiny when applied outside of their country of origin and especially in the global south. USCs don't address over-development, e.g. over-densification, which might have as well negative outcomes, like urban noise, pollution, limited mobility, etc., and "the results are generalizable to many formal areas". As Day & Day (1973) noted, "density […] cannot be isolated in analysis, from either the social and cultural setting, the demographic characteristics of the population, or the broader processes of social change within the society".

Figure 12 - Population and residential densities of Cairo (census of 2006)
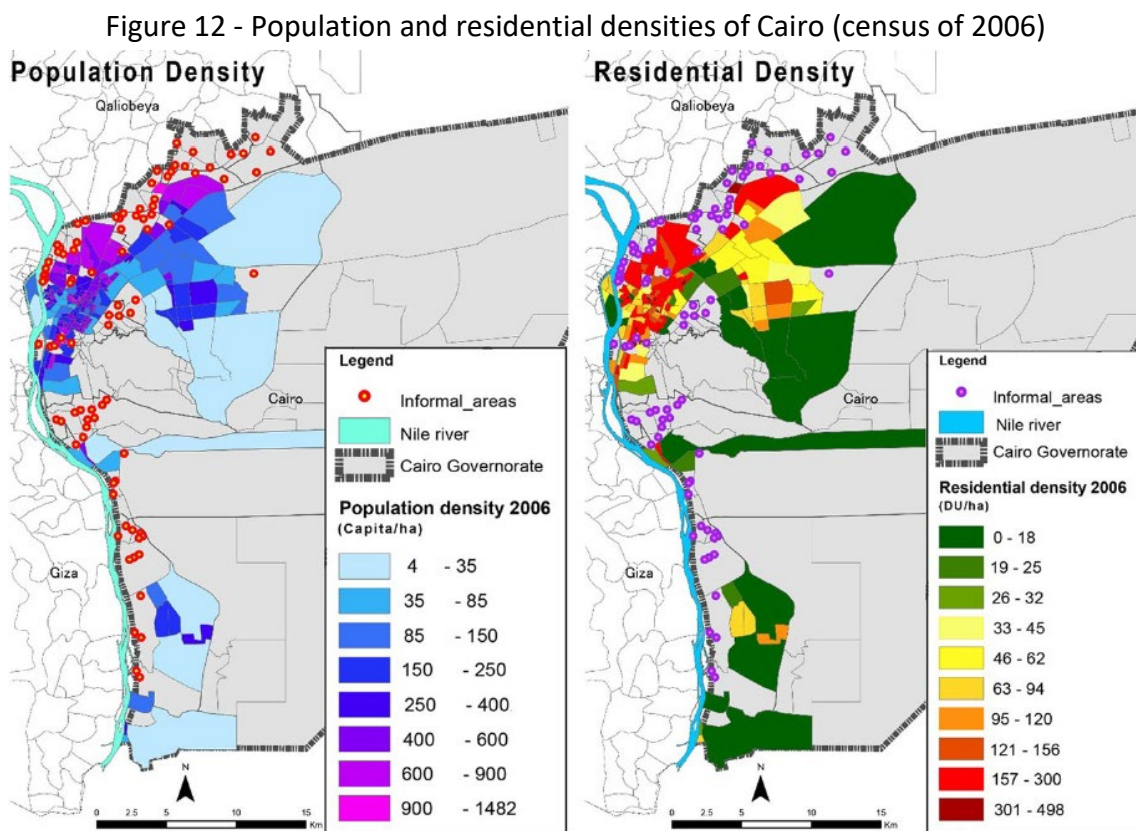
Source: (Gouda and Masoumi 2018)

Nonetheless, following Sims (2010), urban development has been a priority for the Cairo Governorate for the last five decades, battling to encourage urban growth and leaving the development of informal settlements behind. However, considering the dynamics of rural-urban migration that have shaped Cairo, he states that "Cairo has generated its own logics of accommodation and development, and that these operate largely outside the truncated powers of government". In his eyes, the city of Cairo can be considered a kind of success story, despite everything, attributed to the operation of informal processes. He hypothesizes, that 'informal urban development' might be the new form of urbanization. Gouda & Masoumi (2018) add, that the local norms of Cairo allow it to "significantly outperform most of the thresholds of compactness, connectivity, and walking accessibility".

In a nutshell, it is necessary to consider a differentiated view on the urban development of cities in the global south, as not all parameters, indicators, and policies can be compared or copied one to one. Or using the words of Hillier (2002):

> There are strong cultural variations in different regions of the world, there are also powerful invariants. The problem is to understand how both cultural variations and invariants can arise from the spatial processes that generate cities.

Especially universal guidelines, like the NUA, have to be handled with care and be adapted to local circumstances and regional contexts. And indicators have to be selected thoroughly, to adequately measure the development and avoid misinterpretations, as different setups and backgrounds require distinct previsions.

Case Rio de Janeiro/Brazil, hosting sports mega-events

As previously mentioned, the global south is relatively underrepresented in A1-rated journals. This has been observed during the investigation of case studies of cities south of the equator, e.g. in Brazil. There are several regional and local periodicals and relevant recently published articles (e.g. LIMA; NETO, 2015; MEIRELES; CASTRO, 2017; SHARIFI, 2012; SILVA; ROMERO, 2013; TILLMANN et al., 2011). However, when narrowing down the research for top-rated journals, only a few matches of recently implemented urban agendas and deployed development indicators were identified. One of them is from Rio de Janeiro (Gaffney 2019), admittedly a rather exceptional case. The Rio article discusses the city's urban agenda previous and during the Olympic games in 2016. Gaffney (2019) claims, that Rio's urban planning agenda was captured by the Summer Olympic Games and identifies four tendencies that pertain to its foreseeable

future: (1) securitization of exception; (2) consolidation of consumer sovereignty; (3) restructuring of urban circulations; and (4) financialisation of urban territories. He furthermore identifies signs of multiple crises, namely "governance, fiscal stress, security, decaying (yet recently built) infrastructure, and the quotidian traumas of a violent and exclusionary urbanism".

Actually, Rio has hosted in the past decade multiple mega-events, like the Pan American Games in 2007, the 2011 World Military Games, the UN Rio+20 Environmental Conference, the 2013 Catholic World Youth Congress, the 2013 FIFA Confederationś Cup, the 2014 FIFA World Cup, and just peaking in the 2016 Summer Olympic Games. All these events tied the city's urban agenda and shaped its development for years. Hayes & Horne (2011) observed a "disconnection between the top-down, elite, nature of sports mega-events and the ostensible redistributive and participatory sustainable development agendas" when they analyzed the previous preparations for the Olympic Games in London 2012 and its "emergency conditions", including "extraordinary forms of governance". Müller (2017) comes to a similar conclusion, stating that "mega-events, and the elites associated with them, take possession of host cities" when analyzing how mega-events capture their hosts during the preparation for the World Cup 2018 in Russia. Usually, urban realities significantly differ from the development path the city had set out to accomplish, analyzing the Olympics preparation in Barcelona, Atlanta, Sydney, and Athens (Kassens-Noor 2012). It can, therefore, be deduced, that the case in Rio is not a specific phenomenon in regards to the global south, but applies in general.

Kassens-Noor *et al.* (2018) alert, that mega-events like those in Rio permit the city administrations to apply unorthodox forms of governance, like securitization of exception, where the "planning process has undermined the public interest and placed the burdens of implementation disproportionally on the urban poor". Also, Raco (2014) states, that the "Olympic model has been characterized by the prioritization of delivery over representative democracy". Molnar & Snider (2011) add the risk of abusive mechanisms for population control and increasing surveillance, e.g. under the guise of terrorist attack prevention. Therefore, Lenskyj (2000) alerts on the pre- and post-Olympic impacts from host cities. On the other hand, Olympic Games generally bring few benefits for socially excluded groups, although these benefits are often important justifications in the bidding stage, and the event is seen as a 'fast-track' to the city's urban regeneration agenda (Silvestre 2009; Minnaert 2012; Castro et al. 2015). Ziakas (2015) criticizes,

therefore, the wrong selection of decisive indicators and sometimes overestimated "leveraging perspective" and positive impacts benefits through such mega-events.

The consolidation of consumer sovereignty has a first impact in the social setting, as socially and economically disadvantaged citizens get excluded from spectatorship and social life through price increases, not only regards attending the mega-event itself but also with respect to the general cost of living (Castro et al. 2015). Besides, the "passage-point urbanism" indicated by Graham (2011), creating environments, relations, and practices of exception and exclusion, become an established part of the urban setting, enforced by paramilitary security forces. The right to freedom of circulation gets rapidly narrowed down to the economic status and restrictions of access to the right credentials. Gaffney (2019) names it the "functional privatization of public life with important repercussions for public space and culture". He also indicates that private enterprises are taking over public financed sports facilities, as "the city and state do not have the technical or financial resources to maintain and operate them". The public authorities are usually contractually obliged per 'Host City Agreements' with the awarding entities (e.g. FIFA, IOC) to pay for infrastructure and facilities, and therefore forced to privatize their attractive parts of investment in the post-Games era, leaving the public behind with uneconomic, unthrifty and underutilized facilities (Gaffney 2019).

The case in Rio indicates the "rise of a new, exceptional, form of neo-liberal urban regeneration in the Latin American landscape […] that helps accelerate the regeneration process while legitimizing exceptional measures and exemptions" (Broudehoux 2013). The impacts of socio-spatial polarization and the commodification of urban space are immense, and gentrification a not always an unwanted side effect. As an example serves the urban revitalization of *Porto Maravilha* (Marvelous Port) in the city center, "anchored on land transformation in finance and in a conception of city based in a disparate way of life that deepen the mercantilization of social life" (Cardoso 2013). Boykoff (2013) argues that the Games have become a massive planned economy designed to shield the rich from risk while providing them with a spectacle to treasure.

In regards to the restructuring of urban circulations, Kassens-Noor (2012) indicates, that large transportation projects play a key role in implementing mega-events like in Rio and are usually historic in scope and cost. Lessa (2000) describes the traffic and transportation challenges in the city as constant traffic-choked, poorly maintained, and highly air-polluted, causing death and health threats. To leverage the stress caused by traffic, major transportation infrastructure investments were undertaken in the years

of preparation for the mega-events in the city, like metro and light rail in the center and south zones of the city, surface level transportation (Bus Rapid Transit) in the north and west, and punctual interventions, e.g. regards the port terminal in the city center and international airport in the north (Figure 13). According to Castro *et al.* (2015), up to 36% of the foreseen overall investment budget for the Olympic Games went into urban mobility projects and the city government claims the "increase daily usage from 18 percent to 63 percent of Rio's population", however without providing data to support the statement. As a matter of fact, the lack of transparency in adequate indicators and data provision by the local government is one of the challenges faced in Rio too.

Figure 13 - Map of principal investments during World Cup & Rio Olympic Games
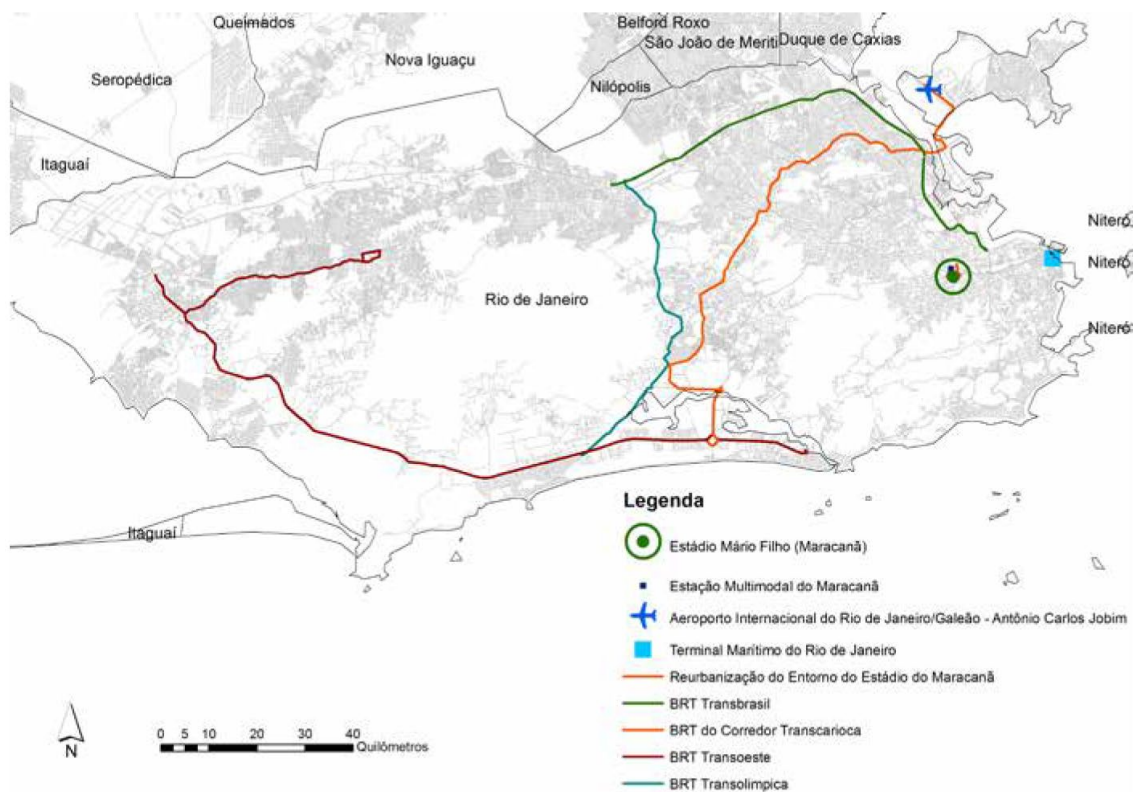
Surprisingly, five out of seven major transportation projects made for the Olympics and World Cup in Rio, connect to *Barra da Tijuca* (Gaffney 2019). According to Herzog (2013), this neighborhood zoned "was initially conceived as an innovative urban design plan for a modernist 'new town' but […] was subsequently absorbed by private developers and turned into an elite, U.S.-style suburb" for residents who do not

typically use public transportation. The local media[30] suspected a broad network of corruption linked to transportation investments, and official investigations are still ongoing. Undoubtful, the case in Rio points out, that general access, to social infrastructure, e.g. healthcare facilities, did not improve as much as hoped and the "accessibility benefits from the recent cycle of investments and disinvestments in the city accrued mainly to middle- and higher-income groups, reinforcing existing patterns of urban inequality" (R. H. M. Pereira 2018). Gaffney (2016a) goes even one step further and hypothesizes, that

> […] these 'legacy' projects have not had positive effects for the city as a whole, but have rather decreased transparency in government, increased socio-economic inequalities, privatised public space, and torqued urban planning agendas to stimulate real-estate speculation and Games-related transportation agendas to the detriment of more equitable long-term planning.

The accelerated financialisation of urban territories and valorization of urban territory due to investment into infrastructure during mega-events goes hand in hand with the gentrification of hole neighborhoods, like *Barra da Tijuca* or *Porto Maravilha,* and the removal of dwellers who don't fit anymore into the new image. "Unlike the mass removals of the 1960s and 1970s, favela families have more recently been displaced through a process of thinning, in the context of a neoliberal development programme centred on a series of mega-events" (Freeman and Burgos 2017). According to Gaffney (2016b), there is a direct link between the occupation of strategic favelas by state military police, the implementation of state-led urban development projects, and an increase in rents across the metropolitan region. Over 77,000 dwellers were evicted or dislocated from their homes due to so-called "'socially necessary' infrastructure projects" whereat poor communities were particularly vulnerable to the secondary and tertiary effects of the mega-events on rent and gentrification (Gaffney 2019; Barbassa 2015). According to Faulhaber & Azevedo (2015) residents who lose their houses as a result of the appreciation process, are marginalized in the reorganization of how the urban space is occupied and appropriated.

---

[30] E.g. "Construção da Linha 4 do metrô custará 70% a mais do que o estimado inicialmente", https://oglobo.globo.com/rio/construcao-da-linha-4-do-metro-custara-70-mais-do-que-estimado-inicialmente-6906779 (03.12.2012, accessed 15.11.2019); or
"Obra da Linha 4 do metrô está sob suspeita" https://oglobo.globo.com/rio/obra-da-linha-4-do-metro-esta-sob-suspeita-19849077 (04.08.2016, accessed 15.11.2019)

The Rio City Hall[31] took a leading role in the reallocation process of violent and conflict-ridden eras and informal settlements in the city (favelas, occupations, squats, quilombos), using ostensible arguments like risk prevention or environmental protection measures to execute the removal between 2009 and 2016. The local government was flanked and escorted by the creation of several "special laws", e.g. the *"Regime Diferenciado de Contratação"* (Differential Contracting Regime), to speed up the transition processes and the formation of "law exclusion zones" by hollowing out the normal legal processes and paving the way for rapid urban transformation (Corrarino 2014). The state-led gentrification projects accelerated the urban land values and are closely linked to transportation pathway investments.

Summing up, Gaffney (2019) states various examples of unfulfilled promises concerning the city's urban agenda, accompanying the hosting of the mentioned mega-events in the past decade: E.g. the stopped financing of the BRT Transbrasil, the discontinued clean-up of Guanabara Bay, the Olympic handball arena (*Arena do Futuro*) which will no longer be dismantled and reconstructed as public schools, or the Olympic Park in the Deodoro region where the city administration is not capable to maintain the installations for public use. Therefore, a rather unsustainable approach to implementing an exceptional urban agenda has been observed.

It can be argued, that institutions responsible for developing these projects have been dissolved soon after the ending ceremony of the events, and most of the projects were externally imposed by international committees (e.g. FIFA, IOC) as a precondition to get awarded as host. Also, accountability mechanisms to enhance transparency in the management and combat corruption are, as usual, insufficiently established. On the other hand, mega-events like those in Rio seem to be most profitable for sponsors (Chapman 2016), and according to Gaffney (2019) "the core practices of this highly mobile, monopolistic, rent-seeking business model have remained intact". But he also points out, that the next generation of urban managers and politicians will have to seek dialogue with civil society so as to make productive use of these investments. Therefore, the use of mega-events to promote local urban agendas has to be treated with special care and is definitely not a prime example, as many politicians want to believe.

---

[31] E.g. "Prefeitura removerá 119 favelas até o fim de 2012" https://oglobo.globo.com/rio/prefeitura-removera-119-favelas-ate-fim-de-2012-3072053 (01.11.2011, accessed 15.11.2019)

Interestingly enough, there are no references in the NUA in regard to hosting mega-events, to successfully implement urban agendas. Maybe it is due to the fact, as mentioned before, that mega-events come along with several risks for the hosts and there are too few examples of successful and sustainable implementations, to provide adequate indicators, recommendations, and tools. More likely however is the fact, that these events are still extremely exceptional cases, and the NUA rather wants to provide guidelines for the rank and file of cities and the urban challenges of the ordinary day-to-day, which by far outnumber the luxury problems of hosting mega-events.

Case Bogota/Colombia, the social dimension implementing BRT system

Shifting the focus to a top-ranked challenge of the global south and the main issue on urban agendas worldwide is transportation. Several articles discuss new approaches to urban transport, being the implementation and expansion of Bus Rapid Transit systems (BRT) one of the most prominent in urban agendas, especially in Latin America (Bocarejo, Portilla, and Meléndez 2015; Duarte and Rojas 2012; Hidalgo et al. 2013; Arteaga Arredondo et al. 2017). A pioneer BRT system was introduced in Runcorn, England in the 1950s, where the first modern local traffic concept was established and implemented in the 1960s. However, Curitiba in Brazil can claim himself the first major city to introduce such a concept area-wide in 1968, being a role model for several other cities around the globe. Nowadays, the most prominent and consequent example is the 'TransMilenio' BRT system (Figure 14), implemented in 2000 in the eight million inhabitants large capital of Colombia, Bogotá.

Figure 14 - TransMilenio Bogotá Map
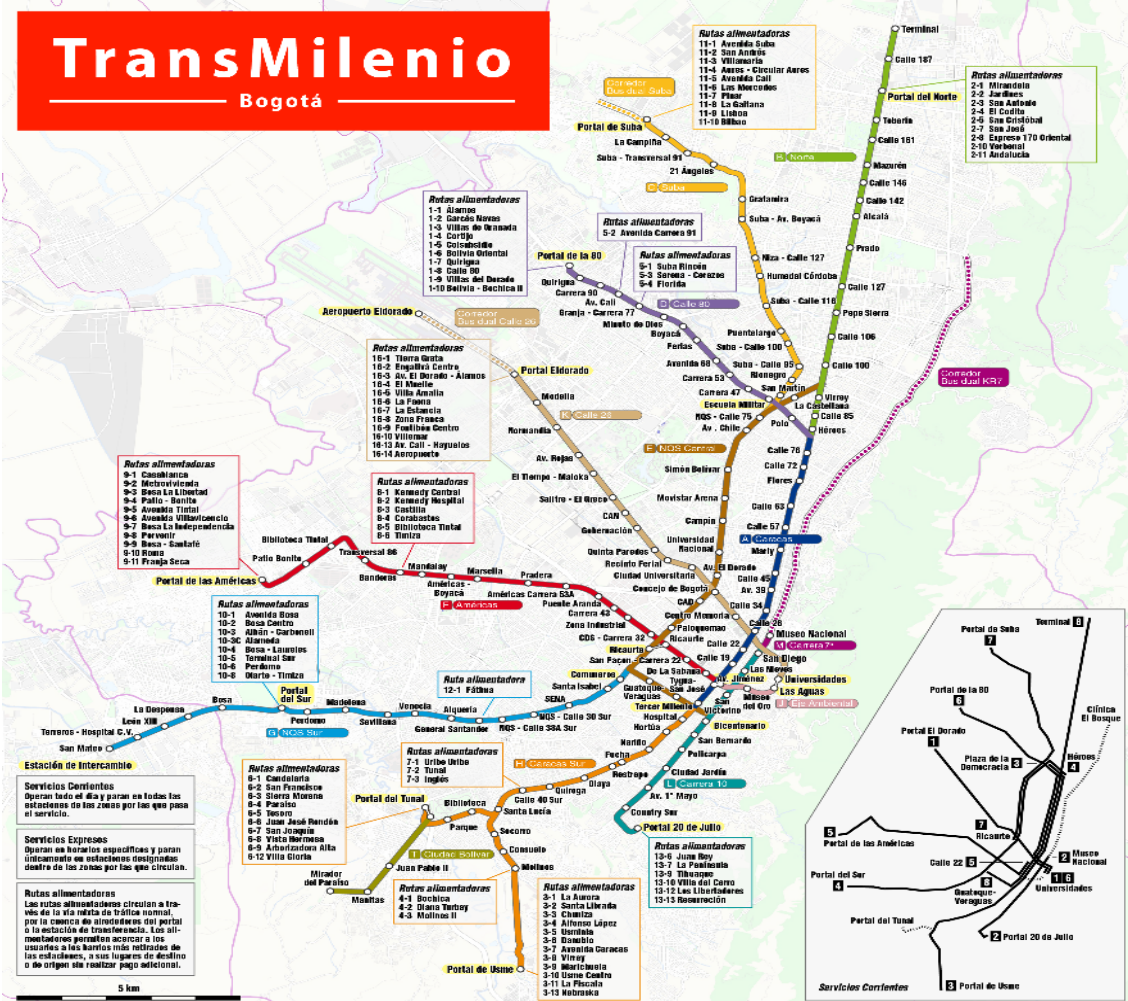
Source: (Dörrbecker 2019)

The implementation of the urban transport agenda by the city administration has a huge impact on relationships between different groups, urban fragmentation, and their urban continuum. Prévôt-Schapira (2001) observed in big Latin American metropolis, that "the notion of fragmentation emphasizes the complexity of the socio-spatial dynamics related to metropolization […] resulting from the aggravation of social inequalities, the rise of poverty and the brutal impoverishment of middle classes". Bocareijo, Portilla & Melénez (2015) analyzed the social fragmentation as a consequence of implementing the BRT system in the city of Bogotá. They state, that "fragmentation is the result of the cities' economic and political history, and it reflects group and individual responses to urban reality". An urban fabric that seems physically to be continuous, not automatically is socially united. Then again, Ramírez & Sainz (2013) argue, that "fragmentation is an attribute of the city" related to "processes of inequality and physical barriers" in the one hand and to the "discontinuities in the expansion process of the urban product metropolization processes" in the other hand. By all means, the question of

distance is seen as an indicator and factor in the unfolding of urban fragmentation, and most of the time, its exclusion has been dictated by economic factors or policy-makers (Le Brazidec 2009).

Scholars have identified a diverse relationship between mobility and urban development. Wegener & Fürst (2004) show, that land-use indicators determine traffic flows and that transport infrastructure changes land-use patterns. In Bogotá, the effectiveness of policies to influence land use and transport in the urban regions can be observed, where the transport system enables multiple social connections and interactions. Kaufmann, Bergman & Joye (2004) analyzed the conceptual and theoretical links between spatial and social mobility, the social and territorial structures, which form intricate relations. They state, that "territorial features and geographic displacements are structuring principles for society, as societal features and social change effect the structure and use of territory".

The key factor of land use, however, is, like in the case of Cairo, its accessibility and the potential opportunities for interaction (Hansen 1959; Dalvi and Martin 1976), including transport alternatives and mobility choices (Ben-Akiva and Lerman 1979). Nevertheless, it has to be noted that the expansion and improvement of the public BRT transport network is not an exclusive solution. "Multimodality", considering furthermore means of transport and their integration into the BRT system, is essential (Duarte and Rojas 2012). Also accessibility measure with socioeconomic opportunities and compete with a number of activities that can be reached within a given range of travel costs (van Wee, Hagoort, and Annema 2001). In Bogotá, complementary different policies, e.g. cross-subsidies through redistributive fare with respect to accessibility to the labor market, showed in some areas greater impact, depending on the population, its location, and purchasing power (Bocarejo S. and Oviedo H. 2012). Therefore, transport supply, including its generalized travel costs and demand characteristics, as well as the spatial distribution of activities and people, land use, and origin-destination interactions, deserve special attention, and urban agenda measures have to consider both indicators simultaneously (Bocarejo, Portilla, and Meléndez 2015).

Another aspect to be observed in Bogotá is the mobility dimension to social exclusion, as the city comprises an extremely unequal urban pattern, where the most vulnerable groups are located in the furthest and least accessible places. As Witter & Hernández (2012) observe, public transport systems are the "mode of the poor" and particularly people of low income and lower education level, living in peripheral areas

were most heavily impacted. There is a strong correlation between a lack of access to adequate mobility and a lack of access to opportunities, social networks, goods, and services. Kenyon Lyons & Rafferty (2002) state, that "this correlation exists as both a cause and consequence of social exclusion". Therefore, urban agendas promoting transport like in Bogotá can be seen as an area of social policy inquiry to combat exclusion (Lucas 2004).

Summing up, the TransMilenio BRT system in Bogotá has a direct positive and robust impact on indicators like travel time, travel cost, and externalities (improved road safety and air quality) as well as on crime, land values, employment, and tax revenue (Hidalgo et al. 2013). Even though some scholars suggest that new transport infrastructure may also contribute to spatial fragmentation, e.g. by cutting adjacent areas and introducing obstacles between territories (Prévôt-Schapira and Cattaneo Pineda 2008), in terms of social fragmentation, a decrease can be observed (Bocarejo, Portilla, and Meléndez 2015). In regards to the urban agenda implemented in Bogotá, the multimodal and integrated approach of the BRT system, which includes also other types of transport, can serve as an example, not only for the global south but especially when considering the lowest socioeconomic strata (i.e., the poorest members of society). This is exceptionally in line with the NUA approach of sustainable urban mobility, which promotes in paragraph 114

> […] meaningful participation in social and economic activities in cities and human settlements, by integrating transport and mobility plans into overall urban and territorial plans and promoting a wide range of transport and mobility options, in particular by supporting […] a significant increase in accessible, safe, efficient, affordable and sustainable infrastructure for public transport, as well as non-motorized options such as walking and cycling, prioritizing them over private motorized transportation. […] (UN-Habitat 2017)

Best practice case Silang/Philippines, a participatory land-use approach

After screening all the selected relevant journals with high impact factors mentioned in Annex 3 for relevant articles, still, no 'best practice' example for sustainable integrated urban development and successful implementation of an international urban agenda in developing countries and emerging economies could be itemized. However, during the research, the 'Best Practices Unit' of UN-Habitat came across, who coordinates, identifies, documents, and disseminates best practices and enabling policies on urban development. The key products of the Unit include documented and peer-reviewed best practices, examples of good policies and enabling legislation, and case studies and briefs.

The products are available through an online Best Practices Database[32], which contains over 4,000 proven solutions to common social, economic, and environmental problems from 140 countries. (UN-Habitat 2018). The database can be filtered by means of four types of practices: (1) Promising Practices, (2) Good Practices, (3) Best Practices, and (4) Award Winner Practices. Through the advanced search, the filter can be further narrowed down by 24 categories (e.g., Urban and Regional Planning), 13 types of organization (e.g., Academic/Research), and seven world regions. Out of the six award-winning practices elaborated by the academy and research institutions, five were situated in developing countries and emerging economies (Table 7).

Table 7 - UN-Habitat Best Practices Database: Award Winners

Title	Organisation Type	Country	Year
Empower, an integrated development approach to informal settlement upgrading	Academic/Research	Switzerland	2017
Making land-use climate-sensitive: A project to increase resilience of cities against floods by integrating climate change into land-use planning	Academic/Research	Philippines	2017
Less Garbage More Environment	Academic/Research	Argentina	2014
Reforming Urban Laws in Africa: a practical guide	Academic/Research	South Africa	2017
Tracing Public Space	Academic/Research	Venezuela	2014
We are Medina Learning from Jnane Aztout	Academic/Research	Morocco	2017

Source: (UN-Habitat 2022c)

The selected last case presented in this subchapter comes from the Philippines and focuses on the international climate change mitigation agendas, by making land-use climate-sensitive. While synergies among climate change adaptation and mitigation policies clearly exist (IPCC 2014; Landauer, Juhola, and Söderholm 2015; Jones et al. 2015), little common understanding has been established on how to introduce these policies in an integrated manner (Wilbanks and Sathaye 2007; Vijayavenkataraman, Iniyan, and Goic 2012; Duguma et al. 2014). A holistic attempt, using spatial planning at the local level as a key tool, is required to successfully overcome the challenge implied by climate change (Davoudi, Crawford, and Mehmood 2009; E. Wilson and Piper 2010).

The project in Silang and Santa Rosa[33] aims to examine the necessary conditions for integrating climate change measures – adaptation and mitigation – by improving land-use planning at the river basin level. The study area, examined by Endo, Magcale-Macandog et al. (2017), is the Silang-Santa Rosa sub watershed, located around 40 km south of Manila, and adjacent to Lake Laguna, the largest lake in the country. The sub-

---

[32] See also: http://mirror.unhabitat.org/bp/bp.list.aspx (accessed 18.03.2022)
[33] See also: Overcoming Floods in the Philippines: A story of climate change adaptation and mitigation https://youtu.be/An47ybg8xrA (accessed 18.03.2022)

watershed, one of 24 sub-watersheds surrounding the lake, has a basin area of about 120 km2 and accounts according to WWF (2011) for 4.1% of the entire watershed of the lake. Four local governments manage the Silang-Santa Rosa sub watershed, which holds a total population of about 570,000 people: the Municipality of Silang, Cavite (upriver) and the Cities of Biñan, Santa Rosa, and Cabuyao, Laguna (downriver).

Due to rapid urbanization and industrialization, a vast area of land in the sub-watershed, especially the cities of Santa Rosa and Biñan, has been converted for industrial use in the past two decades (Lasco, Espaldon, and Tapia 2005). Population growth, land-use change, and climate change have altered the water resources in the river basin in ways that have negatively impacted several indicators like the availability of drinking water, access to public health, and food security and are also associated with large weather-related natural disasters such as floods and landslides. In addition, the dense clustering of wells, especially among residential and industrial wells, has resulted in the lowering of the water table in the long term. In these circumstances, local governments understand the need to manage land and other natural resources holistically (WWF-Philippines 2011). Local governments in the Silang-Santa Rosa sub watershed have been revising their comprehensive land-use plans, paying attention to both climate change and disaster risk prevention and reduction.

In the scenario and risk analyses undertaken by Endo, Magcale-Macandog *et al.* (2017), the pilot project has identified the area and population likely to be affected by flooding and examined plausible impacts as further development and climate change materialized. Figure 15 shows the land use of the Silang-Santa Rosa sub watershed in 2014 and indicates flood-prone zones. Most of the upriver area is either agricultural land or green space, while downstream areas are mostly developed but do hold some agricultural and unused land. In stark contrast, the 2025 scenario illustrates, about 80-90% of the land in the sub-watershed will have been converted for residential and commercial. Farmland and forests will only remain in midstream and downstream areas. According to the authors, it is expected that flood damage – observed already in approximately half of the sub-watershed and affecting about 100,000 people – will be aggravated by planned massive land conversion, which will increase the runoff coefficient indicator (i.e. the percentage of rainfall that appears as stormwater runoff from a surface), as shown in Figure 16. The number of disaster victims and the economic damage that they suffer will increase because of increased flooding in terms of area, frequency, depth, and/or duration.

Figure 15 - Land-use in the Silang-Santa Rosa sub watershed as of 2014 and 2025
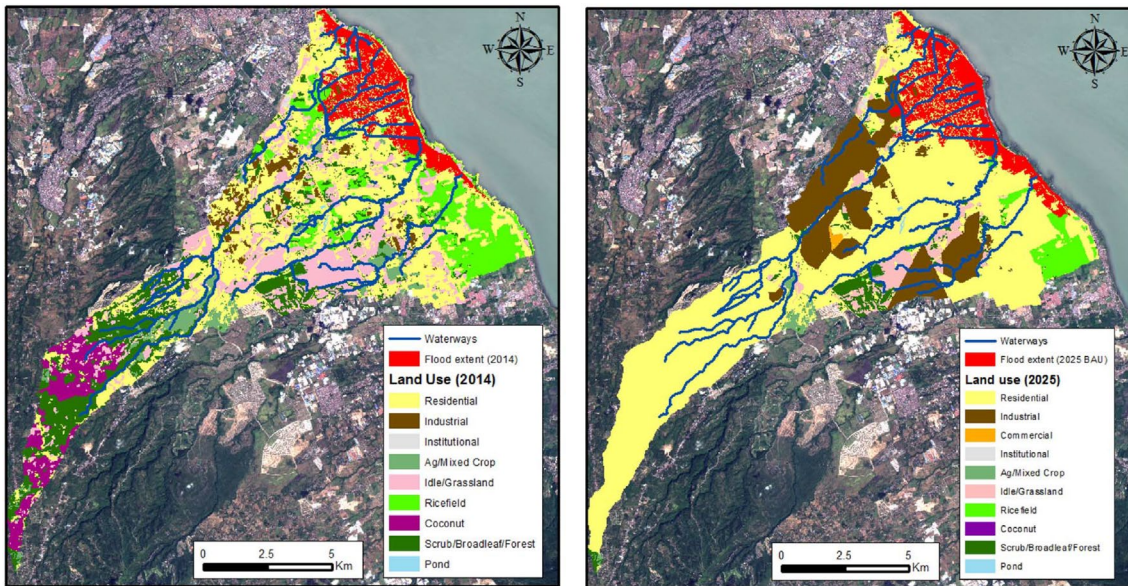
Source: (Endo et al. 2017)

Figure 16 - Runoff coefficient / curve number of sub watershed as of 2014 and 2025
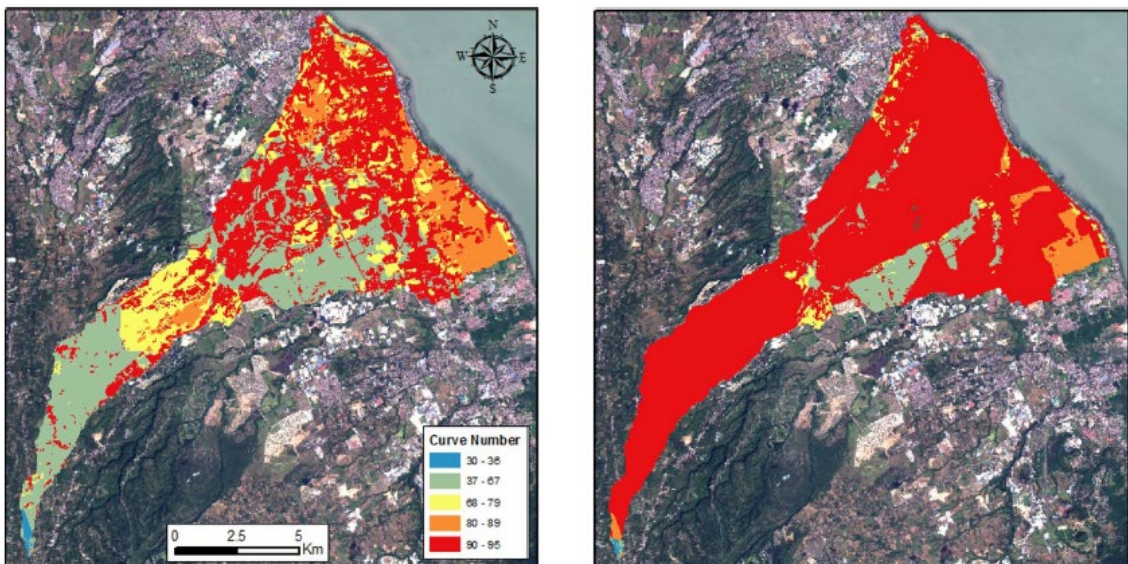
Source: (Endo et al. 2017)

With the support of the research project and the determination of key indicators, local governments have devised a set of priority measures for climate change adaptation and mitigation, based on a list of possible measures (Table 8): Firstly, improving zoning ordinances aims to ease and/or evade flood risks by, for example, regulating development in high-risk areas. Runoff mitigation measures are mandated when forest or agricultural land is converted to built-up types of land use (e.g., residential developments, industrial facilities, shopping malls). Secondly, water course management actions including riverbank re-enforcement and reforestation are proposed to reduce surface runoff and erosion as well as speed the flow of water in rivers (to reduce flooding). Depending on

the geographic location (e.g., up-, mid-, or down-stream), different actions are to be taken. Lastly, training activities are to be implemented to strengthen the capacity of local government staff to undertake these actions. This includes an assessment of training needs followed by the development of training materials. While most of these measures address mainly adaptation, some measures such as afforestation and reforestation could provide mitigation benefits as well as non-climate benefits of livelihood creation and improved health.

As part of the implementation of climate change adaptation and mitigation measures, immediate actions were proposed according to the needs indicator of each local government. To alleviate flood risks, it was suggested that the building codes in high-risk areas in Santa Rosa be strengthened by mandating measures such as the construction of floodwalls and the introduction of elevated flooring and that administrative guidelines be prepared in Silang to implement runoff mitigation measures where forest and/or agricultural land is converted to built-up land use types. Watercourse management measures in the downstream basin, including Biñan and Cabuyao, were also recommended to maintain and improve the watershed protection functions (i.e., flood alleviation, water retention ability) of the ecosystem. Additionally, activities for strengthening the capacity of IWMC were included in the proposal (Endo et al. 2017).

Table 8 - List of possible measures for climate change mitigation and adaptation

Category	Measures	Mitigation	Adaptation
Engineered and built environment options	Flood levees, sea walls and lakeshore protection, etc.		X
	Improved drainage; storm and wastewater management; water storage, etc.		X
Improved land-use	Development control in high-risk areas		X
	Green space, urban greening	X	X
Flood-tolerant, Environment-conscious building	Strengthened building codes in high-risk areas (e.g. embankment, high-floored housing)		X
	Roof greening, green building	X	X
Ecosystem-based, integrated watershed management	Maintenance and improvement of watershed protection function (flood alleviation, water retention ability) of ecosystem		X
	Afforestation & reforestation	X	X
	Watercourse management (e.g. riverbank reinforcement, dredging, river cleaning)		X
	Change in varieties and cultivation methods of agricultural products to prevent soil runoff		X

Source: (Endo et al. 2017)

In conclusion, the research project successfully developed and assessed an approach to integrate climate change mitigation and adaptation measures at the local level, especially in land-use planning and management, by analyzing risks, examining

significant indicators, and setting out countermeasures, including utilizing ecosystem services, in a river basin context. The research project highlights the need for a holistic approach to land-use planning and management by local governments in the Philippines that incorporates climate change mitigation and adaptation strategies, to sustainably implement international urban agendas in these regards. Endo, Magcale-Macandog, *et al.* (2017) stress, that "collaboration among local government agencies at the river basin / watershed level is critical to an effective response to weather-related disasters, especially flooding, which are expected to become more pronounced with climate change." But if implemented properly, it can serve as award-winning best practices, as acknowledged by UN-Habitat and "be scaled up in the Philippines and beyond" (UN-Habitat 2022c).

1.3   Common international challenges

Summarizing the six previously given records of already implemented experiences around the globe, the importance of adequate indicators to benchmark, measure and compare urban development and local agendas is evident and omnipresent. Furthermore, common international challenges in urban development can be identified. Four key issues for the effective implementation crystalize in these urban agendas and emerged, according to Bai *et al.* (2016), from the UN-Habitat III Conference, namely: (1) a radical redesign of the multilateral institutional setup on urban issues, alike occurred during the Olympic Games in Rio or indicated in the land-use approach in Silang; (2) promoting regenerative culture, behavior, and design, as shown in the cases of Amsterdam and Milan; (3) exploring ways to finance a systems approach, as for instance through the BRT system in Bogota; and (4) a new and enhanced role for science in sustainable development, e.g. through new sustainability assessment tools like applied in Cairo. These key issues are crucial to meet collectively agreed sustainability goals like the SDGs and NUA at local, regional, and global scales, and more broadly to securing human well-being worldwide. Nonetheless, "cities and human settlements are critical sites for implementation of these universal objectives, indicating the need for local action that serves global and local interests", as indicated also by Fenton and Gustafsson (2017).

To overcome these common urban challenges worldwide, according to Bai *et al.* (2016), "a systems approach is urgently needed in urban research and policy analysis, but such an approach rarely features in current analysis or urban decision-making for various reasons". The researchers identified several barriers to implementing a systems approach,

like the institutional evolution/behavior, the failure to recognize the systemic nature of cities, the inadequacy of mental models, lack of incentives, inadequate decision-support systems, as well as path-dependency and lock-in. They claim that the systems approach entails recognizing several important system characteristics of a city, as illustrated below (Figure 17). In the figure, the left component focuses more on the internal structure, and the right one highlights external linkages and interactions of cities. The symbols represent actors/constituents, structure, and processes across physical/built, social/economics, and ecological subsystems. The arrows represent complex processes and linkages within and between cities and between cities and their hinterlands. The actors and constituents are typically self-organizing, and the structure, processes, linkages, and functions are dynamic and evolving, with non-linear pathways.

Figure 17 - Urban system structure and interlinkages
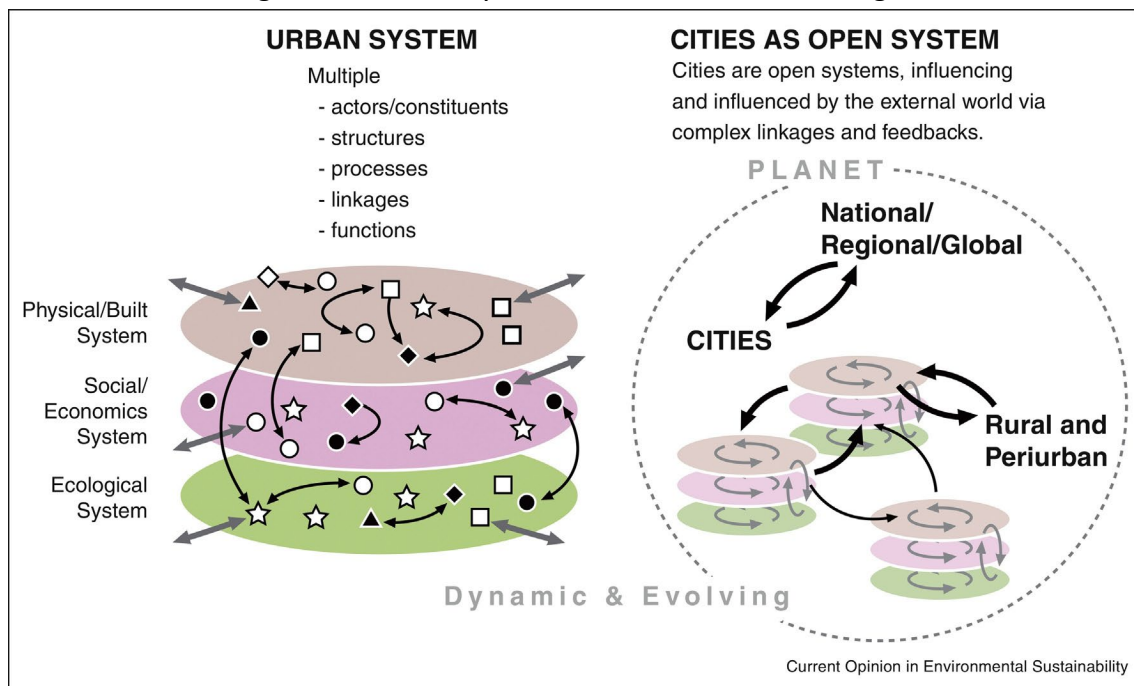
The urban system structure exemplifies the common international challenges of implementing urban agendas. Actually, a mix of the above-mentioned four key issues would be necessary, to overcome all the existing implementation barriers and drive building more economically, socially, and environmentally sustainable and equitable cities.

To a similar result come J.A.P. de Oliveira *et al.* (2015), highlighting the positive effect and mutual gain of adapting the systems approach in the urban context, where "policies implemented in particular sectors (such as transport, energy or waste) often

generate multiple co-benefits in other areas", linking climate change and urban health across multiple sectors. The authors highlight five steps, to facilitate the transition and overcome common urban challenges: (1) the need for improving understanding and coordination among different sectors; (2) the design of service providers and reforms carried forward; (3) the efforts to bring together different civil society stakeholders in the decision-making process; (4) the need for systemic approaches as a means to better integrate sectors and that seeking out co-benefits can facilitate such integration; and (5) tools that explicitly and quantitatively estimate co-benefits to improve sectoral integration and decision-making. However, they critically observe as well, that researchers "must move beyond the siloed thinking that exists across sectors and urban governance, [...] ultimately there needs to be a change in the incentive structure in governance that rewards addressing urban issues from a systemic rather than a sectoral standpoint".

In a nutshell, a system approach has a huge potential regards urban transformations and plays therefore an important role, to overcome common urban challenges. However, it is not the only tool in the toolbox. It has to be combined with other measures, creating synergies, to unfold its full potential, and provide good governance in the context of urban sustainability.

1.3.1 Governance for urban sustainability

Current international urban agendas usually aim through an integrated approach, requesting multi-level governance, and involving actors from multiple sectors. It requires the integration of sustainable goals in local strategies, policies, and practices. In specific, the UN acknowledges and emphasizes the collaboration between countries and stakeholders, in order to sustainably implement urban development (UN-Habitat 2017).

However, in the absence of decentralizing reforms and lack of adequate indicators to measure progress, the complexity of managing inter-related development goals and agendas may present difficulties for municipalities with capacity constraints or similar challenges (Fenton and Gustafsson 2017). Barrutia *et al.* (2015) compared exemplarily the "ideal Local Agenda 21 model" with "real-world Local Agenda 21" and highlighted the mismatches. They claim, that the "gap between purposes and real-world practices seems to be related to limited and decreasing resources and decision-making powers of local governments". The hierarchically oriented political-administrative system and the

top-down mindset of many local representatives are some of the major challenges of governance when it comes to the implementation of urban agendas.

According to Fenton & Gustaffson (2017), "past efforts to achieve decentralization appear to have failed, and nation-states continue to protect their power base in global governance, despite acknowledging the need for subsidiarity on issues such as sustainable development". The governance system becomes more and more fragmented, polycentric, and transnational, therefore the strategy in regard to urban agendas has to adapt themselves accordingly, e.g. through global networking (Hakelberg 2014) (Bansard, Pattberg, and Widerberg 2017) or supranational initiatives (Pablo-Romero, Sánchez-Braza, and Manuel González-Limón 2015), promoting 'governance by diffusion' between municipalities and thereby contributing to intra-municipal transformations.

These global collaborations can provide as well constructive feedback loops and deliver input to new international agendas themselves. Parnell (2016) therefore points out once again the need for pluralism and reflexivity in the practice and study of governing for sustainable development and cities, especially in an "increasingly complex process of the global policy environment". Exemplarily, Wittmayer, *et al.* (2016) dissolve along six dimensions (history, aim, kind of change, governance understanding, process methodologies, and actors) the tensions between aiming for radical change and working with status quo-oriented actors and governing settings. They suggest, that "the explicit orientation towards radical change is a precondition for governing sustainability in a way that addresses the root causes of societal challenges" and conclude, that "governing sustainability should be about finding creative ways for opening spaces for participation, change, and experimentation, that is, for creating alternative ideas, practices, and social relations". Fenton & Gustaffson (2017) come to a similar conclusion and indicate the "need to urgently clarify the roles and responsibilities of actors participating in governing for sustainable development at the local level". A major stake and consequently one of the keys to the success of the sustainability of international urban agendas lay therefore in the governance and the way, the respective local level actors, such as the municipalities, identify their role and responsibility in the implementation process.

1.3.2 Hard and soft law in international governance

For greater comprehension of the extent to which international urban agendas are contributing to fostering sustainable urban development, a closer look at hard and soft law in international governance is required. The term 'hard law' refers to all legally binding obligations that are precise, like rules or taxes. The term 'soft law' on the other hand is more volatile and can be described best as follows:

> The generic term soft law covers a wide range of instruments of different nature and functions that make it very difficult to contain it within a single formula. Its only common feature is that it is in written form, but the other characteristics are variable and negotiable and they constitute an "infinite variety." So the term encompasses soft rules that are included in treaties, nonbinding or voluntary resolutions, recommendations, codes of conduct, and standards. (Fajardo 2014)

More briefly, Shelton (2000) defined it as "normative provisions contained in non-binding texts" that take place in international voluntary agreements such as environmental policies like the Rio Summit Declaration Agenda 21 or urban agendas like the NUA. These agreements provide an empirical example of the putative shift from the government towards governance. However, the successful implementation of soft law policies at a national and regional level is in fact the most challenging aspect in this regard. One of the reasons is that they are non-binding doctrinaire documents of voluntary adoption by the member states. Abbott and Snidal (2000) argue that international actors actually choose to order their relations through international law and design treaties and other legal arrangements to solve specific substantive and political problems and that international actors intentionally decide on softer forms of legalized governance when those forms offer superior institutional solutions. They claim, that "the realm of 'soft law' begins once legal arrangements are weakened along with one or more of the dimensions of obligation, precision, and delegation." This is especially the case when hard law might challenge the autonomy and state sovereignty of participating actors.

In addition, the predicate that soft legalization also provides certain benefits not available under hard law, offering more effective ways to deal with uncertainty, especially when it initiates processes that allow actors to learn about the impact of agreements over time. Downs, Rocke, and Barsoom (1996) also acknowledge that a high level of compliance has been achieved through soft law with little attention to hard law enforcement, however, consider that "a high rate of compliance is often the result of states formulating treaties that require them to do little more than they would do in the absence of a treaty" and therefore critique much international cooperation for consisting of

agreements that reflect what states would have done on their own and so do not change behavior. They further argue, that "in those cases where noncompliance does occur and where the effects of selection are attenuated, both self-interest and enforcement play significant roles." Wurzel, Zito, and Jordan (2013) point out similarly, that voluntary agreements have often been adopted in the "shadow of the law" or "shadow of hierarchy" and therefore have the most success, where also a strong regulatory framework is in place, and require additional monitoring.

In a nutshell, hard and soft law hold both important stakes to solve specific substantive and political problems and contribute to fostering sustainable urban development. However, unlike hard law with its hierarchical mainly national structure and outreach to the regional and local level, soft law normative provisions require additional alternative mechanisms (e.g. knowledge transfer; exchange of good practices; monitoring and follow-up of indicators, etc.) to promote implementation to the detriment of traditional hard policy mechanisms. These alternative mechanisms regarding urban development will be scrutinized in a later stage, to provide recommendations for the improvement of successful implementations of urban agendas in specific and enhance soft law policies of international guidelines in general.

1.3.3 Specific regional challenges, showcase Latin America

Urbanization, climate change, and natural hazards are common challenges around the globe. However, when it comes to the approach regards the implementation of international urban agendas, a more specific look has to be taken, considering as well the regional and local context. According to Mycoon (2017), many countries are underperforming in achieving the sustainable development goal of safe, resilient, and sustainable urban settlements, as specific regional settings and backgrounds can't be considered properly in a universal agenda, developed in the global north. She proclaims, that countries "should not adopt an imported blueprint to resolve critical urban issues". They should rather craft a relevant "indigenous" urban agenda, based on the "four pillars of economic, social and environmental sustainability, and governance" (Figure 18).

Figure 18 - Suggested architecture of regional urban agendas in Latin America

National Urban Policy [HIGH]
1 Urban Housing
1 Inner-city Revitalisation
2 Compact Urban Form

Local Implementation [HIGH]
1 Decentralisation
1 Budgetary Reforms
2 Public Participation
2 NGO Involvement

Monitoring, Reporting and Reviewing Mechanisms [HIGH]
1 Urban Data
1 Urban sustainability indicators and proxies
1 Monitoring Mechanisms
2 Urban Profiling

Urban Economy, Finance and Market Incentives [HIGH]:
1 Land- Based Financing   3 Community Financing
1 Public-Private Partnership
2 Ecological Tax Reform
2 Social Impact Bonds
2 Progressive Taxation
2 Private Sector Financing

Urban Legal Frameworks [MEDIUM]
1 Building Codes
1 Enforcement
2 Planning Legislations
2 Land Tenure and Environmental Laws2)

Integrated Urban and Territorial Planning and Design [MEDIUM]
1 Integrated Coastal Zone Management
1 Urban Governance
1 Climate Change and Disaster Risk Reduction
2 Urban Environment: Mainstreaming Ecosystems Services in Urban Planning

Source: (Mycoo 2017)

In the showcase of Latin America, economic, environmental, and social vulnerabilities become exaggerated because of geographical location, the scale of economies, unique biodiversity, governance, political institutions, and land settlement history. Therefore, the implementation of the regional urban agendas has to prioritize and favor especially the most effective measures in the short-term to overcome common challenges, nevertheless considering and not neglecting secondary complementary measures on a medium and long-term agenda. Barnett & Bridge (2016) complement, that "urban concepts should be conceptualized problematically" and consequently state:

> Approaching urban concepts problematically suggests a move away from the idea of critique as a form of scholastic correction towards an appreciation of the contested fields of practice in and through which critical understandings of urban problems emerge. (Barnett and Bridge 2016)

Mycoon (2017) particularly emphasizes, that "more financial resources, relevant policies, effective tools, robust urban governance, education, and training are paramount to close the gap, build capacity and effectively implement" localized urban agendas in Latin America.

The overarching challenge of these international shortcomings is to be able to measure and benchmark adequately the status quo and progress of global and national urban agendas within the regional and local context, and the diversity of realities and development stages these agendas represent. A conclusion might be, that the diversity of sustainability in cities is prohibitive to a universal indicator set, which will be further scrutinized in the following chapters.

1.4 Indicators for urban development

Already the Agenda 21[34] of the Earth Summit in 1992 had foreseen the "development of indicators of sustainable development" (United Nations 1992), like most of the international agendas afterward. UN-Habitat has been a pioneer organization in the collection of urban indicators. In 1991, it initiated the Housing Indicators Program, focusing on monitoring shelter performances. It then became the Urban Indicators Program in 1993 in order to focus on a larger range of urban issues (UN-Habitat 2004). The first Global Urban Indicators Database (GUID1) was produced, and Habitat Agenda urban indicators were formulated in 1996 in order to provide information on urban conditions and trends for the Habitat II Conference in Istanbul that same year. According to Hoornweg *et al.* (2007), "this database provided information on 237 cities worldwide and was perhaps the first representative sample of urban indicators on a global basis".

The annually updated online Global Urban Indicators Database[35] monitored by the Global Urban Observatory (GUO) unit addresses the Habitat Agenda's key issues, with a specific focus on the Global Development Goals, particularly, MDGs, SDGs, Paris Climate Agreement, New Urban Agenda, among others. The Data and Analytics section is, among others, responsible for various SDG 11 indicators and the New Urban Agenda monitoring. Since the development of the urban indicators database, the evidence from database has been very useful in the development of the world cities report and other regional reports (Africa, Asia, LAC), UN-Habitat's flagship products (UNSD 2021).

However, it has to be taken into account, that indicators always attempt to simplify complex systems into easily digested 'bites' of information, and Morse (2004) rightly alerts us in this regard:

> At one level they are intended to enhance transparency, accountability and local democracy, while at another they provide a means of enhancing performance. However, all indicators suffer from the same basic problem that, ironically, is also their biggest advantage - condensing something highly complex into a few simple numbers.

Keeping this important note at the back of one's mind, the main sets of indicators will be presented in the consecutive sub-chapters, to provide a good, although not conclusive overview of different approaches.

---

[34] See Agenda 21, Chapter 40, Objective 40.5.a

[35] See also: https://urban-data-guo-un-habitat.hub.arcgis.com/ (accessed 16.04.2021)

1.4.1 The analytical framework of policy cycles

Beyond question, the so-far introduced indicators try to enhance standardization by structuring the indicators into a respective analytical framework (Table 9).

Table 9 - Indicator frameworks

Framework	For whom	Purpose	Scope	Context	By whom	Example
Policy-driven	City planners, policymakers	Dialog between poli-cymakers and stakeholders	City or sector	Political, pluralist	Stakeholders, experts; ideally, both directions	UNCHS[36]
Theme- or index-driven	Development professionals	Comparative	Theme or metaphor	Development	Experts top down	UNDP[37]
Systems	Experts advising policy	Sustainability	City or theme	Physical	Usually top down by experts	State of the Environment
Performance	Policymakers	Accountability	Sector	Managerial	Bureaucracy top down	Program budgeting
Needs-based allocation	Central policy-makers	Resources for target groups	Target groups	Budget setting	Bureaucracy top down, may be negotiated	Asian Crisis Thailand
Bench-marking	Middle management	Efficiency	Organization	Units	Employees bottom up	Best practice

Source: (Hall et al. 2001)

The frameworks applied for urban agendas are usually policy-driven and follow a policy cycle system. Indicators represent the "past or projected performance of different units", and are generated through a "process that simplifies raw data about a complex social phenomenon" (Merry, Davis, and Kingsbury 2015). Most of the formerly developed indicators are typically organized according to strategic issues, led by policy goals, and set by political priorities. Therefore, "the main difference between indicators and other kinds of data is that the connection with policy is, or should be, explicit. Indicators are about the interface between policy and data" (Hall et al. 2001).

Complementary, the conceptual framework approach is based on a model of sustainable development processes and their interactions. Several such methods for sustainability assessment have been already developed, tested, and compared (Hak, Moldan, and Dahl 2007; G. Atkinson, Dietz, and Neumayer 2007; Singh et al. 2009; Tasaki and Kameyama 2015). Both, policy and conceptual frameworks have their place in supporting the different stages of the policy cycle (Hák, Janoušková, and Moldan 2016). The usual cycle (Figure 19) initiates with policy formulation by identifying issues,

---

[36] United Nations Centre for Human Settlements (Habitat)
[37] United Nations Development Program

67

setting goals and objectives reflecting ideas and visions, and formulating issues, as done e.g. by the Agenda 2030 through the SDGs or the NUA via leading paragraphs. Usually, they are followed by a science and evidence-based policy legitimization and guidance for policy implementation, to avoid that decision-maker working with criteria of salience and particular or short-term objectives (Glaser 2012).

Figure 19 - A policy cycle linked to policy and conceptual frameworks
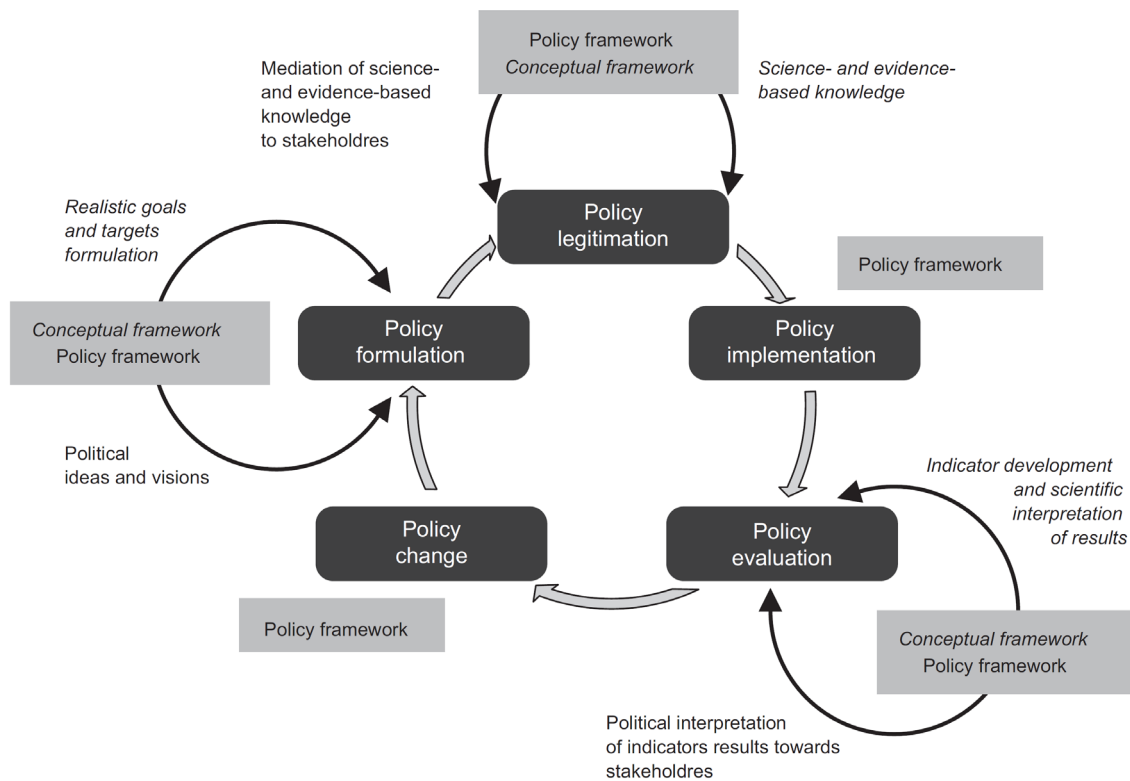
Source: (Hák, Janoušková, and Moldan 2016)

For the subsequent policy evaluation, the development of reliable and robust indicators is key crucial and according to Hák, Janoušková, and Moldan (2016) substantial to assessing the extent to which the policy was successful or the policy decision was correct. The cycle concludes finally with policy change and adaptation of the initial policy formulation, as can be observed during the transformation of the former Agenda 21 and the formulation of the MDGs into the later Agenda 2030 and the recent SDGs.

1.4.2 Construction and selection criteria for indicators

Without a doubt, the construction and selection of indicators are key for the successful monitoring of development. To develop indicators, the following five steps are required: (1) identify what to measure; (2) use substantiated criteria to develop high-quality

indicators; (3) establish a reference point; (4) set targets; and (5) determine the frequency of data collection (Compass 2007). The Encyclopedia of Statistical Sciences edited by Kotz (2006) and adopted by the UNSD highlights five general principles of criteria for the construction and selection of indicators (Figure 20).

Figure 20 - Key principles of criteria for the selection of high-quality indicator
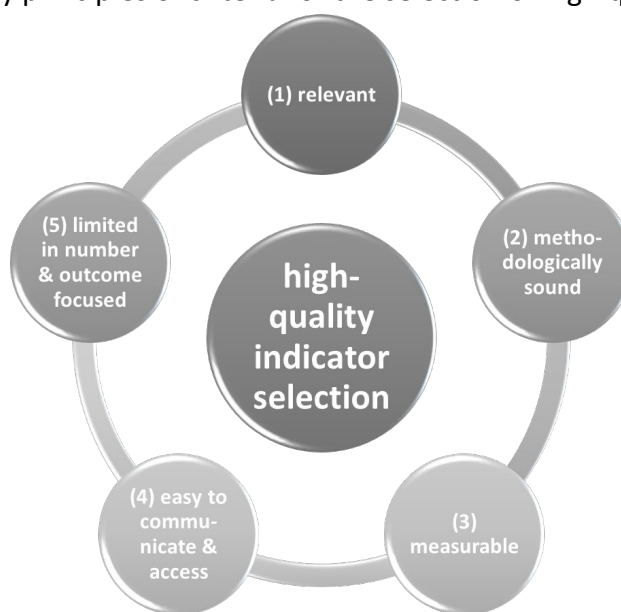
Source: (Kotz 2006), graphic own elaboration

The key principles trace back to the former introduced SMART objectives (Specific, Measurable, Achievable, Realistic, and Time-related), developed by Dolan (1981). Smith, Blanchet, and Frison (2018) adapted the component of SMART criteria for alternative descriptions regarding the construction and selection of indicators of high quality (Table 10).

Table 10 - SMART criteria

Component	Description
Specific	The indicator must be translatable into operational terms and made visible. While the outcome/result itself may be broad, the indicator should be narrow and focus on the "who" and "what" of the intervention. Additionally, "how" and "where" the "who is doing the "what" is important to include in the indicator as it provides the action for the intervention
Measurable	The indicator can be counted, observed, anaysed, tested, or challenged
Attainable	The indicator is achievable if the performance target accurately specifies the amount or level of what is to be measured in order to meet the outcome/result
Relevant	An indicator is relevant to the extent that it captures or measures a fact of the outcome (in our case the minimum standards) that it is intended to measure
Time-Bound	The indicator states within what period of time it will be measures

Source: (Smith, Blanchet, and Frison 2018)

Other organizations and institutions like the OECD or World Bank have slightly different names or catchwords for their construction and selection criteria, like "conceptual soundness" and "reliance on data of high quality" (OECD 2011) or "useful

to management" and "capable of being disaggregated" (Görgens and Kusek 2009a), but follow the same five key principles.

In 2015, the UNSD disassembled and refined the key principles further on, to enhance the monitoring of the newly created SDGs. In conformity with the discussion paper on criteria for high-quality indicator construction and selection, they should comprise the following additional premises (Table 11).

Table 11 - Additional premises for the selection of indicator

1. Relevant	
1.1.	Linked to the target
1.2.	Policy relevant
1.3.	Applicable at the appropriate level
2. Methodologically sound	
2.1.	Based on sound methodology
2.2.	Tested to be valuable
2.3.	Coherent and complementary
3. Measurable	
3.1.	Stable and sustainable
3.2.	Disaggregated
3.3.	Managed by one or more responsible agencies
4. Easy to communicate and access	
4.1.	Easy to interpret and communicate
4.2.	Easily accessible
5. Limited in number and outcome focused at the global level	
5.1.	Limited in number
5.2.	Outcome focused

Source: (UNSD 2015)

Regarding the first principle "relevant", the indicator should, according to the UNSD: (1.1) be clearly linked to one or more targets and provide robust measures of progress towards the targets; (1.2) be relevant to policy formulation and provide enough information for policy-making as well as sensitive/responsive to policy interventions and other underlying causes of change at the appropriate level (global, regional, national, and local); and (1.3) be relevant for global/national monitoring to all countries / national priorities.

Concerning the second principle "methodological sound", the indicator should: (2.1) be scientifically robust and based, to the greatest extent possible, on existing internationally agreed definitions, classifications, standards, recommendations, and best practices, implicating that the methodology behind the indicator (data sources, method of computation, treatment of missing values, regional estimates, etc.) should be well documented and readily available; (2.2) be recommended by a well-established and recognized peer review mechanism or through international mechanisms whereas, for new indicators, pilot projects are needed and must be supported with necessary resources

to assess and document the indicators and data collection methods; and (2.3) be consistent with and complementary to other indicators in the monitoring framework (e.g. through an inter-dependency map to show the information required and the relationship between the indicators).

In respect of the third principle "measurable", the indicator should: (3.1) be measured in a cost-effective and practical manner by countries and constructed from well-established sources of public and private data, requiring statistical capacity or potential capacity for data collection and analysis to support the indicator at national and international levels; (3.2) be possible to be disaggregate by geographical region, sex, income, or special population groups where applicable and relevant; and (3.3) be managed by one or more designated lead responsible agencies for timely and high-quality reporting of the indicator and for undertaking the related analysis at the international level, being responsible for the production of country-level data, regional aggregates, development and dissemination of concepts, methods and analysis used, describing the assessment of progress made globally and by regions, as well as provide guidance and/or assistance to countries to strengthen their capacity to produce the indicators.

As for the fourth principle "easy to communicate and access, the indicator should: (4.1) be clear and easy to understand for policy makers, the general public and other stakeholders, and unambiguous for interpreting, including carefully considered use of language, terminology and presentation of information and considering statistical training to policy makers and the general public where scientific concepts and terminology have to be used; and (4.2) be easily and openly accessible to the general public, policy makers and other stakeholders. In matters of the last principle being "limited in number and outcome focused", the number of indicators at the global level should: (5.1) be minimal while at the national level, supplemental indicators can be added according to national priorities and circumstances to address their specific needs; and finally (5.2) be mainly outcome focused, or in the absence of reliable outcome indicators, process or input indicators can be used (UNSD 2015).

In addition to these key principles and criteria, high-quality indicators should ideally be defined by a transparent process and by consulting all relevant stakeholders, especially on a local scale (Yuan et al. 2003). A valid example in this regard can serve the selection and application process of sustainable indicators executed by Lannes (2017). However, the difficulty in building indicators able to face the multidimensionality of sustainable development requires many measurement experiences on the local level and

consequentially literature and "becomes, ever and unavoidably, a political issue leading to important consequences" (Scipioni et al. 2008).

Hanley *et al.* (1999) argue, that "different indicators provide different insights for policy making" and consequently change through time. For instance, in 1989 the Dutch government published a National Environmental Policy Plan and requested the National Institute of Public Health and Environmental Protection and the Institute for Environmental Studies of the Free University of Amsterdam to bring together scientists and stakeholders from different disciplines to outline the options for "measuring" sustainable development. The papers resulting from the research have been compiled by Kuik and Verbruggen (1991) in the volume "In Search of Indicators of Sustainable Development" to provide policy-makers and the general public some feeling for whether the country was moving in a more or less sustainable direction over time since 1981. The collaboration was necessary, as there were no other measuring rods or yardsticks available to measure practical policy initiatives against the goal at the time. Ten Brinck (1991) points out, that "it is not so much that […] information, on which a policy of sustainable development must be based, is missing; it is the fragmentary, often qualitative and very detailed nature of the information that hampers its direct usefulness in policy making". Therefore, the search for indicators of sustainable urban development means foremost the search for policy-relevant and coherent urban information that adheres to these criteria.

For the consecutive research, the key principles developed by Kotz (2006), the adapted SMART criteria introduced by Smith, Blanchet, and Frison (2018) and the additional premises refined by UNSD (2015) were consulted for the introduction of an improved set of high-quality indicators.

Justification on choice of research focus "indicators":

To conclude the first chapter of this thesis, the necessity to provide a brief justification on the research focus selection came to light. At this point, several different thesis focal points could be elected, and research paths adopted. It is acknowledged that there exists an enormous complexity of the whole topic about urban agenda setting, their planning & monitoring, the international experiences & challenges, and an approach had to be chosen. Besides, there is the additional intricacy of the diverse situations in the global south. This is also an important part of the expectation management, in order to avoid disappointment and tensions of readers during the next chapters, as not all aspects could and will be examined with the same depth, although all interlinked topics would deserve further deeper investigations. It was the author's deliberate choice to investigate and **focus on indicators as the key monitoring tool for development**. One argument for the selection of this topic was the impartiality of the instrument, in a governance world which gets more and more hampered and manipulated through the local policy loop, led by policy goals, and set by political priorities. Indicators are about the interface between policy and data (Hall et al. 2001). They can lay the grounds for a civilized and constructive discussion on urban agenda setting and their successful implementation. They have as well the potential to break down complex correlations into manageable pieces, to process and work through the current urban challenges in a structured manner. Therefore, the critical review of existing indicators was opted and a suggestion for a new indicator spectrum developed in the consecutive chapters, climaxing in the elaboration of recommendations and suggestions for indicators. The selection is not to disregard or disesteem further urban topics, and the overall matter of international urban agendas, but to valorize and upgrade the potential of urban indicators in the planning and monitoring context.

2   METHODOLOGY AND RESEARCH DESIGN

The general structure of the thesis and a brief overview of the predicted chapters are already presented in the introduction (Figure 5, Chapter 0.5). Alike the main chapters, the methodology itself is structured as well along the four specific objectives through five steps (Figure 21). The subsequent subchapters provide information about the methodology applied for the desk study on the state of the art of urban agendas and urban challenges (Chapter 2.1) and the approach for the analysis and critical review of monitoring instruments and existing indicators (Chapter 2.2). Consecutively, the methodology for the global overview survey (Chapter 2.3) and the following selection and assessment of the derived indicator spectrum are expounded (Chapter 2.4). Finally, the approach for the pretended elaboration of recommendations and mechanisms is presented (Chapter 2.6).

Figure 21 - Methodology steps overview

Chapter 2.1	• **STEP 1: Desk study on international urban agendas & urban challenges** ➢ 1. specific objective
Chapter 2.2	• **STEP 2: Approach for analysis and critical review of existing indicators** ➢ 2. specific objective
Chapter 2.3	• **STEP 3: Global overview survey to iteratively verify perceptions & hypotheses** ➢ 1., 2. & 3. specific objective
Chapter 2.4 & 2,5	• **STEP 4: a) Selection and b) assessment of derived adaptive indicator spectrum** ➢ 3. specific objective
Chapter 2.6	• **STEP 5: Elaboration of recommendations and suggest mechanisms** ➢ 4. specific objective

Source: Own elaboration

For the whole study, an experimental research design, as highlighted by Creswell (2010), is intended, to determine if a specific treatment influences an outcome, "for exploring and understanding the meaning individuals or groups ascribe to a social or human problem". The final written thesis has a flexible structure and involves the intersection of philosophical assumptions, strategies of inquiry, and specific methods (Table 12). Similar to social constructivist researchers, this research follows an interactive approach with a "hermeneutic-dialectical process" (M. M. de Oliveira 2014), which addresses the processes of interaction among individuals and intends to focus on the

74

specific contexts in which people live and work, in order to understand the contextual (geographical and cultural) settings of the participants and tries to make sense of (or interpret) the meanings others have about the world. Alike used in information systems, the dialectical hermeneutics framework applied in this work combines both, interpretive and critical elements, and pretends to address those social and organizational issues that are critical to the successful implementation of urban agendas (Myers 1995). Interviews can be exploratory or record information and can be structured or fixed-answer, semi-structured, or open-ended (Freebody 2003).

As indicated by M. M. de Oliveira (2014), the required qualitative data for this research is obtained through a mix of bibliographic review, expert interviews, questionnaires, tables, and other technical instruments necessary to obtain information. Qualitative research is therefore not generalizable, but exploratory, in the sense of seeking knowledge for an issue on which the available information is still insufficient (Vieira 2009). The research seeks to understand the context or setting of the participants through visiting this context and gathering information personally, although allowing the interpretation shaped by the researcher's own experiences and background. (Creswell 2010).

Table 12 - Qualitative Approaches

Tend to or Typically . . .	Qualitative Approaches
• Use these practices of research as the researcher	• Constructivist/ advocacy/ participatory knowledge claims
• Use these philosophical assumptions	• Phenomenology, grounded theory, ethnography, case study, and narrative
• Employ these strategies of inquiry	• Open-ended questions, emerging approaches, text or image data
• Employ these methods	• Positions him- or herself • Collects participant meanings • Focuses on a single concept or phenomenon • Brings personal values into the study • Studies the context or setting of participants • Validates the accuracy of findings • Makes interpretations of the data • Creates an agenda for change or reform • Collaborates with the participants

Source: (Creswell 2010)

The grounded theory strategy hereby applied derives a general, abstract theory of a process, action, or interaction grounded in the views of participants which during the process involves using multiple stages of qualitative data collection and the refinement and interrelationship of categories of information (Charmaz 2006; Corbin and Strauss 1998). The consecutive qualitative data analysis is a "continuous, iterative enterprise", as

outlined by Miles and Huberman (1994), and involves several steps, delineated in the consecutive sub-chapters.

2.1 Desk study on the state of the art of urban agendas

As already mentioned in the previous section, to provide an overview of the current situation and state of the art regarding already implemented and ongoing implementations experiences of urban agendas worldwide, and to expand the understanding of urban agenda applications, a qualitative document review is undertaken in Chapter 1. The focus of the review is to analyze publications in scientific journals, which offer insights about knowledge transfer in global urban agendas and tackle the role of cities in multi-level climate governance. To identify the most relevant sources of periodicals worldwide, the online tool Sucupira Platform[38] is used. By selecting the valuation area (1) 'Architecture, Urbanism & Design' (AUD) and (2) 'Urban & Regional Planning / Demography' (PURD), 169 top A-rated international scientific journals with the highest impact factors are detected. After a preselection of 20 topic-relevant periodicals, eleven international A1 and two Brazilian A2 journals are chosen, to screen for current articles with selected keywords affine to 'urban agendas' (see Annex 3). During the first research cycle, 32 relevant papers were detected, based on the following sample keywords (Table 13):

Table 13 - Research keywords

English		Portuguese
- Urban agendas	- City agendas	- Agendas urbanas
- Urban guidelines	- City guidelines	- Diretrizes urbanas
- Urban implementation	- City implementation	- Implementação urbana
- Urban development plan	- City development plan	- Plano de desenvolvim. urbano
- Urban masterplan	- City masterplan	- Plano diretor
- Urban statute/charter	- City statute/charter	- Estatuto da cidade
- Urban sustainability	- Sustainable city	- Cidade sustentável
- Urban challenges	- City challenges	- Desafios urbanos
- Urban case studies	- City case studies	- Estudos de caso
- Urban indexes	- City indexes	- Índices urbanas
- Urban indicators	- City indicators	- Indicadores urbanas

Source: Own elaboration

---

[38] Sucupira Platform:
https://sucupira.capes.gov.br/sucupira/public/consultas/coleta/veiculoPublicacaoQualis/listaConsultaGeralPeriodicos.jsf (2016, accessed 16.08.2019)

After a second cycle, combining the previous keywords with additional catchwords from international urban agendas (Figure 22), already 95 articles have been identified, of which 14 are deeply used for the elaboration of the first chapter.

Figure 22 - Catchwords of international urban agendas

Inclusive cities
Migration and Refugees in Urban Areas
Safer Cities
Urban Culture and Heritage
1. Social Cohesion and Equity

Urban Rules and Legislation
Urban Governance
Municipal Finance
2. Urban Framework

Urban and Spatial Planning and Design
Urban Land
Urban-rural linkages
Public Space
3. Spatial Development

International Urban Agendas

Local Economic Development
Jobs and Livelihoods
Informal Sector
4. Urban Economy

Urban Resilience
Urban Ecosystems and Resource Management
Cities and Climate Change and Disaster Risk Management
5. Urban Ecology and Environment

Urban Infrastructure and Basic Services, including energy
Transport and Mobility
Housing
Smart Cities
Informal Settlements
6. Urban Housing and Basic Services

Source: Own elaboration

Supplementary articles are reviewed to complement and comprise the identification of common international challenges implementing urban agendas and provide a reflection of the experiences so far encountered and publicized by researchers around the globe.

The objective of the first literature review is to get a brief overview and analyze publications in the most relevant scientific journals, which offer insights about knowledge transfer in global urban agendas and tackle the role of cities in multi-level climate governance. Exemplarily, the cases of six global cities with prominent urban agendas (including one 'Best Practice' case) are scrutinized to provide examples of international experiences in implementing urban agendas.

To enhance the understanding of the actual needs and knowledge gaps in developing cities, an additional research survey on international challenges is undertaken, with a special focus on the global south. The subsequent clipping of the research, including only developing cities in the global south, allowed focusing on their special needs, corresponding to the previously identified global research gap of the global south (see Chapter 2.3).

2.2   Analysis and improvement of existing indicators

Successively to the above-mentioned expansion of understanding about urban agenda applications and knowledge gaps, and to approach the second specific objective, also a consolidating analysis about globally identified and comparable indicators, including their respective selection criteria, baselines, and expected outcome & output targets, is undertaken in the consecutive survey, in order to evaluate the components for urban development. The determination of adequate urban sustainability indicators to monitor urban development and track performance applied by the policy and conceptual frameworks is the challenge. The foundation for the analysis is already paved through the bibliographic review of urban agendas and urban challenges in the first chapter. The review further scrutinized the analytical framework of policy cycles and the construction and selection criteria for indicators. In Chapter 3, prominent international samples of urban indicator sets are gathered, and assessment procedures are exemplified.

To further approach the topic, and examine the landscape of existing urban sustainability indicators, a "horizon-scanning" (e.g. Joss 2011; Garnett et al. 2016; National Academies of Sciences et al. 2020) is exercised to identify and characterize indicators. The method is chosen to early detect and assess emerging indicator sets and indexes of relevant mainstream international institutions and authorities, indicate trends as well as protruding events in this context. To ensure important scoring for policy implications, a semi-quantitative assessment of the information landscape is attempted, based on the "weight-of-evidence (WOE) approach" (Linkov et al. 2009; Garnett et al. 2016), to allow the synthesis of information of the gauging characteristics quantity, quality, and price from diverse and different sources rather than referring to a particular type of assessment (Suter and Cormier 2011). The goal of the assessment is to gather priorities and policy implications, by generating insights, trends, and knowledge regarding existing urban indicators for consecutive decision-making support, highlighting risks, opportunities, and knowledge gaps and leading to responsive priorities and actions, and in the ideal case to the adaptation of policies, strategies, and delivery mechanism. Alike for the literature review assessment on urban agendas, a preliminary quest by keywords such as "urban sustainability indicator" and "urban environment indicator" is undertaken, to identify further indicators of urban development or sustainability, beyond the sample indicators already identified.

In parallel, the study is accompanied by the execution of semi-structured expert interviews with specialists who work with or research on indicators for urban

development, to learn and receive insights about potential threats and implementation challenges, as outlined by Vieira (2009). The methodological approach for the online face-to-face meetings followed the mini-Delphi technique (also known as Estimate-Talk-Estimate or ETE), to help approximate expert consensus and develop professional guidelines (Dalkey and Helmer 1963; Linstone and Turoff 2002; Steurer 2011).

The group of experts and institutions were selected though indications from the liaison persons of the municipalities participating in the global overview survey (see consecutive chapter 2.3). The interview partners are asked, among others, the following three guiding questions:

I. Considering the widely accepted sets of indicators from SDG11, UN-Habitat Agenda/GUID, and ISO 37120, what other indicator sets have been shown practicable and feasible specifically in developing countries, in light of the four selected thematic topics: Energy, Solid Waste, Transportation, Water?

II. Standards claim to be "applicable to any city, municipality or local government". Do these global standards (like the ones developed by UN-Habitat and ISO) mainly elaborated in the global north also reflect the needs and reality of cities and municipalities in the global south and measure their performance adequately?

III. "Most indicators designed from an intergovernmental standpoint are not meant to capture the reality, diversity and complexity of local contexts, resulting in a significant loss of knowledge and explanatory detail" (see GOLD V Report, 2019). Key characteristics for successful indicators seem to be "simple" and "inexpensive to collect". What other characteristics could be identified for workable indicators in southern municipalities?

The horizon-scanning and analysis are not envisioned to be a concluding review; instead, it is intended to stop collecting indicators when a wide diversity of concepts covered in the indicators are reached (Dijken, Dorenbos, and Kamphof 2012). The selected indicators assess geographic areas ranging from neighborhoods to mixed urban-rural regions and created by organizations including NGOs, academic institutions, governments, development agencies, and consulting companies (Newton et al. 1998). The goal of reviewing these indicators is ultimately to understand what individual urban sustainability indicators measure in terms of urban development if they address sustainable growth and at what scale and the data sources they rely upon.

Urban sustainability indicators cover a wide range of topics and often include economic and social indicators alongside environmental or ecological indicators. The

analysis focuses on individual indicators included in composite indexes, rather than the indexes as a whole, alike the sample research presented in Chapter 3.3 by Simon *et al.* (2016) and the selection and application process exercised by Lannes (2017). The horizon-scanning of the research aims to identify indicators with adequate metadata (e.g. information or data about the data itself) to allow to analyze of the characteristics (e.g. target type, presence or absence of baseline) of the sampled urban sustainability indicators and to be able to consecutively propose an improved set of viable indicators (Garnett et al. 2016). The analysis led to the elaboration of an indicator matrix with more than 200 globally recognized and applied indicators (see Annex 6), out of which a new selection of appropriate indicator spectrum and proxies is proposed, and assessed in a consecutive step, as outlined in the following subchapters.

2.3   Global overview survey in developing countries[39]

During preliminary studies and discussions with members of municipalities and public servants of developing cities at global conferences like the WUF about the difficulties and challenges to implementing international agendas, knowledge gaps on-site and lack of adaptable indicators were often named as the main challenging factors for local staff, especially in more remote or decentralized urban areas. It occurs, that capacity development and knowledge transfer is one of the key topics, to guarantee a successful understanding, and further on, the implementation of urban agendas. Therefore, in addition to the literature review and expert interviews, iterative global overview surveys by means of the Delphi method (multiple times going out, feedback, looping back the feedback) are undertaken during the research, to review and assess the preliminary hypothesis and expand the understanding of urban agenda applications in developing cities (Dalkey and Helmer 1963; Linstone and Turoff 2002; Steurer 2011). Throughout the research, it is intended to continuously contact at multiple stages different municipal experts via liaison persons in diverse parts of the world, especially in developing cities of the global south. These interactions help to verify and assess perception and gather structured feedback throughout the research, e.g., about the current dissemination status of international agendas and their respective capacity needs to implement these agendas,

---

[39] Ethical consideration: The researcher might have been in some aspects of the global overview survey and overall research in developing countries unintentionally biased through his background (born and raised in Germany, a country of the Global North). Although the author tried the best of his knowledge and belief to avoid any prejudice, the survey and research work might still be influenced by his origin.

or to what extent international standards for city performance indicators are known in their municipality.

The main challenge for scholars is to get a hold of data and be in contact with individual municipal staff in a broader spectrum and distribution worldwide. To overcome the challenge, and out of working economics, the thesis seeks collaboration with the German Development Cooperation (Engagement Global[40] and German Corporation for International Cooperation GmbH, short GIZ[41]) and the program "Experts for Municipal Partnerships Worldwide (FKPW)"[42]. The program comprises partnerships of German municipalities and municipal associations in Germany and the global south. Through this program, access to municipalities, local staff, and international experts in a wide spectrum of the developing world was guaranteed. In specific, the research foresees contacting municipalities in the following countries and regions of the global south (Figure 23):

- 7 countries from Africa (Ethiopia, Mozambique, Rwanda, Sierra Leone, South Africa Tanzania, Tunisia,)
- 4 countries from East Europe (Belarus, Georgia[43], North Macedonia, Ukraine,)
- 3 countries from Asia (Indonesia, Palestine, Turkey[43])
- 3 countries from South America (Brazil, Ecuador, Peru)

Figure 23 - World map of research countries
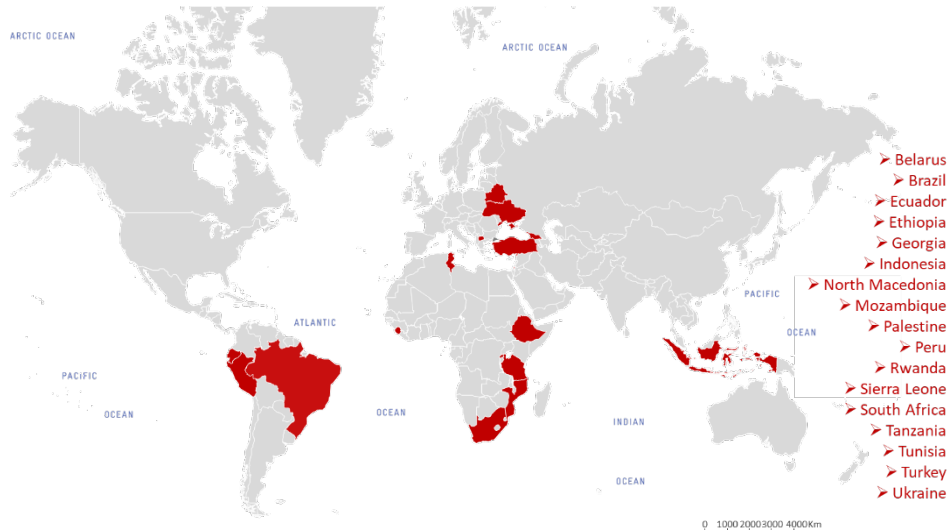
Source: Own elaboration

---

[40] Engagement Global: https://www.engagement-global.de/who-we-are.html (accessed 21.07.2020)
[41] GIZ: https://www.giz.de/en/html/about_giz.html (accessed 21.07.2020)
[42] FKPW: https://skew.engagement-global.de/experts-worldwide.html (accessed 21.07.2020)
[43] Georgia and Turkey are both transcontinental countries spanning Eastern Europe and western Asia (WorldAtlas 2022). In this study, Georgia was added to Eastern Europe, whereas Turkey was added to Asia.

The program comprises a wide range of different local urban agendas, targeting specific city missions and mandates of municipalities in the global south. The focusses vary from general town planning and development or networking and communication work through rather specific or technical topics like integrated air quality management, waste management, water management, and implementation and monitoring of measures contained in climate action plans. Table 14 provides a rough overview of the variety of focusses and local agendas of the collaborating municipalities.

Table 14 - Local agendas of municipalities in the global South

City/Municipality	Local urban agendas and city focus
Addis Abeba, Ethiopia	Networking & strengthening municipal partnership
Beit Jala, Palestine	Communal geographic information system (GIS)
Charkiw, Ukraine	Energy efficiency & local economic development
Curitiba, Brazil	Urban mobility & renewable energy
Drakenstein, South Africa	Resource efficiency
Durban, South Africa	Participatory & integrated open-space city development
Eskişehir Tepebaşı, Turkey	Local social & economic development
Freetown, Sierra Leone	Organizational consulting in urban development
Harare, Zimbabwe	Sustainable urban mobility & transport
Jakarta, Indonesia	Municipal digitalization and good governance
Kigali, Rwanda	Environment and forest management & capacity development
Kouga, South Africa	Networking and communication work (water, energies)
Lviv, Ukraine	Energy efficiency
Masasi, Tanzania	Sustainable communication structures & climate change
Mogilev, Belarus	Local economic development
Moshi District, Tanzania	Environment and forest management
Padang, Indonesia	Local governance, river regeneration, and water management
Poltawa, Ukraine	Integrated urban planning
Rio de Janeiro, Brazil	Waste management & renewable energy
San Miguel de los Bancos, Ecuador	Integrated water and waste management
Skopje, North Macedonian	Air quality management systems
Tbilisi, Georgia	Sustainable urban mobility
Tunis, Tunisia	Waste management
Uzhgorod, Ukraine	Networking & strengthening municipal partnership
Vilankulo, Mozambique	Town planning and development
Yarinacocha, Peru	Resource efficiency & waste management
Zanzibar, Tanzania	Integrated urban development

Source: Own elaboration

For the first pilot overview assessment about the dissemination of international agendas and the referring capacity development need assessment in mid-2020, civil servants of the following 14 municipalities were contacted (Table 15).

Table 15 - Selected municipalities of the global south for the pilot assessment

05/2020													
Eastern Europe				Asia		Africa						S. America	
Ukraine			*Belarus*	*Turkey*	Indonesia	Tanzania			*Ethiopia*	S.A.	*Tunisia*	Brazil	
Livi	*Charkiw*	*Uzhgorod*	*Mogilev*	*Eskişehir*	Jakarta	Moshi	*Masasi*	*Zanzibar*	*Addis*	Durban	*Tunis*	Curitiba	Rio

Source: Own elaboration

The selection of the municipalities was based on the current availability of FKPW liaison officers in the municipalities of the previously mentioned partner countries. To guarantee a good cross-section and disperse feedback from the municipal staff in several departments, including non-English speakers, the questionnaire was first sent to the integrated English-speaking liaison persons of the respective municipal administration and briefly explained. The liaison person then interviewed 5-8 staff members of key departments to gather information and filled out the questionnaire on behalf of the municipality. The questionnaire was then replied during a 1h online meeting, to be able to address further inquiries and clarify doubts.

Due to global incidences (e.g., the Ukrainian War in 2022ff), changes in municipal staff, and fluctuations in the partnership program, some municipalities (*marked in italics*) had to be substituted by other municipalities of the global south for the interim knowledge assessment (Table 16) about international indicator standards and the consecutive final case study to assess the derived indicator spectrum (Table 17).

Table 16 - Selected municipalities for the interim assessment

06/2022													
Eastern Europe		Asia			Africa						S. America		
N.Macedonia	*Georgia*	*Palestine*	Indonesia		Tanzania	*Rwanda*	South Africa			*Mozambique*	Brazil		*Ecuador*
Skopje	*Tbilisi*	*Beit Jala*	Jakarta	*Padang*	Moshi	*Kigali*	Durban	*Drakenstein*	*Kouga*	*Vilankulo*	Curitiba	Rio	*Los Bancos*

Source: Own elaboration

The content of the first short qualitative pilot questionnaire was elaborated in close collaboration with FKPW experts from the GIZ department "Global Policy, Governance, Cities", to derive current information about the dissemination and general knowledge of international agendas in sample municipalities of the global south and examine potential capacity development needs as well as verify primary suppositions obtained by the literature review (see Chapter 1.3). For the scientific elaboration of this survey and the consecutively applied questionnaires, additional methodological literature was consulted and applied (Kvale 1996; Marshall and Rossman 1998; Bauer and Gaskell 2000; Vieira 2009; M. M. de Oliveira 2014). The respondents were informed of the questionnaire's purpose and made clear that the information collected was confidential. As Bauer and

Gaskell (2000) highlight, special attention was given to the structure of the applied questionnaires during the research, to prevent any contradictions and thus avoid breaking the dynamics of the questions. A well-defined guide for the questions is essential to facilitate later analysis of the questionnaire. The content and purpose of the interview need to be very clear before defining the analysis method (Kvale 1996).

The introductory survey of the first questionnaire comprised three main areas: (1) Interrogation about the actual dissemination of international agendas like the SDGs and the NUA, how familiar the municipalities are respective their content, and what the main topics and development challenges for successful implementation are. (2) The additional need for capacity development in respective management areas, specific technical areas, and further skills, to support the effective implementation of new agendas. (3) The main target group within the municipality as well as the type/layout and setup/timeframe of potential capacity development, training, and courses. In detail, the pilot questionnaire contained 44 questions in six sub-sections (see Annex 7):

I. General familiarity with urban agendas
II. Capacity development needs in management area
III. Capacity development needs in technical area
IV. Capacity development needs in further skills
V. Main target group for capacity development
VI. Preferred type, setup & timeframe of capacity development

During the evaluation, the liaison person could stress the emphasis of the municipality by providing a bold mark to the respective topic. In sections II till VI of the questionnaire, multiple answers were allowed. In section VII additional feedback, observations, and suggestions from the municipality in regard to capacity development in general and gaps/needs identified in specific could be registered. All 14 liaison persons collaborated conscientiously, providing a diversified picture of the current state of affairs. The "Likert scale" or sum of scores was applied for the rating in all sections to get an overall sentiment measurement of the respective topics (Vieira 2009). To structure and highlight the findings of the matrix, traffic light colors representing the frequency of positive replies were introduced.

The findings of the first global assessment about the dissemination of international agendas and the referring capacity development need assessment as well as the findings of the interim assessment about the dissemination of internationally acknowledged

indicator standards are summarized in Chapter 4.1 and provide useful input for the consecutive selection and assessment of indicators.

In addition to the questionnaire, a desk study about the availability of local in-house and online capacity development institutions in the investigated countries was undertaken by means of online search tools[44] and indications of the liaison persons, to review the possibility and capability, to bridge the identified knowledge gaps with local solutions and already existing further education or training infrastructure in the municipalities of the global south. The brief results and summary findings of the desk study are presented in Annex 5.

2.4   Determining of improved indicator spectrum

To address the third specific objective, a new improved adaptive spectrum of indicators was derived and subsequently assessed. For a start, the four recurrent and confined main sample sectors[45] identified in Chapter 3.1 are utilized for the first spectrum analysis. Complementary urban indicators, identified through the horizon-scanning and the literature review, are considered (e.g. Joss 2011; Garnett et al. 2016; National Academies of Sciences et al. 2020). As an initial step, all 16 globally recognized sets and 198 aggregated indicators of the elaborated indicator matrix (Annex 6) are once again crosschecked based on the five key criteria for selection: (1) relevant, (2) methodologically sound, (3) measurable, (4) easy to communicate and access, (5) limited in number and outcome-focused, elaborated by the UNSD (2015), as set out in Chapter 1.4.2. Furthermore, it is observed, that several indicators of the matrix have similar or equivalent objectives, as they come from multiple sources with comparable target settings. For instance, the indicator about total energy consumption iterates in 8 out of 16 surveyed sets. By analyzing their strengths, weaknesses, and potential for improvement or substitution by other, more adequate indicators, a sieving and selection process is conducted.

In order to obtain an embracing mix of indicators and balanced weight of evidence, as recommended by Linkov *et al.* (2009) and Garnett *et al.* (2016), all globally recognized and applied indicators are grouped along three gauging characteristics: (1) quantity (e.g., amount, volume; represented by the color green), (2) quality (e.g., time,

---

[44] E.g. via Google, Bing, etc.
[45] Energy (electricity), Solid Waste, Transportation (mobility), Water (fresh/drinking)

pollution, security; represented by the color purple), and (3) price (e.g., Purchasing Power Parity - PPP/unit, budget; represented by the color blue) (Figure 24). Although admittedly, all indicators feature "quantity" and provide at the end measurable enumerating figures, they can nonetheless be differentiated between diverse characteristics of the surveyed content. This aims to capture and guarantee a constructive mixture of indicators to obtain a diverse urban measurement spectrum, e.g., regarding sustainability, ecology, quality of life, lifestyle, standard of living, affordability, feasibility, saturation, and other aspects.

Figure 24 - Main gauging characteristics of indicators
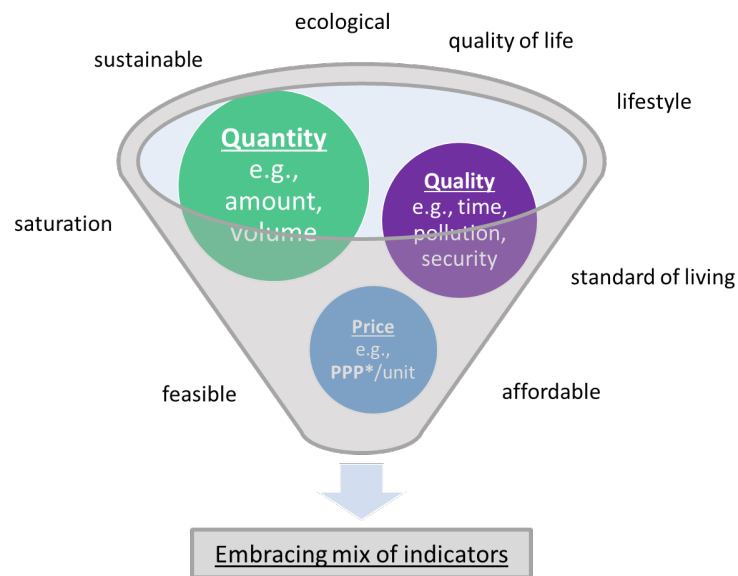
Source: Own elaboration

At this point, it must be noted that the objective of each indicator is not necessarily to point at a better or more sustainable city (ranking) but to monitor development (measure change) and impact (desired goal) concerning a specific local agenda. As several indicators of the matrix are derived from "northern" sets, a filtering process must occur, to examine and eliminate indicators, that might partially be incompatible in developing countries (MOHURD 2022).

As a first sieve, indicators with a potential lack of availability of data are sorted out. A reference sample, in this case, might be for instance the quality indicator "Report the total number and total volume of recorded significant waste spills (soil or water surfaces)" of the GRI Standard Context index (Arcadis 2019). Obtaining reliable aggregated data about water spills is already very difficult in highly developed countries but might be very challenging in emerging and developing economies of the global south.

In case of doubt, and due to the availability of better, alternative qualitative indicators, this indicator, alike others, is sorted out.

A second sieve is the lack of applicability, as not all indicators in the aggregated matrix are employable. For example, the quantitative indicator "OECD non-energy imports from developing countries (% of total imports)" of the OECD Indicators set (OECD 2004) is undoubtfully biased and not applicable in the southern context.

A third sieve comprises the absence of relevance, as some indicators are tackling rather northern challenges and stages of development. For instance, the indicator "kilometers of bicycle paths and lanes per 100 000 population" of the ISO 37120 (ISO 2018) is a very valid indicator in cities and municipalities where bicycle lanes are a common phenomenon, but seem irrelevant to southern peers, which might struggle with more general infrastructure shortcomings. But again, indicators are not screened out due to their irrelevance or absence of applicability and data, but due to the presence of better, more appropriate alternative indicators for the global south.

Finally, after compiling similar indicators, grouping them among gauging characteristics, and thorough filtering, a proposed tailormade spectrum of 20 indicators for the global south derived out of the initial 198 indicators is gathered in the matrix, as presented in Chapter 4.2.

2.5   Assessment of derived indicator spectrum

To fully address the third specific objective and assess the viability of the derived improved spectrum of indicators, a crosscheck with the respective municipalities (Table 17) interviewed in the global pilot survey, via a second qualitative questionnaire in early 2023 was undertaken (see previous Subchapter 2.3).

Table 17 - Selected municipalities for the final case study assessment

01/2023									
Eastern Europe	**Asia**			**Africa**				**S. America**	
[Georgia]	Palestine	Indonesia		Tanzania	*Sierra Leone*	South Africa		Brazil	*Peru*
[Tbilisi][46]	Beit Jala	Jakarta	Padang	Moshi	*Freetown*	Durban	Kouga	Curitiba	Rio	*Yarinacocha*

Source: Own elaboration

Regarding the size of the contacted cities, the OECD (2022) classifies between large metropolitan areas if they have a population of 1.5 million or more; metropolitan

---

[46] The municipality of Tbilisi in Georgia was used as a test (guinea pig) city, to verify the feasibility and applicability of the elaborated questionnaire. As the questionnaire was revised afterwards, their answers are not reflected in the final evaluation matrix.

areas if their population is between 500 000 and 1.5 million; and small to medium-size urban areas if their population is below 500 000. The obtained diversity sample comprises therefore three large metropolitan areas, two metropolitan areas, and five small to medium-size urban areas. Respective the mean HDI value[47] for developing countries of 0,685 (UNDP 2022), two municipalities are rated low [between 0,45 and 0,60], five are rated medium [between 0,60 and 0,75], and three are rated high [between 0,75 and 0,90] (Figure 25). Concerning the regional distribution, four of the ten municipalities are from sub-Saharan Africa, three municipalities are from Asia, and three municipalities are from Latin America.

Figure 25 - Distribution of municipal data obtained
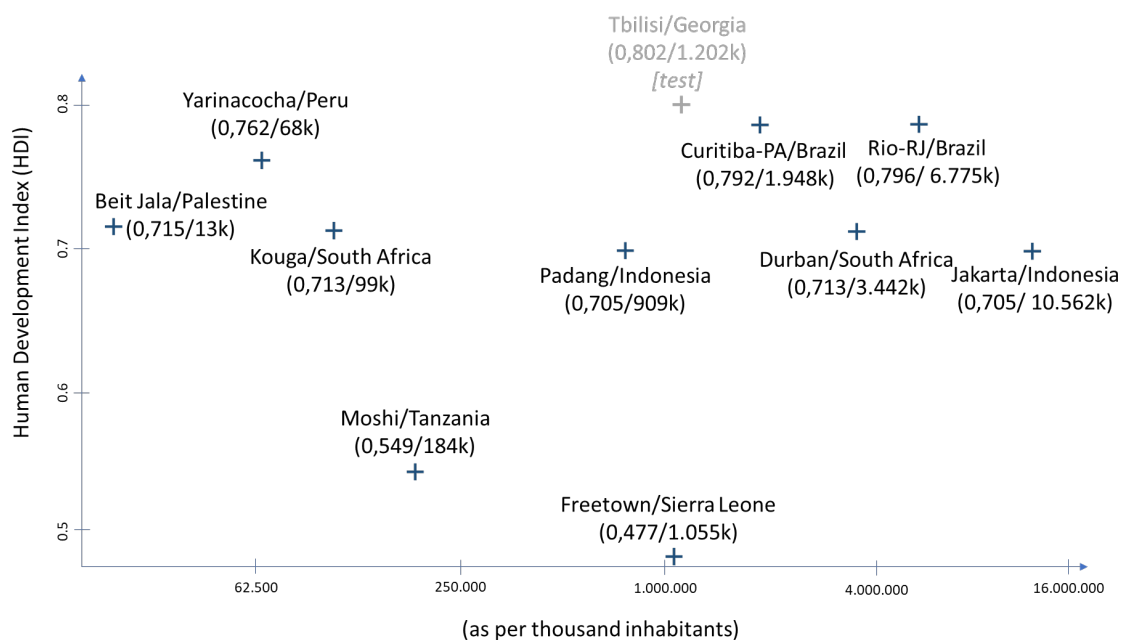
Source: Own elaboration

The same methodological approach for the engagement with the stakeholders was once again applied (Kvale 1996; Marshall and Rossman 1998; Bauer and Gaskell 2000; Vieira 2009; M. M. de Oliveira 2014). The purpose of the subsequent survey is to verify the actual local availability of data and applicability of the introduced indicators on-site in the context of the global south, as well as the identification of potential and required proxy indicators. The six specific questions are:

1. Are the proposed 20 indicators on a scale from 1 to 5 clear, unequivocally, and comprehensible?

2. On a scale from 1 to 5, how difficult would it be, to obtain data for this indicator?

---

[47] As of 2021

3. In case, one of the indicators would not be feasible to be collected, can you propose another viable (similar/proxy) indicator?

4. Would reference data from former years for the proposed (or a similar/comparable) indicator be available already in your municipality?

5. Which data would be available at what level (municipal, state, federal, or private sector companies)?

6. At which temporal frequency are the data collected (yearly, by census only in 3-5 years)

Also, a scientific follow-up on their operationalization was assumed, considering all four key dimensions of integration, as highlighted in Chapter 3.4: (1) variety of strategic urban sectors and services; (2) variety of relevant actors and stakeholders; (3) different spatial areas; and (4) different government levels for the implementation of the measure. As a first step, the 120 questions (the six mentioned above on each of the respective 20 proposed indicators) were sent to the municipality of Tbilisi in Georgia, which was used as a test (guinea pig) city, to verify the feasibility and applicability of the elaborated questionnaire prior to the disbursement to the remaining core liaison persons in the collaborating partner municipalities. The questionnaire was then reviewed and sharpened[48] after obtaining constructive feedback from the liaison person and local staff in Georgia. In a consecutive step, the revised questionnaire was sent to the remaining 13 current core liaison persons (and some additional deactivated liaison persons) in the municipalities. The mode of contact and reply option comprised an online google questionnaire (via link[49]) and a respective offline tabularly sheet template (via excel), see Annex 8. 75 follow-up emails and several text messages by mobile phone were sent, and finally responses from additional ten municipalities obtained. The results from the pilot assessment municipality did not enter the final evaluation matrix. Similar to the previous questionnaire, the "Likert scale" or sum of scores was once again applied for the rating in all sections to get an overall sentiment measurement of the respective topics (Vieira 2009). The findings are summarized in the evaluation matrix (Table 32) in Chapter 4.3.

---

[48] E.g., external links to the source data on the indicators were provided, to enable the respondent to obtain further information about the application and decisive elements of each queried indicator. Also, additional response options like "Not collected" or "Not sure" were added to the initial questionnaire.
[49] Google-Forms link:
https://docs.google.com/forms/d/e/1FAIpQLSehuEis4VkKi9TXMP7_DNA3JKkecfnD7F2y6k8CTJBqei hiMQ/viewform

In order to exemplify the application of the suggested indicators, data from open-access city databases, annual records, yearbooks, and statistical reports were requested from the liaison persons in the collaborating municipalities (see Annex 10). Due to working economics, only one sample sector (Energy) in one sample city (Curitiba, Brazil) was processed and juxtaposed by data from the same city over time (2022, 2017, and 2012) and with cities of similar HDIs, one in the same country (Rio de Janeiro, Brazil), and a second in a different country and continent (Jakarta, Indonesia). The feedback obtained by the collaborating municipalities and the findings of the exemplified application are processed in Chapter 4.4.

2.6   Elaboration of recommendations and mechanisms for application

To be able to learn from the past, project the future, and improve sustainable and successful implementation of forthcoming urban agendas, a transacting chapter was elaborated. This chapter aims to compile the results, summarize the findings, provide final recommendations for further improvement, and suggest mechanisms, to foster implementation to the detriment of traditional hard policy mechanisms, as described previously in the fourth specific objective.

The chapter follows the "5 I" model (initiate, inquire, imagine, innovate, and implement), for a continuous improvement process (Stavros and Hinrichs 2009). In the first step, clarity for aligned commitment and action to a strategic initiative through a defined project is provided. The second stage includes the data-driven strength-based discovery of the "As Is" state and the organization's roots of success. Subsequently, the co-creation of the preferred future, the "To Be" state, is presented, followed by the construction of the "To Be" state by designing processes, systems, structures, and culture, and the creation of the "what" is desired. Finally, the focus could be shifted towards the engagement and involvement of stakeholders in the strategic projects and the implementation focuses on the "how" it is pretended to achieve the desired "what". However, it must be remarked, that this last step is beyond the project scope of the thesis and the study has not the aspiration to actually implement the findings, but rather elaborate recommendations for potential implementations (Figure 26).

Figure 26 - 5 I Process Improvement Approach
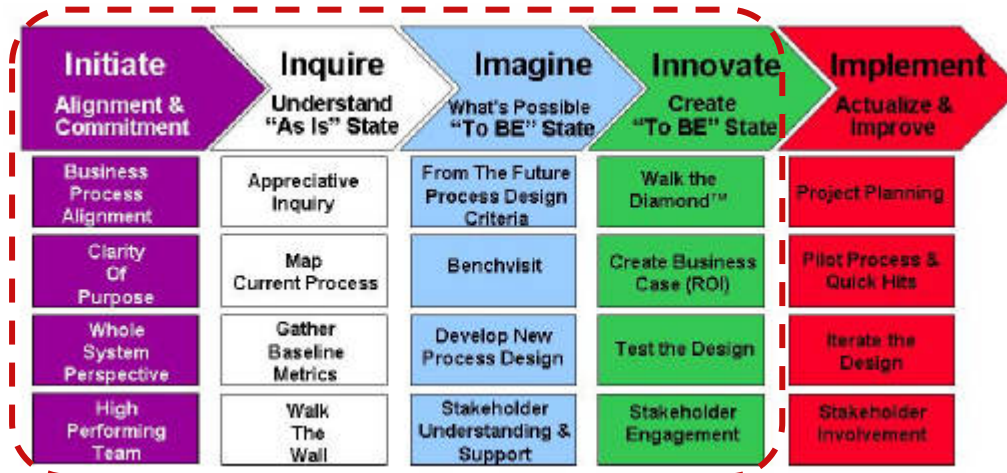
Source: (Stavros and Hinrichs 2009)

The investigation includes a forward-looking assessment (actualize & improve) and focus on the weakness of the associated monitoring, limited evaluation of previous initiatives, and the changing dynamics of human settlements, as Cohen (2016), Fenton & Gustafsson (2017), and others exemplarily highlight. In this respect, the adaptive proxy approach for different development levels is created, and the debate on the policy loop and analytical framework is proposed, to innovate the monitoring process.

In a nutshell, to initiate the transacting chapter, a final set of indicators and proxies was introduced, which most adequately measure sustainable urban development and the successful implementation of urban agendas (see Chapter 5.1). The introduced adaptive proxy approach was based on the survey findings obtained and summaries in the evaluation matrix (Table 32) in Chapter 4.3. It was further analyzed, where existing mechanisms still fail and supports derived from the analytical framework and urban sustainability indicators, might be applicable. Also, the influence of the indicators on the policy loop is further assessed, and a debate about general and global agendas and the respective analytical framework is initiated. The view on the role of indicators in the urban sustainability policy loop global debate draws on actual local deficiencies and challenges left behind when the dust of the internationally agreed urban agendas settles down.

3   A CRITICAL REVIEW OF EXISTING INDICATORS

To narrow the knowledge gaps identified in Chapter 1 and contribute to the improvement of urban development, scientific and objective instruments, and tools are required, to monitor the efficiency and effectiveness of proposed measures. The most common tool to supervise progress is the introduction of indicators. The word 'indicator' derives from the Late Latin word *indicātor* ("one who points out") and was initially applied in chemical science, to describe certain chemical reactions or physical processes using substances that give a visible sign, usually by a color change, of the presence or absence of a threshold concentration of a chemical species, such as an acid or an alkali in a solution (Encyclopedia Britannica 2019). It, later on, was transcribed into other sciences, mainly biology, economics, mathematics, and engineering. Consecutively, the term found also its way into the field of architecture and urban planning and is nowadays often applied to monitor development in modern urban agendas. "In measurement theory the term "indicator" is used for the empirical specification of concepts that cannot be (fully) operationalized on the basis of generally accepted rules" (Vos et al. 1985).

3.1   Sample urban indicators

Perhaps the currently most widespread indicators were developed by the United Nations Statistics Division (UNSD). Alike its predecessor, the MDGs, the recent Agenda 2030 with its SDGs banks on the introduction of 231 unique indicators[50] to promote and monitor "global awareness, political accountability, improved metrics, social feedback, and public pressures" (J. D. Sachs 2012). 15 of these 231 indicators (Table 18) derive from the ten SDG 11 targets[51] about "Sustainable Cities and Communities", and are therefore dedicated directly to urban issues, e.g. Solid Waste and Transportation. Other goals, like SDG 6 about "Clean Water and Sanitation" or SDG 7 regarding "Affordable and Clean Energy" have strong intersections with urban topics.

---

[50] The global indicator framework includes 231 unique indicators. Please note that the total number of indicators listed in the global indicator framework of SDG indicators is 247. However, twelve indicators repeat under two or three different targets. (See also: https://unstats.un.org/sdgs/indicators/indicators-list/, accessed 23.02.2021)

[51] Regarding target 11.c, no suitable replacement indicator was proposed. The global statistical community is encouraged to work to develop an indicator that could be proposed for the 2025 comprehensive review; E/CN.3/2020/2, paragraph 23. (See also: https://unstats.un.org/sdgs/iaeg-sdgs/2020-comprev/UNSC-proposal/, accessed 29.03.2021)

Table 18 - SDG 11 indicators

Nº	Indicators
11.1.1	Proportion of urban population living in slums, informal settlements or inadequate housing
11.2.1	Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities
11.3.1	Ratio of land consumption rate to population growth rate
11.3.2	Proportion of cities with a direct participation structure of civil society in urban planning and management that operate regularly and democratically
11.4.1	Total per capita expenditure on the preservation, protection and conservation of all cultural and natural heritage, by source of funding (public, private), type of heritage (cultural, natural) and level of government (national, regional, and local/municipal)
11.5.1	Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population
11.5.2	Direct economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters
11.5.3	(a) Damage to critical infrastructure and (b) number of disruptions to basic services, attributed to disasters
11.6.1	Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities
11.6.2	Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)
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
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
11.a.1	Number of countries that have national urban policies or regional development plans that (a) respond to population dynamics; (b) ensure balanced territorial development; and (c) increase local fiscal space
11.b.1	Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030
11.b.2	Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies

Source: (United Nations 2015a)

All SDG indicators are disaggregated, where relevant, by income, sex, age, race, ethnicity, migratory status, disability, geographic location, or other characteristics, in accordance with the Fundamental Principles of Official Statistics[52]. The indicators are monitored through annual high-level progress reports by the United Nations Secretary-General. In 2018, a High-level Political Forum (HLPF) under the theme "Transformation towards sustainable and resilient societies" took stock of the progress on the SDGs in general and SDG 11 "cities and human settlements" in specific, to discuss "progress, successes, challenges, and lessons learned on the road to a fairer, more peaceful and prosperous world and a healthy planet by 2030" (United Nations 2018).

Apart from these popular 14 urban indicators, there exists worldwide an innumerable range of indicators produced by academic or nongovernment organizations (NGOs), governments, and private sector/consulting groups, claiming to track the process

---

[52] Resolution 68/261

of sustainable urban development. The indicators are often clustered into self-proclaimed city indexes, like the "Global Liveable Cities Index", which evaluates 64 cities on five dimensions (Economic Vibrancy and Competitiveness, Environmental Sustainability and Friendliness, Domestic Security and Stability, Social Cultural Conditions, and Political Governance) of urban quality of life (Giap et al. 2012), or the "Sustainable Cities Index", which is a private-sector effort to assess 100 cities' environmental sustainability performance to three sub-categories (People, Planet, and Profit) (Arcadis 2015). Also, local governments and municipalities adjust existing sets of indicators and develop their own tailormade index. E.g., the "Shanghai Adapted Index" (SAI)[53] is based on the UN-Habitat's Global Urban Monitoring Framework and the SDGs but restructured around five specific domains (Society, Economy, Environment, Culture, and Governance) and four fundamental objectives (Safe and Peaceful, Inclusive, Resilient, and Sustainable), launching a new proposal of indicators (MOHURD 2022).

The first such set of city development indicators was elaborated for the Habitat II conference in 1996 as a response to the Habitat Agenda and Resolutions 15/6 and 17/1 of the UN Commission on Human Settlements and required the development of an indicators system representing the minimum data required to monitor changes in conditions in human settlements post Habitat II (Hoornweg et al. 2007). The list of indicators is grouped into five main divisions, namely: (1) Shelter; (2) Social development and eradication of poverty; (3) Environmental management; (4) Economic development; and (5) Governance (Table 19).

The Habitat Agenda Indicators[54] are composed of:

- 20 Key indicators (KI) which are both important for policy and relatively easy to collect. They are either numbers, percentages, or ratios;

- 13 Extensive indicators (EI) which are intended to complement the results of the key indicators and qualitative data in order to make a more in-depth assessment of the issue.

---

[53] The Shanghai Adapted Index (SAI) has been developed through the collaboration among the Ministry of Housing and Urban-Rural Development of the People's Republic of China (MOHURD), the UN-Habitat, and the Shanghai Municipal People's Government.

[54] The indicators methodology sheets for each individual urban indicator (including information about rationale, definition, methodology, gender, comments and limitations, and level) can be found under: https://unhabitat.org/sites/default/files/download-manager-files/Urban Indicators.pdf (accessed 16.04.2021)

Table 19 - List of Habitat Agenda Indicators

Chapter/ Habitat Agenda goals	Indicators	Cluster
1. Shelter		
Promote the right to adequate housing	KI 1: durable structures	A
	KI 2: overcrowding	A
	EI 1: housing price and rent-to-income	B
Provide security of tenure	KI 3: secure tenure	B
	EI 2: authorized housing	B
	EI 3: evictions	B
Provide equal access to land	EI 4: land price -to-income	B
Promote access to basic services	KI 4: access to safe water	A
	KI 5: access to improved sanitation	A
	KI 6: connection to services	A
2. Social development and eradication of poverty		
Provide equal opportunities for a safe and healthy life	KI 7: under-five mortality	A
	KI 8: homicides	B
	EI 5: HIV prevalence	A-B
Promote social integration and support disadvantaged groups	KI 9: poor households	A
Promote gender equality in human settlements development	KI 10: literacy rates	A
	EI 6: school enrolment	A
	EI 7: women councilors	B
3. Environmental management		
Promote geographically balanced settlement structures	KI 11: urban population growth	A
	KI 12: planned settlements	B
Manage supply and demand for water in an effective manner	KI 13: price of water	B
	EI 8: water consumption	B
Reduce urban pollution	KI 14: wastewater treated	B
	KI 15: solid waste disposal	B
	EI 9: regular solid waste collection	B
Prevent disasters and rebuild settlements	EI 10: houses in hazardous locations	B
Promote effective and environmentally sound transportation systems	KI 16: travel time	B
	EI 11: transport modes	B
4. Economic development		
Strengthen small and microenterprises, particularly those developed by women	KI 17: informal employment	A-B
Encourage public-private sector partnership and stimulate productive employment opportunities	KI 18: city product	B
	KI 19: unemployment	A-B
5. Governance		
Promote decentralization and strengthen local authorities	KI 20: local government revenue	B
Encourage and support participation and civic engagement	EI 12: voters' participation	B
	EI 13: civic associations	B

Source: (UN-Habitat 2004)

Besides, nine check-lists assess areas that cannot easily be measured quantitatively. They are audit questions generally accompanied by checkboxes for yes or no answers. To make data collection more effective, urban indicators have been grouped into two clusters data sources by UN-Habitat were cluster A referred to as official government data and includes "indicators to be obtained from census, demographic and

health surveys, multiple indicators cluster surveys and national households surveys", and cluster B indicators represent all other data sources, including "official record and published studies of government institutions, housing boards, and agencies, service parastatals, finance institutions, police, NGOs as well as using informed estimates made by small groups of experts on specific issues" (UN-Habitat 2004).

From this set of indicators, the multi-criteria "City Development Index" (CDI), was derived, to rank cities of the world according to their level of development. The CDI is somehow an urban sister or daughter indicator set of the widely known Human Development Index (HDI), which is a statistic composite index of (1) life expectancy, (2) education, and (3) per capita income indicators, and used to rank countries into four tiers of human development (UNDP 2020). The urban CDI in turn is based on the five sub-indexes: (1) infrastructure, (2) waste, (3) health, (4) education, and (5) city product, following statistical analysis of urban indicators data. The multi-criteria CDI is calculated according to the formulae in Table 20. Each sub-index is a combination of several indicators that have been normalized to give a value between 0 and 1. However, unlike the HDI which has geographical coverage and data availability of basically all countries registered by the UN, the CDI started with 18 participating cities in 1999 (Hall et al. 2001) and provides comparative data of only a minor fraction of cities worldwide up to date.

Table 20 - City Index Formulas calculating the CDI

Index	Formula
Infrastructure	25 x Water connections + 25 x Sewerage + 25 x Electricity + 25 x Telephone
Waste	Wastewater treated x 50 + Formal solid waste disposal x 50
Health	(Life expectancy - 25) x 50/60 + (32 - Child mortality) x 50/31.92
Education	Literacy x 25 + Combined enrolment x 25
Product	(log City Product - 4.61) x 100/5.99
City Development	(Infrastructure index + Waste index + Education index + Health index + City Product index)/5

Source: (UN-Habitat 2002)

Furthermore, several locally adapted indexes in pilot cities were endorsed by UN-Habitat, like the previously mentioned SAI, to mitigate emerging issues like data gaps (missing indicator values), establishing benchmarks for indicators with insufficient global data, proxy measures (related but not similar), and variations in indicators' weight and relevance for cities (UN-Habitat 2022b). All adapted indexes follow the same indicator design principles and ten selection standards (Table 21).

Table 21 - Indicator design principles and standards

	Indicator selection standards
1	Relevance to SDGs, tasks, and indicators
2	Relevance to the main objectives and tasks of the NUA
3	Relevance to the main objectives and tasks of Urban Monitoring Framework (UMF)
4	Reference value of other relevant mainstream international institutions' (authorities') indexes
5	Relevance to sustainable development policies in the country (region) where the city is located
6	People-centered
7	Capacity to measure the extent to which the five urban domains are achieving the stated objectives
8	Consistency of index meaning and boundary between international cities
9	Accessibility of data
10	Difficulty of adaptive adjustment of the indicator system

Source: (UN-Habitat 2022b)

Since the development of the first GUID by the UNSD in 1996, also other organizations and institutions followed in the elaboration of databases and City Data Books (CDBs). Further global players in the field of urban indicators are the Asian Development Bank (ADB), the European Statistical Office (Eurostat), and the Organization for Economic Co-operation and Development (OECD).

The ADB developed a CDB database grouped into 13 main divisions considering a total of 140 urban indicators[55], including 16 lists or descriptions, two checkbox questions, and 122 quantitative indicators, of which 29 require multiple answers for a total of 234 numeric data items per city. Their divisions consider (1) Population, migration, and urbanization; (2) Income disparity, unemployment, and poverty; (3) Health and Education; (4) Urban productivity and competitiveness; (5) Technology and connectivity; (6) Housing; (7) Land use; (8) Municipal services; (9) Urban environment; (10) Urban transport; (11) Cultural; (12) Local government finance; and (13) Urban governance and management (Hall et al. 2001).

Data on European cities were collected in the Urban Audit and the Large City Audit project of Eurostat. At the city level, the Urban Audit contains more than 130 variables and more than 50 indicators[56]. These indicators are derived from the European Common Indicator (ECI) set and the variables collected by the European Statistical System. The data has been collected on two spatial levels, (A) the City according to the administrative definition, as the basic level, and (B) the Functional Urban Area being an approximation of the functional urban zone centered around the city. The data is

---

[55] The full list of indicators can be found under:
https://www.adb.org/sites/default/files/publication/30020/urban-indicators-managing-cities.pdf
(accessed 16.04.2021)
[56] The full list of indicators can be found under:
https://ec.europa.eu/eurostat/web/cities/data/database (accessed 20.09.2022)

published in thematic tables and refer to (1) Population on 1 January by age groups and sex; (2) Population structure; (3) Population by citizenship and country of birth; (4) Fertility and mortality; (5) Living conditions; (6) Education; (7) Culture and tourism; (8) Labour market; (9) Economy and finance; (10) Transport; and (11) Environment.

The OECD assembled sustainable development indicators in seven policy areas, namely (1) reducing emissions of greenhouse gas, (2) reducing air pollution, (3) reducing water pollution, (4) improving natural resource management, (5) reducing and improving the management of municipal waste, (6) improving living conditions in developing countries, and (7) ensuring sustainable retirement income (OECD 2004).

For an overview of "exemplar indicators", Newton *et al.* (1998) compiled a representative list of city metaphors as sources of urban indicators, based on the four key divisions (1) Environment, (2) Economy, (3) Social well-being, and (4) Governance (Table 22). Some of the metaphors, but not all, are linked to the earlier-mentioned concept of city models (Chapter 1.1.3).

Table 22 - City Metaphors as Sources of Urban Indicators

Urban Metaphor	Exemplar Indicators	Source
1. Environment		
Ecological City	• Use of ISO 14000 Standards; • Existence of coordinated transport and landuse planning • Frequency of environmental incidents	OECD (1995)
Exploding City	• Rates of natural increase • Rural-urban migration • International immigration to cities • Urbanisation • Levels of infrastructure provision and access (physical and social infrastructure)	Devas and Rakodi (1993)
Megacity	• Number of cities with more than one million population • Percentage of population in large cities world's population in large cities	Hall (1998)
Compact City	• Level of public transport usage • Residential density • Average travel times for key activities (work, shop, etc.) • Level of mixed landuse	Jenks *et al.* (1996)
2. Economy		
Human Innovation City	• Industrial innovations • Quality and qualifications of local labour markets • Number of small high growth firms	Maillat (1991)
Information City	• Information industries • Information workers • Information infrastructure (networks and capacities) • Access to information technologies and services	Castells (1991)
Entrepreneurial City	• New capital investment • Job creation	Gaye (1996)
Competitive Cities	• City's share of jobs, industries, events, growth, investment, etc.	Brotchie *et al.* (1995)
3. Social well-being		
Livable City	• Proportion of trips undertaken on foot or by bicycle • Broad range of indicators related to social and physical well-being	Pressman (1981)
Multicultural City	• Levels of social segregation based on race, political affiliation, social status, family status, gender and sexuality • Nature of political representation at municipal metropolitan and state levels • Appeal mechanisms and rate of overturned decisions	Sandercock (1998)
Health City	• Indicators of physical, mental, social and environmental well-being	World Health Organisation (1992)
Safe City	• Crime statistics • Resident perceptions of neighbourhood safety • Police per 1000 population	Oc and Tiesdell (1997)
Whose City	• Accessibility and affordability indicators related to key urban services • Level of public participation in urban decision making	Pahl (1975); Harvey (1973)
4. Governance		
Designer Cities	• City structure and form	Corden (1977)
Intentional Cities	• Level of balance of public / private involvement in the process of urban development	Jensen (1974); Troy (1996)
Global City	• Headquarters of int. companies and organisations • Telecommunications traffic • Air passenger traffic	Sassen (1991)

Source: (Newton et al. 1998)

As mentioned earlier, the listing of urban indicators and databases is enormous and could be continued almost infinitely. Incidentally, in line with the periodic city models and agenda themes[57], also recurrent thematical subjects such as the classic and confined 'Energy, Solid Waste, Transportation, and Water' topics can be found in most of the indicator sets. For this work, 16 representative urban indicator sets are further analyzed and the four thematical subjects juxtaposed (Table 23). In the 16 analyzed sets, each of the four sample sectors comprises on average three proposed indicators per set, and in total single 198 indicators. The full matrix is provided in Annex 6.

Table 23 - 16 globally recognized and applied indicator sets

Set name / Source	Energy (Electricity)	Solid Waste	Transportation (Mobility)	Water (City/Fresh)
1. ISO 37120 (2018) / (ISO 2018)	9	10	9	7
2. SDG Indicators (2015) / (United Nations 2015c)	6	2	2	6
3. Habitat Agenda Urban Indicators (2002) & GUID (2004) / (UN-Habitat 2002)	-	2	2	3
4. NUA Monitoring Framework Ind. (2021) & GUMF Indicators (2022) / (UN-Habitat 2021, 2022a)	2	1	3	3
5. ADB City Data Book (2001) / (Hall et al. 2001)	5	6	5	5
6. European Common Indicators (2003) / (Ambiente Italia Research Institute 2003)	2	1	2	-
7. Eurosat Indicators (2009) / (Eurostat 2009)	3	3	7	3
8. OECD Indicators (2004) / (OECD 2004)	1	4	1	3
9. China Urban Sust. Indices (2013) / (UCI 2014)	2	1	1	2
10. UCLG Mandala Tool (2018) / (UCLG 2018)	-	1	-	1
11. City Prosperity Index (2016) / (UN-Habitat 2016b)	3	1	3	1
12. Global Reporting Initiative (GRI) Standards Content Index (2016) / (Arcadis 2019)	5	3	1	3
13. Arcadis Sustainable City Index (2018)/ (Arcadis 2018)	3	1	7	3
14. Santa Monica Sust. City Plan (2014) / (City of Santa Monica 2014)	4	4	12	4
15. IBGE - Sustainable Development Indicators: Brazil (2015) / (IBGE 2015)	3	2	1	2
16. Shanghai Adapted Index (2022) / (UN-Habitat 2022b)	3	1	1	1
Total number of indicators per subject:	51	43	57	47
Total number of analysed indicators:	198			

Source: Own elaboration

---

[57] See also Chapter 1.1.3 and 1.2.2

However, it must be noted that similar indicators are often deployed in multiple indexes and sets. E.g., an indicator about "power consumption" is not only available in one index but, considering slightly modified versions (e.g., substituting the word "power" with "energy"; or measuring the consumption in joules, or kg of oil equivalent, instead of kWh per capita), iterates in fact in several of the surveyed indicator sets. The 16 representative sets serve as a basis for the deriving and selection of pilot indicators for the global south and are further analyzed in Chapter 4.2.

Also, a closer look at the different targets and baselines resting upon these indicators is worth undertaking. As Thomas, Hsu, and Weinfurter (2020) distinguish, there are different combinations of possible targets and baselines: no target and no baseline; no target with a baseline, which could make it possible to assess the direction of change over time; directional target, a goal to increase or decrease an indicator from a baseline or the current level without specifying by how much; and specific targets, an aspirational absolute level of the indicator or specific percent change from the baseline, both within a particular time frame. Table 24 provides examples of how these different target types were articulated in practice. Baselines were in most cases provided by date as a baseline year, rather than from metadata. In rare cases, the indicators include original calculations from existing data.

Table 24 - Examples of indicators with different target types and baselines

Type of Target	Baseline	No Baseline
Specific Target	**Indicator:** Daily demand of water in gallons demand **Index:** Santa Monica Sustainable City Plan **Target:** Reduce water demand by 1,300,000 gallons per day (GPD) **Baseline:** The targets are for the year 2020 using 2010 as a baseline.	**Indicator:** Daily commutes of employed workers, trips taken to school or college, errands and childcare, including trips by unemployed residents and retired individuals. **Index:** Greater New Haven Community Index **Target:** Mentions of both "zero car" and "low car" households (less than one car per worker). **Baseline**: No baseline.
Directional Target	**Indicator:** Climate Change - reduction of greenhouse gas emissions **Index:** Minneapolis Sustainability Indicators **Target**: Reduce citywide greenhouse gas emissions by 15 percent by 2015, and 30 percent by 2025 using 2005 as baseline. **Baseline:** 2005 GHG emissions in Minneapolis	**Indicator:** Building permits by type and location **Index:** Central Texas Sustainability Indicators Project **Target:** "Encourage development in appropriate areas to ensure affordable infrastructure, preserve open space, promote ecosystem health, minimize pollution, and support economical and efficient transportation." **Baseline:** No baseline
No Target	**Indicator:** Total Pesticide Amount **Index:** Cumulative Environmental Vulnerabilities Assessment **Target:** No Target **Baseline:** 2009 levels	**Indicator:** Parks and public green spaces that help maintain societal and individual health while contributing to regional quality of life and economic development potential. **Index:** Central Texas Sustainability Indicators Project **Target:** No target **Baseline:** No baseline

Source: (Thomas, Hsu, and Weinfurter 2020)

Recapitulatory, for the future selection of appropriate indicators, the proposed set or adaptive spectrum should advisably consider all five key principles of criteria (relevant, methodologically sound, measurable, easy to communicate and access, limited in number and outcome-focused) (UNSD 2015), cover four recurrent confined technical sample sectors of the global south (Energy, Solid Waste, Transportation, Water), and preferably comprise directional or specific targets and solid baselines, to facilitate the consecutive monitoring process.

3.2   ISO 37120: the first ISO International Standard on urban indicators

In 2012, the Technical Committee 268 of the International Organization for Standardization (ISO[58]) started the development of an internationally accepted standard to establish and define the methodologies for a set of indicators to measure and steer the

---

[58] The letters ISO do not represent an acronym or initialism. The organization provides this explanation of the name: "Because 'International Organization for Standardization' would have different acronyms in different languages (IOS in English, OIN in French), our founders decided to give it the short form ISO. ISO is derived from the Greek word isos (ίσος, meaning "equal"). Whatever the country, whatever the language, the short form of our name is always ISO." (ISO 2019)

performance of city services and quality of life. ISO is an independent, non-governmental organization that develops standards to ensure the quality, safety and efficiency of products, services and systems. In 2014, the first edition of ISO 37120 about "Sustainable development of communities - Indicators for city services and quality of life" was published, and a second edition was updated in 2018[59]. The intention was to standardize and level out urban indicators among different countries. The committee claims, that the "standardization in the field of Sustainable Cities and Communities will include the development of requirements, frameworks, guidance and supporting techniques and tools related to the achievement of sustainable development considering smartness and resilience […]" and therefore contribute to the UN Sustainable Development Goals (ISO 2021). According to ISO, the document is "applicable to any city, municipality or local government that undertakes to measure its performance in a comparable and verifiable manner, irrespective of size and location" (ISO 2018). Furthermore, the indicators and associated assessment methods in this document have been developed in order to help cities:

> a) measure performance management of city services and quality of life over time;
> b) learn from one another by allowing comparison across a wide range of performance measures; and,
> c) support policy development and priority setting. (ISO 2018)

The indicators have been selected to make reporting as simple and inexpensive as possible, and therefore reflect an initial platform for reporting. The indicators are structured around 19 themes and sectors like Energy, Solid Waste, Transportation, and Water, which were considered essential for steering and assessing the performance management of city services and quality of life and have no hierarchical significance. Indicators under each theme were selected and paired on the basis of input and outcome indicators for further contextual analysis. Recognizing the differences in resources and capabilities of cities worldwide, the overall set of indicators for city performance has been divided into "core" indicators (Table 25), "supporting" indicators, and" profile" indicators.

Table 25 - City "core" indicators

Theme	Core indicator
Economy	• City's unemployment rate
Education	• Percentage of female school-aged population enrolled in schools • Percentage of students completing primary education: survival rate • Percentage of students completing secondary education: survival rate • Primary education student/teacher ratio
Energy	• Total end-use energy consumption per capita (GJ/year) • Percentage of total end-use energy derived from renewable sources • Percentage of city population with authorized electrical service (residential) • Number of gas distribution service connections per 100 000 population • Final energy consumption of public buildings per year (GJ/m2)
Environment and climate change	• Fine particulate matter (PM2.5) concentration • Particulate matter (PM10) concentration • Greenhouse gas emissions measured in tonnes per capita
Finance	• Debt service ratio (debt service expenditure as a percentage of a municipality's own-source revenue) • Capital spending as a percentage of total expenditures
Governance	• Women as a percentage of total elected to city-level office
Health	• Average life expectancy • Number of in-patient hospital beds per 100 000 population • Number of physicians per 100 000 population • Under age five mortality per 1 000 live births
Housing	• Percentage of city population living in inadequate housing • Percentage of population living in affordable housing
Population and social conditions	• Percentage of city population living below the international poverty line
Recreation	• Square metres of public indoor recreation space per capita • Square metres of public outdoor recreation space per capita
Safety	• Number of firefighters per 100 000 population • Number of fire-related deaths per 100 000 population • Number of natural-hazard-related deaths per 100 000 population • Number of police officers per 100 000 population • Number of homicides per 100 000 population
Solid waste	• Percentage of city population with regular solid waste collection (residential) • Total collected municipal solid waste per capita • Percentage of the city's solid waste that is recycled • Percentage of the city's solid waste that is disposed of in a sanitary landfill • Percentage of the city's solid waste that is treated in energy-from-waste plants
Sport and culture	• Number of cultural institutions and sporting facilities per 100 000 population
Telecommunication	• Number of internet connections per 100 000 population • Number of mobile phone connections per 100 000 population
Transportation	• Kilometres of public transport system per 100 000 population • Annual number of public transport trips per capita
Agriculture and food security	• Total urban agricultural area per 100 000 population
Urban planning	• Green area (hectares) per 100 000 population
Wastewater	• Percentage of city population served by wastewater collection • Percentage of the city's wastewater receiving centralized treatment • Percentage of population with access to improved sanitation
Water	• Percentage of city population with potable water supply service • Percentage of city population with sustainable access to an improved water source • Total domestic water consumption per capita (litres/day) • Compliance rate of drinking water quality

Source: (ISO 2018)

The broader set of ISO 37120 Series for Sustainable Development on Communities (Figure 27) embraces two other sets as well, the ISO 37122 and ISO 37123, which specify and establish definitions and methodologies for sets of indicators for smart cities and on resilience in cities. Both standards were consecutively elaborated in 2019.

Figure 27 - Relationship between the family of urban indicators standards

Source: (ISO 2018)

The organization however gives already the disclaimer and sets the limitation, that "for data interpretation purposes, cities shall take into consideration contextual analysis when interpreting results. The local institutional environment may affect the capacity to apply indicators." Also, "when interpreting the results of a particular service area, it is important to review the results of multiple types of indicators across themes; to focus on a single indicator can lead to a distorted or incomplete conclusion."(ISO 2018).

According to the World Council of City Data (WCCD 2018), ISO 37120 represents the very first ISO standard explicitly for cities, and 56 cities (including 22 cities in the global south) already certified the standard till 2018 (Figure 28).

Figure 28 - ISO 37120 certified cities

Source: (WCCD 2018)

However, a major obstacle to the worldwide dissemination and further spread of the norm is the fact, that alike all other ISO standards, also ISO 37120 is not available for free, but must be purchased in order to get access to its content and be applied by municipalities and city administration. This is a substantial initial hurdle, especially for municipalities in the global south, where financial resources and budgets are limited.

According to United Cities and Local Governments (UCLG) several countries have rather developed national statistical platforms with the involvement of local and regional governments, "even though most countries are still in the process of constructing an effective way to localize indicators" (UCLG 2019).

3.3 Qualitative assessment of urban indicators

According to the European Commission, the challenge for urban authorities is deciding which tool best addresses the needs and goals of a particular city, which would be easy to implement, and which is worth the financial and human effort, as in some cases, a selection of different indicators may be desirable for a city home to a small population; in others, a large city may want to join an established global program of indicators (Science for Environment Policy 2018). Therefore, to measure the feasibility and practicability of selected indicators for urban development, ideally, they have to be qualitatively assessed and tested beforehand conferring to their expected dimensions through comparative pilots. According to Dijken, Dorenbos, and Kamphof (2012), the main tasks for the assessment phase are to consolidate, test, evaluate, improve, and finalize the prototype of the indicator tool. The authors emphasize the need for pilot municipalities that reflect the "width and diversity" in terms of "size, function, type, and challenges" to draw conclusions and make recommendations for the eventual further development of proposed sets of indicators. Therefore, the assessment "stimulates internal and external dialogue about sustainable and integrated urban development" and leads to "more and better-integrated policies, to improved coordination and synergies, to more efficiency and effectiveness and thus to cost-savings in the long run" (Dijken, Dorenbos, and Kamphof 2012).

A sound example of a qualitative assessment of urban sustainable development goal indicators was undertaken by Simon *et al.* (2016). They started a reality check through a comparative pilot project involving co-production between researchers and local authority officials in five diverse secondary and intermediate cities: Bangalore

(Bengaluru), India, Cape Town, South Africa, Gothenburg, Sweden, Greater Manchester, United Kingdom, and Kisumu, Kenya. In each city, academic and/or consultant researchers worked with local authority counterparts to assess (1) data availability, (2) the relevance of the proposed indicators and feasibility of their measurement; and (3) any recommendations for improvement to particular indicators. According to the authors of the research, the five cities provided already a reasonably representative sample of the diversity of urban contexts and conditions around the world, to develop and improve a universally applicable set of indicators that are "comparable across a range of settings".

The assessment study revealed that each city faced problems in providing all the data required, as the current local authority statistical capacity is highly variable and often inadequate for the purpose of fulfilling the reporting requirements. The precise extent of responsibilities varies by country in terms of how national reporting agencies allocate roles, but the specific urban focus of these indicators makes some urban involvement both "desirable and inescapable". While the draft indicators complied with these 10 principles to varying extents, the municipalities proposed various changes to maximize the local relevance of particular indicators. Thus, the research "provided invaluable inputs to the process of finalizing the urban SDG prior to the formal announcement of the entire SDG set by the UN Secretary-General in late September 2015" (Simon et al. 2016).

Other international organizations, like the United Nations Economic Commission for Africa (UNECA), sing from the same hymn sheet. Their assessment of Africa's progress on the 2030 Agenda confirmed that approximately six out of every ten SDG indicators cannot be tracked in Africa due to severe data limitations (UNECA 2017). And UCLG corroborates, that in developing countries and emerging economies, "the relevance of informality makes it even more difficult to collect reliable data in a standardized and systematic way", especially when existing northern sets are adopted one-to-one (UCLG 2019).

A similar unfortunate output would be expected also by the qualitative assessment phase of this research, in case existing sets would be examined through the investigation of case studies in the selected developing cities (Chapter 2.3). Therefore, the survey foresees a prior selection and sieving of adaptive indicators (Chapter 2.4), to be able to consolidate, assess, evaluate, improve, and propose a new spectrum of indicators in this study (Chapters 4.3 & 5.1).

Derived from the debate on international urban agendas, in particular regarding the selection criteria for quality indicators in Chapter 1.4.2 and the critical review of

existing indicators, the community of the global south has the aspiration and requires appropriate indicator sets, which absorb the mentioned critique and might buffer the uneven quality of agendas and data situation in the developing countries and emerging economies (Figure 29). An improved decent indicator spectrum should, therefore (1) adequately benchmark the point of departure and monitor development, (2) provide comparability within the city over time, (3) provide comparability among peer cities in comparable contexts and similar agendas, (4) be adaptive to development stages, uneven data situations, alterations, and new processes, and ideally (5) comprise local policy definitions and guidelines, as well as consider local governability and policy cycles.

Figure 29 - The five key requirements from the global south regarding indicators
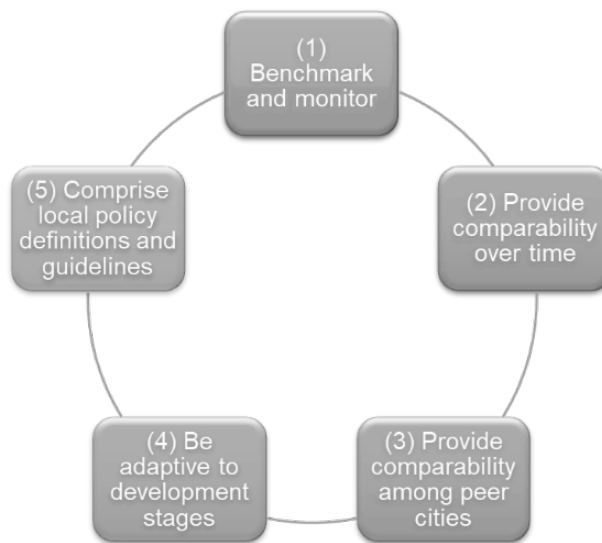
Source: Own elaboration

Most of the current renowned indicator sets are not able to attend to all these listed requirements at the same time but focus rather on two or three of the above-mentioned aspects. For example, sets like the ISO 37120 try to solve the problem with a one-size-fits-all approach and paint with a single broad brush for all cities, but have an aspiration, which can be attended only in the global north. On the other hand, sets like the SDG Indicators or NUA Monitoring Framework Indicators try to provide a very broad comparability between different worlds, and therefore have an enlarged indicator set with much flexibility, but turns sometimes out to be too specific, that respective data is not available. The new suggested spectrum of indicators aspires to bridge the gap between these characteristics and narrow down the limited accessibility of the existing renowned sets with a lowest common denominator approach, although surmising that a satisfactory single common southern indicator set won't be achievable.

3.4   A brief reflection on existing indicators and urban agendas

Since 1976, the year of Habitat I, local administrations, and non-governmental organizations have gained importance in the management of cities and promoted an advance in political awareness about the "urbanization of poverty" and environmental unsustainability in the growth of cities, especially in developed countries. Alike other non-binding doctrinaire international guidelines, the NUA and further agendas like the SDGs try to encourage public and private stakeholders and decision-makers to raise consciousness about the challenges of the new urban era and point possible pathways to overcome the same by implementing the agenda through supportive political framework activities and traditional hard policy mechanisms.

Globally connected cities like Amsterdam, Milan, Cairo, Rio, Bogotá, and Silang have adequate access and vivid exchange with international organizations in regard to their local agendas. They are very often used as guinea pigs and successfully implement new urban approaches and internationally acknowledged indicators to measure development and effective implementation. The lessons learned in these kinds of cities often help other similar urban areas to adopt the best pest practices. On the other hand, e.g., the NUA or ISO 37120, similar to other international urban agendas and indicator sets, struggle with the application process breadthways, especially in remote urban areas and secondary, less integrated cities with inferior connectedness in developing countries and emerging economies.

Besides, as highlighted in the preceding item, all kinds of cities and settlements are confronted with urban challenges on multiple levels. The unstructured growth and concomitant urban sprawl are not only since the last century one of the main tasks of human mankind (Day and Day 1973; Vidal and Scruton 2007; Gobbi 2016). Classic and confined sectors like Energy, Solid Waste, Transportation, and Water are common principal urban difficulties. Reasons are multiple, like the virtue of environmental overburdening and climate change (Calthorpe 2010; J. A. P. de Oliveira et al. 2015; Lee and Hughes 2017), but also due to overpopulation (Day and Day 1973; Vidal and Scruton 2007; Gobbi 2016) and the limitation of resources (Hansen 1959; Meadows et al. 1972; Neuman 2005), as pinpointed in the previous chapters. New regulations often overload the capacity of city administrations and must be realistically adapted to the diverse capacities of small and large municipalities. Organizational structures, planning instruments, and coordination mechanisms must be strengthened in a broader sense.

International agendas and guidelines try to mitigate these challenges, structure the irreversible process, and identify steps and procedures toward a more sustainable urban development. However, these agendas can't be seen as standalone directives to be implemented on a political level. In this regard, four key dimensions of integration have to be named for successful urban development: (1) Integration of a variety of strategic urban sectors and services; (2) Integration of a variety of relevant actors and stakeholders; (3) Integration of different spatial areas; and (4) Integration of different government levels for the implementation of measure (Keilmann-Gondhalekar, Vogt, and Eisenbeiß 2018). To preserve and enhance urban values, the challenges must be tackled on different levels and scales, simultaneously through scientific and ethical dimensions, as well as multiple actors and stakeholders. In addition, each local urban agenda must be located in the context of other international guidelines and sets of indicators.

To successfully overcome the urban challenges, the joint forces of other development driving forces are required. As a good guiding example, one can name the attempt of Goal 17 "Strengthen the means of implementation and revitalize the global partnership for sustainable development" of the Agenda 2030. Its targets advocate simultaneously financial resource mobilization, technology transfer, capacity-building, trade reform, policy and institutional coherence, multi-stakeholder partnerships, data, monitoring, and accountability (United Nations 2015b). Just with a holistic and mutual approach, the current uncontrolled growth of global urbanization can be transformed into prosperous cohabitation for future generations and set the global vision of sustainable urbanization for the next 20 years.

Besides, alternative mechanisms like knowledge transfer and exchange of good practices are necessary for effective implementation. In this regard, the potential of south-south and south-north exchanges is still very much under-exploited. Furthermore, the introduction, monitoring, and follow-up of national and regionalç indicators are required, to benchmark and measure urban development on a local scale. Apart from the political commitment of the public sector at diverse government levels, the private sector, the academic sector, and civil society must be involved in a successful implementation. Also, the application in different spatial areas plays an important role in success. Though to increase the participation of these sectors, actors, areas, and levels, broad dissemination of the urban guideline, especially extensive capacity building and training is required.

Hence, as mentioned before, special attention must be paid by the national governments and local bodies to the intrinsic value of sustainability and the persistence

of the long-term transformational change intended to be triggered by national and international urban agendas and guidelines. Only if they fully commit to the cause and streamline agendas alike crosscutting issues through all governmental entities, national ministries, regional administrations and local bodies, a changing of the course of sustainable urban development policies is possible, and the desired impact feasible. In several developing countries of the global south, urban development and sustainability issues are only recently reviewed jointly. If carried out properly, this can derive important actions for the creation and strengthening of public policies. Based on the examined literature and cases, with all the advancements and setbacks in urban policies, it can be concluded, that the impact of international urban agendas at a national and regional level is still very limited and the high expectations in most developing cities underachieved[60].

To properly monitor the progress of urban development and the success or non-achievement of urban agendas, indicators are indispensable for decision-makers like policymakers and city planners, and the respective policy framework. However, despite almost three decades of introducing new compound (composite and aggregated) indicators, leading to almost an "explosion of indicators" (Riley 2001), there has not been theoretical consensus on how to measure current well-being or sustainability (UNECE, OECD, and Eurostat 2008; Stiglitz, Sen, and Fitoussi 2009; Görgens and Kusek 2009b), nor indicator sets that are "universally accepted, backed by compelling theory, rigorous data collection and analysis, and influential in policy" (Parris and Kates 2003), and policies feature two basic characteristics: "incommensurability and strong uncertainty" (Marletto and Mameli 2012). Even the introduction of the international standard ISO 37120 could not mitigate and close this gap. Also, the recent Agenda 2030 with its SDGs, and its predecessor, the MDGs, bank on the introduction of particular indicators to promote global awareness, political accountability, social feedback, and public pressures as well as monitor progress. This might have even led to an unhealthy "obsession with numbers" (Morse 2004), as the use of numbers to condense complex systems into easily digested 'bites' of information is very much in fashion.

Besides all past efforts, most indicators still comprise "uneven quality" (Hák, Janoušková, and Moldan 2016), and "fall short of defining or ensuring sustainability"

---

[60] However, it must also be noted, that several major challenges developing countries confront are related to the intense instability of the current political and economic conditions which most countries face since the global recession in 2008, deteriorated through Covid-19 and resource constrains through global conflicts, like the Ukrainian War in 2022ff. As a result, interruptions of these kind of projects for the implementation of policies and agendas must be expected at all times.

(Dahl 2012). In addition, as Fenton & Gustafsson (2017) highlight, global initiatives such as the SDGs, MDGs, or the local Agenda 21 "were not always synchronized, monitored, or evaluated in detail, meaning potential synergies, results or lessons have been missed or poorly understood". Other critics complement, that "most indicators designed from an intergovernmental standpoint are not meant to capture the reality, diversity, and complexity of local contexts, resulting in a significant loss of knowledge and explanatory detail" (UCLG 2019).

To conclude the reflection, the so-far elaborated preliminary findings based on the bibliographic review were processed and condensed into two scientific articles, and successfully published in national[61] and international[62] journals (see Annex 1 & 2). On account of the still ongoing research and field study, it is expected to map further on successful implementation measures, accumulate more information about the sustainability of non-binding doctrinaire international guidelines, and the persistence of the long-term transformational change of national urban agendas.

---

[61] *Espaço & Geografia*, Posgea – University of Brasília, Vol.22, No 1 (2019), 285:326; ISSN: 1516-9375
[62] *CIDADES, Comunidades e Territórios*, ISCTE - Lisbon University Institute, Spring Special Issue (Apr/2021); ISSN: 2182-3030 ERC: 123787/2011

In a nutshell:

During the analysis of sample agenda approaches (Chapter 1.1 & 1.2) and urban indicators (Chapter 1.4 & 3.1), in addition to the spotlight insights gained through the global pilot overview survey and interim assessment (Chapter 2.3 & 4.1), three main challenges of international agendas and global indicators, which claim universal applicability, were identified:

1. The lack of theoretical consensus to measure development, incommensurability, and uneven quality of agendas, indicators, and data.

2. The lack of knowledge and application of these agendas and indicators, as farther down the municipality is situated in the worldwide city chain (by size, political and economic importance, and development).

3. And finally, the local preference for already existing and proven national alternatives.

There is certainly a need for future debates. In order to successfully implement and monitor urban agendas, there might be rather a demand for a wider range and variety or adaptive spectrum of potentially proven decent applicable indicators to the municipalities, especially in cities that have already an approach to sustainability but have lower capacity and more success in emerging countries. This could also include an adaptive proxy approach, attending different city development levels. Municipalities apparently prefer to choose their personalized kit of indicator set, according to their needs, current agendas, local availability of data, and national policies, rather than apply one fixed universally applicable set. Naturally, this goes along with some downsides, like enhanced incomparability among peer cities. But it might come closer to the reality of local administrations and their demand, especially in the global south. Therefore, the research will pursue with the meta-level debate and introduce and assess a suggestive adaptive spectrum of applicable and locally feasible indicators and respective proxies to four recurrent confined technical sample sectors[63] of the global south, to contribute to the discussion.

---

[63] Energy (electricity), Solid Waste, Transportation (mobility), and Water (fresh/drinking); see also Chapter 1.2.2 and 3.1.

4   SUGGESTED SPECTRUM OF INDICATORS

To address the third specific objective of this study, to introduce quality indicators deliberately for cities that have already an approach to sustainability but have a lower capacity to benchmark and measure sustainable urban development and assess the new indicator spectrum through case studies with international municipal experts of developing cities and municipalities, the derivative results are gathered. To start with, the first findings of the pilot overview surveys about the state of knowledge are compiled. Subsequently, to extend the reach and success of urban agendas in the future and improve the evaluability, the deriving and selection of pilot indicators are expounded. In a consecutive step, the suggested indicator spectrum is assessed through structured feedback of the global south, as outlined in the preceding methodology (Chapters 2.3 & 2.4). These findings contribute to the refinement of the suggested indicators as well as the development of the later recommendations.

4.1   Findings of the pilot overview surveys about state of knowledge

At the beginning of the research, before entering the subject of indicators, a pilot overview survey was undertaken, to touch base with municipals in the global south, in order to access the general state of knowledge about the dissemination of international agendas and a brief capacity development need assessment. This pre-survey provided a foundation and basis of trust among the liaison interviewees for the consecutive assessments.

The preliminary results (Table 27) of this first global pilot overview survey indicate a broad general knowledge of current international agendas worldwide, especially the SDGs & Agenda 2030. 13 of the 14 municipalities reported at least a fair knowledge and partial application of the SDGs. To a less wide extent, (nine municipalities out of 14), also the NUA is known. However, almost half of the municipalities reported struggles with the actual implementation of these agendas and identified potential knowledge gaps during the application. These findings confirm the assumptions gathered through the bibliographic review. Thus, the survey emphasizes the need for efficient indicators assessing and measuring the successful implementation of urban agendas in developing countries.

Relating thereto, several management areas, specific technical areas, and skills were identified, which deter the municipalities from the successful implementation of these agendas (Table 26).

Table 26 - Principal sections of identified capacity development weaknesses

Topics	Specific sections	Mentions (out of 14)
Administrative areas	Project management	11
	Knowledge management	11
	Financial management	10
Technical areas	**Water & wastewater**	11
	Renewable energies	11
	Citizen participation	11
	Local economic development	11
	Digitalization & good governance	11
	Transportation & mobility	11
	Solid waste	10
	Inclusive service delivery & governance	10
Operational skills	Cooperation & networking	13
	Language	12
	Leadership	10

Source: Own elaboration

In the administrative area, shortcomings regarding general project management (mentioned 11x), knowledge management (11x), and financial management (10x), were reported.

In the technical areas, the four recurrent sample sectors water & wastewater (11x), renewable energies (11x), solid waste (10x), as well as transportation & mobility (11x) were named. In addition, citizen participation (11x), local economic development (11x), digitalization & good governance (11x), and inclusive service delivery & governance (10x) were highlighted as weak spots.

Additional operational loopholes reported included insufficient cooperation & networking skills (13x), language skills (12x) as well as leadership skills (10x). Particularly the technical staff and specialists of the municipality were named (13x) as the main target group for required capacity development. According to the interviewed experts, especially short and specific attendance courses (12x) and workshop formats (13x) could help to narrow the knowledge gap, but also online learning platforms and certified courses (both 11x) could contribute. The complete summarizing evaluation matrix is shown in Table 27.

Table 27 - Evaluation matrix on pilot overview survey

Obs.: Topics marked with a "X" in bold were emphasised by the interviewed experts.

| N° | Question | Eastern Europe | | | | Asia | | Africa | | | | | | South America | | Average |
| | | Ukraine | | | Belarus | Turkey | Indonesia | Tanzania | | | Ethiopia | S.A. | Tunisia | Brazil | | (x/y) out |
		Livi	Charkiw	Uzhgorod	Mogilev	Eskişehir	Jakarta	Moshi	Masasi	Zanzibar	Addis A.	Durban	Tunis	Curitiba	Rio	of 14
	Familiar with:															
1	SDGs & Agenda 2030	**X**	x	**X**	**X**	x	**X**	**X**	**X**	**X**	**X**	x	(-) 2019	**X**	**X**	(**10**/13)
	New Urban Agenda	**X**	(-) 2020	**X**	(-) 2020	x	**X**	x	(x)	(x)	(-) 2018	(x)	(-) 2019	x	(-) 2020	(**3**/9)
	Most relevant SDGs	**7**, 11, 4, **9, 17**, 3	**11**, 7, 13, 3, 6	15, **11**, 16, 5, 10	**7, 15**, 11	8, 13, 10, 12, 16, 5	**11**, 13, 6, 4, 2, 3	**13**, 3, **2**, 6, 5, **1**	3, 6, 1, 4, 13	3, 6, 1, 4, 14	**11**, 6, 4, 1, 9	**11, 2**, 13, 6	(12, 11)	**13, 9, 11**, 4, 6	**13, 11, 6**, 5, 16	**11** (**7**/10) 6 (**1**/9)
	Knowledge gaps areas	*Implem.*	5, 8, 10	*Depends*	*Depends*	10, 13	*Implem.*	*Implem.*	*Implem.*	*Implem.*	*Depends*	*Implem.*	*Awareness*	5, 12	10	*Imp.* (6)
	Identified CD need in management area:															
2	Financial Management	x	x		**X**	x	**X**	x	**X**	**X**		x	x			(**4**/10)
	Contract management	x		x				x				x				(**0**/4)
	Legal management	**X**	**X**		**X**		x	x			x	**X**	x	**X**		(**5**/9)
	Institutional quality management	x		x			**X**	**X**			x		x		**X**	(**2**/6)
	General project management	**X**	x	x		x	**X**	**X**	x	x	**X**	x	**X**			(**5**/11)
	Knowledge management		x	x	x	x	x	**X**	**X**	**X**	**X**	**X**	**X**	x		(**6**/11)
	Identified CD need in technical area:															
3	Water & wastewater	**X**	**X**	**X**	**X**		**X**	x	**X**	**X**	x	**X**	**X**			(**9**/11)
	Energy efficiency	**X**	**X**	x	**X**		**X**	**X**				**X**	x		**X**	(**7**/9)
	Renewable energies	**X**	**X**	**X**			**X**	**X**	x	x		x	x		**X**	(**5**/11)
	Citizen participation	x	x		x		**X**	x	x	x	x	x	x		x	(**1**/11)
	Sustainable tourism	**X**	x		x			x	x	x		x		x		(**1**/8)
	Local economic development	**X**	**X**		x	x	**X**	x	**X**	**X**	**X**	x			**X**	(**7**/11)
	Environmental	x	x				x	**X**	x	x		**X**				(**2**/7)
	Forestry							x	x	x		x				(**0**/4)
	Digitalization & good governance	**X**	**X**				**X**	x	x	x	**X**	x	x	**X**	**X**	(**6**/11)
	Integrated urban planning	x	x				**X**	**X**	x	x	**X**	x	**X**			(**3**/9)
	Climate change	x	**X**				x	**X**	x	x	**X**	**X**	x			(**4**/9)
	Education	**X**			x		x	x	x	x	x	**X**				(**2**/8)
	Health	x	x		x		x	x	**X**	**X**	x	**X**				(**3**/9)
	Solid waste	**X**	**X**	**X**	x		x	x		x	x	**X**	**X**			(**5**/10)
	Transportation & mobility	x	x	x	x			x	x	x	**X**	**X**	x			(**3**/11)
	Security	x	**X**					x				x	**X**			(**2**/5)
	Inclusive Service Delivery & Governance	x				x	x	x	x	x	**X**	**X**		x	x	(**2**/10)
	Migration & refugee	x	**X**			x	x							x		(**1**/7)
	Heritage preservation & protection	**X**					x	x		x			x			(**1**/6)
	Identified CD need in further skills:															
4	Language skills	x		x	**X**	x	**X**	x	x	x		x	x	**X**	**X**	(**4**/12)
	Communication skills	**X**			x		x	x				x	**X**		**X**	(**3**/7)
	IT skills		**X**				**X**	**X**	**X**	**X**		**X**		x		(**6**/7)
	Cooperation & Networking skills	**X**	x	x	x	x	x	**X**	x	x	x	**X**	x		x	(**3**/13)
	Leadership skills	x		**X**			**X**	**X**	x	x	x	**X**	**X**	x		(**5**/10)
	Main target group for CD:															
5	Upper Management & decision-makers	x			x			**X**			x	x	x			(**1**/6)
	Specialists	**X**	x	**X**	**X**	x	**X**	x	x	x	x	x		**X**	**X**	(**6**/13)
	Technical municipal staff	**X**	x	**X**	**X**		**X**	**X**	**X**	**X**	x	**X**	x	**X**	**X**	(**9**/13)
	Administrative municipal staff						**X**	**X**	x	x		**X**	x			(**3**/7)
	Privy council	x						x	x	x		**X**	**X**			(**2**/6)
	Prefered type, setup & timeframe of CD:															
6	Online learning platform	**X**	**X**	**X**	**X**	x	x				x	x	x	**X**	x	(**5**/11)
	Attendance course	x	x	x			**X**	**X**	**X**	**X**	**X**	**X**	**X**	x	**X**	(**8**/12)
	Workshop format (1 week)	**X**	**X**	**X**	**X**	x	**X**	**X**	**X**	**X**	**X**	x	**X**		x	(**10**/13)
	Certified courses (6 months)	x	x	x	x	x	x		x	x		**X**		x	**X**	(**2**/11)
	Post-graduate studies (1-2 years)	x						x						x	x	(**0**/4)

LEGEND: Colour classifies total amount of municipals (out of 14 possible replies) | 10-14 | 6-9 | 0-5 |

Source: Own elaboration

In conclusion, several capacity development shortcomings were identified, which require specific indicators dedicated to monitoring the capacity needs and knowledge gaps of municipalities. The discoveries of the pilot survey were further processed in the following chapters of the literature review. Based on the findings of the first pilot questionnaire, a second, more specific questionnaire with the international municipal experts was elaborated, to consolidate findings and assess the prospective selection of appropriate indicators concerning the five principles of criteria presented in Chapter 1.4.2. The outcomes of the second survey also subsequently contribute to the preliminary suggestions to improve the dissemination of urban agendas in general and support the local government and municipalities on-site with recommendations for capacity development.

In mid-2022, the 14 sample municipalities in the global south were contacted a second time for an interim assessment[64]. When asked to what extent international standards for city performance indicators regarding "sustainable urban development" are known in their municipality, only one city mentioned knowledge regarding the Global Urban Indicator Database (GUID) and the ISO 37120 specification. Although specifically asked about the GUID and ISO, the civil servants of the remaining 13 municipalities were not familiar with, and not even aware of the existence of such standards. Only Jakarta had undertaken a status quo assessment about indicators in 2020 in collaboration with the Swiss Federal Institute of Technology (ETH) in Zürich and the German international consulting company Dress & Sommer. The contacted liaison person stated, that during the assessment, also the GUID 2, ISO 37120, and other sets of indicators were discussed, but not adapted, and rather given preference to already existing proven national indicators. This gives preliminary hints to still limited general dissemination of international standards in the global south, especially in secondary cities, where the transnational political focus is less pronounced, and which are globally less interlaced.

4.2   Deriving and selection of pilot indicators for the global south

After the interim assessment and inquiry about the general state of knowledge, the analysis of existing indicator sets took place, to derive feasible indicators for the global south. The goal of the subsequent exercise is not to produce another new globally applicable indicator set or index, but rather to illustrate the practicability (or impracticability) of existing indicators, and to illustrate the advantage and viability of an embracing mix.

As elucidated already in the methodology (Chapter 2.4), the compilation of 16 major representative urban indicator sets and indexes based on the horizon-scanning and critical review of existing indicators (Chapter 3) was executed (see Annex 6). To narrow the analysis down to a workable number of indicators, a clipping to the four recurrent confined sample technical sectors 'Energy, Solid Waste, Transportation, and Water' occurred. On average, the 16 analyzed indicator sets comprise around three[65] indicators per theme. Following the methodical approach, the filtering of the gathered 193 indicators through the sieves of "relevance", "applicability", and "availability of data" in the context

---

[64] The interim assessment was undertaken prior to the indicator assessment. For further information on the selection of the sample municipalities, see Chapter 2.3 and Table 16.

[65] 198 indicators divided through 16 sets divided though 4 sector themes (198 ÷ 16 ÷ 4 = 3,09375)

of developing countries was performed. Consecutively, the selection of an embracing mix of 20 indicators was elaborated, five on each of the four thematic sectors.

In the first thematic section of Energy, the proposed embracing spectrum comprises two quantitative indicators '1. Residential power consumption per capita (in kWh/year)' from the China Urban Sustainability Index and '2. Percentage of residential city population with authorized electrical service (in %)' from the ISO 37120 Core Indicator set. The Energy indicator set is further complemented by the two qualitative indicators '3. Average annual hours of electrical service interruptions per household (in h/year)' from the ISO 37120 Supporting Indicator set and '4. Installed renewable energy-generating capacity in developing countries (in watts/capita)' from the SDG Indicator set. To complete the embracing set, the price indicator '5. Median price of kW/h (per household as a percentage of the median annual household income of tenants)' from the ADB City Data Book is added (see Table 28).

Table 28 - Proposed embracing spectrum of adaptive indicator set on Energy

Energy (electricity)	1. Residential power consumption per capita (in kWh/year) [inter alia China Urban Sustainability Index]
	2. Percentage of residential city population with authorized electrical service (in %) [i.a. ISO 37120 CI]
	3. Average annual hours of electrical service interruptions per household (in h/year) [i.a. ISO 37120 SI]
	4. Installed renewable energy-generating capacity in developing countries (in watts/capita) [i.a. SDG Indicators]
	5. Median price of kW/h (per household as a percentage of the median annual household income of tenants) [i.a. ADB City Data Book]

Color legend gauging indicators: Green = quantitative indicator; Purple = qualitative indicator; Blue = price indicator

Source: Own elaboration

As already elaborated in Chapter 3.1, it must be noted that the selected indicators are often applied in multiple indexes and sets, although only one source is mentioned as a reference example in the tables. E.g., indicator 1. about "power consumption" is not only available in the 'China Urban Sustainability Index' but, considering slightly modified versions, the specific indicator iterates in fact in 8 out of 16 surveyed indicator sets.

In the second thematic section of Solid Waste, the proposed embracing spectrum comprises the two quantitative indicators '6. Total collected municipal solid waste per capita (in ton/year)' and '7. Percentage of residential city population with regular solid waste collection (in %)', both from the ISO 37120 Core Indicator set. The Solid Waste indicator set is further complemented by the two qualitative indicators '8. Proportion of

municipal solid waste collected and managed in controlled facilities out of total municipal waste (estimates) generated, by cities (in %)' and '9. Municipal recycling rate, tons of material recycled (in %)', both from the SDG Indicator set. To complete the embracing set, the price indicator '10. Median price of solid waste disposal (in PPP/ton)' from the ADB City Data Book is added (see Table 29).

Table 29 - Proposed embracing spectrum of adaptive indicator set on Solid Waste

Solid Waste	6. Total collected municipal solid waste per capita (in ton/year) [i.a. ISO 37120 CI]
	7. Percentage of residential city population with regular solid waste collection (in %) [i.a. ISO 37120 CI]
	8. Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste (estimates) generated, by cities (in %) [i.a. SDG Indicators]
	9. Municipal recycling rate, tons of material recycled (in %) [i.a. SDG Indicators]
	10. Median price of solid waste disposal (in PPP/ton) [i.a. ADB City Data Book]

Source: Own elaboration

In the third thematic section of Transportation, the proposed embracing spectrum comprises the two quantitative indicators '11. Number of motorized vehicles per capita (in units/capita)' from the ISO 37120 Profile Indicator set and '12. Annual number of public transport trips per capita (in trips/year)' from the ISO 37120 Core Indicator set. The Transportation indicator set is further complemented by the two qualitative indicators '13. Average time (or length) of journey to work by private car (in minutes, or km)' from the Eurostat Indicator set and '14. Traffic Fatalities (number per 100.000)' from the City Prosperity Index. To complete the embracing set, the price indicator '15. Median amount of money spent on transportation (per household as a percentage of the median annual household income of tenants)' from the NUA Monitoring Framework Indicator set is added (see Table 30).

Table 30 - Proposed embracing spectrum of adaptive indicator set on Transportation

Transportation (Mobility)	11. Number of motorized vehicles per capita (in units/capita) [i.a. ISO 37120 PI]
	12. Annual number of public transport trips per capita (in trips/year) [i.a. ISO 37120 CI]
	13. Average time (or length) of journey to work by private car (in minutes, or km) [i.a. Eurostat Indicators]
	14. Traffic Fatalities (number per 100.000) [i.a. City Prosperity Index]
	15. Median amount of money spent on transportation (per household as a percentage of the median annual household income of tenants) [i.a. NUA Monitoring Framework Indicators]

Source: Own elaboration

In the last thematic section of Water, the proposed embracing spectrum comprises the two quantitative indicators '16. Total domestic water consumption per capita (in litres/day)' from the ISO 37120 Core Indicator set and '17. Number of household connections and ratio to number of households (in %)' from the ADB City Databook. The

Water indicator set is further complemented by the two qualitative indicators '18. Average annual hours of water service interruptions per household (in h/year)' from the ISO 37120 Supporting Indicator set and '19. Compliance rate of drinking water quality (in %)' from the ISO 37120 Core Indicator set. To complete the embracing set, the price indicator '20. Median price paid per 1000 liters of water in US dollars, at the time of year when water is most expensive (in PPP/1000l)' from the Habitat Urban Indicator set is added (see Table 31).

Table 31 - Proposed embracing spectrum of adaptive indicator set on Water

Water (City/Fresh/Drinking)	16. Total domestic water consumption per capita (in litres/day) [i.a. ISO 37120 CI]
	17. Number of household connections and ratio to number of households (in %) [i.a. ADB City Databook]
	18. Average annual hours of water service interruptions per household (in h/year) [i.a. ISO 37120 SI]
	19. Compliance rate of drinking water quality (in %) [i.a. ISO 37120 CI]
	20. Median price paid per 1000 liters of water in US dollars, at the time of year when water is most expensive (in PPP/1000l) [i.a. Habitat Urban Indicators]

Source: Own elaboration

As already mentioned in the methodological approach (Chapter 2.4), all indicators feature "quantity" and provide at the end measurable enumerating figures. Nonetheless, they can be differentiated between diverse characteristics of the surveyed content. Each sample team comprises two indicators related to "Quantity" (presented in green), two related to "Quality" (presented in purple), and one related to "Price" (presented in blue).

4.3   Assessment of suggested derived indicator spectrum

In early 2023, a consecutive case study to assess the derived indicator spectrum was initiated. Alike the pilot surveys, they were reviewed through a global assessment in municipalities of the global south. Although admittedly, a global qualitative survey in a single research could barely represent the multiple universes of cities in the global south, the obtained data from the ten contacted cities characterize nonetheless a 'diversity sample' and is heterogeneously distributed (see Chapter 2.5, Figure 25).

After merging the municipal data obtained via the online google questionnaire and offline via the tabularly excel sheet, an evaluation matrix was developed. To analyze the data and distill observations and tendencies on feedback gathered, the information was processed in the following template (Table 32). The entire data of the 1.200 answers obtained are compiled in Annex 9.

The general observations and tendencies on feedback gained about the six specific questions (outlined in Chapter 2.4) were:

- None of the preselected indicators is completely unclear or incomprehensible (Q1)
- None of the preselected indicators is completely useless or data impossible to collect (Q1 & Q2)
- The filtering and preselection of feasible indicator was decent and reasonable (Q1 & Q2)
- An embracing mix of indicators about quantity, quality & price is feasible and recommended (Q1 & Q2)
- The better the cities develop, the more indicators could be brought in, and data availability arises (Q2)
- When international and local experts were asked to provide better alternative indicators, they mainly couldn't (Q3)
- In general, very few alternative proxy indicators were suggested (Q3)
- The few suggested alternative indicators comprise rather modified phrasing, than a different approach (Q3)
- Among the four sectors, the 'Transportation' sector is the most difficult to obtain data (Q2, Q5 & Q6)
- Indicator 13 (average travel time) and indicator 15 (medium PPP spent on transport) seem the least feasible (Q2, Q4, Q5 & Q6)
- Reference data from former years are likely in the sectors 'Solid Waste' & 'Water' (Q4)
- Reference data from former years are not very likely in the sector 'Energy' (Q4)
- An adaptive proxy approach for different development levels seems advisable, as the availability of data is not dispersed homogeneously (Q4 & Q5)
- Data on the sector 'Energy' is likely to be collected at private entities (Q5)
- Data on the sector 'Solid Waste' is likely to be collected at the municipal level (Q5)
- Data on the sector 'Transport is likely to be collected at the municipal and state levels (Q5)
- Data on the sector 'Water' is likely to be collected at municipal & private entities (Q5)
- Most data can be obtained at least on a yearly basis (Q6)
- Data in the 'Water' sector is most frequently obtained (Q6)

Table 32 - Evaluation matrix on assessed indicators

Topic	Indicator	Q1: clarity (1 very clear, 5 very unclear)	Q2: difficulty (1 very easy, 5 very difficult)	Q3: new proxy indicator / Indicate source (if available)	Q4 Yes	Q4 No	Q4 Not sure	Q5 Municipal (public)	Q5 State (public)	Q5 Federal (public)	Q5 Other (private sector)	Q5 Not collected	Q5 Not sure	Q6 Monthly	Q6 Yearly	Q6 By census (e.g. 3-5y)	Q6 Only on demand/not regular	Q6 Not possible to collect	Q6 Not sure
Energy (electricity)	1. Residential power consumption per capita (in kWh/year)	1,6	2,7	Per capita electrical power purchased from supplier	4	5	1	3		2	5			5	3	1			1
	2. Percentage of residential city population with authorized electrical service (in %)	1,8	2,7	Payment Collected as a percentage of the per KWh	3	6	1	4	1	1	3	1		5	3	1	1		
	3. Average annual hours of electrical service interruptions per household (in h/year)	1,7	2,6		3	4	3	2	3	1	4			3	2		1		4
	4. Installed renewable energy-generating capacity (in watts/capita)	1,7	2,3	% of household with installed renewable energy systems	3	5	2	1	4	1	4			3	3	1	2		1
	5. Median price of kW/h (per household as a % of the median annual household income of tenants)	2,3	2,8		2	3	5	1	2	1	4		2	2	2	1	1		4
Solid Waste	6. Total collected municipal solid waste per capita (in ton/year)	1,4	1,5		9	1		10						4	4	1	2		
	7. Percentage of residential city population with regular solid waste collection (in %)	2,0	1,7		8	1	1	9	1					2	6	1	1		
	8. Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste (estimates) generated, by cities (in %)	2,4	2,8		6	2	2	8					2	2	2		2		4
	9. Recycling rate, tons of material recycled (in %)	1,7	2,8		5	1	4	8			1		1	2	2		1		4
	10. Median price of solid waste disposal for households (in PPP/ton)	1,7	2,5		7	1	2	10						4	3		1		2
Transportation / Mobility	11. Number of motorized vehicles per capita (in units/capita)	1,4	2,1		6	3	1	4	5	1				4	2	1	1		2
	12. Annual number of public transport trips per capita (in trips/year)	2,0	2,6		6	4		4	2	1	1	1	1	2	3		2		2
	13. Average time (or length) of journey to work by private car (in minutes, or km)	2,2	3,0		3	4	3	3	1	1		3	2	1	1	1	1	2	4
	14. Traffic Fatalities (number per 100.000 inhabitants)	1,7	2,4		6	3	1	5	3	1			1	3	2	1	2		2
	15. Median amount of money spent on transportation (per household as a % of the median annual household income of tenants)	2,0	3,1		2	2	6	3	3	1			3	1	2	1	1	1	4
Water (fresh / drinking)	16. Total domestic water consumption per capita (in liters/day)	1,4	2,0		7	2	1	5	1		4		1	6	2	1	2		
	17. Number of household connections and ratio to number of households (in %)	1,5	2,0		6	2	2	4	1		4		1	4	3		1		1
	18. Average annual hours of water service interruptions per household (in h/year)	2,0	2,7		5	2	3	4	1		3	1	1	6	1		2		1
	19. Compliance rate of drinking water quality (in %)	2,0	2,7	% of samples with non-std. values for fecal coliforms.	5	2	3	4	2		4			5	3		1		1
	20. Median price paid per 1000 liters of water in US dollars, at the time of year when water is most expensive (in PPP/1000l)	2,0	2,0		7	1	2	5	1		3	1	1	7	1		1		1
Legend		1,0-2,0	1,0-2,5		6-10	1-3	0-2	4-10	4-10	4-10	4-10	1	1	4-10	4-10	4-10	4-10	1	1
		2,1-2,5	2,5-2,9		4-5	4-5	3-4	2-3	2-3	2-3	2-3	2	2	2-3	2-3	2-3	2-3	2	2
		2,5-5,0	3,1-5,0		1-3	6-10	5-10	0-1	0-1	0-1	0-1	3-10	3-10	0-1	0-1	0-1	0-1	3-10	3-10

Side note on legend:

* If a proxy indicator is suggested, the consecutive questions Q4-Q6 refer to the proposed indicator.

- No need for alt. Indicator
- Alternative to be consid.
- Proxy indicator better

Once again, the methodological approach for analysis and weighing was applied, as outlined by: Kvale 1996; Marshall and Rossman 1998; Bauer and Gaskell 2000; Vieira 2009; and M. M. de Oliveira 2014.

Source: Own elaboration

Four of the distilled messages were key for the adaptive proxy approach further elaborated in the subsequent Chapter 5.1. Especially through questions 1 & 2 about the general understanding of the proposed indicators and the respective availability of data, the response pointed out, that the filtering and preselection of feasible indicators were decent and reasonable, and an embracing mix of indicators about quantity, quality & price is endorsed. Unfortunately, when the international and local experts had the opportunity to suggest better alternative indicators in question 3, they mainly couldn't provide enhanced proxies. However, an adaptive proxy approach for different development levels, as concluded in Chapter 3.4, seems still advisable, based on the confirming feedback obtained through questions 4 and 5. The availability of data differs and is not dispersed homogenously among the proposed indicators. Cities that lack governability or are understaffed might likely have an insufficient data situation regarding particular indicators. And finally, most data is feasible to be acquired at least on a yearly basis, according to the responses to question 6.

Through having a closer look at the principal guiding question 2 about the feasibility of obtaining data for the respective indicators, and especially though analyzing detected outlier responses[66] (Table 33), further specific observations and tendencies on access to data for indicators regarding size, human development, and regional distribution could be obtained.

Table 33 - Specific outlier responses assessment of question 2: 'Access to data'

Outlier responses on Q2		Med.	City	Country	HDI	Popul. (in k)
2	0	20,0	Curitiba	Brazil	0,792	1948
10	1	10,0	Moshi	Tanzania	0,549	184
5	1	5,0	Padang	Indonesia	0,705	909
11	4	2,8	Jakarta	Indonesia	0,705	10562
10	6	1,7	Rio de Janeiro	Brazil	0,796	6775
5	4	1,3	Kouga	South Africa	0,713	99
5	6	0,8	Durban	South Africa	0,713	3442
6	9	0,7	Beit Jala	Palestine	0,715	12
7	12	0,6	Yarinacocha	Perú	0,752	68
0	7	0,0	Freetown	Sierra Leone	0,477	1055

A ÷ B

Positive outlier answers: A	Negative outlier answers: B					Data situation
			If pos. A ÷ neg. B ≤ 1,5			GOOD
			If pos. A ÷ neg. B between 0,5 and 1,5			FAIR
	Colour legend:		If pos. A ÷ neg. B ≥ 0,5			BAD

Source: Own elaboration

---

[66] Further information on how positive and negative outlier responses were classified (respective to each of the 20 indicators of Q2) can be obtained in Annex 9.

Concerning the size of the municipality, the questionnaire did not substantiate the hypothesis that very small cities and urban areas face more challenges in obtaining data for indicators. Actually, the group of cities with a relatively "good" data situation compared to its peers of the diversity sample is quite heterogenous and includes large metropolitan areas (e.g., Jakarta and Rio) as much as they include regular metropolitan areas (e.g. Padang) and small to medium-size urban areas (e.g. Moshi). And on the other side of the spectrum, the worst city in this respect with a "bad" data situation compared to the others in the survey is not one of the smaller urban areas, but again a regular metropolitan area with a population over one million (Freetown). The data obtained indicate, that it depends rather on the local administration and internal organization/governance (e.g. the connectedness and linkage to other levels/stakeholders like the private sector and federal/state where data can be obtained) than on its sheer size and own population.

However, the observation and rule of thumb, that the higher the human development index is, the better a city administration can obtain data for indicators, could be partially confirmed. The most challenges with reliable data were obtained by the city administration with the lowest index (e.g. in Sierra Leone) and fewer difficulties by those with higher indexes (e.g. in Brazil). Individual negative outlier responses in this regard, like the only "fair" data situation from Yarinacocha/Peru, which would be expected to have better access to data according to the HDI, could be explained due to the remote location in the Amazon basin (less connectedness) and uneven HDI within the country. Other positive outlier responses, like from Moshi/Tanzania which would be expected to have more difficulties in obtaining data for this indicator, could be explained due to the regional importance as the tourist capital of the Kilimanjaro Region and its high connectedness and relevance to the country's GDP.

Finally, it was observed, that Asian and Latin American countries have in general slightly better access to data for indicators than their peers in sub-Saharan African countries. However, data indicate it is rather linked to the lower development index and menial connectedness in sub-Saharan Africa in general, than to the regional/spatial distribution.

Ultimately, also sector-specific observations and tendencies on how data are made available could be obtained through questions 4-6 in the evaluation matrix (Table 32). For instance, solid waste collection and freshwater distribution are in most cases tasks of the city administration and in one single hand or department. Therefore, the availability of

data is local/municipal, and the temporal frequency on which the respective data would be collected is quite high. Respectively, reference data from former years for the indicator would be available already within the respective municipality subdivision. Energy distribution in cities is in most cases organized by the private sector via a regional utility company in a regulated market environment. Nonetheless, the availability of data at the municipal level is still fairly high, as the metering and billing system is partially digitalized, and data is comparably transparent and impartial. Therefore, also the temporal frequency on which the respective data would be collected is quite high. However, as the data is stored by the private utility company, reference data from former years for the indicator would be harder to obtain. The transportation sector comprises mainly a heterogeneous mix of different local and regional service providers, with only a loose link to the city administration. Data is usually not stored uniformly and not digitalized. Correspondingly, most uncertainties about the availability/accessibility, temporal frequency, and storage of historical data are observed. Consequently, indicators in this specific sector must be hand-picked very carefully.

Further general observations about the imprecision of data across all four thematic sectors could be obtained. For instance, another reinforcing correlation detected was the fact, that cities with a lower HDI rate have usually a higher score of informality in the four surveyed sectors. Therefore, the procurement of officially available data is respectively further hampered, and obtained data might not fully represent the particular situation in the city. For example, according to the literature on urban waste management in the global south (D. C. Wilson, Velis, and Cheeseman 2006; Velis 2017) recycling rates of 20–30% are achieved by the informal sector in many lower-income countries. Thus, in the 'Solid Waste' sector, e.g. the indicator[67] about the municipal recycling rate and data about tons of material recycled most likely will not comprise information about the informal gathered and processed material, which represents a quite significant share in developing countries. Consequently, the trustworthiness and validity of information gathered through the indicators could be contested.

The same applies to other sectors. In 'Transportation' informal public transport "employ a large percentage of the overall work force" (Kumar, Zimmerman, and Arroyo Arroyo 2021). According to Cervero (2000), "in many poor cities, informal transport

---

[67] 'Solid Waste' Indicator B (initially indicator 9): Municipal recycling rate, tons of material recycled (in %) [i.a. SDG Indicators]

comprises as much as 15 percent of total employment". Respectively, numerous data about transportation might be hampered and partially compromised, not only data respective to the indicator on public transport[68]. Similar observations about informality and uneven data situations are perceived in the sectors of 'Water' (Garrick et al. 2019) and 'Energy' (Butera et al. 2016). Admittedly, there might be possibilities to measure the reliability of data, and discrepancies within the information obtained. E.g., in the 'Water' or 'Energy' sector, it could be gauged how much water/energy is provided in the system, and how much is being paid. The difference between those two might be a quite good approach to identify if the system works properly; if there are a lot of losses (in terms of maintenance); if there is stolen material; etc. But this kind of analysis would go beyond the scope of the current research and is therefore not further assessed.

In a nutshell, it is acknowledged that the data obtained in less developed city administrations is likely "softer", critical, or less reliable, and the further evolved the administrations are, the better and sounder the data situation gets. Thus, direct comparability between cities might always be challenged. Even the best possible selection of applicable indicators from the top globally recognized indicator sets will not be able to "heal" the insufficient data quality of cities. Nonetheless, the constant processing and application of data and indicators will lead possibly in the long run to information improvement and a more solid data baseline and data availability. Hence, the application of indicators should be encouraged also in cities that lack governability or are insufficiently prepared for sophisticated gauging parameters. To address and somehow mitigate the different quality levels in developing countries, an adaptive proxy approach is suggested in the following recommendation chapter.

4.4   Exemplified application of suggested indicator spectrum

In order to review the applicability and usefulness of the suggested indicator spectrum, data from open-access statistical city databases, annual records, yearbooks, and reports were requested from the liaison persons in the collaborating municipalities of the final case study assessment[69], to undertake an acid test (see Annex 10). The reply to this request was very broad, ranging from precise data and several links to very well-organized

---

[68] E.g. 'Transportation' Indicator D (initially indicator 12): Annual number of public transport trips per capita (in trips/year) [i.a. ISO 37120 CI]; or Indicator E: Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities (in %) [SDG Indicators]
[69] For the full list of contacted municipalities, see Table 17 in Chapter 2.5.

different public and private online source databases like in Jakarta[70], to a complete shortfall in open accessible data, like in Freetown.

The challenge for some cities is that data is often not readily available or shared between different public sector agencies. In the case of Freetown (Sierra Leone), the liaison person stated for example: "As a local authority we are often reliant on government agencies for data which can often be time-consuming in collecting the data required. I would suggest your request can better be met by cities with a more open approach to data sharing." (Williams 2023). In other words, data for indicators are not in all cities readily available but have to be collected sometimes on demand. Even for a simplified and regionally adapted set of indicators, sufficient resources (time and budget) must be allocated before any indicator assessment, to be able to obtain required data.

Another heads up was provided by the liaison person from Padang (Indonesia), who professed, that statistical data from the global south often falls short in accuracy and don't correspond to reality, either due to ignorance, lack of human power to have the statistics done, or "those responsible often simply make light of the situation, as that is much easier than actually working to improve the situation" (Rohmann 2023). This aspect must also be taken into account during any development assessment but would require further studies and was therefore not conclusively worked off during the research of this thesis (see also list of working limitations in the last chapter).

Nevertheless, different sample cities from Africa, Asia, and Latin America provided data and key performance indicators (KPI) from readily accessible open databases and statistical yearbooks. This information and values were contrasted with each other and briefly scrutinized for their comparability. To exemplify the application of the suggested indicator spectrum, the obtained sector data on 'Energy' from Curitiba was processed and juxtaposed. The provided sample data from Curitiba of the years 2022, 2017 and 2012 are presented in Table 34, indicating slight variations over time and some punctual improvements within the last 10 years.

---

[70] In total, the sample liaison person from Jakarta provided five data source links to the following three public and two private institutions:
- Central Statistic Agency (BPS) Jakarta: https://jakarta.bps.go.id/
- Province Sectorial Statistics (PPS) Jakarta: https://statistik.jakarta.go.id/
- Jakarta Provincial Government Open Data: https://data.jakarta.go.id/
- Katadata Media Network - DKI Jakarta: https://databoks.katadata.co.id/tags/dki-jakarta
- Open Streetmap - Data DKI Jakarta: https://openstreetmap.or.id/en/data-dki-jakarta/

Table 34 - Provided energy data from Curitiba (over time)

Compare same city over time:		Year:	2022	2017	2012
		Location:	Curitiba	Curitiba	Curitiba
#	Indicator description (parameter):		Value:	Value:	Value:
Energy (electricity):	1 Residential power consumption per capita (in kWh/year)		881	835	900
	2 Percentage of residential city population with authorized electrical service (in %)		99,98%	99,98%	99,98%
	3 Average annual hours of electrical service interruptions per household (in h/year)		7,98h	10,46h	10,25h
	4 Installed renewable energy-generating capacity in developing countries (in % or watts/capita)		92,8%	95,0%	93,2%
	5 Median price of kW/h (in US$ or per household as a percentage of the median annual household income of tenants)		$ 0,108	$ 0,133	$ 0,175

Color legend gauging indicators: Green = quantitative indicator; Purple = qualitative indicator; Blue = price indicator

Sources: (COPEL 2023; IPARDES 2023; ANEEL 2023b; EPE 2023, 2018, 2013; Instituto Acende 2020)

Regarding residential power consumption, the figures were relatively easy to obtain from the regional energy distribution company COPEL and indicate a stable consumption pattern. The minor variations between the years might be influenced by the annual climatic variations or linked to other particular consumption variables.

Also, the percentage of the residential city population with authorized electrical service remains stable at a very high level, at least when the figures from the Paraná Institute of Economic and Social Development (IPARDES) are considered[71]. However, some might challenge these figures, as the number of irregular households, e.g. in favelas, slums, and other illegal dwellings, are generally not adequately registered and considered. The non-technical losses in Brazil, which are most likely to be attributed to illegal tapping into electricity in favelas (so-called "*gatos*") amounted in 2020 up to 7,5% (ANEEL 2021). Therefore, as indicated before by Rohmann, the accuracy of the data is continuously at stake and often doesn't correspond to reality.

The average annual hours of electrical service interruptions per household could be obtained through the Brazilian Electricity Regulatory Agency (ANEEL) and their online database on continuity indicators, which is split up by the regional energy distributors and historically recorded since 2000. The data for the region of Curitiba show a significant alteration of -24% within the last 5 years, but apparently a stable situation between 2017 and 2012. When peaking back for more figures, the continuity values point out that the determined Equivalent Interruption Duration per Consumer Unit (DEC) was

---

[71] The Statistical Booklet of the Municipality of Curitiba issued by IPARDES indicate a total of 576.190 households in Curitiba, and further claims that 576.057 of these households have access to electrical energy. (IPARDES 2023)

even higher (13,54h in 2007 and 16,33h in 2002). This indicates that the distribution network considerably improved and substantially stabilized in recent years, but also during the last two decades, and the 2012 value is only an outlier in this otherwise positive performance improvement curve.

Data on the installed renewable energy-generating capacity could be obtained only on the state level, not on the municipal/city level, though the yearly National Energy Balance report, published by the Brazilian Ministry of Mines and Energy (MME) in collaboration with the public Energy Research Company (EPE). Similar to the second indicator, the obtained figures remain stable at a considerably high level, and the variations are likely due to the high share in regional hydro-energy generation, which is subject to fluctuations in the annual precipitation quantity.

Finally, data on the last indicator was provided in local currency once again by the regional energy distributor COPEL and then converted with the historic exchange rate of the respective year into US$. The obtained price indications revealed that the median price of kW/h increased in local currency[72], but decreased by -19% within 5 years, and -38% within 10 years when converted into US$. The energy prices in Curitiba indicate therefore an amortization of past investments and prudent budget allocation of the energy distributing company. However, critics might rightly point out, that in order to increase comparability, the indicator should ideally be calculated per household as a percentage of the median annual household income of tenants. Yet data containing these specific parameters are usually not ready on hand, and especially historic price data is in most cases only recorded and available in local currency. Therefore, once again deductions in data accuracy must be accepted, to be able to proceed with the assessment.

When urban development is assessed and compared to other cities, the situation gets more complex, and the provided data must be carefully checked for their comparability. The way data is collected and recorded likely diverges from city to city, and key parameters might change or might be interpreted differently. Exemplarily, the local energy distribution company in Curitiba COPEL (2023) pointed out, that there are several ways to calculate the average annual hours of electrical service interruptions per household. In Brazil, the indicator for service provision continuity is backed by the

---

[72] According to COPEL, the average price per kW/h was 0,56974 R$ in 2022, 0,44056 R$ in 2017 and according to 'Instituto Acende' 0,3571 R$ (COPEL 2023; Instituto Acende 2020).
The respective historic exchange rate applied was 5,28418 R$ per US$ for 2022, 0,44056 R$ per US$ for 2017, and 0,3571 R$ per US$ for 2012, as per currency converter Oanda
https://www.oanda.com/currency-converter/ (assessed 03.10.2023).

Normative Resolution n. 896/2020[73]. Supply interruptions are commonly evaluated in Brazil using specific indicators, because the mere sum of the interruption durations would cause distortion, given that an interruption that affected only one consumer unit would have the same weight as one that affected thousands of consumer units simultaneously. In the distribution segment in Brazil, it is therefore customary to adopt the indicators 'Equivalent Interruption Duration per Consumer Unit' (DEC) – the average time that, during the observation period, each consumer unit was without electricity, and 'Equivalent Interruption Frequency per Consumer Units' (FEC) – the number of interruptions that occurred, on average, during the observation period[74]. In other counties, the average annual hours of electrical service interruption per household might be calculated on different national standards or regulations. All obtained data must therefore be handled with care, in order to prevent misinterpretation or wrong assumptions.

The following Table 35 provides comparative data from two other participating cities, namely Rio de Janeiro and Jakarta, to juxtapose the obtained data from Curitiba from the year 2022 with similar peers of comparatively good data situation.

Table 35 - Provided energy data from Curitiba, Rio, and Jakarta (same year)

		Year:	2022	2022	2022
Compare cities with similar HDIs in different countries:		Location:	Curitiba	Rio	Jakarta
	# Indicator description:	Parameter:	Value:	Value:	Value:
Energy (electricity):	1 Residential power consumption per capita (in kWh/year)		881	2.251	1.388
	2 Percentage of residential city population with authorized electrical service (in %)		99,98%	100,00%	47,42%
	3 Average annual hours of electrical service interruptions per household (in h/year)		7,98h	6,32h	25h
	4 Installed renewable energy-generating capacity in developing countries (in % or watts/capita)		92,8%	14,8%	15,7%
	5 Median price of kW/h (in US$ or per household as a percentage of the median annual household income of tenants)		$ 0,108	$ 0,143	$ 0,094

Sources: (IPP 2023; ICS 2023; ANEEL 2023a; EPE 2023; Light 2023; BPS 2023a, 2023b; SSP 2023; ESDM 2023; SETKAB 2023)

The obtained data from the peer cities and respective energy distribution companies indicate that the residential power consumption per capita of Curitiba is relatively low. Reasons for the deviation could vary from the simple fact, that the compared cities are situated in very different climatic zones with divergent demands in residential cooling and heating, to the bold hypothesis that Curitiba might have

---

[73] See also: https://www.in.gov.br/web/dou/-/resolucao-normativa-aneel-n-896-de-17-de-novembro-de-2020-289455209 (accessed 03.10.2023)
[74] In the case of Curitiba (and Rio), the accumulative DEC gross was considered.

implemented already some advanced energy efficiency standards, which led to reduced energy consumption, compared to its peers. Any analysis, however, would require further deeper investigations. It is therefore refrained at this point to interpret the data satisfactorily or conclusively, as the function of this exercise is simply to exemplify the application and feasibility of the suggested indicator spectrum, but not to draw any conclusions on the sample cities themself.

The second indicator shows a very venturing picture of the local data situation obtained by the benchmarking cities. On the one hand, like Curitiba, Rio claims to have 100% coverage of the residential city population with authorized electrical service. On the other hand, Jakarta admits having only about half of its population covered with authorized electrical service. Although the data sources can be considered fairly reliable, the provided data must be challenged. In Rio, the data was obtained for the 'Sustainable Cities Institute' (ICS) and shows similar weaknesses as the data obtained from Curitiba. It once again seems that informal settlements are simply not considered adequately, and the data therefore doesn't correspond to reality. The data from Jakarta was provided by the 'Central Statistic Agency' (BPS), where a total population of 10.679.951 is listed, but according to the customer service units of the local service provider 'State Electricity Company', only 5.064.418 electricity customers are registered in 2022. This figure seems not to reflect reality as well, and the customer's counting must be challenged. An premature explanation would be, that the service provided mixed customers and households. However, Jakarta has according to the BPS only 2.788.989 households, and the hasty explanation therefore doesn't serve as justification. Again, the devil is in the details, and a deeper assessment of the obtained data must occur, to draw adequate conclusions, from which is once again refrained at this point of the research. The findings on the data discrepancy will be reflected in the next chapter when further recommendations on the indicators are proposed.

The third indicator of the average annual hours of electrical service interruptions per household is very well documented in Brazil through the Brazilian Electricity Regulatory Agency (ANEEL) and the data from Curitiba easily compared to its county peer in Rio, where the electricity network seems to be slightly more stable. On the other hand, data on this specific indicator could not be obtained as easily and concisely in Jakarta. The 'Province Sectorial Statistics' (SSP) Department of Jakarta was only able to provide a rough general figure for 2022, indicating a much higher rate of electrical service

interruptions compared to its peers in Brazil. For further analysis, more information would be once more required.

When assessing the fourth indicator, the installed renewable energy-generating capacity, the city, and regional context is very important to be considered. One could challenge, that most energy consumed within the city boundaries is actually not generated within the same territorial boundaries. Therefore, the data from the regional energy distribution company is usually provided by the city, which generates the energy in a broader spatial area, e.g., the state where the city is located. In the case of Curitiba, the state of Paraná comprises several hydroelectric power plants, among others the third largest hydroelectric power station of the world 'Itaipu'. Therefore, it is obvious that the renewable energy mix in Curitiba is influenced by the very high share of hydro energy, which is reflected also in the data obtained. Besides this special outlier, the data from Rio and Jakarta show a fairly similar renewable mix of hydro, solar, and wind energy, which is quite common in a regular context.

Closing with the application of the fifth indicator about the median price of kW/h, the provided data are, as explained earlier, vulnerable to the exchange rate, but can be nevertheless easily obtained and relatively accurately compared to each other. The provided figures show that Rio has the highest median price among the three cities, and Jakarta is only slightly below the energy tariff of its peer in Curitiba. But again, to provide the reason for the slightly different values, further information would be required and is not reflected in the mere supply of the values.

In summary, the exemplified acid test and crosscheck via the data sources revealed that although the indicators were preselected and passed the sieving process as outlined in Chapter 2.4, yet not 100% of the data could be obtained for all cities, and the obtained data might not always be satisfactory and must be challenged from time to time. All indicators need further extended reality checks and exemplified applications, to enhance and expand the applicability and feasibility on-site at the city or municipality level. Nonetheless, several similarities, lowest common denominators, and threats could already be identified, and lessons learned, which are further processed in the following chapter.

Concerning the vision of application on a broader scale, it must be admitted that out of working economics, the research focused on more tangible engineering and infrastructure topics such as energy supply. Due to this, other areas are not (yet) adequately assessed and represented. Ideally, the next iteration would be at a higher, more

complex qualitative level and include e.g. social, economic, natural, and political factors and their respective indicators. However, when developing these ideas further, one must consider that the problems and challenges already encountered in the rather tangible technical sectors mentioned above may be exacerbated by further complexity. The large informal sector and weak governance structure in the global south are also not favorable to social, economic, and political urban agendas. Nonetheless, a broader framework and scope are valuable in the future, to develop a systemic approach to urban development and the monitoring of progress. The presented steps in this chapter can guide the further development of a comprehensive mix of indicators in other sectors as well.

Conclusively, regarding the five key requirements mentioned in Chapter 3.3, the suggested indicator spectrum already attends mostly to the first three. It (1) adequately benchmarks the point of departure and monitor development, (2) provides comparability within the city over time as exemplified with the city of Curitiba, and (3) provides comparability among peer cities in comparable contexts and similar agendas as demonstrated through the cities of Rio de Janeiro and Jakarta. The derived embracing mix of indicators enables local municipalities to benchmark and compare data from before, during, and after the implementation of local urban agendas to assist on-site policy making, although admittedly not to the stage require for a deeper policy impact analysis. It also allows a city's administration to compare data from multiple southern municipalities at different developmental levels with similar urban agendas, who may compete for recognition or collaborate to identify best practices together. Moreover, city networks (such as UCLG, 'Connective Cities'[75]) and other regional, national, and international non-governmental organizations and federal enterprises that promote sustainable development (such as GIZ, ICS, ICLEI[76]) could benefit from this derived indicator spectrum. International development banks and funding organizations (like World Bank, ADB, KfW[77]) could set certain benchmarks using these indicators and link respective funding awards with certain requirements. The versatility of this contextualized 'southern' indicator spectrum matches its high demand. However, in order to succeed, it must also attend the remaining two key requirements, (4) be adaptive to development stages, uneven data situations, alterations, and new processes, and (5)

---

[75] 'Connective Cities', see also https://www.connective-cities.net/en/ (accessed 16.10.2023)
[76] 'Local Governments for Sustainability' (ICLEI), see https://iclei.org/ (accessed 16.10.2023)
[77] 'KfW Development Bank', see https://www.kfw-entwicklungsbank.de/International-financing/KfW-Entwicklungsbank/ (accessed 16.10.2023)

comprise local policy definitions and guidelines, as well as consider local governability and policy cycles. In other words, the spectrum must still be more flexible to reflect different needs and development levels. In the next chapter, recommendations are developed to further refine the spectrum and to address these final two key requirements, in order to increase and enhance the usability of the suggested indicator spectrum also for the international agenda debate and reflexivity.

5 RECOMMENDATIONS, SUGGESTIONS AND MECHANISMS

In order to address the final specific objective of this study, and to create recommendations, suggestions, and mechanisms based on the indicator set, the findings of the previous chapters are once again discussed in the context of prospects. To take the extremely varied settings and data situation of cities in the global south into account, an adaptive proxy approach for different development levels is proposed. Furthermore, regarding the influence of indicators on the policy loop, a closer look and review of previous findings is required. Further debate specifically about general and global agendas and analytical frameworks is also helpful to provide adequate recommendations and outcomes through the obtained data and study results.

5.1 Proposed adaptive proxy approach for different development levels

Cities of the global south are heterogeneous not only regarding continent, general location, culture, etc., but also concerning their governability, or the lack of available human power to process required statistics. Data availability may largely correlate with the status of development. Therefore, if a city in the global south has a certain level of development, the following proxy or lowest common denominator approach (Figure 30) with a flexible, dynamic, and adaptable indicator set is proposed, which can better represent the diversity of cities in the global south.

Figure 30 - Adaptability/different development levels: Minimum/Regular/Enhanced

Minimum indicator spectrum
E.g. for understaffed cities

Reduced spectrum:
- Indicator A
- Indicator B
- Indicator C

Regular indicator spectrum
For common cities of global south

Basic/consistent indicators:
- Indicator A
- Indicator B
- Indicator C
- Indicator D
- Indicator E

Enhanced indicator spectrum
E.g. for economical or political capitals

Enriched indicator:
- Indicator A
- Indicator B
- Indicator C
- Indicator D
- Indicator E
- Indicator F
- Indicator G

Source: Own elaboration

Cities that lack governability or the human power to collect the necessary statistics might leave out a couple of the more complex indicators, as indicated in the reduced/minimum (bronze) spectrum, and instead work with a more rudimentary, but

nonetheless embracing mix of indicators. The majority of cities should however be able to apply the basic/regular (silver) indicator spectrum. Cities with high or advanced internal standards could apply an enhanced and refined, custom-tailored (golden) indicator spectrum, according to their local city agenda, e.g., with increased emphasis on sustainability or a smart city approach. As the basis of indicators remains the same, it still enables cities of different development levels to compare themselves across peers and deepen their analysis where the capacity is present.

Taking the findings of the global survey gathered in the evaluation matrix of the previous chapter into account, the proposed adaptive proxy approach for the sample theme 'Energy' comprises the following indicators of Table 36:

Table 36 - Adaptive proxy indicator spectrum for 'Energy'

Minimum indicator spectrum:
A - Residential power consumption per capita (in kWh/year) [i.a. China Urban Sustainability Index]
B - Installed renewable energy-generating capacity in developing countries (in watts/capita) [i.a. SDG Indicators]
C - Median price of kW/h (per household as a percentage of the median annual household income of tenants) [i.a. ADB City Data Book]

Regular indicator spectrum:
D - Percentage of residential city population with authorized electrical service (in %) [i.a. ISO 37120 CI]
E - Average annual hours of electrical service interruptions per household (in h/year) [i.a. ISO 37120 SI]

Enhanced indicator spectrum:
F - Energy intensity measured in terms of primary energy and GDP (in TJ/GDP) [i.a. SDG Indicators]
G - Energy consumptions and related CO2 emissions products (in tons CO2/TJ per capita) [i.a. European Common Indicator]

Color legend gauging indicators: Green = quantitative indicator; Purple = qualitative indicator; Blue = price indicator

Source: Own elaboration

As all five assessed indicators have proven their applicability in the diversity sample of the global south, they are adopted in the 'Regular indicator spectrum' (A-E). As the quantitative indicator 1. and qualitative indicator 4. designated in Table 32 had slightly more relevance and accuracy[78] than their peer indicators 2. and 3., they comprise, together with the price indicator 5., the proxy 'Minimum indicator spectrum' (A-C). Concerning the 'Enhanced indicator spectrum' (A-G), the price indicator F and quality indicator G are proposed to enrich the regular set with additional gauging parameters regarding energy intensity and CO2 emissions.

The corresponding proposed adaptive proxy approach for the sample theme 'Solid Waste' comprises the following indicators of Table 37:

---

[78] For further details, see Chapter 4.4.

Table 37 - Adaptive proxy indicator spectrum for 'Solid Waste'

A - Total collected municipal solid waste per capita (in ton/year) [i.a. ISO 37120 CI]
B - Municipal recycling rate, tons of material recycled (in %) [i.a. SDG Indicators]
C - Median price of solid waste disposal (in PPP/ton) [i.a. ADB City Data Book]

D - Percentage of residential city population with regular solid waste collection (in %) [i.a. ISO 37120 CI]
E - Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste (estimates) generated, by cities (in %) [i.a. SDG Indicators]

F - Share of budget spent on operations and maintenance (in %) [i.a. ADB City Data Book]
G - Waste generation relative to consumption (kg per PPP) [i.a. OECD indicators]

Source: Own elaboration

As all five assessed indicators had again proven their applicability in the diversity sample of the global south, they are adopted as well in the 'Regular indicator spectrum' (A-E). As in the previous set, the quantitative indicator 6. and qualitative indicator 9. designated in Table 32 had slightly more relevance than their peer indicator 7. and 8., they comprise, together with the price indicator 10., the proxy 'Minimum indicator spectrum' (A-C). Concerning the 'Enhanced indicator spectrum' (A-G), the price indicator F and quality indicator G are proposed to enrich the regular set with additional gauging parameters regarding the O&M budget and waste generation relative to consumption.

The subsequent proposed adaptive proxy approach for the sample theme 'Transportation' comprises the following indicators of Table 38:

Table 38 - Adaptive proxy indicator spectrum for 'Transportation'

A - Number of motorized vehicles per capita (in units/capita) [i.a. ISO 37120 PI]
B - Traffic Fatalities (number per 100.000) [i.a. City Prosperity Index]
C - Cost of a combined monthly ticket (all modes of public transport) for 5-10 km in the central zone (in PPP) [Eurosat Indicator]

D - Annual number of public transport trips per capita (in trips/year) [i.a. ISO 37120 CI]
E - Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities (in %) [SDG Indicators]

F - Kilometres of bicycle paths and lanes per 100 000 population (in km) [i.a. ISO 37120 SI]
G - Median travel time (in min.) [ADB City Data Book]

Excluded indicators:
13. Average time (or length) of journey to work by private car (in minutes, or km) [i.a. Eurostat Indicators]
15. Median amount of money spent on transportation (per household as a percentage of the median annual household income of tenants) [i.a. NUA Monitoring Framework Indicators]

Source: Own elaboration

As the assessed qualitative indicator 13. and price indicator 15. had not proven comprehensive applicability in the diversity sample of the global south, they are excluded and substituted by slightly less complex indicators. Concerning indicator '13. Average

time (or length) of journey to work by private car (in minutes, or km)', several city administrations revealed challenges to data acquisition, as access to information regarding private cars is often limited. Therefore, the indicator was substituted by a newly proposed qualitative indicator E regarding access to public transport[79]. Indicator '15. Median amount of money spent on transportation (per household as a percentage of the median annual household income of tenants)' was also challenged, as the data situation and public access to knowledge about household spending are limited. Hence, the indicator was substituted by the new price indicator C regarding the cost of combined monthly tickets for public transport[79] (see Table 38). This latter indicator, together with the successfully assessed quantitative indicator 11. and qualitative indicator 14. form the 'Minimum indicator spectrum' (A-C). The 'Regular indicator spectrum' (A-E) comprises the quantitative indicator 12. Concerning the annual number of public transport trips per capita, in addition to the four previously mentioned indicators A, B, C & E. Finally, the 'Enhanced indicator spectrum' (A-G), the quantitative indicator F, and quality indicator G are proposed to enrich the regular set with additional gauging parameters regarding bicycle path kilometres and median travel time.

The last proposed adaptive proxy approach for the sample theme 'Water' comprises the following indicators of Table 39:

Table 39 - Adaptive proxy indicator spectrum for 'Water'

A - Total domestic water consumption per capita (in litres/day) [i.a. ISO 37120 CI]
B - Compliance rate of drinking water quality (in %) [i.a. ISO 37120 CI]
C - Median price paid per 1000 liters of water in US dollars, at the time of year when water is most expensive (in PPP/1000l) [i.a. Habitat Urban Indicators]

D - Number of household connections and ratio to number of households (in %) [i.a. ADB City Databook]
E - Average annual hours of water service interruptions per household (in h/year) [i.a. ISO 37120 SI]

F - Share of budget spent on operations and maintenance (in %) [i.a. ADB City Data Book]
G - Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (in %) [SDG Indicators]

Source: Own elaboration

As all five assessed indicators had once more proven their applicability in the diversity sample of the global south, they are adopted as well in the 'Regular indicator

---

[79] The newly introduced and proposed indicator E and C were not assessed during the global survey. However, it can be assumed, that due to the lower level of complexity, the availability of data on the respective two new proposed indicators is superior to the former indicator 13. and 15.
Moreover, as this thesis is a living document, the suggested indicators serve just as a first proposal, that (once applied and rolled out) must be assessed by far more cities and potentially be further adopted than it was feasible in this diversity sample survey.

spectrum' (A-E). As the quantitative indicator 16. and qualitative indicator 19. designated in Table 32 had a slightly better pertinence than their peer indicators 17. and 18., they comprise, together with the price indicator 20., the proxy 'Minimum indicator spectrum' (A-C). Concerning the 'Enhanced indicator spectrum' (A-G), the price indicator F and quality indicator G are proposed, to enrich the regular set with additional gauging parameters regarding the O&M budget and level of water stress.

By defining, selecting, and creating this newly introduced adaptive proxy approach for the derived indicator spectrum, it is assumed that progress in local urban agendas can be adequately benchmarked to the point of departure, and improvements can be monitored adaptively in various development stages, according to their local data situation, government potential, and policy cycle needs. The derived indicator spectrum and adaptive proxy approach claims not only to be able to provide comparative data for urban administrations with respect to previous years within the municipality to measure local progress, e.g., to be able to compare data from before, during, and after the implementation of a local urban agenda for on-site policy making. It would also be possible to compare data from multiple southern municipalities in different development levels with similar thematic urban agendas, who might even compete for international funding or would like to identify best practices together. It therefore attends also to the fourth key requirement requested by the community of the global south mentioned[80], to be adaptive to development stages, uneven data situations, alterations, and new processes, taking into account the different development levels. The proxy approach complements existing renowned indicator sets, without the intention to substitute them.

5.2 The role of indicators in the urban sustainability policy loop

As stated already in the introduction (Chapter 0.2), decision-makers in cities around the world are forced to take immediate action to mitigate and adapt to the urban challenges of our era, among others by virtue of environmental overburdening and climate change (Calthorpe 2010; J. A. P. de Oliveira et al. 2015; Lee and Hughes 2017), but also due to overpopulation (Day and Day 1973; Vidal and Scruton 2007; Gobbi 2016) and the limitation of resources (Hansen 1959; Meadows et al. 1972; Neuman 2005). The descriptions of the concept of city models are very often reproduced and used by local politicians, to differentiate their cities' actions and agendas and emphasize the respective

---

[80] See Chapter 3.3, Figure 29

regional priorities regarding their urban development pathways and goals. In that respect, politics serves as a main "conveyer" for the channelized transition and development of society, which in turn requires a solid base of sufficient information and data to avoid drawing false conclusions (Edelman 1964; Jervis 2010).

The critical review of existing indicators in Chapter 3 clarified that, in order to properly monitor the progress of urban development and the success or stagnation of local urban agendas, indicators are invaluable for decision-makers like policymakers and city planners, and the respective local policy loop. For policy evaluation, the development of reliable and robust indicators is key and substantial to assessing the extent to which a policy was successful. Indicators are therefore a crucial tool to gauge and monitor the evaluation progress of local agendas. They can help to show points of intervention and the effects of political actions. Most of the formerly developed indicators are organized according to strategic issues, led by policy goals, and set by political priorities. Therefore, according to Hall *et al.* (2001), "the main difference between indicators and other kinds of data is that the connection with policy is, or should be, explicit. Indicators are about the interface between policy and data".

The search for indicators of sustainable urban development is first and foremost the search for policy-relevant and coherent urban information that adheres to these criteria. However, as already observed, "all indicators suffer from the same basic problem that, ironically, is also their biggest advantage - condensing something highly complex into a few simple numbers" which might have even led to an unhealthy "obsession with numbers" (Morse 2004). There has not been theoretical consensus on how to measure current well-being or sustainability (UNECE, OECD, and Eurostat 2008; Stiglitz, Sen, and Fitoussi 2009; Görgens and Kusek 2009b), nor on indicator sets that are "universally accepted, backed by compelling theory, rigorous data collection and analysis, and influential in policy" (Parris and Kates 2003). Policies typically feature two basic characteristics: "incommensurability and strong uncertainty" (Marletto and Mameli 2012). In addition, Hanley *et al.* (1999) assert that "different indicators provide different insights for policy making" and consequently change through time. In the absence of decentralizing reforms and a lack of accurate indicators to measure progress, the complexity of managing inter-related development goals and agendas may present difficulties for municipalities with capacity constraints or similar challenges. This research won't be able to produce a single or simple solution to these challenges but tries

to contribute to an increased understanding of the complexity and point out directions for improvements.

The findings of the pilot and interim study in the global south with peers of local administrations confirmed these findings. As previously mentioned, though current international agendas are widely known, cities reported struggling with the actual implementation of these agendas and indicated several knowledge gaps during tentative applications. Furthermore, the indicator assessment and respective feedback gathered revealed loopholes in the applicability of international indicator sets that are not "tropicalized" or further locally adjusted.

There is no need for a theoretical consensus on how to measure current well-being or sustainability and a unique universally accepted set of indicators, as the diversity of sustainability in cities is prohibitive to a universal indicator set (see Chapter 1.3.3). The field study revealed rather the need for a more flexible and adaptive indicator spectrum to address local needs. It also confirmed the observation in Chapter 1.2.3 regarding the challenge to select adequate indicators in order to avoid misinterpretations, as each local background setting requires its own distinct approach and considerations. Even a perfect indicator set would not heal or solve the uneven quality of agendas and data situations. However, a flexible and adaptive indicator spectrum can help set and steer new local agendas (goal setting) to achieve a higher level of local development (albeit by multiple steps, e.g., in 5- or 10-year cycles) and evolve alongside the worldwide city chain (e.g., by size, political and economic importance, and development). This is also enforced by the observed local preference for already existing and proven national alternatives (see for instance the Jakarta example in Chapter 4.1), as municipalities appear to prefer to desire their personalized set of indicators according to their needs, current agendas, local availability of data, and national policies, rather than apply one fixed universally applicable set. According to UCLG (2019), several countries have therefore rather developed national statistical platforms with the involvement of local and regional governments.

With the proposed adaptive proxy approach (Chapter 5.1), incomparability among peer cities can be alleviated, as an agreed set of reduced minimum indicators spectrum (A-C) or a basic and consistent regular indicator spectrum (A-E) remains a constant foundation, allowing also the parallel comparison of cities with similar local agendas and comparable context. This adaptive proxy approach might come closer to the reality of local administrations and their demand, especially in the global south, where the local

governance of city administration and data situations differ significantly. It moreover supports the positive effect and mutual gain of adapting the approach in the urban context, where "policies implemented in particular sectors (such as transport, energy or waste) often generate multiple co-benefits in other areas", linking climate change and urban health across multiple sectors (J. A. P. de Oliveira et al. 2015). The results of this study also revealed that the outcome of indictor assessments should ideally be linked with the policy loop, especially with decision-makers such as policymakers and city planners, to enhance the applicability and relevance of applied indicator sets and improve the ability to monitor urban development and local agendas.

5.3   Final reflections on global agendas and their analytical framework

As outlined in the introduction, this study also endeavors to lessen the general research gap regarding the implementation of international urban agendas and increase awareness of the challenges of sustainable urban development in national and municipal management in the global south. To overcome common urban challenges and implementation barriers worldwide, as stated previously by Bai *et al.* (2016), a new systemic approach is imperatively required in urban research and policy investigations, especially for current analysis and urban decision-making. To preserve and enhance urban values, the challenges must be tackled on different levels and scales, simultaneously through scientific and ethical dimensions, as well as multiple actors and stakeholders. Additionally, each local urban agenda must be considered in the context of other international guidelines and sets of indicators. Therefore, the presented derived indicator spectrum and consecutive adaptive proxy approach claims to attend most, if not all the five key requirements mentioned in Chapter 3.3 (Figure 29), contemplating also the last fifth key requirement requested by the community of the global south, to be able to comprise local policy definitions and guidelines, as well as consider local governability and policy cycles.

The proposed spectrum and adaptive proxy approach can facilitate the transition and mitigate (although not solve) the five common urban challenges named by Oliveira *et al.* (2015) in Chapter 1.3. The direct application comprises the explicit and quantitative estimation and measurement of local agenda development, to improve the sectorial integration and decision-making, due to the easily accessible data, which facilitates the understanding and coordination. It further contributes to the long-term perspective of a

systemic approach to better integrated sectors, bring together different civil society stakeholders in the decision-making process, improve the design of service providers and reforms, as well as the general improvement of understanding and coordination among the different sectors.

A new systemic and dynamic approach has huge potential regarding urban transformations and plays therefore an important role in overcoming common urban challenges. However, it is not the only tool available for soft law governance, and it requires additional alternative mechanisms (e.g. knowledge transfer, exchange of good practices, etc.) to promote implementation in contrast to traditional hard policy mechanisms. It must be combined with other measures to achieve its full potential and assist good governance in the context of urban sustainability. In this regard, the potential of south-south and south-north exchanges is still very much underutilized.

Through the diversity sample study in the global south (Chapter 4.3), several preliminary findings of the literature review (Chapter 1) and critical review of existing indicators (Chapter 3) regarding the knowledge and implementation gap in the global south could be confirmed. E.g. institutional evolution and behavior, the failure to recognize the systemic nature of cities, the inadequacy of mental models, lack of incentives, inadequate decision-support systems, as well as path-dependency and lock-in. The urban system structure exemplifies the common international challenges of implementing urban agendas. The hierarchically oriented political-administrative system and the top-down mindset of many local representatives are some of the major challenges of governance when it comes to the implementation of urban agendas. A major stake and consequently one of the keys to the success of the sustainability of international urban agendas lay therefore in governance and the way that respective local level actors, such as municipalities, identify their role and responsibility in the implementation process.

The first chapter provided a better understanding of how modern urban agendas try to influence current habitats and overcome urban challenges. Local and global planning practices are in constant interaction and global collaborations can provide constructive feedback and deliver input to new international agendas themselves. The knowledge shared in global urban agendas, or the "knowledge translation", as it is called by Cociña *et al*. (2019), plays a key factor in success, and community-based actors located on the 'margins' of global processes have a central role in this process. Planning ideas no longer move only from global north to global south; there are many cross- and counter-currents, yet traditional north-south flow is still dominant. Hence, knowledge transfer

can't be seen as a mere top-down or north-south process but should be seen rather as a transfer of knowledge and exchange of good practices, regardless of origin. Global urban agendas must be shaped accordingly, and internationally agreed upon indicators (explicitly including indicators from the global south) can help to benchmark, monitor, and follow the progress of implementation.

Sustainable urban agendas aim to shape urban development based on long-term considerations and are aligned with overarching common social, economic, cultural, ecological, and spatial values. Of course, international agendas such as the SDGs and NUA and their analytical frameworks, which are designed to structure an analyst's thinking and to help logical thinking systematically, are also well known in the city administrations of the global south. The frameworks applied for urban agendas are usually policy-driven and follow a policy cycle system. Both policy and conceptual frameworks have their place in supporting different stages of the policy cycle. Indicators represent the "past or projected performance of different units", and are generated through a "process that simplifies raw data about a complex social phenomenon", as stated by Merry, Davis, and Kingsbury (2015). However, they frequently don't reflect the most urgent needs and realities of these cities. The analytical frameworks of these globally agreed upon agendas are models that rather aim to guide and facilitate policymaking and understanding of the global north.

This is partially reflected in the international standards for city performance indicators regarding sustainable urban development. As confirmed though the global survey, very often these international standards (like the ISO or GUID) are not even known in developing countries, and also partially not suitable to measure their performance adequately (see Chapter 4.1). For the development of future agendas, an enhanced involvement of the analytical framework from a "southern" point of view should be promoted to tackle the lack of preparedness and increase the acceptance of such agendas. One possible directive includes the addition of more simplified indicators, criteria, and targets which are already available and applied in most developing countries and emerging economies, shifting the focus and point of view of the development needs of the global north towards the reality of less privileged areas of the world. As a precondition, the use of these simplified standards must be applicable and relevant in the less developed context of the global south, and data should be available and inexpensive to collect.

A final recommendation goes to the current academic world itself, which continues to be very focused on the northern hemisphere, partially due to the current allocation of research funds. As Walton (1982) noted, most research work is not really comparative and its geographical focus has historically centered on the advanced countries of Europe and North America. Contrary to other fields of study, urbanist researchers are still reluctant to perform comparative studies, although there are existing strategies and methodologies for comparing cities. Due to the research gap in developing countries regarding successful southern implementations, lessons of the past were not learned or applied adequately to future agendas.

According to Robinson (2011), this division phenomenon of research in urban studies calls "for an international and post-colonial approach" and "revitalized and experimental international comparativism". In fact, the slogan 'LNOB - Leave no one behind' of the Agenda 2030 applies to researchers and academic circles around the globe as well and should therefore also serve as their compass. This research is intended to be a small jigsaw piece in the ocean of unexplored science in this field and motivate other researchers to draw their attention to the global south as well, to avoid the underuse of its huge and underestimated potential. Especially as the worldwide growth of cities is concentrated mainly in the global south, academics should focus more on researching dominant factors, address the common international challenges, and further loop their findings back into lessons learned for new international agenda settings and set the stage for policy making.

6   CONCLUSION

To conclude and summarize what has been done so far, a brief review of the initial hypothesis and research question of the study, which encompasses mainly the **'lack of preparedness and acceptance in the global south to monitor development'** in the context of urban growth, is useful to reinforce the context of the work. Four assumptions were made at the beginning of this research. They can be condensed into the following points:

- Very often, there is a **lack of local governance** and ownership of society on the national level in implementing international urban agendas. In particular, developing countries and emerging economies very often struggle with the implementation of these agendas.

- In the global south, there is a **lack of preparedness** for such agendas, due to the research and knowledge gap in developing countries regarding successful southern implementations.

- Cities and municipalities in many developing countries **lack management tools and reliable indicators** for successful implementation and monitoring of progress.

- In particular, due to partial incompatibility with current northern indicator sets (e.g., lack of applicability, absence of relevance, lack of availability of data) and certain commonalities and differences between the spheres, a **new tailor-made set of indicators might be necessary for the global south.**

These four assumptions and presumed issues have led to the principal research questions: **Is a fixed common "southern" indicator set possible? And if yes, what kind of set would it be?**

This thesis attempted to analyze these assumptions and finally provide an answer to the key question highlighted. The study sought to clarify and elaborate further on the first two points and gain an understanding of existing urban agenda applications in developing cities at the executing municipal level, to improve preparedness, actions, and acceptance for successful implementation, fulfilling the first specific objective of the study. Additionally, definitions for the work were determined, specifically concerning the scope of developing countries of the global south and the sustainable urban agendas, to improve the focus of the research.

International experiences in implementing urban agendas were examined, especially regarding adequacy of indicators, knowledge transfers, and experiences of ongoing and already implemented agendas. To summarize, the assessment confirmed the general hypothesis, that **global sets of indicators are partially incompatible with the global south situation**. Due to the context in the global south and their status of development, cities have difficulties adhering to the demands of global north agenda data sets. Besides, there is the additional intricacy of the diverse situations in the global south. The lack of ample urban data, adequate indicators, and baseline studies are in many cases obstacles to the process of successful implementation. These findings were backed by the pilot overview survey of the research, where struggles with the actual implementation of these agendas and potential knowledge gaps during the application were reported.

Additionally, knowledge transfer can't be seen as a mere top-down or north-south process, but rather as a knowledge application and an exchange of good practices, regardless of its origin. The overarching challenge of these international shortcomings is the ability to adequately measure and benchmark the status and progress of global and national urban agendas within the regional and local context, as well as the diversity of realities and development stages these agendas represent. To elaborate further on this third point, this study attempted, with a conscious look at existing indicators, to analyze and critically review monitoring instruments and indicators of the non-binding doctrinaire documents for implementation on national federal, and local municipal levels, fulfilling the second specific objective of the study. Importantly, the main characteristics of successful indicators are "simple" and "inexpensive to collect". Furthermore, recommended indicators should advisably consider all five key principles of quality criteria (relevant, methodologically sound, measurable, easy to communicate and access, limited in number and outcome-focused), cover recurrent confined sectors, and preferably comprise directional or specific targets and solid baselines, to facilitate the consecutive monitoring process.

Several sample urban indicators were traced, in particular the ISO 37120, and compiled further in a list of globally recognized and adopted indicator sets (Annex 6), to gain an understanding of the monitoring process and to scrutinize the viability of these existing indicators in light of the reality of the global south. The challenge for urban authorities is deciding which tool best addresses the needs and goals of a particular city, which should also be easy to implement and worth the financial and human effort. Ideally, they should be assessed beforehand through comparative pilot testing.

However, UNECA, UCLG, and other internationally recognized organizations have already provided a heads-up regarding the still limited general dissemination of international standards in the global south, especially in secondary cities that are globally less interlaced, and where the transnational political focus is less pronounced. The conducted interim assessment acknowledged the observations of the previous assessment of urban indicators in developing countries and confirmed that most municipalities queried by the global survey were not familiar with or not even aware of the existence of such international monitoring standards and indicator sets.

This led to the last assumption summarized in the final point, that a new tailor-made set of indicators might be necessary for the global south. This study introduced quality indicators deliberately for cities that already have an approach to sustainability but have a lower capacity to benchmark and measure sustainable urban development. The new indicator spectrum was then assessed through case studies with international municipal experts of developing cities and municipalities to extend the reach and success of urban agendas in the future and improve their evaluability, fulfilling the third specific objective of the study. To narrow the analysis to a workable number of indicators, the focus was restricted to the four recurrent confined technical sample sectors 'Energy, Solid Waste, Transportation, and Water'. After filtering the previously compiled indicators through the sieves of "relevance", "applicability", and "availability of data", an embracing mix of five new pilot indicators per theme was selected, comprising the main gauging characteristics of quality, quantity, and price.

The newly derived indicator spectrum was reviewed through a global assessment in municipalities of the global south. The two key findings of the survey and responses obtained revealed that (1) the filtering and preselection of feasible indicators was serviceable and reasonable, and an embracing mix of indicators covering quantity, quality & price is well-received; and (2) an adaptive proxy approach for different development levels seems advisable, as the availability of data differs and is not equal among the proposed indicators. Furthermore, the survey acknowledged that the data obtained in less developed city administrations is likely "softer" or less reliable, and the further evolved the administrations are, the better and sounder the collected data becomes. Even the best possible selection of applicable indicators from the top globally recognized indicator sets will not be able to "heal" the insufficient data quality of less developed cities.

This summary returns to the principal research question, as stated above. The answer, however, is rather complex: **A fixed common "southern" indicator set can**

only partially be generated or determined, because such a set would have to be contextually adaptive, and a trade-off must be made between something that is comparable and the lowest common denominator. The realities, settings, and needs of cities in the global south are too varied to be covered by one fixed set. They are dissimilar not only in continent, general location, culture, etc., but also concerning their governability, or the lack of human power to process the required statistics, as data availability may largely correlate with their status of development.

The created recommendations, suggestions, and mechanisms fulfil the fourth and last specific objective of the study and propose an adaptive proxy approach for different development levels. This lowest common denominator approach with a flexible, dynamic, and adaptable indicator set can better attend to the diversity of municipalities in the global south. By defining, selecting, and creating this newly introduced adaptive proxy approach for the derived indicator spectrum, it is assumed that progress in local urban agendas can be adequately measured and benchmarked in various development levels, according to their government potential and needs.

To complete the study, the influence of the indicators on the policy loop was assessed, and a debate about general and global agendas was initiated. The results of the study revealed that the outcome of indicator assessments should ideally be communicated to decision-makers such as policymakers and city planners, to enhance the applicability and relevance of applied indicator sets and increase the monitoring quality of urban development and local agendas. In this specific case, the general findings and the four presented adaptive proxy indicator spectra (minimum, regular, enhanced) of the sample sectors could be, for instance, further validated, to enhance and promote their applicability. But as in any study, certain work limitations must be defined, in order to be able to conclude one research cycle and start a new one.

There are still several underexplored aspects, which also reveal the limitations of this thesis for immediate ample application and roll-out. For instance, the assessment of the applicability of the suggested indicator spectrum is limited to the current thematic sectors, regions and collaborating city administration. A broader range of spatial areas, countries and sector areas could not be assessed. Several topics were not further elaborated, like informalities and their respective challenges which play a significant role in the global south. In this respect, the complexity and diverse situation of the global south must be acknowledged and deserve further investigations. Also, dynamic elements, e.g., regarding urban growth and specifically the speed of growth, are not analysed to an

adequate level. Furthermore, the issues of uneven data quality and accuracy of statistical databases are not reviewed to the desired extent, which the topic would deserve.

It would therefore be desirable if this research will open new perspectives and enhance discussions in interdisciplinary groups of experts, broaden the debate, to further improve the presented indicator spectrum, and possibly create a new benchmark system. For instance, the current indicator spectrum could be broadened, and more social, economic, cultural, ecological/environmental, and spatial indicators further introduced by a multidisciplinary group of researchers to the so far rather infrastructure-biased set of the four recurrent thematical subject samples. Also, the above-mentioned topics of informalities, dynamic elements, uneven data quality and accuracy of statistical databases, which reflect the multifaceted and diverse realities of the global south, require additional research and could be further assessed. Likewise, a debate about how, or to whom this data is made available, and rules for data accessibility and disclosure could be meaningful, as it makes a big difference which data do or do not exist, and whether they are accessible and to whom, especially in the context and new age of artificial intelligence and new software applications like ChatGPT. This also applies to the reliability and trustworthiness of processed data, as having public access to quality data is a crucial condition for peaceful and informed debates on social-economic matters and public policies. In the current digital age, access to basic information on the distribution of income and wealth growth should be considered as a public good.

The above highlighted areas of research limitations of this thesis and disclaimers are not conclusive and could be further expanded almost infinitely, as the current working scope is a unilateral decision, to conclude a specific research cycle. As a first next step, additional assessments of the derived indicators spectrum could be undertaken, with more data from other locations. Consecutively, the responses of the complementary municipalities could be evaluated in relation to the requested data, and further, more refined indicators and supplementary proxies, be proposed, before broadening the scope towards an interdisciplinary group of experts.

Hopefully, this thesis inspires other researchers and leaves its active readers with the desire to take up the torch, continue with research on international urban agendas, and enhance the scientific global picture of sustainable development in cities of the global south and its indicators for implementation.

REFERENCES

Abbott, Kenneth W., and Duncan Snidal. 2000. "Hard and Soft Law in International Governance." *International Organization* 54 (3): 421–56. https://doi.org/10.1162/002081800551280.

Albanna, Basma, Julia Handl, and Richard Heeks. 2021. "Publication Outperformance among Global South Researchers: An Analysis of Individual-Level and Publication-Level Predictors of Positive Deviance." *Scientometrics* 126 (10): 8375–8431. https://doi.org/10.1007/s11192-021-04128-1.

Ali-Toudert, Fazia, and Limei Ji. 2017. "Modeling and Measuring Urban Sustainability in Multi-Criteria Based Systems — A Challenging Issue." *Ecological Indicators* 73 (February): 597–611. https://doi.org/10.1016/j.ecolind.2016.09.046.

Altenhain, Claudio. 2016. "Tropicalizing Surveillance: How Big Data Policing 'Migrated' from New York to Sao Paolo." In *IV Simposio Internacional LAVITS*, 13. Buenos Aires. https://www.researchgate.net/profile/Claudio_Altenhain/publication/311497419_T ropicalizing_Surveillance/links/58494e1608ae5038263d60f0.pdf.

Álvarez Rivadulla, María José, and Diana Bocarejo. 2014. "Beautifying the Slum: Cable Car Fetishism in Cazucá, Colombia." Edited by Intergovernmental Panel on Climate Change. *International Journal of Urban and Regional Research* 38 (6): 2025–41. https://doi.org/10.1111/1468-2427.12201.

Ambiente Italia Research Institute. 2003. "European Common Indicators - Towards a Local Sustainability Profile." Milano, Italy. https://publications.europa.eu/en/publication-detail/-/publication/33eba485-e1e3-4748-9358-0d66ef86bcc3.

American Planning Association. 2006. *Planning and Urban Design Standards*. John Wiley & Sons. https://books.google.com.br/books?hl=en&lr=&id=3spWR8wdGaQC&oi=fnd&pg =PR9&dq=Planning+and+urban+design+standards&ots=vEMFW_nO2-&sig=xMaMauLzS6FtWkLj9JHSpdejGa8&redir_esc=y#v=onepage&q=Planning and urban design standards&f=false.

Andrade, Elisabete Agrela de, and Maria Cristina Trousdell Franceschini. 2017. "O Direito à Cidade e as Agendas Urbanas Internacionais: Uma Análise Documental." *Ciencia e Saude Coletiva* 22 (12): 3849–58. https://doi.org/10.1590/1413-812320172212.24922017.

ANEEL. 2021. "Perdas de Energia Elétrica Na Distribuição." Vol. 2021. https://antigo.aneel.gov.br/documents/654800/18766993/Relatório+Perdas+de+En ergia_+Edição+1-2021.pdf/143904c4-3e1d-a4d6-c6f0-94af77bac02a.

———. 2023a. "Indicadores de Continuidade - Região Sudeste." 2023. https://www2.aneel.gov.br/aplicacoes_liferay/indicadores_de_qualidade/pesquisa.c fm?regiao=SE.

———. 2023b. "Indicadores de Continuidade - Região Sul." 2023.

https://www2.aneel.gov.br/aplicacoes_liferay/indicadores_de_qualidade/pesquisa.c
fm?regiao=SU.

Arcadis. 2015. "Sustainable Cities Index - Balancing the Economic, Social and
Environmental Needs of the World's Leading Cities." Amsterdam, Holland.
https://s3.amazonaws.com/arcadis-whitepaper/arcadis-sustainable-cities-index-
report.pdf.

———. 2018. "Citizen Centric Cities - The Sustainable Cities Index 2018."
Amsterdam, Netherlands.
https://www.arcadis.com/campaigns/citizencentriccities/images/%7B1d5ae7e2-
a348-4b6e-b1d7-6d94fa7d7567%7Dsustainable_cities_index_2018_arcadis.pdf.

———. 2019. "GRI Standards Content Index." Amsterdam, Netherlands.
https://arcadis.com/-/media/project/arcadiscom/com/about-
arcadis/global/sustainability/non-financial-reporting/the-gri-
standards/arcadis_gri_content-index_2019.pdf.

Armondi, Simonetta. 2012. "What We Talk about When We Talk about Productive
Territories: The Case of Shrinking Italy." *International Journal of Architectonic,
Spatial, and Environmental Design* 6 (3): 61–76. https://doi.org/10.18848/2325-
1662/CGP/v06i03/38342.

Armondi, Simonetta, and Antonella Bruzzese. 2017. "Contemporary Production and
Urban Change: The Case of Milan." *Journal of Urban Technology* 24 (3): 27–45.
https://doi.org/10.1080/10630732.2017.1311567.

Arteaga Arredondo, Isabel, Diva Marcela García, César Ernesto Guzmán Guzmán, Jose
Mario Mayorga, and Jose Mario Mayorga. 2017. "El Espacio Público de Los
Puentes Peatonales: Lecciones Del BRT de Bogotá." *Revista Urbano* 20 (36): 104–
14. https://doi.org/10.22320/07183607.2017.20.36.09.

Atkinson, Giles, Simon Dietz, and Eric Neumayer. 2007. *Handbook of Sustainable
Development*. Edited by Edward Elgar. Cheltenham, UK & Northampton, MA,
USA: Edward Elgar Publishing Limited. https://doi.org/10.1093/erae/jbv009.

Atkinson, Rowland., and Gary. Bridge. 2005. *Gentrification in a Global Context: The
New Urban Colonialism*. Edited by G. Bridge. New York, London: Routledge.
https://doi.org/10.4324/9780203392089.

Bai, Xuemei, Alyson Surveyer, Thomas Elmqvist, Franz W. Gatzweiler, Burak
Güneralp, Susan Parnell, Anne Hélène Prieur-Richard, et al. 2016. "Defining and
Advancing a Systems Approach for Sustainable Cities." *Current Opinion in
Environmental Sustainability* 23: 69–78.
https://doi.org/10.1016/j.cosust.2016.11.010.

Bansard, Jennifer S., Philipp H. Pattberg, and Oscar Widerberg. 2017. "Cities to the
Rescue? Assessing the Performance of Transnational Municipal Networks in
Global Climate Governance." *International Environmental Agreements: Politics,
Law and Economics* 17 (2): 229–46. https://doi.org/10.1007/s10784-016-9318-9.

Barbassa, Juliana. 2015. *Dancing with the Devil in the City of God : Rio de Janeiro on*

the Brink. Touchstone.

Barbosa, José Amarilio, Luís Bragança, and Ricardo Mateus. 2014. "New Approach Addressing Sustainability in Urban Areas Using Sustainable City Models." *International Journal of Sustainable Building Technology and Urban Development* 5 (4): 297–305. https://doi.org/10.1080/2093761X.2014.948528.

Barnett, Clive, and Gary Bridge. 2016. "The Situations of Urban Inquiry: Thinking Problematically about the City." *International Journal of Urban and Regional Research* 40 (6): 1186–1204. https://doi.org/10.1111/1468-2427.12452.

Barnett, Clive, and Susan Parnell. 2016. "Ideas, Implementation and Indicators: Epistemologies of the Post-2015 Urban Agenda." *Environment and Urbanization* 28 (1): 87–98. https://doi.org/10.1177/0956247815621473.

Barrutia, Jose M., Carmen Echebarria, Mario R. Paredes, Patrick Hartmann, and Vanessa Apaolaza. 2015. "From Rio to Rio+20: Twenty Years of Participatory, Long Term Oriented and Monitored Local Planning?" *Journal of Cleaner Production* 106: 594–607. https://doi.org/10.1016/j.jclepro.2014.12.085.

Batista, Marcela Moraes, and Tharsila Maynardes Dallabona Fariniuk. 2017. "Mechanisms of the Smart City: A Case Study of Smart City Búzios, Brazil." *PlaNext - next Generation Planning* 4 (July): 27–40. https://doi.org/10.24306/plnxt.2017.04.003.

Batty, Michael. 2016. "Preface, p.2." In *The Social Fabric of Cities*, edited by Vinicius M. Netto, 1–250. London and New York: Routledge. https://doi.org/10.4324/9781315552804.

Bauer, Martin W., and George Gaskell. 2000. *Pesquisa Qualitativa Com Texto, Imagem e Som: Um Manual Prático,*. Editora Vozes. https://www.amazon.com.br/Pesquisa-qualitativa-com-texto-imagem-ebook/dp/B076H3W1PH.

Bell, David, and Mark Jayne. 2004. *City of Quarters: Urban Villages in the Contemporary City*. *City of Quarters*. Routledge. https://doi.org/10.4324/9781315260181.

Ben-Akiva, Moshe, and Steven R. Lerman. 1979. "Disaggregate Travel and Mobility Choice Models and Measures of Accessibility." In *Behavioural Travel Modelling*, edited by David A. Hensher and Peter R. Stopher, 654–679. London: Croom Helm. https://www.worldcat.org/title/behavioural-travel-modelling/oclc/954126745.

Blicharska, Malgorzata, Richard J. Smithers, Magdalena Kuchler, Ganesh K. Agrawal, José M. Gutiérrez, Ahmed Hassanali, Saleemul Huq, et al. 2017. "Steps to Overcome the North-South Divide in Research Relevant to Climate Change Policy and Practice." *Nature Climate Change* 7 (1): 21–27. https://doi.org/10.1038/nclimate3163.

Bocarejo, Juan Pablo, Ingrid Portilla, and David Meléndez. 2015. "Social Fragmentation as a Consequence of Implementing a Bus Rapid Transit System in the City of Bogotá." *Urban Studies* 53 (8): 1617–34.

https://doi.org/10.1177/0042098015588739.

Bocarejo S., Juan Pablo, and Daniel Ricardo Oviedo H. 2012. "Transport Accessibility and Social Inequities: A Tool for Identification of Mobility Needs and Evaluation of Transport Investments." *Journal of Transport Geography* 24 (September): 142–54. https://doi.org/10.1016/j.jtrangeo.2011.12.004.

Bonduel, Ludovic. 2018. "Smart City Development: The Milan Model." The Urban Media Lab. 2018. https://labgov.city/theurbanmedialab/smart-city-development-the-milan-mode/.

Borges, Vavy Pacheco, Ruy Moreira, and Carlos Benedito Martins. 1990. *O Que É: História - Geografia - Sociologia*. Edited by Circulo do Livro. Primeiros Passos.

Boykoff, Jules. 2013. *Celebration Capitalism and the Olympic Games. Celebration Capitalism and the Olympic Games*. Routledge. https://doi.org/10.4324/9780203370421.

BPS. 2023a. "BPS-Statistics of DKI Jakarta Province." Central Statistics Agency (BPS). 2023. https://jakarta.bps.go.id/indicator/7/178/1/jumlah-daya-kwh-terjual-menurut-tarif-dan-cabang-di-provinsi-dki-jakarta.html.

———. 2023b. "BPS-Statistics of DKI Jakarta Province." Central Statistics Agency (BPS). 2023. https://jakarta.bps.go.id/indicator/7/174/1/jumlah-pelanggan-listrik-menurut-unit-pelayanan-pelanggan-di-provinsi-dki-jakarta.html.

Brandt, Willy. 1980. *North-South: A Programme for Survival: Report of the Independent Commission*. Pan Books. https://books.google.com/books/about/North_South_a_Programme_for_Survival.html?id=yS-7AAAAIAAJ.

Brazidec, Nicolas Le. 2009. "Distance et Fragmentation Urbaine Dans Une Métropole Brésilienne : L ' Exemple de Porto Alegre." *ATALA* 12: 139–155.

Brinck, Ben ten. 1991. "The AMOEBA Approach as a Useful Tool for Establishing Sustainable Development." In *In Search of Indicators of Sustainable Development*, edited by Onno Kuik and Harmen Verbruggen. Dordrecht: Springer Netherlands.

Broudehoux, Anne-Marie. 2013. "Neo-Liberal Exceptionalism in Rio de Janeiro's Olympic Port Regeneration." In *The Routledge Companion to Urban Regeneration*, edited by Michael E. Leary and John McCarthy, 558–568. Routledge. https://books.google.com.br/books?id=PULfAQAAQBAJ&pg=PA558&dq=Neo-Liberal+Exceptionalism+in+Rio+de+Janeiro's+Olympic+Port+Regeneration&hl=en&sa=X&ved=0ahUKEwjXiu268enlAhXFD7kGHe98AkUQ6AEIKzAA#v=onepage&q=Neo-Liberal Exceptionalism in Rio de Janeiro's Olym.

Butera, Federico Maria, Paola Caputo, Rajendra Singh Adhikari, and Angelo Facchini. 2016. "Urban Development and Energy Access in Informal Settlements. A Review for Latin America and Africa." *Procedia Engineering* 161: 2093–99. https://doi.org/10.1016/j.proeng.2016.08.680.

Calthorpe, Peter. 2010. *Urbanism in the Age of Climate Change*. Washington, DC: Island Press. https://doi.org/10.5822/978-1-61091-005-7.

Caprotti, Federico, Robert Cowley, Ayona Datta, Vanesa Castán Broto, Eleanor Gao, Lucien Georgeson, Clare Herrick, Nancy Odendaal, and Simon Joss. 2017. "The New Urban Agenda: Key Opportunities and Challenges for Policy and Practice." *Urban Research & Practice* 10 (3): 367–78. https://doi.org/10.1080/17535069.2016.1275618.

Cardoso, Isabel Cristina da Costa. 2013. "O Papel Da Operação Urbana Consorciada Do Porto Do Rio de Janeiro Na Estruturação Do Espaço Urbano: Uma 'Máquina de Crescimento Urbano'? Isabel." *O Social Em Questão* n°29 (January): 69–100.

Carolini, Gabriella Y. 2017. "Sisyphean Dilemmas of Development: Contrasting Urban Infrastructure and Fiscal Policy Trends in Maputo, Mozambique." *International Journal of Urban and Regional Research* 41 (1): 126–44. https://doi.org/10.1111/1468-2427.12500.

Castro, Demian Garcia, Christopher Gaffney, Patrícia Ramos Novaes, Juciano Martins Rodrigues, Carolina Pereira dos Santos, and Orlando Alves dos Santos Junior. 2015. *Rio de Janeiro: Os Impactos Da Copa Do Mundo 2014 e Das Olimpíadas 2016*. Observatório das Metrópoles, Rio de Janeiro: Letra Capital Editora. http://www.observatoriodasmetropoles.net/images/abook_file/livro_megaeventos_2015.pdf.

Cervero, Robert. 2000. "Informal Transport In the Developing World." *UN Habitat*, 117–44. http://mirror.unhabitat.org/pmss/getElectronicVersion.aspx?nr=1534&alt=1.

Chapman, Ben. 2016. "Rio 2016: The Richest Games in 120 Years of Olympic History." *Independent Online*, 2016. https://www.independent.co.uk/news/business/analysis-and-features/rio-2016-olympic-games-richest-ever-usain-bolt-mo-farah-a7171811.html.

Charmaz, K. 2006. *Constructing Grounded Theory: A Practical Guide through Qualitative Analysis*. Sage Publishers Inc. https://books.google.com.br/books?hl=pt-BR&lr=&id=2ThdBAAAQBAJ&oi=fnd&pg=PP1&dq=Charmaz,+K.+(2006).+Constructing+grounded+theory.+Thousand+Oaks,+CA:+Sage.&ots=f_oTbImBBV&sig=PQCseJ-WnJgxuLENJbvJ4nSmLj8#v=onepage&q=Charmaz%2C K. (2006). Constructing ground.

Chaskin, Robert J. 1997. "Perspectives on Neighborhood and Community: A Review of the Literature." *Social Service Review*. University of Chicago Press. https://doi.org/10.1086/604277.

Chee, Chan Heng, and Harvey Neo. 2018. "Five Big Challenges Facing Big Cities of the Future | World Economic Forum." World Economic Forum. 2018. https://www.weforum.org/agenda/2018/10/the-5-biggest-challenges-cities-will-face-in-the-future/.

City of Santa Monica. 2014. "Sustainable City Plan." Santa Monica, US.

https://www.smgov.net/uploadedFiles/Departments/OSE/Categories/Sustainability/Sustainable-City-Plan.pdf.

Club of Rome. 2015. "History • Club of Rome." 2015. http://www.clubofrome.org/about-us/history/.

Cociña, Camila, Alexandre Apsan Frediani, Michele Acuto, and Caren Levy. 2019. "Knowledge Translation in Global Urban Agendas: A History of Research-Practice Encounters in the Habitat Conferences." *World Development* 122: 130–41. https://doi.org/10.1016/j.worlddev.2019.05.014.

Cohen, Michael A. 2016. "From Habitat II to Pachamama: A Growing Agenda and Diminishing Expectations for Habitat III." *Environment and Urbanization* 28 (1): 35–48. https://doi.org/10.1177/0956247815620978.

Compass. 2007. "How to Develop Indicators | The Compass for SBC." 2007. https://www.thecompassforsbc.org/how-to-guides/how-develop-indicators.

Cooke, Philip, and Luciana. Lazzeretti. 2007. *Creative Cities, Cultural Clusters and Local Economic Development. Creative Cities, Cultural Clusters and Local Economic Development*. Edward Elgar. https://doi.org/10.4337/9781847209948.

COPEL. 2023. "Personal Communication to Tobias Kühner, 28. September and 02. October 2023." 2023.

Corbin, Juliet M., and Anselm L. Strauss. 1998. *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. 2nd ed. Thousand Oaks, CA: Sage Publications Inc.

Corrarino, Megan. 2014. "'Law Exclusion Zones': Mega-Events as Sites of Procedural and Substantive Human Rights Violations." *Yale Human Rights & Development Law Journal* 17 (2012): 180–204. http://meridian.aag.org/callforpapers/program/AbstractDetail.cfm?AbstractID=53194.

Cox, Robert W. 1979. "Ideologies and the New International Economic Order: Reflections on Some Recent Literature." *International Organization*. Cambridge University Press. https://doi.org/10.1017/S0020818300032161.

Creswell, John W. 2010. "The Selection of a Research Design." In *Designing and Conducting Mixed Methods Research*, 3rd ed., 22–38. Thousand Oaks, California: Sage Publications Inc.

Crot, Laurence. 2010. "Transnational Urban Policies: 'relocating' Spanish and Brazilian Models of Urban Planning in Buenos Aires." *Urban Research and Practice* 3 (2): 119–37. https://doi.org/10.1080/17535069.2010.481217.

Dados, Nour, and Raewyn Connell. 2012. "The Global South." *Contexts* 11 (1): 12–13. https://doi.org/10.1177/1536504212436479.

Dahiya, Bharat, and Ashok Das. 2020. *New Urban Agenda in Asia-Pacific: Governance for Sustainable and Inclusive Cities. Advances in 21st Century Human Settlements*.

https://doi.org/10.1007/978-981-13-6709-0_1.

Dahl, Arthur Lyon. 2012. "Achievements and Gaps in Indicators for Sustainability." *Ecological Indicators* 17 (June): 14–19. https://doi.org/10.1016/j.ecolind.2011.04.032.

Dalkey, Norman, and Olaf Helmer. 1963. "An Experimental Application of the DELPHI Method to the Use of Experts." *Management Science* 9 (3): 458–67. https://doi.org/10.1287/mnsc.9.3.458.

Dalvi, M. Q., and K. M. Martin. 1976. "The Measurement of Accessibility: Some Preliminary Results." *Transportation* 5 (1): 17–42. https://doi.org/10.1007/BF00165245.

Davoudi, Simin, Jenny Crawford, and Abid Mehmood. 2009. *Planning for Climate Change: Strategies for Mitigation and Adaptation for Spatial Planners*. *Planning for Climate Change: Strategies for Mitigation and Adaptation for Spatial Planners*. https://doi.org/10.4324/9781849770156.

Day, A T, and L H Day. 1973. "Cross-National Comparison of Population Density." *Science (New York, N.Y.)* 181 (4104): 1016–23. https://doi.org/10.1126/science.181.4104.1016.

Dijken, Koos Van, Ruud Dorenbos, and Ries Kamphof. 2012. "The Reference Framework for Sustainable Cities (RFSC) - Testing Results and Recommendations." The Hague, The Netherlands. https://www.eukn.eu/fileadmin/Lib/files/EUKN/2013/Final report Nicis testing RFSC.pdf.

Dolan, George T. 1981. "There's a S.M.A.R.T. Way to Write Management's Goals and Objectives." *Management Review* 70 (11): 35–36. moz-extension://e34d5858-be44-412b-bf46-592eca7924a7/enhanced-reader.html?openApp&pdf=https%3A%2F%2Fcommunity.mis.temple.edu%2Fmis0855002fall2015%2Ffiles%2F2015%2F10%2FS.M.A.R.T-Way-Management-Review.pdf.

Dörrbecker, Maximilian. 2019. "TransMilenio Bogotá Map." https://commons.wikimedia.org/wiki/File:TransMilenio_Bogota_Map.png.

Downs, George W., David M. Rocke, and Peter N. Barsoom. 1996. "Is the Good News about Compliance Good News about Cooperation?" *International Organization* 50 (3): 379–406. https://doi.org/10.1017/s0020818300033427.

Duarte, Fábio, and Fernando Rojas. 2012. "Intermodal Connectivity to BRT: A Comparative Analysis of Bogotá and Curitiba." *Journal of Public Transportation* 15 (2): 1–18. https://doi.org/10.5038/2375-0901.15.2.1.

Duguma, Lalisa A., Susan W. Wambugu, Peter A. Minang, and Meine van Noordwijk. 2014. "A Systematic Analysis of Enabling Conditions for Synergy between Climate Change Mitigation and Adaptation Measures in Developing Countries." *Environmental Science and Policy* 42 (October): 138–48. https://doi.org/10.1016/j.envsci.2014.06.003.

Edelman, Murray Jacob. 1964. *The Symbolic Uses of Politics*. Urbana: University of Illinois Press.

Encyclopedia Britannica. 2015. "Urban Planning | Britannica Online." Encyclopedia Britannica. 2015. https://www.britannica.com/topic/urban-planning.

———. 2019. "Chemical Indicator | Britannica Online." Encyclopedia Britannica. 2019. https://www.britannica.com/science/chemical-indicator.

Endo, Isao, Damasa B. Magcale-Macandog, Satoshi Kojima, Brian A. Johnson, Milben A. Bragais, Paula Beatrice M. Macandog, and Henry Scheyvens. 2017. "Participatory Land-Use Approach for Integrating Climate Change Adaptation and Mitigation into Basin-Scale Local Planning." *Sustainable Cities and Society* 35 (September 2016): 47–56. https://doi.org/10.1016/j.scs.2017.07.014.

EPE. 2013. "Balanço Energético Nacional - 2013 (Ano Base 2012): Relatório Completo." *Ministério de Minas e Energia, Brasília & Empresa de Pesquisa Energética, Rio*. https://www.epe.gov.br/sites-pt/publicacoes-dados-abertos/publicacoes/PublicacoesArquivos/publicacao-129/topico-101/Relatório Final 2013.pdf.

———. 2018. "Balanço Energético Nacional de 2018 (Ano Base 2017): Relatório Completo." *Ministério de Minas e Energia, Brasília & Empresa de Pesquisa Energética, Rio*. Vol. 1. http://www.epe.gov.br/sites-pt/publicacoes-dados-abertos/publicacoes/PublicacoesArquivos/publicacao-303/topico-419/BEN2018__Int.pdf.

———. 2023. "Balanço Energético Nacional 2023 (Ano Base 2022) / Empresa de Pesquisa Energética." *Ministério de Minas e Energia, Brasília & Empresa de Pesquisa Energética, Rio*. https://www.epe.gov.br/sites-pt/publicacoes-dados-abertos/publicacoes/PublicacoesArquivos/publicacao-748/topico-687/BEN2023.pdf.

ESDM. 2023. "Kementerian ESDM RI - Media Center - News Archives - Sekilas Tentang International Energy Agency (IEA)." Ministry of Energy and Mineral Resources (ESDM). 2023. https://www.esdm.go.id/en/media-center/news-archives/energy-ministry-targets-157-renewable-energy-share-in-2022.

Eurostat. 2009. "Database - Cities (Urban Audit) - Eurostat." 2009. https://ec.europa.eu/eurostat/web/cities/data/database.

Fainstein, Susan S. 1994. *The City Builders : Property, Politics, and Planning in London and New York*. Blackwell. http://www.openbibart.fr/item/display/10068/896053.

Fajardo, Teresa. 2014. "Soft Law." *Oxford Bibliographies*, no. 2 (325): 11–13. https://doi.org/10.1093/OBO/9780199796953-0040.

Faulhaber, Lucas, and Lena Azevedo. 2015. *SMH 2016 : Remoções No Rio de Janeiro Olímpico*. MORULA. https://books.google.com.br/books?id=AT7PsgEACAAJ&dq=SMH+2016:+remoç ões+no+Rio+de+Janeiro+Olímpico&hl=en&sa=X&ved=0ahUKEwjz__bo9-

zlAhXzILkGHSf5A7kQ6AEIKTAA.

Fenton, Paul, and Sara Gustafsson. 2017. "Moving from High-Level Words to Local Action — Governance for Urban Sustainability in Municipalities." *Current Opinion in Environmental Sustainability* 26–27: 129–33. https://doi.org/10.1016/j.cosust.2017.07.009.

Fernandes, José A. Rio, and José Francisco Meirinhos. 2008. "Cidades Ideais, Ideais de Cidade, Cidades Reais." In *A Filosofia e a Cidade*, edited by Paula Cristina Pereira, 127–57. Porto, Portugal: CAMPO DAS LETRAS-Editores, S. A.

Filho, Gilberto Montibeller. 1993. "Ecodesenvolvimento e Desenvolvimento Sustentável; Conceitos e Princípios." *Textos de Economia - CSE/UFSC*. Vol. 4. Florianópolis.

Freebody, Peter. 2003. *Qualitative Research in Education: Interaction and Practice*. London: SAGE Publications.

Freeman, James, and Marcos Burgos. 2017. "Accumulation by Forced Removal: The Thinning of Rio de Janeiro's Favelas in Preparation for the Games." *Journal of Latin American Studies*. Cambridge University Press. https://doi.org/10.1017/S0022216X16001942.

Gaffney, Christopher. 2016a. "Transforming Rio – For the Benefit of Whom?" *ICSSPE Bulletin: Journal of Sport Science and Physical Education*, no. 70: 35–42.

———. 2016b. "Gentrifications in Pre-Olympic Rio de Janeiro." *Urban Geography* 37 (8): 1132–53. https://doi.org/10.1080/02723638.2015.1096115.

———. 2019. "Can We Blame It on Rio?" *Bulletin of Latin American Research* 38 (3): 267–83. https://doi.org/10.1111/blar.12748.

Galal, Hazem. 2018. "How Much Progress Has Been Made on the New Urban Agenda?" World Economic Forum. 2018. https://www.weforum.org/agenda/2018/10/how-much-progress-has-been-made-on-the-new-urban-agenda/.

Galster, George. 2001. "On the Nature of Neighbourhood." *Urban Studies* 38 (12): 2111–24. https://doi.org/10.1080/00420980120087072.

Garde, Ajay. 2009. "Sustainable by Design?: Insights from U.S. LEED-ND Pilot Projects." *Journal of the American Planning Association* 75 (4): 424–40. https://doi.org/10.1080/01944360903148174.

Garnett, K., F. A. Lickorish, S. A. Rocks, G. Prpich, A. A. Rathe, and S. J.T. Pollard. 2016. "Integrating Horizon Scanning and Strategic Risk Prioritisation Using a Weight of Evidence Framework to Inform Policy Decisions." *Science of the Total Environment* 560–561: 82–91. https://doi.org/10.1016/j.scitotenv.2016.04.040.

Garrick, Dustin, Erin O'Donnell, R. Damania, S. Moore, N. Brozovic, and T. Iseman. 2019. "Informal Water Markets in an Urbanising World: Some Unanswered Questions." Washington, DC: World Bank.

https://documents.worldbank.org/en/publication/documents-reports/documentdetail/358461549427540914/informal-water-markets-in-an-urbanising-world-some-unanswered-questions.

Gascó, Mila, Benedetta Trivellato, and Dario Cavenago. 2016. "How Do Southern European Cities Foster Innovation? Lessons from the Experience of the Smart City Approaches of Barcelona and Milan." In *Public Administration and Information Technology*, 11:191–206. Springer, Cham. https://doi.org/10.1007/978-3-319-17620-8_10.

Gent, W.P.C. van. 2013. "Neoliberalization, Housing Institutions and Variegated Gentrification: How the 'Third Wave' Broke in Amsterdam." *International Journal of Urban and Regional Research* 37 (2): 503–22. https://doi.org/10.1111/j.1468-2427.2012.01155.x.

Geurs, Karst T., and John Östh. 2016. "Advances in the Measurement of Transport Impedance in Accessibility Modelling." *European Journal of Transport and Infrastructure Research*, April 1, 2016. https://doi.org/10.18757/ejtir.2016.16.2.3138.

Giap, Tan Khee, Woo Wing Thye, Tan Kong Yam, Linda Low, and Ee Ling Grace Aw. 2012. *Ranking the Liveability of the World's Major Cities: The Global Liveable Cities Index (GLCI)*. World Scientific Publishing Co. https://doi.org/10.1142/8553.

Glaser, Gisbert. 2012. "Policy: Base Sustainable Development Goals on Science." *Nature*. https://doi.org/10.1038/491035a.

Gobbi, Leonardo Delfim. 2016. "Urbanização Brasileira | Urbanização | Geografia | Educação." 2016. http://educacao.globo.com/geografia/assunto/urbanizacao/urbanizacao-brasileira.html.

Godoy, Raimundo, and Claudia Bessas. 2020. *Plan, Do, Check, Act - a Practical Guide for Managers: Understanding Results-Focused Management EBook : Godoy, Raimundo, Bessas, Claudia: Kindle Store*. Sydney: Aquila Institute Pty Ltd. https://books.google.com.br/books?id=qkD1DwAAQBAJ&pg=PT56&lpg=PT56&dq=%22you+can%27t+define+what+you+don%27t+understand%22+William+Edwards+Deming&source=bl&ots=XPYNydIWzW&sig=ACfU3U2pZ2zH_ibDCIeQVSi8P1ABUdp83A&hl=en&sa=X&ved=2ahUKEwi8067vyImAAxX5uJUCHbw7D.

Goodland, Robert. 1991. "The Case That the World Has Reached Limits." In *Environmentally Sustainable Economic Development: Building on Brundtland*, 5–17. World Bank. http://documents.worldbank.org/curated/en/332821467989482335/pdf/multi-page.pdf.

Görgens, Marelize, and Jody Zall Kusek. 2009a. "Annex C: Selecting Good Quality Indicators - Indicator Selection Process." In *Making Monitoring and Evaluation Systems Work - A Capacity Development Toolkit*, 179–81. Washington, DC: World Bank.

http://documents1.worldbank.org/curated/fr/708391468331216900/pdf/533030PU
B0moni101Official0Use0Only1.pdf.

———. 2009b. *Making Monitoring and Evaluation Systems Work A CAPACITY DEVELOPMENT TOOLKIT*. Washington, DC: World Bank. https://documents1.worldbank.org/curated/fr/708391468331216900/pdf/533030PU B0moni101Official0Use0Only1.pdf.

Gouda, Amr Ah, and Houshmand E. Masoumi. 2018. *Compactness, Connectivity, and Walking Accessibility on the Neighborhood Level According to Sustainability Certifications: Improvement or Downgrade? A Case Study of Cairo, Egypt. Journal of Geographical Systems*. Vol. 20. Springer Berlin Heidelberg. https://doi.org/10.1007/s10109-018-0272-7.

Graham, Stephen. 2011. *Cities under Siege : The New Military Urbanism*. Verso.

Greenfield, Adam. 2013. *Against the Smart City (The City Is Here for You to Use)*. New York: Do Projects.

Haapio, Appu. 2012. "Towards Sustainable Urban Communities." *Environmental Impact Assessment Review* 32 (1): 165–69. https://doi.org/10.1016/j.eiar.2011.08.002.

Haavelmo, Trygve, and Stein Hansen. 1991. "On the Strategy of Trying to Reduce Economic Inequality by Expanding the Sale of Human Activity." In *Environmentally Sustainable Economic Development: Building on Brundtland*, 27–35. World Bank. http://documents.worldbank.org/curated/en/332821467989482335/pdf/multi-page.pdf.

Hák, Tomáš, Svatava Janoušková, and Bedřich Moldan. 2016. "Sustainable Development Goals: A Need for Relevant Indicators." *Ecological Indicators* 60: 565–73. https://doi.org/10.1016/j.ecolind.2015.08.003.

Hak, Tomas, Bedřich Moldan, and Arthur Lyon Dahl. 2007. *Sustainability Indicators: A Scientific Assessment. Island Press*. Washington, Covelo, London. https://www.researchgate.net/publication/258261619.

Hakelberg, Lukas. 2014. "Governance by Diffusion: Transnational Municipal Networks and the Spread of Local Climate Strategies in Europe." *Global Environmental Politics* 1: 107–29.

Hall, Peter, Terrence Gary McGee, Peter Newton, Matthew Westfall, and Giles Clarke. 2001. *ADB City Data Book - Urban Indicators for Managing Cities*. Edited by Matthew S. Westfall and Victoria A. de Villa. Asian Development Bank. http://www.kas.de/upload/dokumente/megacities/ADB.pdf.

Hanley, Nick, Ian Moffatt, Robin Faichney, and Mike Wilson. 1999. "Measuring Sustainability: A Time Series of Alternative Indicators for Scotland." *Ecological Economics* 28 (1): 55–73. https://doi.org/10.1016/S0921-8009(98)00027-5.

Hansen, Walter G. 1959. "How Accessibility Shapes Land Use." *Journal of the*

American Institute of Planners 25 (2): 73–76.
https://doi.org/10.1080/01944365908978307.

Harrison, Philip. 2006. "On the Edge of Reason: Planning and Urban Futures in Africa." *Urban Studies* 43 (2 SPEC. ISS.): 319–35.
https://doi.org/10.1080/00420980500418368.

Hayes, Graeme, and John Horne. 2011. "Sustainable Development, Shock and Awe? London 2012 and Civil Society." *Sociology* 45 (5): 749–64.
https://doi.org/10.1177/0038038511413424.

Hemel, Zef. 2010. "Soft Planning: Collaborators in a Metropolitan Story." In *Strong Stories: How the Dutch Are Reinventing*, edited by Maarten Hajer, Susan Van 't Klooster, and Jantine Grijzen, 2012th ed., No. 3.:140–53. Rotterdam: 010 Publishers,. https://dare.uva.nl/search?identifier=8136fd5e-9dc9-4559-a089-cbea11bc82bc.

Herzog, Lawrence A. 2013. "Barra Da Tijuca: The Political Economy of a Global Suburb in Rio de Janeiro, Brazil." *Latin American Perspectives* 40 (2): 118–34.
https://doi.org/10.1177/0094582X12467765.

Hidalgo, Darío, Liliana Pereira, Nicolás Estupiñán, and Pedro Luis Jiménez. 2013. "TransMilenio BRT System in Bogota, High Performance and Positive Impact – Main Results of an Ex-Post Evaluation." *Research in Transportation Economics* 39 (1): 133–38. https://doi.org/10.1016/J.RETREC.2012.06.005.

Hillier, Bill. 2002. "A Theory of the City as Objects: Or, How Spatial Laws Mediate the Social Construction of Urban Space." *Urban Design International* 7 (3–4): 153–79. https://doi.org/10.1057/palgrave.udi.9000082.

Hollands, Robert G. 2008. "Will the Real Smart City Please Stand up? Intelligent, Progressive or Entrepreneurial?" *City* 12 (3): 303–20.
https://doi.org/10.1080/13604810802479126.

Hollington, Andrea, Oliver Tappe, Tijo Salverda, and Tobias Schwarz. 2015. "Introduction: Concepts of the Global South | GSSC." Global South Studies Center Cologne. 2015. https://web.archive.org/web/20160904205139/http:/gssc.uni-koeln.de/node/451.

Hoornweg, Daniel, Natalie Palugyai, Maria Villaveces, and Henry Wadsworth Longfellow. 2007. "City Indicators: Now to Nanjing." World Bank Policy Research Working Paper WPS4114.
http://documents1.worldbank.org/curated/en/707781468263936449/pdf/wps4114.pdf.

Iberdrola. 2020. "New Urban Agenda: Towards a Sustainable Urbanism." 2020.
https://www.iberdrola.com/social-commitment/new-urban-agenda.

IBGE. 2015. "Indicadores de Desenvolvimento Sustentável - Brasil 2015." *INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA - IBGE*. Rio de Janeiro, Brazil.
https://www.ibge.gov.br/geociencias/informacoes-ambientais/estatisticas-e-indicadores-ambientais/15838-indicadores-de-desenvolvimento-sustentavel.html.

ICS. 2023. "Domicílios Com Acesso à Energia Elétrica - Cidades Sustentáveis."
    Instituto Cidades Sustentaveis (ICS). 2023.
    https://www.cidadessustentaveis.org.br/visualizarindicador/3927.

IMF. 2021. "World Economic Outlook." 2021.
    https://www.imf.org/external/datamapper/NGDPD@WEO/WEOWORLD/ADVE
    C.

———. 2022. "IMF Glossary." 2022. https://www.imf.org/en/About/Glossary.

Instituto Acende. 2020. "Evolução Das Tarifas de Energia Elétrica e a Formulação de
    Políticas Públicas." *White Paper*, no. 22: 1–28. https://acendebrasil.com.br/wp-
    content/uploads/2020/04/WP22_WEB.pdf.

IPARDES. 2023. "Caderno Estatístico Do Município de Curitiba." *Instituto Paranaense
    de Desenvolvimento Econômico e Social*.
    www.ipardes.gov.br/cadernos/MontaCadPdf1.php?Municipio=80000.

IPCC. 2014. *CLIMATE AND CLIMATE CHANGE | Intergovernmental Panel on
    Climate Change: Summary for Policymakers. Encyclopedia of Atmospheric
    Sciences*. Elsevier. https://doi.org/10.1016/B978-0-12-382225-3.00492-8.

IPP. 2023. "Consumo Total, Médio Anual, Mensal e Diário de Energia Elétrica Por
    Habitante No Município Do Rio de Janeiro Entre 1980-2021 | Data Rio." Instituto
    Perreira Pessoa (IPP). 2023. https://www.data.rio/documents/PCRJ::consumo-
    total-médio-anual-mensal-e-diário-de-energia-elétrica-por-habitante-no-município-
    do-rio-de-janeiro-entre-1980-2021/about.

ISO. 2018. "ISO 37120:2018 Sustainable Cities and Communities — Indicators for City
    Services and Quality of Life." In *ISO 37120:2018*, 19.
    https://www.iso.org/standard/68498.html.

———. 2019. "ISO - About Us." 2019. https://www.iso.org/about-us.html.

———. 2021. "ISO - ISO/TC 268 - Sustainable Cities and Communities." 2021.
    https://www.iso.org/committee/656906.html.

Jervis, Robert. 2010. "Why Intelligence and Policymakers Clash." *Political Science
    Quarterly* 125 (2): 185–204. https://doi.org/10.1002/j.1538-165X.2010.tb00672.x.

Jones, Roger Neville, Anand Patwardhan, Stewart J. Cohen, Suraje Dessai, Annamaria
    Lammel, Robert J. Lempert, M. Monirul Qader Mirza, et al. 2015. "Foundations
    for Decision Making." *Climate Change 2014 Impacts, Adaptation and
    Vulnerability: Part A: Global and Sectoral Aspects*, January, 195–228.
    https://doi.org/10.1017/CBO9781107415379.007.

Joss, S. 2011. "Eco-Cities: The Mainstreaming of Urban Sustainability - Key
    Characteristics and Driving Factors." *International Journal of Sustainable
    Development and Planning* 6 (3): 268–85. https://doi.org/10.2495/SDP-V6-N3-
    268-285.

Kassens-Noor, Eva. 2012. "Planning Olympic Legacies : Transport Dreams and Urban

Realities." In *Planning Olympic Legacies : Transport Dreams and Urban Realities*, 131. Routledge. https://books.google.com.br/books?id=A1zuRvw0Rs0C&dq=Planning+Olympic+Legacies+:+TransportDreams+and+Urban+Realities.

Kassens-Noor, Eva, Christopher Gaffney, Joe Messina, and Eric Phillips. 2018. "Olympic Transport Legacies: Rio de Janeiro's Bus Rapid Transit System." *Journal of Planning Education and Research* 38 (1): 13–24. https://doi.org/10.1177/0739456X16683228.

Kaufmann, Vincent, Manfred Max Bergman, and Dominique Joye. 2004. "Motility: Mobility as Capital." *International Journal of Urban and Regional Research* 28 (4): 745–56. https://doi.org/10.1111/j.0309-1317.2004.00549.x.

Keilmann-Gondhalekar, Daphne, Carmen Vogt, and Katrin Eisenbeiß. 2018. "Integrated Urban Development: Implementing the Sustainable Development Goals for Urban Resource Efficiency , Economic Prosperity and Social Inclusion." Eschborn. www.bmz.de.

Kenyon, Susan, Glenn Lyons, and Jackie Rafferty. 2002. "Transport and Social Exclusion: Investigating the Possibility of Promoting Inclusion through Virtual Mobility." *Journal of Transport Geography* 10 (3): 207–19. https://doi.org/10.1016/S0966-6923(02)00012-1.

Kitchin, Rob. 2014. "The Real-Time City? Big Data and Smart Urbanism." *GeoJournal* 79 (1): 1–14. https://doi.org/10.1007/s10708-013-9516-8.

Kotz, Samuel, ed. 2006. *Encyclopedia of Statistical Sciences*. Hoboken, NJ, USA: John Wiley & Sons, Inc. https://doi.org/10.1002/0471667196.ess7026.pub2.

Kuik, O.J., and H. Verbruggen. 1991. *In Search of Indicators of Sustainable Development*. Edited by Onno Kuik and Harmen Verbruggen. Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-011-3246-6.

Kumar, Ajay, Sam Zimmerman, and Fatima Arroyo Arroyo. 2021. *Myths and Realities of Informal Public Transport in Developing Countries. Myths and Realities of Informal Public Transport in Developing Countries*. Washington, DC: World Bank. https://doi.org/10.1596/37083.

Kvale, Steinar. 1996. *Interviews: An Introduction to Qualitative Research Interviewing*. Thousand Oaks, California: Sage Publications. https://books.google.com.br/books/about/InterViews.html?id=tJPZAAAAMAAJ&source=kp_book_description&redir_esc=y.

Landauer, Mia, Sirkku Juhola, and Maria Söderholm. 2015. "Inter-Relationships between Adaptation and Mitigation: A Systematic Literature Review." *Climatic Change* 131 (4): 505–17. https://doi.org/10.1007/s10584-015-1395-1.

Lannes, Maiza Seabra Nogueira. 2017. "Sustentabilidade de Comunidades Isoladas Com Ênfase Em Gestão Da Água, Gestão de Energia e Dimensão Psicossocial: Os Pelotões Especiais de Fronteira." Doctoral thesis, Universidade de Brasília. https://sucupira.capes.gov.br/sucupira/public/consultas/coleta/trabalhoConclusao/v

iewTrabalhoConclusao.jsf?popup=true&id_trabalho=5303855.

Lanzani, Arturo, Chiara Merlini, and Federico Zanfi. 2014. "Quando «un Nuovo Ciclo Di Vita» Non Si Dà. Fenomenologia Dello Spazio Abbandonato e Prospettive per Il Progetto Urbanistico Oltre Il Paradigma Del Riuso." *ARCHIVIO DI STUDI URBANI E REGIONALI*, no. 109 (November): 28–47. https://doi.org/10.3280/asur2014-109003.

Lasco, R.D., M. V. O. Espaldon, and M. A. Tapia. 2005. "Philippine Sub-Global Assessment: Synthesis." In *Ecosystems and People: The Philippine Millennium Ecosystem Assessment (MA) Sub-Global*, 9–34. https://www.millenniumassessment.org/documents_sga/Philippine SGA Report.pdf.

Laura, Aquiles Arce. 2004. "Um Método de Modelagem de Um Sistema de Indicadores de Sustentabilidade Para Gestão Dos Recursos Hídricos-MISGERH: O Caso Da Bacia Dos Sinos." Universidade Federal do Rio Grande do Sul.

Lee, Taedong, and Sara Hughes. 2017. "Perceptions of Urban Climate Hazards and Their Effects on Adaptation Agendas." *Mitigation and Adaptation Strategies for Global Change* 22 (5): 761–76. https://doi.org/10.1007/s11027-015-9697-1.

Lees, Nicholas. 2021. "The Brandt Line after Forty Years: The More North-South Relations Change, the More They Stay the Same?" *Review of International Studies*. Cambridge University Press. https://doi.org/10.1017/S026021052000039X.

Lenskyj, Helen. 2000. *Inside the Olympic Industry : Power, Politics, and Activism*. New York: State University of New York Press.

Lessa, Carlos. 2000. *O Rio de Todos Os Brasis [Uma Reflexão Em Busca de Auto-Estima]*. Editora Record. https://www.livrariacultura.com.br/p/livros/historia/historia-do-brasil/o-rio-de-todos-os-brasis-525113.

Light. 2023. "Tarifa de Energia Elétrica Rio de Janeiro: Valor Do KWh | Blog WebAr." 2023. https://www.webarcondicionado.com.br/tarifa-energia-eletrica-rio-de-janeiro.

Lima, Rosirene Martins, and Joaquim Shiraishi Neto. 2015. "Socio-Environmental Conflicts: Environmental Law as an Instrument for Legitimizing the Actions of Public Authorities an Intervention in Jardim Icaraí, Curitiba, Pr." *Ambiente e Sociedade* 18 (2): 129–44. https://doi.org/10.1590/1809-4422ASOCEx08V1822015en.

Linkov, Igor, Drew Loney, Susan Cormier, F. Kyle Satterstrom, and Todd Bridges. 2009. "Weight-of-Evidence Evaluation in Environmental Assessment: Review of Qualitative and Quantitative Approaches." *Science of the Total Environment* 407 (19): 5199–5205. https://doi.org/10.1016/j.scitotenv.2009.05.004.

Linstone, Harold A, and Murray Turoff. 2002. "The Delphi Method: Technology and Applications," 616.

http://repository.umpwr.ac.id:8080/bitstream/handle/123456789/162/Delphi Method - Techniques and Applications.pdf?sequence=1.

Litonjua, M. D. 2012. "Third World/Global South: From Modernization, to Dependency/Liberation, to Postdevelopment." *Journal of Third World Studies* 29 (1): 25–56. https://www.proquest.com/openview/8764d38d058f4906299e791ab1ec38d0/1?cbl =33899&loginDisplay=true&pq-origsite=gscholar.

Lucas, Karen. 2004. *Running on Empty : Transport, Social Exclusion and Environmental Justice*. Bristol: Policy Press.

Macke, Janaina, Rodrigo M. Casagrande, João Alberto R. Sarate, and Kelin A. Silva. 2018. "Smart City and Quality of Life: Citizens' Perception in a Brazilian Case Study." *Journal of Cleaner Production* 182 (May): 717–26. https://doi.org/10.1016/j.jclepro.2018.02.078.

Marletto, Gerardo, and Francesca Mameli. 2012. "A Participative Procedure to Select Indicators of Policies for Sustainable Urban Mobility. Outcomes of a National Test." *European Transport Research Review* 4 (2): 79–89. https://doi.org/10.1007/s12544-012-0075-8.

Marshall, Catherine, and Gretchen B. Rossman. 1998. *Designing Qualitative Research*. Thousand Oaks, CA: SAGE Publications. https://books.google.com.br/books/about/Designing_Qualitative_Research.html?id =vxN-xwEACAAJ&source=kp_book_description&redir_esc=y.

Martinez-Fernandez, Cristina, Ivonne Audirac, Sylvie Fol, and Emmanuèle Cunningham-Sabot. 2012. "Shrinking Cities: Urban Challenges of Globalization." In *International Journal of Urban and Regional Research*, 36:213–25. John Wiley & Sons, Ltd (10.1111). https://doi.org/10.1111/j.1468-2427.2011.01092.x.

Meadowcroft, James. 2007. "The New Encyclopedia Britannica: In 32 Volumes; [Trudeau - Zywiec]; Description, Theories, & Practices | Sustainability." In *In 32 Volumes*, edited by Jacob E Safra, 15th ed. Chicago [u.a.]: Encyclopedia Britannica. https://www.britannica.com/science/sustainability.

Meadows, Donella H., Dennis L. Meadows, William W. Behrens, Jorgen Randers, and Club of Rome. 1972. *The Limits to Growth; a Report for the Club of Rome's Project on the Predicament of Mankind*. Universe Books. https://www.clubofrome.org/report/the-limits-to-growth/.

Meadows, Donella H., Dennis L. Meadows, and Jørgen. Randers. 1992. *Beyond the Limits : Confronting Global Collapse, Envisioning a Sustainable Future*. Chelsea Green Pub. Co.

Meireles, Eduardo, and Carolina Maria Pozzi De Castro. 2017. "Provision of the Minha Casa Minha Vida Program in São José Do Rio Preto (SP): Urban Insertion and Socioeconomic and Environmental Adequacy - a Case Study of the New Hope Housing Project." *Ambiente Construído*, 219–33.

Mensah, Justice. 2019. "Sustainable Development: Meaning, History, Principles,

Pillars, and Implications for Human Action: Literature Review." *Cogent Social Sciences* 5 (1). https://doi.org/10.1080/23311886.2019.1653531.

Merry, Sally Engle, Kevin E. Davis, and Benedict Kingsbury. 2015. *The Quiet Power of Indicators: Measuring Governance, Corruption, and Rule of Law. The Quiet Power of Indicators: Measuring Governance, Corruption, and Rule of Law*. https://doi.org/10.1007/9781139871532.

Miles, Matthews B., and A. Michael Huberman. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*. 2nd ed. Thousand Oaks, CA: SAGE Publications. https://books.google.com.br/books?hl=en&lr=&id=U4lU_-wJ5QEC&oi=fnd&pg=PA10&dq=huberman+miles+qualitative+data+analysis&ots=kFYC_JVQVT&sig=oxePbO5dN0XlvMOlq79c3WIMGuY&redir_esc=y#v=onepage&q&f=false.

Minnaert, Lynn. 2012. "An Olympic Legacy for All? The Non-Infrastructural Outcomes of the Olympic Games for Socially Excluded Groups (Atlanta 1996-Beijing 2008)." *Tourism Management* 33 (2): 361–70. https://doi.org/10.1016/j.tourman.2011.04.005.

MOHURD. 2022. "Shanghai Adapted Index (SAI) - Leaflets." Ministry of Housing and Urban-Rural Development of the People's Republic of China, Shanghai.

Molnar, Adam, and Laureen Snider. 2011. "Mega-Events and Mega-Profits: Unravelling the Vancouver Security-Development Nexus." In *Security Games: Surveillance and Control at Mega-Events*, edited by Colin J. Bennett and Kevin D. Haggerty, 150–68. Abingdon: Routledge, Taylor & Francis Group. https://doi.org/10.4324/9780203827475.

Morse, Stephen. 2004. *Indices and Indicators in Development: An Unhealthy Obsession with Numbers*. 1st Ed. London: Routledge. https://doi.org/10.4324/9781849771719.

Müller, Martin. 2017. "How Mega-Events Capture Their Hosts: Event Seizure and the World Cup 2018 in Russia." *Urban Geography* 38 (8): 1113–32. https://doi.org/10.1080/02723638.2015.1109951.

Mumford, Lewis. 1961. *The City in History : Its Origins, Its Transformations, and Its Prospects*. Harcourt Brace Jovanovich. https://books.google.com.br/books?id=q0NNgjY03DkC&dq=The+city+in+history:+Its+origins,+its+transformations,+and+its+prospects&hl=en&sa=X&ved=0ahUKEwil-rrM6vnlAhXmIbkGHYvPBZkQ6AEIMDAB.

Mycoo, Michelle A. 2017. "A Caribbean New Urban Agenda Post-Habitat III: Closing the Gaps." *Habitat International* 69: 68–77. https://doi.org/10.1016/j.habitatint.2017.09.001.

Myers, Michael D. 1995. "Dialectical Hermeneutics: A Theoretical Framework for the Implementation of Information Systems." *Information Systems Journal* 5 (1): 51–70. https://doi.org/10.1111/j.1365-2575.1995.tb00089.x.

Namdeo, Anil, Paul Goodman, Gordon Mitchell, Anthony Hargreaves, and Marcial

Echenique. 2019. "Land-Use, Transport and Vehicle Technology Futures: An Air Pollution Assessment of Policy Combinations for the Cambridge Sub-Region of the UK." *Cities* 89 (July 2018): 296–307. https://doi.org/10.1016/j.cities.2019.03.004.

Neuman, Michael. 2005. "The Compact City Fallacy." *Journal of Planning Education and Research* 25 (1): 11–26. https://doi.org/10.1177/0739456X04270466.

Newton, Peter, Joe Flood, Mike Berry, Kuldeep Bhatia, Steve Brown, André Cabelli, Jeanette Gomboso, John Higgins, Tony Richardson, and Veronica Ritchie. 1998. *Environmental Indicators for National State of the Environment Reporting: Human Settlements*. Environment Australia, part of the Department of the Environment. https://www.environment.gov.au/system/files/pages/592d75b7-2981-40e7-a74b-5bda6a6c5c81/files/settlements.pdf.

OECD. 2004. *Sustainable Development in OECD Countries: Getting the Policies Right*. Vol. 9789264016. Organisation for Economic Cooperation and Development (OECD). https://doi.org/10.1787/9789264016958-en.

———. 2011. "Compendium of OECD Well-Being Indicators." https://www.oecd.org/sdd/47917288.pdf.

———. 2020. *Cities in the World: A New Perspective on Urbanisation. OECD Urban Studies*. https://read.oecd.org/10.1787/d0efcbda-en?format=pdf%0Ahttps://www.oecd-ilibrary.org/urban-rural-and-regional-development/cities-in-the-world_d0efcbda-en.

———. 2022. "Population by Region - Urban Population by City Size - OECD Data." 2022. https://data.oecd.org/popregion/urban-population-by-city-size.htm.

Oglesby, Carl. 1969. "Vietnamism Has Failed ... The Revolution Can Only Be Mauled, Not Defeated." *Commonweal* 90.

Oliveira, Jose A. Puppim de, Christopher N. H. Doll, José Siri, Magali Dreyfus, Hooman Farzaneh, and Anthony Capon. 2015. "Urban Governance and the Systems Approaches to Health-Environment Co-Benefits in Cities." *Cadernos de Saúde Pública* 31 (suppl 1): 25–38. https://doi.org/10.1590/0102-311x00010015.

Oliveira, Maria Marly de. 2014. *Como Fazer Pesquisa Qualitativa*. 6. ed. Petropolis, RJ: Vozes.

Pablo-Romero, María del P., Antonio Sánchez-Braza, and José Manuel González-Limón. 2015. "Covenant of Mayors: Reasons for Being an Environmentally and Energy Friendly Municipality." *Review of Policy Research* 32 (5): 576–99. https://doi.org/10.1111/ropr.12135.

Pagel, Hieke, Karen Ranke, Fabian Hempel, and Jonas Kohler. 2014. "The Use of the Concept 'Global South' in Social Science & Humanities." *Symposium "Globaler Süden / Global South: Kritische Perspektiven", Institut Für Asien- & Afrikawissenschaften, Humboldt-Universität Zu Berlin, 11 July 2014* 1 (2): 2014. https://www.academia.edu/7917466/The_Use_of_the_Concept_Global_South_in_Social_Science_and_Humanities.

Panter, Jenna R., Andrew P. Jones, Esther M.F. van Sluijs, and Simon J. Griffin. 2010. "Neighborhood, Route, and School Environments and Children's Active Commuting." *American Journal of Preventive Medicine* 38 (3): 268–78. https://doi.org/10.1016/j.amepre.2009.10.040.

Papagni, John. 2017. "INTA 40 Focuses on Habitat III." *Journal of Housing & Community Development*. http://web-a-ebscohost.ez54.periodicos.capes.gov.br/ehost/pdfviewer/pdfviewer?vid=1&sid=8f6598f4-631d-4da4-979c-aa0efef3a42f%40sessionmgr4007.

Parnell, Susan. 2016. "Defining a Global Urban Development Agenda." *World Development* 78: 529–40. https://doi.org/10.1016/j.worlddev.2015.10.028.

Parris, Thomas M., and Robert W. Kates. 2003. "Characterizing and Measuring Sustainable Development." *Annual Review of Environment and Resources* 28 (1): 559–86. https://doi.org/10.1146/annurev.energy.28.050302.105551.

Peck, Jamie. 2012. "Recreative City: Amsterdam, Vehicular Ideas and the Adaptive Spaces of Creativity Policy." *International Journal of Urban and Regional Research* 36 (3): 462–85. https://doi.org/10.1111/j.1468-2427.2011.01071.x.

Pereira, Rafael H.M. 2018. "Transport Legacy of Mega-Events and the Redistribution of Accessibility to Urban Destinations." *Cities* 81 (November): 45–60. https://doi.org/10.1016/j.cities.2018.03.013.

Pietrapertosa, Filomena, Monica Salvia, Sonia De Gregorio Hurtado, Valentina D'Alonzo, Jon Marco Church, Davide Geneletti, Francesco Musco, and Diana Reckien. 2019. "Urban Climate Change Mitigation and Adaptation Planning: Are Italian Cities Ready?" *Cities* 91 (June 2018): 93–105. https://doi.org/10.1016/j.cities.2018.11.009.

Pimentel Walker, Ana Paula. 2016. "Self-Help or Public Housing? Lessons from Co-Managed Slum Upgrading via Participatory Budget." *Habitat International* 55: 58–66. https://doi.org/10.1016/j.habitatint.2016.02.005.

Pratt, Andy C. 2011. "The Cultural Contradictions of the Creative City." *City, Culture and Society* 2 (3): 123–30. https://doi.org/10.1016/j.ccs.2011.08.002.

Prévôt-Schapira, Marie France, and Rodrigo Cattaneo Pineda. 2008. "Buenos Aires: La Fragmentación En Los Intersticios de Una Sociadad Polarizada." *Eure* 34 (103): 73–92. https://doi.org/10.4067/s0250-71612008000300004.

Prévôt Schapira, Marie. 2001. "Fragmentación Espacial y Social: Conceptos y Realidades." *Perfiles Latinoamericanos: Revista de La Facultad Latinoamericana de Ciencias Sociales, Sede México* 19 (19): 33–56. https://doaj.org/article/f10ce4382f004cb2bfe8f328ad141610.

Raco, Mike. 2014. "Delivering Flagship Projects in an Era of Regulatory Capitalism: State-Led Privatization and the London Olympics 2012." *International Journal of Urban and Regional Research* 38 (1): 176–97. https://doi.org/10.1111/1468-2427.12025.

Raco, Mike, and Emma Street. 2012. "Resilience Planning, Economic Change and the Politics of Post-Recession Development in London and Hong Kong." *Urban Studies* 49 (5): 1065–87. https://doi.org/10.1177/0042098011415716.

Ramírez, Alejandro Guzmán, and Kitzia Marcela Hernández Sainz. 2013. "La Fragmentación Urbana Y La Segregación Social Una Aproximación Conceptual." *Revista Legado de Arquitectura y Diseño*, no. 14: 41–55.

Reith, András, and Melinda Orova. 2015. "Do Green Neighbourhood Ratings Cover Sustainability?" *Ecological Indicators* 48 (January): 660–72. https://doi.org/10.1016/j.ecolind.2014.09.005.

República Federativa do Brasil. 1996. "Relatorio Nacional Brasilieiro, Habitat II." Brasilia.

Riley, Janet. 2001. "The Indicator Explosion: Local Needs and International Challenges." *Agriculture, Ecosystems and Environment*. Elsevier. https://doi.org/10.1016/S0167-8809(01)00271-7.

Robinson, Jennifer. 2011. "Cities in a World of Cities: The Comparative Gesture." *International Journal of Urban and Regional Research* 35 (1): 1–23. https://doi.org/10.1111/j.1468-2427.2010.00982.x.

Robinson, Jennifer, and Susan Parnell. 2011. "Travelling Theory: Embracing Post-Neoliberalism through Southern Cities." In *The New Blackwell Companion to the City*, edited by Gary Bridge and Sophie Watson. Oxford, UK: Wiley-Blackwell. https://doi.org/10.1002/9781444395105.

Rodríguez, Alfredo, and Ana Sugranyes. 2017. "La Nueva Agenda Urbana: Pensamiento Mágico." *Hábitat y Sociedad*, no. 10: 165–80. https://doi.org/10.12795/HabitatySociedad.2017.i10.10.

Rohmann, Michell. 2023. "Personal Communication to Tobias Kühner, 29. August 2023." 2023.

Romero, Federico. 2016. "Rethinking Italy's Shrinking Place in the International Arena." *International Spectator* 51 (1): 1–12. https://doi.org/10.1080/03932729.2016.1108613.

Sachs, Ignacy. 1974. "Environment and Styles of Development." *Economic and Political Weekly* 9 (21): 828–37. https://doi.org/10.23074363676.

———. 1993. "Estratégias de Transição Para o Século XXI." In *Para Pensar o Desenvolvimento Sustentável.*, edited by Marcel Bursztyn, 34:29–56. São Paulo: Brasiliense. https://doi.org/10.1590/S0034-75901994000200011.

Sachs, Jeffrey D. 2012. "From Millennium Development Goals to Sustainable Development Goals." *The Lancet*. Lancet Publishing Group. https://doi.org/10.1016/S0140-6736(12)60685-0.

Santos, Mônica Veríssimo. 2018. "O Parlamento e Os Acordos Multilaterais. Estudo de Caso: Projeto de Lei n. 132/2017, de Uso e Ocupação Do Solo No Distrito Federal,

No Contexto Da Agenda 2030 e Nova Agenda." Monografia Especialização. Brasilia.

Sauvy, Alfred. 1986. "Document: Trois Mondes, Une Planete." *Vingtième Siècle. Revue d'histoire*, no. 12 (October): 81. https://doi.org/10.2307/3768593.

Savini, Federico. 2013. "The Governability of National Spatial Planning: Light Instruments and Logics of Governmental Action in Strategic Urban Development." *Urban Studies* 50 (8): 1592–1607. https://doi.org/10.1177/0042098012465131.

———. 2016. "Self-Organization and Urban Development: Disaggregating the City-Region, Deconstructing Urbanity in Amsterdam." *International Journal of Urban and Regional Research* 40 (6): 1152–69. https://doi.org/10.1111/1468-2427.12469.

Savini, Federico, Willem R. Boterman, Wouter P.C. van Gent, and Stan Majoor. 2016. "Amsterdam in the 21st Century: Geography, Housing, Spatial Development and Politics." *Cities* 52: 103–13. https://doi.org/10.1016/j.cities.2015.11.017.

Savini, Federico, and Sebastian Dembski. 2016. "Manufacturing the Creative City: Symbols and Politics of Amsterdam North." *Cities* 55 (June): 139–47. https://doi.org/10.1016/j.cities.2016.02.013.

Säynäjoki, Eeva, Riikka Kyrö, Jukka Heinonen, and Seppo Junnila. 2012. "An Assessment of the Applicability of Three International Neighbourhood Sustainability Rating Systems to Diverse Local Conditions, with a Focus on Nordic Case Areas." *International Journal of Sustainable Building Technology and Urban Development* 3 (2): 96–104. https://doi.org/10.1080/2093761X.2012.696319.

Science for Environment Policy. 2018. "Indicators for Sustainable Cities." *In-Depth Report 12. Produced for the European Commission DG Environment by the Science Communication Unit, UWE*. Bristol, UK. https://doi.org/10.2779/121865.

Scipioni, Antonio, Anna Mazzi, Filippo Zuliani, and Marco Mason. 2008. "The ISO 14031 Standard to Guide the Urban Sustainability Measurement Process: An Italian Experience." *Journal of Cleaner Production* 16 (12): 1247–57. https://doi.org/10.1016/j.jclepro.2007.06.013.

SDSN - Sustainable Development Solutions Network Australia/Pacific. 2015. "Getting Started with the Sustainable Development Goals December 2015 A Guide for Stakeholders." moz-extension://2bd833bb-2230-4154-99bc-827cf1e73dd6/enhanced-reader.html?openApp&pdf=https%3A%2F%2Firp-cdn.multiscreensite.com%2Fbe6d1d56%2Ffiles%2Fuploaded%2Fgetting-started-guide-FINAL-PDF-.pdf.

Semi, Giovanni. 2015. *Gentrification : Tutte Le Città Come Disneyland?* Bologna: Il Mulino. https://iris.unito.it/handle/2318/1524407#.XcWAJ9XDmCg.

Sennett, Richard. 2012. "No One Likes a City That's Too Smart." *The Guardian*, December 4, 2012. https://www.theguardian.com/commentisfree/2012/dec/04/smart-city-rio-songdo-masdar.

SETKAB. 2023. "Sekretariat Kabinet Republik Indonesia | Gov't Adjusts Electricity Tariffs." Cabinet Secretariat of the Republic of Indonesia (SETKAB). 2023. https://setkab.go.id/en/govt-adjusts-electricity-tariffs/.

Sharifi, Ali Soltani and Ehsan. 2012. "A Case Study of Sustainable Urban Planning Principles in Curitiba (Brazil)." *International Journal of Development and Sustainability* 1. (2): 120–34. www.isdsnet.com.

Sharifi, Ayyoob, and Akito Murayama. 2013. "A Critical Review of Seven Selected Neighborhood Sustainability Assessment Tools." *Environmental Impact Assessment Review* 38 (January): 73–87. https://doi.org/10.1016/J.EIAR.2012.06.006.

Shelton, Dinah. 2000. *Commitment and Compliance: The Role of Non-Binding Norms in the International Legal System. Oxford University Press*. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199270989.001.0001.

Silva, Geovany Jessé Alexandre da, and Marta Adriana Bustos Romero. 2013. "Cidades Sustentáveis: Uma Nova Condição Urbana a Partir de Estudos Aplicados a Cuiabá, Capital Do Estado de Mato Grosso, Brasil." *Ambiente Construído* 13 (3): 253–66. https://doi.org/10.1590/s1678-86212013000300015.

Silvestre, Gabriel. 2009. "The Social Impacts of Mega-Events: Towards a Framework." *Esporte e Sociedade* 4 (10): 1–26. https://www.academia.edu/1047180/The_Social_Impacts_of_Mega-events_Towards_a_Framework_2008_Esporte_e_Sociedade_9_4_.

Simon, David, Helen Arfvidsson, Geetika Anand, Amir Bazaz, Gill Fenna, Kevin Foster, Garima Jain, et al. 2016. "Developing and Testing the Urban Sustainable Development Goal's Targets and Indicators – a Five-City Study." *Environment and Urbanization* 28 (1): 49–63. https://doi.org/10.1177/0956247815619865.

Simple Maps. 2022. "World Cities Database." 2022. https://simplemaps.com/data/world-cities.

Sims, David. 2010. "Understanding Cairo. The Logic of a City out of Control," 335.

Singh, Rajesh Kumar, H.R. Murty, S.K. Gupta, and A.K. Dikshit. 2009. "An Overview of Sustainability Assessment Methodologies." *Ecological Indicators* 9 (2): 189–212. https://doi.org/10.1016/j.ecolind.2008.05.011.

Smith, James, Karl Blanchet, and Severine Frison. 2018. "Does the Humanitarian Sector Use Evidence-Informed Standards? A Review of the 2011 Sphere Indicators for Wash, Food Security and Nutrition, and Health Action." *PLoS Currents* 10. https://doi.org/10.1371/currents.dis.40805a591152be1c1431b5dab43e516d.

SSP. 2023. "Province Sectorial Statistics - DKI Jakarta." Statistik Sektoral Provinsi (SSP). 2023. https://statistik.jakarta.go.id/.

Stavros, Jacqueline M., and Gina Hinrichs. 2009. *The Thin Book Of® SOAR: Building Strengths-Based Strategy*. Thin Book Publishing. https://www.amazon.com/Thin-Book-Building-Strengths-Based-Strategy/dp/0982206801.

Stettner, Walter F. 1982. "The Brandt Commission Report: A Critical Appraisal." *International Social Science Review* 57 (2): 67–81. https://www.jstor.org/stable/41881303?saml_data=eyJzYW1sVG9rZW4iOiIzZjAwN2UwNC05MmUyLTQxNjAtODRmZS01ZTYzZGM1MzVmMTIiLCJlbWFpbCI6IjE5MDAwODQ0MEBhbHVuby51bmIuYnIiLCJpbnN0aXR1dGlvbklkIjoWyJjOWNmZjRhNi00YWI3LTQ4NDgtYjY2OS05MWRiZjk3MTliZGEiXX0.

Steurer, Johann. 2011. "The Delphi Method: An Efficient Procedure to Generate Knowledge." *Skeletal Radiology* 40 (8): 959–61. https://doi.org/10.1007/s00256-011-1145-z.

Stiglitz, Joseph E, Amartya Sen, and Jean-Paul Fitoussi. 2009. "Report by the Commission on the Measurement of Economic Performance and Social Progress." Paris, France. www.stiglitz-sen-fitoussi.fr.

Suter, Glenn W., and Susan M. Cormier. 2011. "Why and How to Combine Evidence in Environmental Assessments: Weighing Evidence and Building Cases." *Science of the Total Environment* 409 (8): 1406–17. https://doi.org/10.1016/j.scitotenv.2010.12.029.

Swyngedouw, Erik, Frank Moulaert, and Rodriguez Arantxa. 2002. "New Geographies of Power , Exclusion and Injustice Neoliberal Urbanization in Europe : Large-Scale Urban Development Projects and the New Urban Policy." *Antipode* 34: 542–77. https://doi.org/10.1111/1467-8330.00254.

Tasaki, Tomohiro, and Yasuko Kameyama. 2015. "Sustainability Indicators: Are We Measuring What We Ought to Measure?" *Global Environmental Research* 19: 147–54. https://doi.org/10.1177/0269215510390719.

Terhorst, Pieter, and Jacques van de Ven. 1995. "The National Urban Growth Coalition in The Netherlands." *Political Geography* 14 (4): 343–61. https://doi.org/10.1016/0962-6298(95)95718-D.

Thérien, Jean Philippe. 1999. "Beyond the North-South Divide: The Two Tales of World Poverty." *Third World Quarterly* 20 (4): 723–42. https://doi.org/10.1080/01436599913523.

Thomas, Ryan, Angel Hsu, and Amy Weinfurter. 2020. "Sustainable and Inclusive – Evaluating Urban Sustainability Indicators' Suitability for Measuring Progress towards SDG-11." *Environment and Planning B: Urban Analytics and City Science* 0 (0): 1–17. https://doi.org/10.1177/2399808320975404.

Tillmann, Patrícia André, Maria Conceição Barletta Scussel, Carlos Torres Formoso, and Luciana Inês Gomes Miron. 2011. "Desafios Para a Gestão de Projetos Urbanos Com Elevada Complexidade: Análise Do Programa Integrado Entrada Da Cidade Em Porto Alegre, RS." *Ambiente Construído* 11 (3): 73–87. https://doi.org/10.1590/s1678-86212011000300006.

Tomlinson, B.R. 2003. "What Was the Third World?" *Journal of Contemporary History* 38 (2): 307–21. https://doi.org/10.1177/0022009403038002135.

Tsoukala, Angelina. 2016. "Container Community in Milan, Italy." 2016.

https://angelinatsoukala.myportfolio.com/container-community-in-milan-italy.

UCI. 2014. "The China Urban Sustainability Index 2013," no. April: 1–36. http://www.mckinseychina.com/wp-content/uploads/2014/04/china-urban-sustainability-index-2013.pdf.

UCLG. 2018. "Monitoring the Global Agenda in Municipalities: The Mandala Tool," 8. https://www.uclg.org/sites/default/files/the_mandala_tool.pdf.

———. 2019. "GOLD V Report: The Localization of the Global Agendas - How Local Action Is Transforming Territories and Communities." Barcelona. www.uclg.org.

———. 2021. "The Global Agenda of Local and Regional Governments: What Is Our Global Agenda ?" 2021. https://www.uclg.org/en/agenda/global-agenda-of-local-regional-governments.

Uitermark, Justus. 2014. "Integration and Control: The Governing of Urban Marginality in Western Europe." *International Journal of Urban and Regional Research* 38 (4): 1418–36. https://doi.org/10.1111/1468-2427.12069.

UN-Habitat. 1976. "Report of Habitat: United United Nations Conference on Human Settlements." *United Nations Publications*. Vancouver. https://documents-dds-ny.un.org/doc/UNDOC/GEN/G96/025/00/PDF/G9602500.pdf?OpenElement.

———. 1996. "Report of the United Nations Conference on Human Settlements (Habitat II)." *United Nations Publications*. Istanbul. https://doi.org/10.1017/s0376892900039321.

———. 2002. "Global Urban Indicators Database: Version 2." Nairobi: Global Urban Observatory, United Nations Human Settlements Programme. http://unhabitat.org/books/global-urban-indicators-database/.

———. 2004. "Urban Indicators Guidelines – Monitoring the Habitat Agenda and the Millennium Development Goals." *United Nations Human Settlements Programme*. https://unhabitat.org/sites/default/files/download-manager-files/Urban Indicators.pdf.

———. 2014. "History, Mandate & Role in the UN System." About Us. 2014. https://unhabitat.org/history-mandate-role-in-the-un-system/.

———. 2016a. "About Habitat III." The United Nations Conference on Housing and Sustainable Urban Development. 2016. http://habitat3.org/the-conference/about-habitat-3/.

———. 2016b. *City Prosperity Index | Urban Indicators Database*. https://data.unhabitat.org/pages/city-prosperity-index.

———. 2016c. "Issue Papers: The Process." 2016. http://habitat3.org/documents-and-archive/preparatory-documents/issue-papers/.

———. 2017. *The New Urban Agenda. United Nations Publications*. http://habitat3.org/wp-content/uploads/NUA-English.pdf.

———. 2018. "Best Practices." 2018. https://unhabitat.org/best-practices.

———. 2021. "NUA Monitoring Framework and Related Indicators - Draft Version," no. March: 1–208.

———. 2022a. "The Global Urban Monitoring Framework." Nairobi. https://unhabitat.org/sites/default/files/2022/08/the_global_urban_monitoring_fram ework_metadata.pdf.

———. 2022b. *The Shanghai Adapted Index: Proposal of the Development of Index Calculation and Evaluation*. Edited by The Shanghai Adapted Index EGM (Daniel Ghithira & Robert Ndugwa). Nairobi.

———. 2022c. "UN-HABITAT Best Practices Database: Award Winners." 2022. https://mirror.unhabitat.org/bp/bp.list.aspx.

UNDP. 2020. "Human Development Index (HDI) | Human Development Reports." *United Nations*. https://hdr.undp.org/data-center/human-development-index#/indicies/HDI.

———. 2022. *Human Development Report 2021/2022*. New York. https://hdr.undp.org/system/files/documents/global-report-document/hdr2021-22pdf_1.pdf.

UNECA. 2017. "Integrating Agenda 2063 and 2030 Agenda for Sustainable Development into National Development Plans: Emerging Issues for African Least Developed Countries." Addis Ababa.

UNECE, OECD, and Eurostat. 2008. "Measuring Sustainable Development: Report of the Joint Working Party on Statistics for Sustainable Development." *United Nations*. New York and Geneva. https://doi.org/10.3141/2017-03.

United Nations. 1992. "Agenda 21: Earth Summit–The United Nations Programme of Action from Rio." *Conference on Environment and Development*. Rio. https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf.

———. 2015a. "Goal 11 | Make Cities and Human Settlements Inclusive, Safe, Resilient and Sustainable." Department of Economic and Social Affairs. 2015. https://sdgs.un.org/goals/goal11.

———. 2015b. "Goal 17 | Department of Economic and Social Affairs." Department of Economic and Social Affairs. 2015. https://sdgs.un.org/goals/goal17.

———. 2015c. "THE 17 GOALS | Sustainable Development." *Sustainable Development*. https://sdgs.un.org/goals.

———. 2017. "Regional Action Plan for the Implementation of the New Urban Agenda in Latin America and the Caribbean 2016-2036." Santiago. http://repositorio.cepal.org/bitstream/handle/11362/42146/4/S1701121_en.pdf.

———. 2018. "High-Level Political Forum: Sustainable Development Knowledge Platform." UNSDG. 2018. https://sustainabledevelopment.un.org/hlpf/2018.

UNSD. 2015. "Discussion Paper on Principles of Using Quantification to Operationalize the SDGs and Criteria for Indicator Selection." ESA/STAT/441/2/58A/14 United Nations Statistics Division. New York.

———. 2021. "UN-Habitat Card - 4th Edition Handbook Statistical Organization - UN Statistics Wiki." 2021. https://unstats.un.org/wiki/display/HSO/UN-Habitat+card.

Vainer, Carlos. 2014. "Disseminating 'Best Practice'? The Coloniality of Urban Knowledge and City Models." In *The Routledge Handbook on Cities of the Global South*, edited by Susan Parnell and Sophie Oldfield, 48–56. https://doi.org/10.4324/9780203387832.

Valencia, Sandra C., David Simon, Sylvia Croese, Joakim Nordqvist, Michael Oloko, Tarun Sharma, Nick Taylor Buck, and Ileana Versace. 2019. "Adapting the Sustainable Development Goals and the New Urban Agenda to the City Level: Initial Reflections from a Comparative Research Project." *International Journal of Urban Sustainable Development* 11 (1): 4–23. https://doi.org/10.1080/19463138.2019.1573172.

Vanolo, Alberto. 2014. "Smartmentality: The Smart City as Disciplinary Strategy." *Urban Studies* 51 (5): 883–98. https://doi.org/10.1177/0042098013494427.

Velis, Costas. 2017. "Waste Pickers in Global South: Informal Recycling Sector in a Circular Economy Era." *Waste Management and Research* 35 (4): 329–31. https://doi.org/10.1177/0734242X17702024.

Viale Pereira, Gabriela, Maria Alexandra Cunha, Thomas J. Lampoltshammer, Peter Parycek, and Maurício Gregianin Testa. 2017. "Increasing Collaboration and Participation in Smart City Governance: A Cross-Case Analysis of Smart City Initiatives." *Information Technology for Development* 23 (3): 526–53. https://doi.org/10.1080/02681102.2017.1353946.

Vidal, John, and Paul Scruton. 2007. "Burgeoning Cities Face Catastrophe, Says UN." *The Guardian* 28. Juni: 1–3. https://www.theguardian.com/environment/2007/jun/28/climatechange.conservation.

Vieira, Sonia. 2009. *Como Elaborar Questionários*. *Editora Atlas*. Vol. 1. https://www.academia.edu/44305827/Como_Elaborar_Questionários.

Vijayavenkataraman, S., S. Iniyan, and Ranko Goic. 2012. "A Review of Climate Change, Mitigation and Adaptation." *Renewable and Sustainable Energy Reviews* 16 (1): 878–97. https://doi.org/10.1016/J.RSER.2011.09.009.

Vos, J.B., J.F. Feenstra, J. de Boer, L.C. Braat, and J. van Baalen. 1985. "Indicators for the State of the Environment." Amsterdam, Holland.

Wahl, Daniel Christian. 2016. *Designing Regenerative Cultures*. Triarchy Press.

Walton, John. 1982. "Comparative Urban Studies." In *Comparative Sociological Research in the 1960s and 1970s*, edited by J. Michael. Armer and Robert Mortimer. Marsh, 22–39. Leiden: Brill.

https://books.google.com.br/books?hl=en&lr=&id=0oUfAAAAIAAJ&oi=fnd&pg=PA22&dq=Comparative+urban+studies+WALTON,+John+&ots=Fow4Ys287A&sig=qMw7gs8U6bHnyh6sV9KM04XrZJI&redir_esc=y#v=onepage&q=Comparative urban studies WALTON%2C John&f=false.

Watson, Vanessa. 2012. "Book Review: Crossing Borders: International Exchange and Planning Practices, by Patsy Healey and Robert Upton." *Planning Theory* 11 (3): 328–30. https://doi.org/10.1177/1473095211432617.

WCCD. 2018. "The New ISO Standard for Resilient Cities Indicators: Opportunities for City and Expert Input Session Overview." https://resilientcities2018.iclei.org/wp-content/uploads/F3_Presentation_Full_Session.pdf.

Weblio. 2022. "Developing Countries." Weblio Japanese Dictionary, GRAS Group, Inc. 2022. https://www-weblio-jp.translate.goog/wkpja/content/開発途上国_開発途上国の概要?_x_tr_sl=auto&_x_tr_tl=en&_x_tr_hl=de&_x_tr_pto=wapp.

Wee, Bert van, Michel Hagoort, and Jan Anne Annema. 2001. "Accessibility Measures with Competition." *Journal of Transport Geography* 9 (3): 199–208. https://doi.org/10.1016/S0966-6923(01)00010-2.

Wegener, Michael, and Franz Fürst. 2004. "Land-Use Transport Interaction: State of the Art." *SSRN Electronic Journal* 46 (Berichte aus dem Institut für Raumplanung): 119. https://doi.org/10.2139/ssrn.1434678.

Wey, Wann Ming, and Jhong You Huang. 2018. "Urban Sustainable Transportation Planning Strategies for Livable City's Quality of Life." *Habitat International* 82 (June): 9–27. https://doi.org/10.1016/j.habitatint.2018.10.002.

Wiig, Alan, and Elvin Wyly. 2016. "Introduction: Thinking through the Politics of the Smart City." *Urban Geography* 37 (4): 485–93. https://doi.org/10.1080/02723638.2016.1178479.

Wilbanks, Thomas J., and Jayant Sathaye. 2007. "Integrating Mitigation and Adaptation as Responses to Climate Change: A Synthesis." *Mitigation and Adaptation Strategies for Global Change* 12 (5): 957–62. https://doi.org/10.1007/s11027-007-9108-3.

Williams, Modupe. 2023. "Personal Communication to Tobias Kühner, 05 September 2023." 2023. https://www.linkedin.com/in/ACoAAAG4xcwBBBZ7AhNBkmeKrtCsB8CROWrkqGE.

Wilson, David C., Costas Velis, and Chris Cheeseman. 2006. "Role of Informal Sector Recycling in Waste Management in Developing Countries." *Habitat International* 30 (4): 797–808. https://doi.org/10.1016/j.habitatint.2005.09.005.

Wilson, Elizabeth, and Jake Piper. 2010. *Spatial Planning and Climate Change. Spatial Planning and Climate Change.* Routledge Taylor & Francis Group. https://doi.org/10.4324/9780203846537.

Witter, Regina, and Diego Hernández. 2012. "Santiago de Chile and the Transantiago:

Social Impact." In *Technologies and Innovations for Development*, 39–54. Paris: Springer Paris. https://doi.org/10.1007/978-2-8178-0268-8_4.

Wittmayer, J. M., F. van Steenbergen, A. Rok, and C. Roorda. 2016. "Governing Sustainability: A Dialogue between Local Agenda 21 and Transition Management." *Local Environment* 21 (8): 939–55. https://doi.org/10.1080/13549839.2015.1050658.

World Commission on Environment and Development. 1987. "Report of the World Commission on Environment and Development: Our Common Future (The Brundtland Report)." *Medicine, Conflict and Survival*. Vol. 4. Oxford: Oxford University Press. https://doi.org/10.1080/07488008808408783.

WorldAtlas. 2022. "Transcontinental Countries Of The World." Reunion Technology Inc.; Montreal, Canada. 2022. https://www.worldatlas.com/articles/which-are-the-transcontinental-countries-of-our-world.html.

Wurzel, Rudiger K.W., Anthony Zito, and Andrew Jordan. 2013. "From Government towards Governance? Exploring the Role of Soft Policy Instruments." *German Policy Studies* 9 (2): 21. https://go-gale.ez54.periodicos.capes.gov.br/ps/i.do?p=AONE&sw=w&issn=15239764&v=2.1&it=r&id=GALE%7CA373747669&sid=googleScholar&linkaccess=fulltext.

WWF-Philippines. 2011. *Santa Rosa Watershed: Managing Water Resources in Urbanizing Landscapes*. Quezon City, Philippines.

Yuan, W., P. James, K. Hodgson, S. M. Hutchinson, and C. Shi. 2003. "Development of Sustainability Indicators by Communities in China: A Case Study of Chongming County, Shanghai." *Journal of Environmental Management* 68 (3): 253–61. https://doi.org/10.1016/S0301-4797(03)00063-X.

Zhang, Xing Quan. 2016. "The Trends, Promises and Challenges of Urbanisation in the World." *Habitat International* 54 (13): 241–52. https://doi.org/10.1016/j.habitatint.2015.11.018.

Ziakas, Vassilios. 2015. "For the Benefit of All? Developing a Critical Perspective in Mega-Event Leverage." *Leisure Studies* 34 (6): 689–702. https://doi.org/10.1080/02614367.2014.986507.

ANNEXES

Annex 1 - Publication: Preliminary analysis of the new urban agenda: the Brazil case study

682-2733-1-PB.pdf

https://periodicos.unb.br/index.php/espacoegeografia/article/view/40168

Annex 2 - Publication: International urban agendas and sustainable integrated urban development in developing countries: the case of Brazil

20208-Article
Text-93897-1-10-202

https://revistas.rcaap.pt/cct/article/view/20208

Annex 3 - Lists of main international journals relevant to the topic of the research

List of main international journals used for the topic of the research:

	INSS:	Journal Name:	Classification:
1	0360-1323	BUILDING AND ENVIRONMENT	A1 (AUD)
2	0264-2751	CITIES	A1 (AUD)
3	0265-8135	ENVIRONMENT & PLANNING. B, PLANNING & DESIGN (PRINT)	A1 (AUD)
4	0197-3975	HABITAT INTERNATIONAL	A1 (AUD)
5	1558-3058	INTERNATIONAL JOURNAL OF ARCHITECTURAL HERITAGE	A1 (AUD)
6	1468-2427	INT. JOURNAL OF URBAN AND REGIONAL RESEARCH (ONLINE)	A1 (AUD)
	0309-1317	INT. JOURNAL OF URBAN AND REGIONAL RESEARCH (PRINT)	
7	0169-2046	LANDSCAPE AND URBAN PLANNING	A1 (AUD)
8	0733-9488	JOURNAL OF URBAN PLANNING AND DEVELOPMENT	A1 (PURD)
9	0042-0980	URBAN STUDIES (HARLOW. PRINT)	A1 (PURD)
10	0066-4812	ANTIPODE	A1 (PURD)
11	1678-8621	AMBIENTE CONSTRUÍDO (ONLINE)	A2 (AUD)
	1415-8876	AMBIENTE CONSTRUÍDO (SÃO PAULO. IMPRESSO)	A2 (AUD)
12	1414-753X	AMBIENTE E SOCIEDADE (CAMPINAS)	A2 (PURD)
13	0261-3050	BULLETIN OF LATIN AMERICAN RESEARCH	A1 (PURD)

List of additional and potential international journals relevant for future research:

	INSS:	Journal Name:	Classification:
	0305-750X	WORLD DEVELOPMENT	A1 (PURD)
	1083-8155	URBAN ECOSYSTEMS	A1 (AUD)
	1877-3435	CURRENT OPINION IN ENVIRONMENTAL SUSTAINABILITY (PRINT)	A1 (PURD)
	1080-7039	HUMAN AND ECOLOGICAL RISK ASSESSMENT	A1 (PURD)
	1544-8444	POPULATION, SPACE AND PLACE	A1 (PURD)
	0032-4728	POPULATION STUDIES	A1 (PURD)
	0102-6909	REVISTA BRASILEIRA DE CIÊNCIAS SOCIAIS (IMPRESSO)	A1 (PURD)
	1063-0732	THE JOURNAL OF URBAN TECHNOLOGY	A1 (PURD)
	1753-5069	URBAN RESEARCH & PRACTICE (PRINT),	- (NA)
	1753-5077	URBAN RESEARCH & PRACTICE (ONLINE)	- (NA)
	0272-3638	URBAN GEOGRAPHY	A2 (GEOGR.)
	1472-3433	ENVIRONMENT AND PLANNING D: SOCIETY AND SPACE	A1 (CP&RI)
	1470-160X	ECOLOGICAL INDICATORS	A1 (GEOGR.)

Annex 4 - Inside the New Urban Agenda – Its principal appeals for action, implementation on the regional level, and goals of UN-Habitat

Principal appeals for action

The second part of the document consists of the effective implementation, follow-up, and review of the agenda. The NUA tries to internalize the new spirit of regenerative cultures with its holistic approach to the living system design, paying attention to quality & quantity, proposing effectiveness, and implementing its measures in patterns and principles, as shown before.

The agenda highlights three areas of implementation: (1) Sustainable urban development for social inclusion and ending poverty; (2) Sustainable and inclusive urban prosperity and opportunities for all; and (3) Environmentally sustainable and resilient urban development. Samples were named like eradicating poverty, respecting human rights, strengthening governments, promoting housing policies, employment, education, healthcare, and social integration sectors, equitable and affordable access to physical and social infrastructure, leveraging of natural and cultural heritage, participation in decision-making, planning, and follow-up processes, support local economic development, strengthening sustainable transport and mobility, encourage spatial development strategies, the generation and use of renewable energy, adopting a smart-city approach, ensure sustainable consumption and production patterns, strengthening the sustainable management of resources, promoting environmentally consolidated waste management, reduce vulnerabilities and risk, as well as climate change adaptation and mitigation.

The national political stakeholders (like the Ministries of Cities) are requested to coordinate their urban and rural development strategies and programs to apply an integrated approach to sustainable urbanization for the effective implementation of the NUA to establish a supportive framework, anchor the effective implementation in inclusive, implementable and participatory urban policies, foster stronger coordination and cooperation among national, subnational and local governments, and support local governments in determining their own administrative and management structures under the umbrella of "integrated planning". The monitoring of the implementation of integrated urban development occurs through sets of indicators, which are further expounded in Chapter 3.

The suggested planning and managing of urban spatial development promote planned urban extensions and infill, support the provision of well-designed networks of safe, accessible, green, and quality streets and other public spaces, improve capacity-

building for urban planners, integrate inclusive measures for urban safety and the prevention of crime and violence, incorporating participatory planning, developing and using basic land inventory information, upgrading and prevention of slums and informal settlements, promote the development of adequate and enforceable regulations in the housing sector, integrating transport and mobility plans into overall urban and territorial plans, ensure universal access to affordable, reliable and modern energy services by promoting energy efficiency and sustainable renewable energy, support access to sustainable waste management systems, and the leveraging of cultural heritage (UN-Habitat 2017).

Implementation on the regional level

The Regional Action Plan for the Implementation of the New Urban Agenda in Latin America and the Caribbean (RAP) seeks to be the regional expression of the New Urban Agenda and provide policy-making, setting out potential actions and interventions as well as relevant and priority policy guidance for all Latin American and Caribbean countries. It provides the NUA with regional context regarding the special needs and challenges within Latin America. The RAP provisions a shift towards a new urban paradigm that distinguishes the city as a macro-level public good, where the economic, social, cultural, and environmental rights of all are guaranteed. The report consists of an introduction about Habitat I-III, regional opportunities, and challenges, the regional action plan for the implementation (background, objectives, and methodology), strategic framework including the global agreements/agendas, vision and mission for sustainable development in the region, city functions, and cross-cutting perspectives, guiding principles, and key strategic outcomes. Consecutively, the six action areas (national urban policies, urban legal frameworks, urban and territorial planning and design, urban economy and municipal finances, local implementation, monitoring, reporting, and revision mechanisms) are elaborated, followed by the next steps toward implementation and monitoring.

Subsequently, the suggested regional action areas have to be broken down towards federal activities by the national governments and disseminated countrywide to the metropolitan and municipality levels. All participating countries are invited to inform the General Assembly by means of a national report about the national implementation progress of the NUA. The report will respond to local, subnational, and national circumstances and legislation, capacities, needs, and priorities.

<u>Goals of UN-Habitat</u>

Regarding the follow-up and review of the implementation, the agenda wants to strengthen data and statistical capacities to effectively monitor progress achieved and promote evidence-based governance, using both globally comparable as well as locally generated data. The follow-up and review of the NUA should occur voluntarily, country-led, open, inclusive, multilevel, participatory, and transparent. The progress of the implementation should be reported to the General Assembly of the UN every four years, with the first report to be submitted in 2021. The report will provide a qualitative and quantitative analysis of the progress made and internationally agreed goals and targets relevant to sustainable urbanization and human settlements. It will be based on the activities of national, subnational, and local governments as well as relevant stakeholders. In 2026, the General Assembly should take stock of the progress made and challenges faced in the implementation of the New Urban Agenda since its adoption. With this balance, further steps till the horizon in 2036 should be identified to steer the process and guarantee the successful implementation until the following Habitat IV conference.

The main objective of the UN-Habitat with the NUA is to enhance its effectiveness, efficiency, accountability, and oversight. In this regard, the UN agency wants to analyze the normative and operational mandate of UN-Habitat, the governance structure of UN-Habitat for more effective, accountable, and transparent decision-making, considering alternatives, including universalization of the membership of its Governing Council, the work of UN-Habitat with national, subnational and local governments and with relevant stakeholders in order to tap the full potential of partnerships, and the financial capability of UN-Habitat. The interfaces and actions for implementation are based and focused on the five P's: people, planet, prosperity, peace, and partnerships (SDSN 2015).

However, as Parnell (2016) observed, "while the UN cannot define the parameters of a new global urban agenda alone, no other body is as powerful in setting out the normative base or systems of implementation for urban change".

Annex 5 - Desk study about capacity development institutions

<u>Results</u>

The small side survey, focusing on short-term courses and workshops for specialists and technical municipal staff in the management and technical areas highlighted in the questionnaire, revealed an existing landscape of capacity development institutions, not only, but also in developing cities of the global south. Besides, a broad range of institutions offers capacity development webinars, offline courses to download, and online workshops, accessible also in remote municipalities, matching the identified training needs.

This raises the consecutive question of why the existing further education infrastructure is not capable of bridging the existing knowledge gaps in the municipalities regarding the implementation of urban agendas. According to the interviewed experts, the quality of these offers seems often not adequate or insufficient specific for public servants, as the majority of the training is focused on the local economy. Also, insufficient funds for capacity development were reported as a motive for the deficiency of attendance. In addition, the sheer lack of knowledge about the availability of the training offer and reluctance within the municipalities was observed.

However, to respond to the answer properly and in a holistic way, further information would be required and be gathered during consecutive assessments, to verify the preliminary findings of the pilot overview survey. But as the specific objectives of this study are rather to gain an understanding of urban agendas and critical review instruments & indicators for implementation, no further time was invested in exploring nature.

Summary findings of desk study assessment

Name	Location	Country	Management area	Specific technical area	Further skills	Costs	Time frame	Language	Remarks	Internet link
MS TCDC	Arusha	Tanzania	Financial Management	Local economic development	Communication	$ 195 / course	10 days	English	42 Online Short Courses	http://mstcdc.or.tz/virtual-class
MS TCDC	Arusha	Tanzania	General project management	Inclusive Service Delivery & Governance	Leadership	$ 195 / course	10 days	English	42 Online Short Courses	http://mstcdc.or.tz/virtual-class
MS TCDC	Arusha	Tanzania	Knowledge management	Integrated urban planning		$ 195 / course	10 days	English	42 Online Short Courses	http://mstcdc.or.tz/virtual-class
MS TCDC	Arusha	Tanzania	Legal management			$ 195 / course	10 days	English	42 Online Short Courses	http://mstcdc.or.tz/virtual-class
MS TCDC	Arusha	Tanzania			Language	Fee $ 1050	3 weeks	Swahili	Presence Course	http://mstcdc.or.tz/trainings/swahili-language-courses
MS TCDC	Arusha	Tanzania			Language	$580	4 weeks	Swahili	Online Course	http://mstcdc.or.tz/swahili-online-courses
College of African Wildlife Management, Mweka	Moshi	Tanzania		Environmental		Tanzanians: TZS500,000; Non-Tanzanians: USD 250 till US1000	16 Days till 3 Months	English	15 Short online and presence courses	http://196.192.79.35/shortcourse.php
College of African Wildlife Management, Mweka	Moshi	Tanzania		Sustainability, mitigation, adaptation, climate change		Tanzanians: TZS500,000; Non-Tanzanians: USD 250 till US1000	16 Days till 3 Months	English	15 Short online and presence courses	http://196.192.79.35/shortcourse.php
Ethiopian Management Institute (EMI)	Addis Abeba	Ethiopia	General project management		Leadership	Information not available	Tailor-made trainings, workshops, conferences or seminars	English	Official Webpage currently not available	http://www.emi.gov.et/ https://www.linkedin.com/company/ethiopian-management-institute/about/
Construction Project Management Institute (ECPMI)	Addis Abeba	Ethiopia	General project management	Heritage preservation & protection	Cooperation & Networking	Information not available	Information not available	English	Official Webpage currently not available	http://www.ecpmi.gov.et/ https://www.facebook.com/ECPMI/
Construction Project Management Institute (ECPMI)	Addis Abeba	Ethiopia		Water/ wastewater		Information not available	Information not available	English	Official Webpage currently not available	http://www.ecpmi.gov.et/ https://www.facebook.com/ECPMI/
Ethiopian Civil Service University (ECSU)	Addis Abeba	Ethiopia	General project management	Digitalization & good governance	Communication	Information not available	3-5 days per training modul	English	42 Short - Term Trainings on Civil Service Reform	https://web.archive.org/web/20141019105330/http://www.ecsu.edu.et/content/civil-service-reform
Ethiopian Civil Service University (ECSU)	Addis Abeba	Ethiopia		Inclusive Service Delivery & Governance	Language	Information not available	3-5 days per training modul	English	42 Short - Term Trainings on Civil Service Reform	https://web.archive.org/web/20141019105330/http://www.ecsu.edu.et/content/civil-service-reform
Ethiopian Civil Service University (ECSU)	Addis Abeba	Ethiopia	Knowledge management			Information not available	3-5 days per training modul	English	12 Short - Term Trainings on Public Financial Management	https://web.archive.org/web/20141019114134/http://www.ecsu.edu.et/content/public-financial-management
Ethiopian Civil Service University (ECSU)	Addis Abeba	Ethiopia	Financial management			Information not available	3-5 days per training modul	English	12 Short - Term Trainings on Public Financial Management	https://web.archive.org/web/20141019114134/http://www.ecsu.edu.et/content/public-financial-management
Ethiopian Civil Service University (ECSU)	Addis Abeba	Ethiopia	Legal management			Information not available	3-5 days per training modul	English	19 Short-Term Trainings on Legal Studies	https://web.archive.org/web/20141019111109/http://www.ecsu.edu.et/content/legal-studies
Ethiopian Civil Service University (ECSU)	Addis Abeba	Ethiopia		Mobility		Information not available	Information not available	English	XY Short - Term Trainings in Urban Development (Official Webpage currently not available!)	https://web.archive.org/web/20141019113452/http://www.ecsu.edu.et/content/urban-development-1
Ethiopian Civil Service University (ECSU)	Addis Abeba	Ethiopia		Integrated urban planning		Information not available	Information not available	English	XY Short - Term Trainings in Urban Development (Official Webpage currently not available!)	https://web.archive.org/web/20141019113452/http://www.ecsu.edu.et/content/urban-development-1

Name	Location	Country	Management area	Specific technical area	Further skills	Costs	Time frame	Language	Remarks	Internet link
Kyiv School of Economics	Kyiv	Ukraine	Financial Management	Local economic development	Cooperation & Networking	10 900 UAH (Mid-Term); 6250 UAH (Short-term) UAH 6 000 till 26 000 (Courses)	Mid-term (11 weeks); Short-term (7 days); Courses (4-12 weeks)	Ukrainian & English	Executive and professionalization programs and Courses	https://kse.ua/education/
Kyiv School of Economics	Kyiv	Ukraine	Knowledge management	Digitalization & good governance	IT skills	11 900 UAH (Mid-Term); 6250 UAH (Short-term) UAH 6 000 till 26 000 (Courses)	Mid-term (11 weeks); Short-term (7 days); Courses (4-12 weeks)	Ukrainian & English	Executive and professionalization programs and Courses	https://kse.ua/education/
Kyiv School of Economics	Kyiv	Ukraine	General project management		Language	12 900 UAH (Mid-Term); 6250 UAH (Short-term) UAH 6 000 till 26 000 (Courses)	Mid-term (11 weeks); Short-term (7 days); Courses (4-12 weeks)	Ukrainian & English	Executive and professionalization programs and Courses	https://kse.ua/education/
National Academy for Public Administration & Kharkov Regional Institute	Kyiv & Kharkov	Ukraine	General project management	Digitalization & good governance	Cooperation & Networking	180 UAH	2 days	Ukrainian	The institute comprises of a Distance Learning Center	http://academy.gov.ua/?lang=eng&tip=dop&tipn=Page&page=32 http://academy.gov.ua/?lang=eng&tip=dop&tipn=Page&page=10 https://kbuapa.kh.ua/?page_id=501#conten
National Academy for Public Administration & Kharkov Regional Institute	Kyiv & Kharkov	Ukraine	Knowledge management	Citizen participation		180 UAH	2 days	Ukrainian	The institute comprises of a Distance Learning Center	http://academy.gov.ua/?lang=eng&tip=dop&tipn=Page&page=32 http://academy.gov.ua/?lang=eng&tip=dop&tipn=Page&page=11 https://kbuapa.kh.ua/?page_id=501#conten
National Academy for Public Administration & Kharkov Regional Institute	Kyiv & Kharkov	Ukraine		Inclusive Service Delivery & Governance		180 UAH	2 days	Ukrainian	The institute comprises of a Distance Learning Center	http://academy.gov.ua/?lang=eng&tip=dop&tipn=Page&page=32 http://academy.gov.ua/?lang=eng&tip=dop&tipn=Page&page=12 https://kbuapa.kh.ua/?page_id=501#conten
National Technical University Kharkov Polytechnic Institute	Kharkov	Ukraine	Financial Management	Energy efficiency	IT skills	Up to $ 1400 per year	1 till 10 months	Russian	Further information to courses, timeframes and costs only available in situ	https://www.kpi.kharkov.ua/rus/osvita/pislyadiploplomna-osvita/ http://www.mipk.kharkiv.edu/index.php?id=840
National Technical University Kharkov Polytechnic Institute	Kharkov	Ukraine	General project management		Cooperation & Networking	Up to $ 1400 per year	1 till 10 months	Russian	Further information to courses, timeframes and costs only available in situ	https://www.kpi.kharkov.ua/rus/osvita/pislyadiploplomna-osvita/ http://www.mipk.kharkiv.edu/index.php?id=841
National Technical University Kharkov Polytechnic Institute	Kharkov	Ukraine	Knowledge management			Up to $ 1400 per year	1 till 10 months	Russian	Further information to courses, timeframes and costs only available in situ	https://www.kpi.kharkov.ua/rus/osvita/pislyadiploplomna-osvita/ http://www.mipk.kharkiv.edu/index.php?id=842
Institute of Postgraduate Education and Pre-University Training	Lviv	Ukraine		Inclusive Service Delivery & Governance	Language	Information not available	16 up tol 72 hours	Ukrainian & English	Certification courses	https://ipodp.lnu.edu.ua/academics/sertyfikatsijni-kursy&use=ALkJrhi7uJ1QQOpXJHThamo0d2Z3mwaOkg
Institute of Postgraduate Education and Pre-University Training	Lviv	Ukraine			IT skills	Information not available	16 up to 72 hours	Ukrainian & English	Certification courses	https://ipodp.lnu.edu.ua/academics/sertyfikatsijni-kursy&use=ALkJrhi7uJ1QQOpXJHThamo0d2Z3mwaOkg
Lviv City-Institut	Lviv	Ukraine		Local economic development	Cooperation & Networking	For free, or with contribution (E.g. UAH 157,955.03)	Flexible, e.g. 7-days site visit	Ukrainian & English	Projects and networking meetings	http://city-institute.org/en/projects/
Lviv Business School	Lviv	Ukraine	Financial Management	Local economic development	Cooperation & Networking	6500 UAH up to 32000 UAH	3 days up to 4 months	Ukrainian & English	Executive Education	https://lvbs.com.ua/en/education/programs/ex-ed/
Beketova University	Kharkov	Ukraine	Financial Management	Energy efficiency	Language	240 UAH - 1200 UAH (prices from 2013/14!)	3 days up to 2 months	Ukrainian (& English, French, German)	Short Presence Course Program & "Moodle" Distance Trainings	https://cpk.kname.edu.ua/index.php/uk/nashi-kursi
Kharkov National University Karazina	Kharkov	Ukraine	Knowledge management	Digitalization & good governance	IT skills	UAH 950	2 weeks	Ukrainian	Advanced distance training courses	https://dist.karazin.ua/for-teachers/training-courses/
Business Schule IPM	Minsk & Mogilev	Belarus	Financial Management	Local economic development	Cooperation & Networking	120 BYN till 1 490 BYN	8 hours till 180 hours	Russian	Short-term programs	https://www.ipm.by/programms/
Business Schule IPM	Minsk & Mogilev	Belarus	General project management	Citizen participation	Communication	120 BYN till 1 490 BYN	8 hours till 180 hours	Russian	Short-term programs	https://www.ipm.by/programms/

Name	Location	Country	Management area	Specific technical area	Further skills	Costs	Time frame	Language	Remarks	Internet link
School of Business of BSU	Minsk	Belarus	Knowledge management	Local economic development	Cooperation & Networking	Information not available	Information not available	Russian	E-Learning Plattform (Webinars & trainings)	http://cdesbmt.by/index.php?lang=2 http://el.sbmt.by/
School of Business of BSU	Minsk	Belarus	Financial Management			Information not available	Information not available	Russian	E-Learning Plattform (Webinars & trainings)	http://cdesbmt.by/index.php?lang=2 http://el.sbmt.by/
Belarusian-Russian University	Mogliev	Belarus			Language	215.00 RUB	48 hours	English & German	Training courses	http://www.ipk.mogilev.by/training-cources.html
Belarusian-Russian University	Mogliev	Belarus	Financial Management	Local economic development	IT skills	185.00 - 259.40 rub	40 - 88 hours	Russian	Training courses	http://www.ipk.mogilev.by/training-cources.html
Belarusian-Russian University	Mogliev	Belarus		Security		690.00 rubles	3 months	Russian	Anti-crisis-training	http://www.ipk.mogilev.by/anti-crisis-trainings.html
Virtual University of Tunis (VUT)	Tunis	Tunesia	General project management	Digitalization & good governance	IT skills	150 DT	15 Weeks	French & Arabic	Continuous trainings and qualifiactions	https://www.uvt.rnu.tn/en/the-university/presentation
Virtual University of Tunis (VUT)	Tunis	Tunesia			Language	150 DT	16 Weeks	English	Continuous trainings and qualifiactions	https://www.uvt.rnu.tn/en/the-university/presentation
National School of Administration of Tunis	Tunis	Tunesia	Financial Management	Local economic development	Cooperation & Networking	Information not available	Information not available	French & Arabic	Basic training, continuing education, and online courses	http://www.ena.tn/cours-et-supports-en-ligne/?lang=fr
The International Academy of Good Governance	Tunis	Tunesia		Digitalization & good governance	Cooperation & Networking	Information not available	8 hours	French & Arabic	Short-term training sessions and workshops	http://www.ena.tn/gouvernance/lacademie-internationale-de-la-bonne-gouvernance/?lang=fr
ITG.ID	Jakarta	Indonesia	General project management	Digitalization & good governance	Cooperation & Networking	IDR 250.000 - 8.000.000	1 - 3 days	English	Live Distance & In-Class Learning Methode	https://itgid.org/interactive-live-distance-learning/
ITG.ID	Jakarta	Indonesia	Institutional quality management	Inclusive Service Delivery & Governance	IT skills	IDR 250.000 - 8.000.000	1 - 3 days	English	Live Distance & In-Class Learning Methode	https://itgid.org/interactive-live-distance-learning/
Value Consult	Jakarta	Indonesia	Institutional quality management	Local economic development	IT skills	Rp 1.000.000 - Rp 5.850.000	1-2 days	English	Public & Web Based Training	https://valueconsulttraining.com/public-training/ https://valueconsulttraining.com/web-based-training-value-consult/
Value Consult	Jakarta	Indonesia	Financial Management		Communication	Rp 1.000.000 - Rp 5.850.000	1-2 days	English	Public & Web Based Training	https://valueconsulttraining.com/public-training/ https://valueconsulttraining.com/web-based-training-value-consult/
Jimmly School of Law and Government	Jakarta	Indonesia	Legal management			Information not available	3-4 Days	Indonesian	Legislative & Legal Drafting Training	https://jimlyschool.com/diklat/legislative-drafting-training/
Training Hukum dan SDM	Yogyakarta	Indonesia	General project management		Communication	6.500.000 IDR	2 days	Indonesian	Trainings	http://training-hukumsdm.com/
Training Hukum dan SDM	Yogyakarta	Indonesia	Legal management		Leadership	6.500.000 IDR	2 days	Indonesian	Trainings	http://training-hukumsdm.com/
GRC Indonesia	Jakarta	Indonesia	Institutional quality management	Digitalization & good governance	Cooperation & Networking	Rp.5,000,000	2 days	Indonesian	Goverance, Risk & Compliance Trainings	https://grc-indonesia.com/pelatihan/
GRC Indonesia	Jakarta	Indonesia	Legal management	Inclusive Service Delivery & Governance		Rp.5,000,000	2 days	Indonesian	Goverance, Risk & Compliance Trainings	https://grc-indonesia.com/pelatihan/
Transform Manpower Indonesia	Yogyakarta	Indonesia	Financial Management	Local economic development	IT skills	6,500,000 - 7,500,000 Rp	2 days	Indonesian	Public, In-house & Online trainings	http://transform-mpi.com
Transform Manpower Indonesia	Yogyakarta	Indonesia	General project management	Water/ wastewater	Leadership	6,500,000 - 7,500,000 Rp	2 days	Indonesian	Public, In-house & Online trainings	http://transform-mpi.com
Kubik Leadership	Jakarta	Indonesia			Leadership	IDR 5,900,000	2 days	Indonesian	Public Trainings	https://www.kubikleadership.com/training-modules/
Kubik Leadership	Jakarta	Indonesia			Cooperation & Networking	IDR 5,900,000	2 days	Indonesian	Public Trainings	https://www.kubikleadership.com/training-modules/
Foster and Bridge Indonesia	Jakarta	Indonesia	Financial Management	Local economic development	Communication	Information not available	2-4 days	Indonesian	Public Online & Face-to-Face trainings	http://fosterandbridgeindonesia.com/annual-public-training-schedule-foster-and-bridge-indonesia-jakarta-2/
Foster and Bridge Indonesia	Jakarta	Indonesia	General project management		Cooperation & Networking	Information not available	2-4 days	Indonesian	Public Online & Face-to-Face trainings	http://fosterandbridgeindonesia.com/annual-public-training-schedule-foster-and-bridge-indonesia-jakarta-2/
SENCICO	Lima	Peru	General project management	Energy efficiency	IT skills	Information not available	18-36 hours	Spanish	Short-term courses	https://www.sencico.gob.pe/formacion/305
SENCICO	Lima	Peru		Water/ wastewater	Cooperation & Networking	Information not available	18-36 hours	Spanish	Short-term courses	https://www.sencico.gob.pe/formacion/306
Plataforma Digital Única del Estado Peruano	Lima	Peru	General project management	Environmental		Information not available	30-60 hours	Spanish	Presencial & online courses	https://www.gob.pe/1029-cursos-de-gestion-ambiental-aprende
Plataforma Digital Única del Estado Peruano	Lima	Peru	Knowledge management	Sustainability, mitigation, adaptation, climate change		Information not available	30-60 hours	Spanish	Presencial & online courses	https://www.gob.pe/1029-cursos-de-gestion-ambiental-aprende
Centro de Educación Continua de la PUCP	San Miguel	Peru	Financial Management	Energy efficiency	IT skills	Information not available	120-150 hours	Spanish	Specialization courses	https://cec.pucp.edu.pe/cursos-de-especializacion.php
Centro de Educación Continua de la PUCP	San Miguel	Peru	Legal management	Local economic development		Information not available	120-150 hours	Spanish	Specialization courses	https://cec.pucp.edu.pe/cursos-de-especializacion.php

Name	Location	Country	Management area	Specific technical area	Further skills	Costs	Time frame	Language	Remarks	Internet link
SIICEX	Lima	Peru	Knowledge management	Digitalization & good governance	Cooperation & Networking	Information not available	2 days	Spanish	Specialization courses	http://www.siicex.gob.pe/siicex/portalSES.asp?_page_=392.38700#ancl_afecha
SIICEX	Lima	Peru		Inclusive Service Delivery & Governance	IT skills	Information not available	2 days	Spanish	Specialization courses	http://www.siicex.gob.pe/siicex/portalSES.asp?_page_=392.38700#ancl_afecha
Instituto Peruano de Capacitación	Lima/ Arequipa/ Tacna	Peru	Institutional quality management	Security	Leadership	S/.900.00	350 hours (3 months)	Spanish	Diplomas, Seminars & Specializations	http://institutoipcperu.com/ipc/index.php
Instituto Peruano de Capacitación	Lima/ Arequipa/ Tacna	Peru	General project management	Environmental		S/.900.00	350 hours (3 months)	Spanish	Diplomas, Seminars & Specializations	http://institutoipcperu.com/ipc/index.php
Instituto Peruano de Capacitación	Lima/ Arequipa/ Tacna	Peru	Contract management	Digitalization & good governance		S/.900.00	350 hours (3 months)	Spanish	Diplomas, Seminars & Specializations	http://institutoipcperu.com/ipc/index.php
Instituto Peruano de Capacitación	Lima/ Arequipa/ Tacna	Peru	Legal management	Inclusive Service Delivery & Governance		S/.900.00	350 hours (3 months)	Spanish	Diplomas, Seminars & Specializations	http://institutoipcperu.com/ipc/index.php
Formate.pe	Diverse	Peru				For free	N.A.	Spanish	Search engine for free short-term courses, workshops and webinars	https://www.formate.pe/cursos-gratuitos-virtuales-presenciales.php
Macedonian Center for International Cooperation	Skopje	North Macedonia	General project management	Security	Cooperation & Networking	Information not available	3-4 Days	Macedonian	Consultations & Trainings	https://mcms.mk/en/our-work/consultations-and-training/themes.html
Macedonian Center for International Cooperation	Skopje	North Macedonia	Financial Management	Digitalization & good governance	Communication	Information not available	3-4 Days	Macedonian	Consultations & Trainings	https://mcms.mk/en/our-work/consultations-and-training/themes.html
Training Center EVA (Educational Vocational Assistance)	Skopje	North Macedonia			Language	6,400 - 9,000 denars	2 days up to 6 months	Macedonian	Educational Vocational Training Courses	http://tc-eva.com/who-we-are.shtml
Training Center EVA (Educational Vocational Assistance)	Skopje	North Macedonia			Communication	6,400 - 9,000 denars	3 days up to 6 months	Macedonian	Educational Vocational Training Courses	http://tc-eva.com/who-we-are.shtml
Adult Education Center	Skopje	North Macedonia	General project management	Local economic development		Information not available	24 - 250 hours	Macedonian	Adult Vocational Training Courses	http://cov.gov.mk/en/all-courses/
Adult Education Center	Skopje	North Macedonia		Inclusive Service Delivery & Governance		Information not available	24 - 250 hours	Macedonian	Adult Vocational Training Courses	http://cov.gov.mk/en/all-courses/
Center for promotion of sustainable agricultural practices and rural development	Skopje	North Macedonia	Institutional quality management	Energy efficiency	Cooperation & Networking	Information not available	e.g. 50 classes	Macedonian	Training program	http://ceprosard.org.mk/en/Default.aspx
Center for promotion of sustainable agricultural practices and rural development	Skopje	North Macedonia		Environmental		Information not available	e.g. 50 classes	Macedonian	Training program	http://ceprosard.org.mk/en/Default.aspx
Knowledge Academy	Skopje	North Macedonia	General project management	Digitalization & good governance	IT skills	95-295 €	1-5 days	English	Online & In-house Training Courses	https://www.theknowledgeacademy.com/mk/courses/
Knowledge Academy	Skopje	North Macedonia	Financial Management	Inclusive Service Delivery & Governance	Leadership	95-295 €	1-5 days	English	Online & In-house Training Courses	https://www.theknowledgeacademy.com/mk/courses/
Institute for Research in Environment, Civil Engineering and Energy (IECE)	Skopje & Ohrid	North Macedonia	General project management	Sustainability, mitigation, adaptation, climate change	Leadership	Information not available	1 week	English	Short-courses	http://www.iece.edu.mk/index.php/en/short-courses/
Sivil Düşün	Ankara	Turkey	General project management	Citizen participation	Cooperation & Networking	Information not available	Information not available	Turkish & English	European Union Program	http://sivildusun.net/english/
Sivil Düşün	Ankara	Turkey		Digitalization & good governance	Communication	Information not available	Information not available	Turkish & English	European Union Program	http://sivildusun.net/english/
Sivil Düşün	Ankara	Turkey		Inclusive Service Delivery & Governance		Information not available	Information not available	Turkish & English	European Union Program	http://sivildusun.net/english/
Sivil Toplumu Geliştirme Merkezi (STGM)	Ankara	Turkey	General project management	Citizen participation	Cooperation & Networking	Information not available (Propably for free)	3-4 days	Turkish & English	P2P On-demand Online	http://www.stgm.org.tr/en http://www.stgm.org.tr/en/icerik/detay/stgm-online-training-continues-project-cycle-management-training-completed
Sivil Toplumu Geliştirme Merkezi (STGM)	Ankara	Turkey		Digitalization & good governance	Communication	Information not available (Propably for free)	3-4 days	Turkish & English	P2P On-demand & Online Trainings	http://www.stgm.org.tr/en http://www.stgm.org.tr/en/icerik/detay/stgm-online-training-continues-project-cycle-management-training-completed
Istanbul Aydin University	Istanbul	Turkey	General project management	Local economic development	IT skills	700 USD	2 weeks	Turkish & English	Short Term Study Programs	https://www.aydin.edu.tr/en-us/international/shortterm/Pages/index.aspx
AZTech Training & Consultancy	Istanbul & Dubai	Turkey & UAE	Financial Management	Integrated urban planning	Leadership	$5,950 till $11,900	1-2 weeks	English	Training Courses	http://aztechtraining.com/training/istanbul-turkey
AZTech Training & Consultancy	Istanbul & Dubai	Turkey & UAE	Contract management	Local economic development	Communication	$5,950 till $11,900	1-2 weeks	English	Training Courses	http://aztechtraining.com/training/istanbul-turkey

Name	Location	Country	Management area	Specific technical area	Further skills	Costs	Time frame	Language	Remarks	Internet link
BMC Training	Istanbul, Dubai & Kuala Lumpur	Turkey, Malaysia & UAE	Financial Management	Energy efficiency	Leadership	5549 till 11100 GBP + VAT	1-2 weeks	English	Training Courses	https://www.bmc.net/location/4/Istanbul
BMC Training	Istanbul, Dubai & Kuala Lumpur	Turkey, Malaysia & UAE	Contract management	Environmental	Cooperation & Networking	5550 till 11100 GBP + VAT	1-2 weeks	English	Training Courses	https://www.bmc.net/location/4/Istanbul
BMC Training	Istanbul, Dubai & Kuala Lumpur	Turkey, Malaysia & UAE	General project management	Security	Communication	5551 till 11100 GBP + VAT	1-2 weeks	English	Training Courses	https://www.bmc.net/location/4/Istanbul
BMC Training	Istanbul, Dubai & Kuala Lumpur	Turkey, Malaysia & UAE	Institutional quality management	Integrated urban planning		5552 till 11100 GBP + VAT	1-2 weeks	English	Training Courses	https://www.bmc.net/location/4/Istanbul
Glomacs Istanbul	Istanbul & Dubai	Turkey & UAE	General project management	Local economic development	Communication	$5,950 till $11,900	5-10 days	English & Arabic	Training Courses	http://glomacs.com/training/istanbul-turkey
Glomacs Istanbul	Istanbul & Dubai	Turkey & UAE	Financial Management	Digitalization & good governance	Leadership	$5,950 till $11,900	5-10 days	English & Arabic	Training Courses	http://glomacs.com/training/istanbul-turkey
CIFAL Durban	Durban	South Africa	General project management	Digitalization & good governance	Leadership	Information not available (Propably for free)	3-5 days	English	Training Program	https://unitar.org/about/offices-training-centres-around-world/cifal-durban http://www.durban.gov.za/Resource_Centre/Current%20Projects%20and%20Programmes/CIFAL_Durban/Training_Programmes/Pages/default.aspx
CIFAL Durban	Durban	South Africa		Integrated urban planning		Information not available (Propably for free)	3-5 days	English	Training Program	https://unitar.org/about/offices-training-centres-around-world/cifal-durban http://www.durban.gov.za/Resource_Centre/Current%20Projects%20and%20Programmes/CIFAL_Durban/Training_Programmes/Pages/default.aspx
CIFAL Durban	Durban	South Africa		Local economic development		Information not available (Propably for free)	3-5 days	English	Training Program	https://unitar.org/about/offices-training-centres-around-world/cifal-durban http://www.durban.gov.za/Resource_Centre/Current%20Projects%20and%20Programmes/CIFAL_Durban/Training_Programmes/Pages/default.aspx
CIFAL Durban	Durban	South Africa		Waste		Information not available (Propably for free)	3-5 days	English	Training Program	https://unitar.org/about/offices-training-centres-around-world/cifal-durban http://www.durban.gov.za/Resource_Centre/Current%20Projects%20and%20Programmes/CIFAL_Durban/Training_Programmes/Pages/default.aspx
CIFAL Durban	Durban	South Africa		Water/ wastewater		Information not available (Propably for free)	3-5 days	English	Training Program	https://unitar.org/about/offices-training-centres-around-world/cifal-durban http://www.durban.gov.za/Resource_Centre/Current%20Projects%20and%20Programmes/CIFAL_Durban/Training_Programmes/Pages/default.aspx
Accredited Africa Training Institute (AATICD)	Gauteng	South Africa	Financial Management	Local economic development	IT skills	USD1750 (online), USD 2,450.00 (1 week) USD 3,820.00 (3 weeks)	1-3 weeks	English, French & Portuguese	Campus, In-House & Online Courses	http://aaticd.co.za/
Accredited Africa Training Institute (AATICD)	Gauteng	South Africa	Contract management	Environmental	Leadership	USD1750 (online), USD 2,450.00 (1 week) USD 3,820.00 (3 weeks)	1-3 weeks	English, French & Portuguese	Campus, In-House & Online Courses	http://aaticd.co.za/
Accredited Africa Training Institute (AATICD)	Gauteng	South Africa	General project management	Security	Communication	USD1750 (online), USD 2,450.00 (1 week) USD 3,820.00 (3 weeks)	1-3 weeks	English, French & Portuguese	Campus, In-House & Online Courses	http://aaticd.co.za/
Accredited Africa Training Institute (AATICD)	Gauteng	South Africa	Institutional quality management	Digitalization & good governance	Cooperation & Networking	USD1750 (online), USD 2,450.00 (1 week) USD 3,820.00 (3 weeks)	1-3 weeks	English, French & Portuguese	Campus, In-House & Online Courses	http://aaticd.co.za/
Accredited Africa Training Institute (AATICD)	Gauteng	South Africa	Legal management	Health		USD1750 (online), USD 2,450.00 (1 week) USD 3,820.00 (3 weeks)	1-3 weeks	English, French & Portuguese	Campus, In-House & Online Courses	http://aaticd.co.za/
SETA Training Center	Pretoria	South Africa	General project management	Local economic development	Cooperation & Networking	Information not available	2 - 18 months	English	Sector Education and Training Authority (SETA) Trainings	http://www.seta-training.co.za/seta-training.html
Municipal Institute of Learning (MILE)	Durban	South Africa	Financial Management	Digitalization & good governance		Information not available (Propably for free)	Information not available	English	E-Learning Platform (Webinars & trainings)	http://www.mile.org.za/Come_Learn/Pages/default.aspx

Name	Location	Country	Management area	Specific technical area	Further skills	Costs	Time frame	Language	Remarks	Internet link
Municipal Institute of Learning (MILE)	Durban	South Africa	Knowledge management	Security		Information not available (Propably for free)	Information not available	English	E-Learning Plattform (Webinars & trainings)	http://www.mile.org.za/Come_Learn/Pages/default.aspx
Municipal Institute of Learning (MILE)	Durban	South Africa		Water/ wastewater		Information not available (Propably for free)	Information not available	English	E-Learning Plattform (Webinars & trainings)	http://www.mile.org.za/Come_Learn/Pages/default.aspx
Municipal Institute of Learning (MILE)	Durban	South Africa		Waste		Information not available (Propably for free)	Information not available	English	E-Learning Plattform (Webinars & trainings)	http://www.mile.org.za/Come_Learn/Pages/default.aspx
Municipal Institute of Learning (MILE)	Durban	South Africa		Integrated urban planning		Information not available (Propably for free)	Information not available	English	E-Learning Plattform (Webinars & trainings)	http://www.mile.org.za/Come_Learn/Pages/default.aspx
Municipal Institute of Learning (MILE)	Durban	South Africa		Sustainability, mitigation, adaptation, climate change		Information not available (Propably for free)	Information not available	English	E-Learning Plattform (Webinars & trainings)	http://www.mile.org.za/Come_Learn/Pages/default.aspx
Municipal Institute of Learning (MILE)	Durban	South Africa		Inclusive Service Delivery & Governance		Information not available (Propably for free)	Information not available	English	E-Learning Plattform (Webinars & trainings)	http://www.mile.org.za/Come_Learn/Pages/default.aspx
College AS	Cape Town	South Africa	Financial management	Digitalization & good governance	Leadership	R1360 per month	2 months	English	Short Courses	https://www.collegesa.edu.za/courses/workplace-skills-short-courses/short-skills-courses-in-the-workplace/
College AS	Cape Town	South Africa	General project management	Local economic development	Communication	R1360 per month	3 months	English	Short Courses	https://www.collegesa.edu.za/courses/workplace-skills-short-courses/short-skills-courses-in-the-workplace/
UNRWA	Alaroub, Deir El-Balha, Tulkarim	Palestine	General project management	Local economic development		Information not available (Propably for free)	8-40 weeks	English	TVET programme Short-term courses	https://unevoc.unesco.org/wtdb/worldtvetdatabase_pse_en.pdf
YMCA East Jerusalem	Ramallah, Jericho, East Jerusalem	Palestine	General project management	Local economic development	Leadership	Information not available (Propably for free)	Information not available	English	Vocational & Training Program Short term courses	https://www.ej-ymca.org/index.php?option=com_content&view=article&id=87&Itemid=109 https://www.ej-ymca.org/index.php?option=com_content&view=article&id=79:womens-training&catid=31&Itemid=95
YMCA East Jerusalem	Ramallah, Jericho, East Jerusalem	Palestine	Financial management	Citizen Participation	IT skills	Information not available (Propably for free)	Information not available	English	Vocational & Training Program Short term courses	https://www.ej-ymca.org/index.php?option=com_content&view=article&id=87&Itemid=109 https://www.ej-ymca.org/index.php?option=com_content&view=article&id=79:womens-training&catid=31&Itemid=96
Al-Quds Open University	Ramallah, Hebron, Amman	Palestine & Jordan	Knowledge management	Inclusive Service Delivery & Governance	IT skills	Information not available	Information not available	English & Arabic	E-Learning, Workshops, Projects and Trainings	https://www.qou.edu/en/olc/proj_Trainings.jsp
Al-Quds Open University	Ramallah, Hebron, Amman	Palestine & Jordan		Digitalization & good governance	Cooperation & Networking	Information not available	Information not available	English & Arabic	E-Learning, Workshops, Projects and Trainings	https://www.qou.edu/en/olc/proj_Trainings.jsp
The Excellence Center in Palestine & Let's Learn Online	Hebron & Halle	Palestine & Germany	Legal management	Environmental	Language	120 Euro - 200 Euro	6h-10h / 3 days	English & Arabic	Short Courses	https://letslearnonline.org/courses/
Academy for International Cooperation (AIZ)	Bonn, Bangkok and others	Germany, Thailand and others	General project management	Sustainability, mitigation, adaptation, climate change	Leadership	680 Euro - 2.200 Euro	1/2 - 5 days	English, French & Spanish	Presencial & online courses	https://www.learning-giz.de/pub/Courses-available-in-English-French-and-Spanish/folder/Fremdsprachen
Academy for International Cooperation (AIZ)	Bonn, Bangkok and others	Germany, Thailand and others	Financial management	Digitalization & good governance	Cooperation & Networking	680 Euro - 2.200 Euro	1/2 - 5 days	English, French & Spanish	Presencial & online courses	https://www.learning-giz.de/pub/Courses-available-in-English-French-and-Spanish/folder/Fremdsprachen
EIPA	Maastricht & Luxembourg	Belgium & Luxembourg	Legal management	Digitalization & good governance	Cooperation & Networking	390 Euro - 2.100 Euro	1 - 5 days	English & French	Presencial & online courses on EU policies	https://www.eipa.eu/courses/
United Nations University GEST	Upon demand	Worldwide		Sustainability, mitigation, adaptation, climate change	Cooperation & Networking	Information not available	3 - 5 days	English	Short courses and training	https://gest.unu.edu/en/education/short-courses-and-training
United Nations University GEST	Upon demand	Worldwide		Inclusive Service Delivery & Governance		Information not available	4 - 5 days	English	Short courses and training	https://gest.unu.edu/en/education/short-courses-and-training
GetSmarter (online plattfrom)	Online	Worldwide	General project management	Sustainability, mitigation, adaptation, climate change	Communication	Payment & currency according course selection	4 - 10 weeks	English	Online Short Courses	https://www.getsmarter.com/courses
GetSmarter (online plattfrom)	Online	Worldwide	Financial management	Local economic development	IT skills	Payment & currency according course selection	4 - 10 weeks	English	Online Short Courses	https://www.getsmarter.com/courses

Name	Location	Country	Management area	Specific technical area	Further skills	Costs	Time frame	Language	Remarks	Internet link
GetSmarter (online plattfrom)	Online	Worldwide	Legal management	Energy efficiency	Cooperation & Networking	Payment & curreny according course selection	4 - 10 weeks	English	Online Short Courses	https://www.getsmarter.com/courses
edX (online plattform)	Online	Worldwide	Knowledge management	Integrated urban planning	Cooperation & Networking	For free	4 - 10 weeks	English	Online Courses and Programs	https://www.edx.org/search?tab=course
edX (online plattform)	Online	Worldwide	Institutional quality management	Energy efficiency	Language	For free	4 - 10 weeks	English	Online Courses and Programs	https://www.edx.org/search?tab=course
edX (online plattform)	Online	Worldwide	Legal management	Sustainability, mitigation, adaptation, climate change	Communication	For free	4 - 10 weeks	English	Online Courses and Programs	https://www.edx.org/search?tab=course
edX (online plattform)	Online	Worldwide	Financial management	Inclusive Service Delivery & Governance	IT skills	For free	4 - 10 weeks	English	Online Courses and Programs	https://www.edx.org/search?tab=course
edX (online plattform)	Online	Worldwide	General project management	Water/ wastewater		For free	4 - 10 weeks	English	Online Courses and Programs	https://www.edx.org/search?tab=course
Reliefweb (online plattform)	Online & On-site	Worldwide	General project management	Sustainability, mitigation, adaptation, climate change	Cooperation & Networking	Free offers & £1250 till 4144€	1 day till 6 weeks	English	328 Free & 561 Payed Courses (Online & on-site)	https://reliefweb.int/training
Reliefweb (online plattform)	Online & On-site	Worldwide	Legal management	Security	Communication	Free offers & £1250 till 4144€	2 day till 6 weeks	English	329 Free & 561 Payed Courses (Online & on-site)	https://reliefweb.int/training
Reliefweb (online plattform)	Online & On-site	Worldwide	Knowledge management	Inclusive Service Delivery & Governance	Leadership	Free offers & £1250 till 4144€	3 day till 6 weeks	English	330 Free & 561 Payed Courses (Online & on-site)	https://reliefweb.int/training
Linkedin-Learning	Online	Worldwide	General project management		Cooperation & Networking	1-month free trial	1-8 hours	Various	13,000 Courses & learning plattform	http://linkedin-learning.pxf.io/jLKzP
Google Digital Garage	Online	Worldwide	Financial management	Digitalization & good governance	Communication	For free	3-40 hours	English	136 free Online courses	https://learndigital.withgoogle.com/digitalgarage/courses
Oxford Home Study	Online	Worldwide	General project management		Cooperation & Networking	For free	10-20 hours	English	466 free Online courses	https://www.oxfordhomestudy.com/free-online-courses-with-certificates
Oxford Home Study	Online	Worldwide	Financial management		Leadership	For free	10-20 hours	English	466 free Online courses	https://www.oxfordhomestudy.com/free-online-courses-with-certificates
Open Learning	Online	Worldwide	General project management			Payment & currency according course selection	Flexible, e.g. 8 hours course	English	1.300 Free and paid online courses	https://www.openlearning.com/courses/
Saylor	Online	Worldwide	General project management		Language	For free	12-80 hours	English	323 free Online courses	https://learn.saylor.org/
Saylor	Online	Worldwide	Financial management		IT skills	For free	12-80 hours	English	323 free Online courses	https://learn.saylor.org/

Annex 6 - Matrix of globally recognized and applied indicators

	Set name / Source	Energy (Electricity)	Solid Waste	Transportation (Mobility)	Water (City/Fresh/Drinking)
1.	**ISO 37120 (2018) /** (ISO 2018)	- Total end-use energy consumption per capita (GJ/year) - Percentage of total end-use energy derived from renewable sources - Percentage of city population with authorized electrical service (residential) - Number of gas distribution service connections per 100 000 population - Final energy consumption of public buildings per year (GJ/m2) - Electricity consumption of public street lighting per kilometre of lighted street (kWh/year) - Average annual hours of electrical service interruptions per household - Heating degree days - Cooling degree days	- Percentage of city population with regular solid waste collection (residential) - Total collected municipal solid waste per capita - Percentage of the city's solid waste that is recycled - Percentage of the city's solid waste that is disposed of in a sanitary landfill - Percentage of the city's solid waste that is treated in energy-from-waste plants - Percentage of the city's solid waste that is biologically treated and used as compost or biogas - Percentage of the city's solid waste that is disposed of in an open dump - Percentage of the city's solid waste that is disposed of by other means - Hazardous waste generation per capita (tonnes) - Percentage of the city's hazardous waste that is recycled	- Kilometres of public transport system per 100 000 population - Annual number of public transport trips per capita - Percentage of commuters using a travel mode other than a personal vehicle - Kilometres of bicycle paths and lanes per 100 000 population - Transportation deaths per 100 000 population - Percentage of population living within 0,5 km of public transit running at least every 20 min during peak periods - Average commute time - Number of personal automobiles per capita - Number of two-wheeled motorized vehicles per capita	- Percentage of city population with potable water supply service - Percentage of city population with sustainable access to an improved water source - Total domestic water consumption per capita (litres/day) - Compliance rate of drinking water quality - Total water consumption per capita (litres/day) - Average annual hours of water service interruptions per household - Percentage of water loss (unaccounted for water)
2.	**SDG Indicators (2015) /** (United Nations 2015c)	- Proportion of population with access to electricity - Proportion of population with primary reliance on clean fuels and technology - Renewable energy share in the total final energy consumption - Energy intensity measured in terms of primary energy and GDP - International financial flows to developing countries in support of clean energy research and development and renewable energy production, including in hybrid systems - Installed renewable energy-generating capacity in developing countries (in watts per capita)	- Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities - National recycling rate, tons of material recycled	- Passenger and freight volumes, by mode of transport - Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities	- Proportion of population using safely managed drinking water services - Proportion of bodies of water with good ambient water quality - Level of water stress: freshwater withdrawal as a proportion of available freshwater resources - Degree of integrated water resources management - Amount of water-related official development assistance that is part of a government-coordinated spending plan - Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water management
3.	**Habitat Agenda Urban Indicators (2002) & GUID (2004) /** (UN-Habitat 2002)		- Percentage of solid waste: a) disposed to sanitary landfill; b) incinerated and burned openly; c) disposed to open dump; d) recycled; e) other. - Defined as proportion of households enjoying weekly solid waste collection.	- Average time in minutes for a one-way work trip. This is an average over all modes of transport. - Percentage of total work trips undertaken by: a) private car; b) train, tram or ferry; c) bus or minibus; d) motorcycle; e) bicycle; f) foot; g) other modes.	- Proportion of the urban population with sustainable access to an improved water source - Median price paid per 1000 liters of water in US dollars, at the time of year when water is most expensive - Average consumption of water in litres per day per person, for all domestic uses (excludes industrial)

4.	**NUA Monitoring Framework Indicators (2021) & GUMF Indicators (2022) /** (UN-Habitat 2021, 2022a)	- Renewable energy share in the total final energy consumption - Percentage reduction in annual final energy consumption in homes using smart monitoring systems	- Proportion of Municipal solid waste collected and managed in controlled facilities	- Proportion of the population that has convenient access to public transport disaggregated by age group, sex, and persons with disabilities - Median amount of money spent on transportation per household as a percentage of the median annual household income of tenants - Percentage of commuters using public transport	- Proportion of population using safely managed drinking water services - Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water - Number of public water and sanitation utilities participating in institutional capacity development programmes
5.	**ADB City Data Book (2001) /** (Hall et al. 2001)	- Number of household connections and ratio to number of households - Investment per head of population - Share of budget spent on operations and maintenance - Energy usage per person (per annum per person in metric tons of coal equivalent) - Median price of kW/h	- Number of households with regular solid waste service and ratio to number of households - Investment per head of population - Share of budget spent on operations and maintenance - Amount of solid waste generated, per year - Current levels of household solid waste disposal - Median price of solid waste disposal	- Existing mode of travel - Median travel time - City Product per Capita vs. Expenditure on Road Infrastructure - Automobile Ownership per 1,000 Population vs. Population Net Density - Transport Fatalities	- Number of household connections and ratio to number of households - Investment per head of population - Share of budget spent on operations and maintenance - Consumption of Water per Capita - Median price of water
6.	**European Common Indicators (2003) /** (Ambiente Italia Research Institute 2003)	- Access for all to adequate and affordable basic energy services - Energy consumptions and related CO2 emissions products	- Accessibility to the recycling facilities or services for solid waste (including recycling bins) (%)	- Access for all to adequate and affordable basic transport services - Percentage of trips by motorized private transport	
7.	**Eurosat Indicators (2009) /** (Eurostat 2009)	- Gross available energy (kg of oil equivalent per capita) - Total energy supply (kg of oil equivalent per capita) - Final consumption - energy use (kg of oil equivalent per capita)	- Municipal waste generated - domestic (in 1000 t per capita) - Municipal waste generated - commercial (in 1000 t per capita) - Recycling rate of municipal waste (%)	- Share of journeys to work (%) - Average time of journey to work (minutes) - Average length of journey to work by private car (km) - People commuting into the city (amount) - Length of bicycle network - dedicated cycle paths and lanes (km) - Cost of a combined monthly ticket (all modes of public transport) for 5-10 km in the central zone (EUR) - Number of registered cars per 1000 population (amount)	- Total use of water (m³) - Share of population connected to potable drinking water system (%) - Price of a m³ of domestic water (EUR)
8.	**OECD Indicators (2004) /** (OECD 2004)	- OECD non-energy imports from developing countries (% of total imports)	- Waste generation relative to population (kg per capita) - Waste generation relative to consumption (kg per $) - Initial treatment for waste disposal (total in 1000 tonnes) - Waste disposal cost (% of GDP)	- Road transport CO² emission per vehicle-kilometer (annual average % change)	- Total freshwater abstractions - amounts (billion m³) - Total freshwater abstractions - relative to renewable resources (%) - Total freshwater abstractions - per unit of GDP (liter per $GDP)
9.	**China Urban Sustainability Indices (2013) /** (UCI 2014)	- Total energy consumption (SCE per unit GDP) - Residential power consumption (kwh per capita)	- Domestic waste treated (%)	- Passengers using public transit (per capita)	- Public water supply coverage (%) - Total water consumption (liters per unit GDP)

10.	**UCLG Mandala Tool (2018) /** (UCLG 2018)		- Rate of coverage of household waste collection		- Rate of loss in urban water distribution
11.	**City Prosperity Index (2016) /** (UN-Habitat 2016b)	- Coverage of electricity supply system in the city (%) - Share of renewable energy consumption (%) - CO_2 Emissions (µg/m3)	- City is adequately collecting and disposing waste (%)	- Use of Public Transport (%) - Average Daily Travel Time (min) - Traffic Fatalities (# per 100.000)	- Access to Improved Water (%)
12.	**Global Reporting Initiative (GRI) Standards Content Index (2016) /** (Arcadis 2019)	- Report total fuel consumption from non-renewable sources (in joules or multiples) - Report total fuel consumption from renewable fuel sources (in joules or multiples) - Report the consumption of Electricity, Heating, Cooling & Steam (in joules, watt-hours or multiples) - Report total energy consumption (in joules or multiples) - Report the amount of reductions in energy consumption achieved as a direct result of conservation and efficiency initiatives (in joules or multiples)	- Provide separate figures for the total weight of hazardous and non-hazardous wastes - Report breakdown of the total weight of hazardous and non-hazardous waste - Report the total number and total volume of recorded significant waste spills (soil or water surfaces)	- Construction or use of transport infrastructure	- Report the total volume of planned and unplanned water discharges - Report water bodies and related habitats that are significantly affected by water discharges - Report the total volume of water recycled and reused by the organization
13.	**Arcadis Sustainable City Index (2018) /** (Arcadis 2018)	- Energy use - Renewables share - Energy consumption per $ GDP	- Solid waste management (landfill vs recycling)	- Congestion - Rail infrastructure - Airport satisfaction - Transport Economic Opportunity - Transport Public Finance - Bicycles per capita and bicycle sharing schemes - National and local government incentives for electric vehicles	- Access to drinking water (% of households) - Access to improved sanitation (% of households with inside toilet) - Risk to water supply
14.	**Santa Monica Sustainable City Plan (2014) /** (City of Santa Monica 2014)	- Total municipal energy use - Total citywide energy use - Energy Efficiency - Total Renewable Energy use	- Generation - Landfilled - Diversion - Residential Household Hazardous Waste	- Modal Split - Total Vehicle Miles Traveled - Residential Use of Sustainable Transportation - Sufficiency of Transportation Options - Pedestrian Facilities - Bike Facilities - Vehicle Use - Transit Service - Alternative Fueled Vehicles - Travel Volumes - Street Safety - Traffic Impacts to Emergency Response	- Total citywide water use (Self Sufficiency) - Total citywide water use (Per Capita) - Percent local vs. Imported water - Potable vs. non-potable water
15.	**IBGE - Sustainable Development Indicators: Brazil (2015) /** (IBGE 2015)	- Per capita energy consumption - Energy intensity (efficiency in final energy consumption in a certain territory) - Participation of renewable sources in the energy supply	- Access to household waste collection service - Recycling (performance of recycling activities of some types of materials by industries in a territory, in a given period)	- Mortality coefficient from transport accidents	- Inland water quality (stretches of rivers and dams, expressed by the biochemical demand of oxygen and the water quality index) - Access to water supply

16.	Shanghai Adapted Index (2022) / (UN-Habitat 2022b)	- Renewable energy share - Energy consumption intensity - Proportion of urban energy-saving buildings in existing buildings	- Harmless disposal of Municipal Solid Waste	- Public Transport Modal Share	- Access to tap water

Annex 7 - Questions of the first short qualitative questionnaire to examine potential capacity development needs

I. a) Is the city administration familiar with the Agenda 2030 and its SDGs? Is the city administration familiar with the NUA?

b) If yes, which aspects/goals of the Agenda 2030 are most relevant for the city development on-site?

c) In regard to the agenda, where might potential knowledge gaps still be located?

II. In which management area does the city municipality identify the additional need for capacity development? As management areas, the following six samples were provided: (1) Financial Management (e.g. legal and financial capacitation for different business models, general accounting, application for funds, etc.); (2) Contract management (e.g. tendering training & bid evaluation, including Product/Systems warranties and claiming procedures); (3) Legal management (e.g. for the development of PPP, international cooperation projects, etc.); (4) Institutional quality management (e.g. ISO 9000 ff. capacity building, Capacity Works training, etc.); (5) General project management (e.g. planning, monitoring and evaluation of municipal projects, best practice multiplication, etc.); and (6) Knowledge management (e.g. database development, lessons learned dissemination, etc.).

III. In which "specific" technical area does the city municipality identify itself further need for capacity development? As technical area, the following 17 specific samples where provided: (1) Water/wastewater (e.g. wastewater treatment); (2) Energy efficiency (e.g. insulation); (3) Renewable energies (e.g. solar power generation); (4) Citizen participation (e.g. participatory budgeting); (5) Sustainable tourism (e.g. eco-tourism development); (6) Local economic development (e.g. start-up enhancement); (7) Environmental (e.g. environmental impact assessment); (8) forestry (e.g. city parks); (9) Digitalization & good governance (e.g. E-governance improvement); (10) Integrated urban planning (e.g. urban masterplan development); (11) Climate change & Resilience (e.g. mitigation and adaptation measures); (12) Education (e.g. distance learning); (13) Health (e.g. health infrastructure maintenance); (14) Waste (e.g. deactivation of dumpsites); (15) Mobility (e.g. open space planning); (16) Security (e.g. occupational & operational safety); (17) Inclusive Service Delivery & Governance (people with

disabilities, ethnical/religious minorities, LGBTI); (18) Migration & refugee (e.g. reception camp mitigation); and (19) Heritage preservation & protection (e.g. restoration).

IV. What further skills might the city municipality identify for capacity development? As further skills, the following five samples were provided: (1) Language skills (e.g. expert English for international bid applications); (2) Communication skills (e.g. regards internal processes); (3) IT skills (e.g. GIS and remote sensing); (4) Cooperation & Networking skills (e.g. partnership project development, intercultural competencies); and (5) Leadership skills (e.g. managerial responsibility).

V. Which would be the main target group for capacity development in your municipality? Possible answers included: (1) Management and decision-makers (e.g. directors & mayors); (2) Specialists (e.g. lawyers, medics, biologists); (3) Technical municipal staff (e.g. engineers & technicians); (4) Administrative municipal staff (secretaries & bureaucratic workforce); and (5) Privy council (Councilors & traditional authorities).

VI. a) Concerning the target groups, which type of capacity development should be executed? Possible answers included: (1) Online learning platform (in terms of time, flexibility, and on-demand); and (2) Attendance courses (including mandatory face-to-face participation and training).
b) Regarding the target groups, what setup & timeframe should the capacity development measures follow? Possible answers included: (1) Workshop format (e.g. 1 week; certificate of attendance); (2) Certified courses (e.g. 6 months; "Lato sensu"); and (3) Post-graduate studies (e.g. 1-2 year master course; "stricto sensu").

Annex 8 - Questions of the final case study assessment to assess the derived indicator spectrum

Topic	Indicator	Q1: On a scale from 1 to 5, how clear, unequivocally, comprehensible and reliable is the indicator? Please indicate a number (1 very clear, 5 very unclear)	Q2: On a scale from 1 to 5, how difficult would it be, to obtain data for this indicator? Please indicate a number (1 very easy, 5 very difficult)	Q3: In case the indicators would NOT be feasible or data hard to be collected (Q2 rated 4 or 5), can you propose another viable similar proxy indicator? Please formulate new proxy indicator*	Indicate source (if available)
Energy (electricity)	1. Residential power consumption per capita (in kWh/year)				
	2. Percentage of residential city population with authorized electrical service (in %)				
	3. Average annual hours of electrical service interruptions per household (in h/year)				
	4. Installed renewable energy-generating capacity (in watts/capita)				
	5. Median price of kW/h (per household as a % of the median annual household income of tenants)				
Solid Waste	6. Total collected municipal solid waste per capita (in ton/year)				
	7. Percentage of residential city population with regular solid waste collection (in %)				
	8. Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste (estimates) generated, by cities (in %)				
	9. Recycling rate, tons of material recycled (in %)				
	10. Median price of solid waste disposal for households (in PPP/ton)				
Transportation / Mobility	11. Number of motorized vehicles per capita (in units/capita)				
	12. Annual number of public transport trips per capita (in trips/year)				
	13. Average time (or length) of journey to work by private car (in minutes, or km)				
	14. Traffic Fatalities (number per 100.000 inhabitants)				
	15. Median amount of money spent on transportation (per household as a % of the median annual household income of tenants)				
Water (fresh / drinking)	16. Total domestic water consumption per capita (in liters/day)				
	17. Number of household connections and ratio to number of households (in %)				
	18. Average annual hours of water service interruptions per household (in h/year)				
	19. Compliance rate of drinking water quality (in %)				
	20. Median price paid per 1000 liters of water in US dollars, at the time of year when water is most expensive (in PPP/1000l)				

* If a proxy indicator is suggested, the consecutive questions Q4-Q6 refer to the proposed indicator.

Topic	Q4: Would reference data from former years for the indicator (or a similar / comparable one) be available already in your municipality?			Q5: At what level would the data for the indicator be available / accessible?						Q6: At which temporal frequency would the respective data be collected?					
	Yes	No	*Not sure*	Municipal (public)	State (public)	Federal (public)	Other (private sector)	Not collected	*Not sure*	Monthly	Yearly	By census (e.g. 3-5y)	Only on demand / not regular	Not possible to collect	*Not sure*
Energy (electricity)															
Solid Waste															
Transportation / Mobility															
Water (fresh / drinking)															

Indicator
Questionaire (maste

Internet screenshot (extract) of Google questionnaire landing page:

Questionnaire about urban indicators

This is a PhD research conducted by the Post-Graduate Program of the Faculty of Architecture and Urbanism of the University of Brasília (FAU - UnB) in collaboration with the Institute for Technology and Resources Management of the University of Applied Sciences Cologne/Germany (ITT - TH Köln).

All data provided by the interviewees is confidential and the name of the municipalities will appear anonymously in the survey.
Thank you very much for participating.

Having the respective information readily at hand, it will take you about 15 minutes to respond.

tobias.kuehner97@gmail.com (not shared) Switch account

* Required

Please insert the name of your city *

Your answer

Please insert the name of your country

Your answer

Next   Page 1 of 21   Clear form

Internet screenshot (extract) of Google questionnaire sample page:

Full questionnaire:

Annex 9 - Compiled responses of the final case study assessment

Indicator 1:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level woul	Q6: At which temporal t	
2	2		No	Municipal (public)	Yearly	
1	1	N/A	Yes	Municipal (public)	Yearly	
3	1		Yes	Other (e.g. private secto	Not sure	
2	3		No	State (public)	Monthly	
2	4		Not sure	Other (e.g. private secto	Yearly	
1	4		No	Other (e.g. private secto	Monthly	
1	2	not applicable	No	State (public)	By census (e.g. 3-5y)	
2	5	Per capita electrical po	Yes	Municipal (public)	Monthly	
1	2		No	Other (e.g. private secto	Monthly	
1	3	Downscaling the indica	Yes	Other (e.g. private secto	Monthly	
1,6	2,7					

| (if av. ≤ 2,4 then) **3-5** | (if av. ≥ 2,5 then) **4-5** | | | | | |
| (if av. ≤ 3, then) **1** | (if av. ≤ 3, then) **1** | | | | | |

1	3					Negative outlier values (Q1-2)
4	5					Average (Q1&2)
5	2					Positive outlier values (Q1&2)

Indicator 2:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level woul	Q6: At which temporal t	
1	2		Not sure	Municipal (public)	Monthly	
2	1	N/A	Yes	Municipal (public)	Yearly	
1	1		Yes	Federal (public)	Monthly	
4	5	Payment Collected as a	No	State (public)	Yearly	
2	5	lack of this data	No	Not collected	Only on demand / not re	
1	1		No	Other (e.g. private secto	Monthly	
1	3	Not applicable	No	Municipal (public)	Monthly	
2	3		Yes	Municipal (public)	By census (e.g. 3-5y)	
2	3		No	Other (e.g. private secto	Monthly	
2	3		No	Other (e.g. private secto	Yearly	
1,8	2,7					

| then) **3-5** | (if av. ≥ 2,5 then) **4-5** | | | | | |
| 9 then) **1** | (if av. ≤ 2,9 then) **1** | | | | | |

1	2					Negative outlier values (Q1-2)
5	5					Average (Q1&2)
4	3					Positive outlier values (Q1&2)

Indicator 3:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level would	Q6: At which temporal
2	2		No	Municipal (public)	Not sure
3	4		Not sure	Municipal (public)	Not sure
2	3		Not sure	Federal (public)	Not sure
3	3		Yes	State (public)	Monthly
1	3		Not sure	Other (e.g. private secto	Only on demand / not re
1	2		No	Other (e.g. private secto	Monthly
1	1	N/A	Yes	State (public)	Yearly
2	2		Yes	State (public)	Not sure
1	3		No	Other (e.g. private secto	Monthly
1	3	Downscaling the indica	No	Other (e.g. private secto	Yearly
1,7	2,6				

(if av. ≤ 2,4 then) **3-5**	(if av. ≥ 2,5then) 4-5
(if av. ≤ 2,9 then) **1**	(if av. ≤ 2,9 then) **1**

2	1	Negative outlier values (Q1-2)
3	8	Average (Q1&2)
5	1	Positive outlier values (Q1&2)

Indicator 4:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level would	Q6: At which temporal
2	3		No	Other (e.g. private secto	Not sure
1	2		Yes	Municipal (public)	Yearly
2	1		No	Federal (public)	Only on demand / not re
4	4	Percentage of Househol	Not sure	State (public)	Only on demand / not re
2	4		No	State (public)	By census (e.g. 3-5y)
1	3	Installed off grid solar p	No	Other (e.g. private secto	Monthly
1	1		Yes	State (public)	Yearly
2	3		Not sure	State (public)	Yearly
1	1		No	Other (e.g. private secto	Monthly
1	1		Yes	Other (e.g. private secto	Monthly
1,7	2,3				

(if av. ≤ 2,4 then) 3-5	(if av. ≤ 2,4 then) 3-5
(if av. ≤ 2,9 then) **1**	(if av. ≤ 2,9 then) **1**

1	5	Negative outlier values (Q1-2)
4	1	Average (Q1&2)
5	4	Positive outlier values (Q1&2)

Indicator 5:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level would	Q6: At which temporal
2	2		Not sure	Other (e.g. private secto	Not sure
3	4	Median price would pro	Not sure	Not sure	Not sure
3	3		Not sure	Not sure	Not sure
3	3		Not sure	State (public)	Only on demand / not re
4	2		Not sure	Other (e.g. private secto	Yearly
1	5		No	State (public)	Yearly
2	3		No	Municipal (public)	Monthly
2	3		Yes	Federal (public)	By census (e.g. 3-5y)
1	2		No	Other (e.g. private secto	Monthly
2	1		Yes	Other (e.g. private secto	Not sure
2,3	2,8				

(if av. ≤ 2,4 then) **3-5**	(if av. ≥ 2,5then) 4-5
(if av. ≤ 2,9 then) **1**	(if av. ≤ 2,9 then) **1**

4	2	Negative outlier values (Q1-2)
4	7	Average (Q1&2)
2	1	Positive outlier values (Q1&2)

Indicator 6:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level woul	Q6: At which temporal
1	1		Yes	Municipal (public)	Monthly
2	3		Yes	Municipal (public)	Only on demand / not re
3	1		Yes	Municipal (public)	Monthly
1	2		Yes	Municipal (public)	Yearly
1	1		Yes	Municipal (public)	Monthly
1	1		Yes	Municipal (public)	Yearly
1	1		Yes	Municipal (public)	Monthly
2	2		No	Municipal (public)	Only on demand / not re
1	2		Yes	Municipal (public)	Yearly
1	1		Yes	Municipal (public)	Yearly
1,4	1,5				

(if av. ≤ 2,4 then) 3-5	(if av. ≤ 2,4 then) 3-5
(if av. ≤ 2,9 then) 1	(if av. ≤ 2,9 then) 1

1	1	Negative outlier values (Q1-2)
2	3	Average (Q1&2)
7	6	Positive outlier values (Q1&2)

Indicator 7:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level woul	Q6: At which temporal
2	2		Yes	Municipal (public)	Yearly
1	1		Yes	Municipal (public)	Yearly
3	1		Yes	Municipal (public)	Monthly
3	3		Not sure	Municipal (public)	Only on demand / not re
4	3		No	State (public)	Yearly
1	1		Yes	Municipal (public)	Yearly
1	1		Yes	Municipal (public)	Monthly
2	2		Yes	Municipal (public)	By census (e.g. 3-5y)
2	2		Yes	Municipal (public)	Yearly
1	1		Yes	Municipal (public)	Yearly
2	1,7				

(if av. ≤ 2,4 then) 3-5	(if av. ≤ 2,4 then) 3-5
(if av. ≤ 2,9 then) 1	(if av. ≤ 2,9 then) 1

3	2	Negative outlier values (Q1-2)
3	4	Average (Q1&2)
4	4	Positive outlier values (Q1&2)

Indicator 8:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level woul	Q6: At which temporal
2	2		Yes	Municipal (public)	Yearly
3	3		Yes	Municipal (public)	Not sure
2	1		Yes	Municipal (public)	Monthly
2	3		Yes	Municipal (public)	Only on demand / not re
4	5	lack of specific data fro	No	Not sure	Not sure
2	3		Not sure	Municipal (public)	Not sure
1	1		Yes	Municipal (public)	Monthly
4	3		No	Municipal (public)	Only on demand / not re
2	2		Yes	Municipal (public)	Yearly
2	5		Not sure	Not sure	Not sure
2,4	2,8				

(if av. ≤ 2,4 then) 3-5	(if av. ≥ 2,5then) 4-5
(if av. ≤ 2,9 then) 1	(if av. ≤ 2,9 then) 1

3	2	Negative outlier values (Q1-2)
6	6	Average (Q1&2)
1	2	Positive outlier values (Q1&2)

Indicator 9:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level would	Q6: At which temporal f
2	2		Yes	Other (e.g. private secto	Monthly
2	3		Yes	Municipal (public)	Not sure
3	3		Not sure	Municipal (public)	Not sure
2	4		No	Municipal (public)	Only on demand / not re
1	5	It's due to the fact that r	Not sure	Not sure	Not sure
1	1		Yes	Municipal (public)	Yearly
2	2		Yes	Municipal (public)	Monthly
1	2		Not sure	Municipal (public)	Only on demand / not re
2	2		Yes	Municipal (public)	Yearly
1	4	There is data for this in	Not sure	Municipal (public)	Not sure
1,7	2,8				

(if av. ≤ 2,4 then) **3-5**	(if av. ≥ 2,5then) 4-5
(if av. ≤ 2,9 then) **1**	(if av. ≤ 2,9 then) **1**

1	3	Negative outlier values (Q1-2)
5	6	Average (Q1&2)
4	1	Positive outlier values (Q1&2)

Indicator 10:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level would	Q6: At which temporal f
2	2		Yes	Municipal (public)	Monthly
1	1		Yes	Municipal (public)	Monthly
4	5		No	Municipal (public)	Not sure
2	3		Yes	Municipal (public)	Only on demand / not re
1	3		Not sure	Municipal (public)	Yearly
1	1		Yes	Municipal (public)	Monthly
2	3		Yes	Municipal (public)	Yearly
2	1		Yes	Municipal (public)	Monthly
1	2		Yes	Municipal (public)	Yearly
1	4	Here in the municipality	Not sure	Municipal (public)	Not sure
1,7	2,5				

(if av. ≤ 2,4 then) **3-5**	(if av. ≥ 2,5then) 4-5
(if av. ≤ 2,9 then) **1**	(if av. ≤ 2,9 then) **1**

1	2	Negative outlier values (Q1-2)
4	5	Average (Q1&2)
5	3	Positive outlier values (Q1&2)

Indicator 11:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level would	Q6: At which temporal f
2	2		No	Municipal (public)	Yearly
2	3		Yes	Municipal (public)	Not sure
1	1		Yes	Municipal (public)	Monthly
2	2		Yes	State (public)	Only on demand / not re
1	1		Yes	State (public)	Yearly
1	4		No	Federal (public)	Monthly
2	2		No	State (public)	By census (e.g. 3-5y)
1	3		Not sure	State (public)	Not sure
1	2		Yes	Municipal (public)	Monthly
1	1		Yes	State (public)	Monthly
1,4	2,1				

(if av. ≤ 2,4 then) **3-5**	(if av. ≤ 2,4 then) **3-5**
(if av. ≤ 2,9 then) **1**	(if av. ≤ 2,9 then) **1**

0	3	Negative outlier values (Q1-2)
4	4	Average (Q1&2)
6	3	Positive outlier values (Q1&2)

Indicator 12:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level would	Q6: At which temporal f
2	2		No	Municipal (public)	Yearly
3	3		Yes	Municipal (public)	Not sure
1	1		Yes	Municipal (public)	Monthly
2	3		Yes	State (public)	Only on demand / not re
1	3		Yes	State (public)	Only on demand / not re
1	5		No	Federal (public)	Yearly
2	2		No	Not sure	Not sure
3	2		No	Not collected	Not sure
2	2		Yes	Municipal (public)	Monthly
3	3		Yes	Other (e.g. private secto	Yearly
2	2,6				

(if av. ≤ 2,4 then) **3-5**	(if av. ≥ 2,5then) **4-5**
(if av. ≤ 2,9 then) **1**	(if av. ≤ 2,9 then) **1**

3	1	Negative outlier values (Q1-2)
5	8	Average (Q1&2)
2	1	Positive outlier values (Q1&2)

Indicator 13:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level would	Q6: At which temporal f
2	2		Yes	Not sure	Not sure
3	3		Yes	Municipal (public)	Not sure
2	2		Yes	Municipal (public)	Monthly
2	3		No	State (public)	Only on demand / not re
1	1		Not sure	Municipal (public)	By census (e.g. 3-5y)
1	5		No	Not possible to collect	Not sure
3	4	GPS data colllection	No	Not possible to collect	Not possible to collect
4	2		No	Not possible to collect	Not possible to collect
3	3		Not sure	Federal (public)	Yearly
1	5	No	Not sure	Not sure	Not sure
2,2	3				

(if av. ≤ 2,4 then) **3-5**	(if av. ≥ 2,5then) **4-5**
(if av. ≤ 2,9 then) **1**	(if av. ≥ 3,0 then) **1-2**

4	3	Negative outlier values (Q1-2)
3	3	Average (Q1&2)
3	4	Positive outlier values (Q1&2)

Indicator 14:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level would	Q6: At which temporal f
2	2		Yes	Municipal (public)	Yearly
2	3		Yes	Municipal (public)	Only on demand / not re
2	2		Yes	Municipal (public)	Monthly
2	2		No	State (public)	Only on demand / not re
4	4		Not sure	Not sure	Not sure
1	5		No	Municipal (public)	Not sure
1	2		No	Federal (public)	By census (e.g. 3-5y)
1	2		Yes	State (public)	Monthly
1	1		Yes	Municipal (public)	Monthly
1	1		Yes	State (public)	Yearly
1,7	2,4				

(if av. ≤ 2,4 then) **3-5**	(if av. ≤ 2,4 then) **3-5**
(if av. ≤ 2,9 then) **1**	(if av. ≤ 2,9 then) **1**

1	3	Negative outlier values (Q1-2)
4	4	Average (Q1&2)
5	3	Positive outlier values (Q1&2)

Indicator 15:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level would	Q6: At which temporal
2	2		Yes	Municipal (public)	Monthly
2	3		Yes	Municipal (public)	Not sure
1	1		Not sure	Municipal (public)	Not sure
3	4		Not sure	State (public)	Only on demand / not re
1	3		Not sure	State (public)	By census (e.g. 3-5y)
1	5		No	State (public)	Yearly
3	3		No	Not sure	Not possible to collect
2	2		Not sure	Not sure	Not sure
3	3		Not sure	Federal (public)	Yearly
2	5	No	Not sure	Not sure	Not sure
2	3,1				

(if av. ≤ 2,4 then) 3-5	(if av. ≥ 2,5then) 4-5
(if av. ≤ 2,9 then) 1	(if av. ≥ 3,0 then) 1-2

2	3	Negative outlier values (Q1-2)
5	4	Average (Q1&2)
3	3	Positive outlier values (Q1&2)

Indicator 16:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level would	Q6: At which temporal
1	1	Yes	Municipal (public)	Monthly
1	3	Yes	Municipal (public)	Monthly
3	3	Yes	Municipal (public)	Monthly
2	2	No	State (public)	Only on demand / not re
1	1	Yes	Other (e.g. private secto	Yearly
1	4	No	Other (e.g. private secto	Monthly
1	1	Yes	Municipal (public)	Monthly
2	2	Yes	Municipal (public)	Only on demand / not re
1	2	Not sure	Other (e.g. private secto	Monthly
1	1	Yes	Other (e.g. private secto	Yearly
1,4	2			

(if av. ≤ 2,4 then) 3-5	(if av. ≤ 2,4 then) 3-5
(if av. ≤ 2,9 then) 1	(if av. ≤ 2,9 then) 1

1	3	Negative outlier values (Q1-2)
2	3	Average (Q1&2)
7	4	Positive outlier values (Q1&2)

Indicator 17:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level would	Q6: At which temporal
1	1	Yes	Municipal (public)	Monthly
3	2	Yes	Municipal (public)	Monthly
3	3	Not sure	Not sure	Not sure
2	2	No	State (public)	Only on demand / not re
1	1	Yes	Other (e.g. private secto	Yearly
1	4	No	Other (e.g. private secto	Yearly
1	1	Yes	Municipal (public)	Monthly
1	3	Yes	Municipal (public)	By census (e.g. 3-5y)
1	2	Not sure	Other (e.g. private secto	Monthly
1	1	Yes	Other (e.g. private secto	Yearly
1,5	2			

(if av. ≤ 2,4 then) 3-5	(if av. ≤ 2,4 then) 3-5
(if av. ≤ 2,9 then) 1	(if av. ≤ 2,9 then) 1

2	3	Negative outlier values (Q1-2)
1	3	Average (Q1&2)
7	4	Positive outlier values (Q1&2)

Indicator 18:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level woul	Q6: At which temporal f
2	2		Yes	Municipal (public)	Monthly
3	3		Yes	Municipal (public)	Monthly
4	3		Yes	Municipal (public)	Monthly
2	2		No	State (public)	Only on demand / not re
4	5	the water is always inte	Not sure / not collected	Not sure	Not sure
1	4		No	Other (e.g. private secto	Monthly
1	1		Yes	Municipal (public)	Monthly
1	3		Not sure / not collected	Not collected	Only on demand / not re
1	3		Not sure / not collected	Other (e.g. private secto	Monthly
1	1		Yes	Other (e.g. private secto	Yearly
2	2,7				

(if av. ≤ 2,4 then) **3-5**	(if av. ≥ 2,5then) **4-5**
(if av. ≤ 2,9 then) **1**	(if av. ≤ 2,9 then) **1**

3	2	Negative outlier values (Q1-2)
2	6	Average (Q1&2)
5	2	Positive outlier values (Q1&2)

Indicator 19:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level woul	Q6: At which temporal f
2	2		Yes	Municipal (public)	Monthly
1	1		Yes	Municipal (public)	Monthly
5	5		Not sure / not collected	Municipal (public)	Monthly
3	4		No	State (public)	Only on demand / not re
1	1		Not sure / not collected	Other (e.g. private secto	Not sure
1	5	Drinking water quality a	No	Other (e.g. private secto	Yearly
1	1		Yes	Municipal (public)	Monthly
1	1		Yes	State (public)	Yearly
1	2		Not sure / not collected	Other (e.g. private secto	Monthly
4	5	Percentage of samples v	Yes	Other (e.g. private secto	Yearly
2	2,7				

(if av. ≤ 2,4 then) **3-5**	(if av. ≥ 2,5then) **4-5**
(if av. ≤ 2,9 then) **1**	(if av. ≤ 2,9 then) **1**

3	4	Negative outlier values (Q1-2)
2	2	Average (Q1&2)
5	4	Positive outlier values (Q1&2)

Indicator 20:

Q1: On a scale from 1 to	Q2: On a scale from 1 to	Q3: In case you scored C	Q4: Would reference da	Q5: At what level woul	Q6: At which temporal f
2	2		Yes	Municipal (public)	Monthly
3	2		Yes	Municipal (public)	Monthly
2	2		Yes	Municipal (public)	Monthly
3	4		No	State (public)	Only on demand / not re
5	4		Not sure	Not sure	Not sure
1	1		Yes	Other (e.g. private secto	Monthly
1	1		Yes	Municipal (public)	Monthly
1	1		Yes	Municipal (public)	Monthly
1	2		Not sure	Other (e.g. private secto	Monthly
1	1		Yes	Other (e.g. private secto	Yearly
2	2				

(if av. ≤ 2,4 then) **3-5**	(if av. ≤ 2,4 then) **3-5**
(if av. ≤ 2,9 then) **1**	(if av. ≤ 2,9 then) **1**

3	2	Negative outlier values (Q1-2)
3	4	Average (Q1&2)
4	4	Positive outlier values (Q1&2)

Category	# Indicator description	Suggested parameter	The recent value for 2022 is:	The record for data for 2017 is:	The record for data for 2012 is:	Easy to obtain, but not at hand right now	Sorry, we don't have it	Link of data source, (if possible):
Energy (electricity):	A Residential power consumption per capita	(in kWh/year)						
	B Installed renewable energy-generating capacity in de	(in watts/capita)						
	C Median price of kW/h	(in US$ or PPP)						
	D Percentage of residential city population with author	(in %)						
	E Average annual hours of electrical service interruptio	(in h/year)						
	F Energy intensity measured in terms of primary energ	(in TJ/GDP)						
	G Energy consumptions and related CO2 emissions proc	(in tons CO2/TJ pe						
Solid Waste:	A Total collected municipal solid waste per capita	(in ton/year)						
	B Municipal recycling rate, tons of material recycled	(in %)						
	C Median price of solid waste disposal	(in US$ or PPP/to						
	D Percentage of residential city population with regula	(in %)						
	E Proportion of municipal solid waste collected and ma	(in %)						
	F Share of budget spent on operations and maintenanc	(in %)						
	G Waste generation relative to consumption	(kg per PPP)						
Trans-portation (Mobility):	A Number of motorized vehicles per capita	(in units/capita)						
	B Traffic Fatalities	(number per 100.						
	C Cost of a combined monthly ticket for 5-10 km in the	(in US$ or PPP)						
	D Annual number of public transport trips per capita	(in trips/year)						
	E Proportion of population that has convenient access t	(in %)						
	F Kilometres of bicycle paths and lanes per 100 000 pop	(in km)						
	G Median travel time	(in min.)						
Water (City/ Fresh/Drinking):	A Total domestic water consumption per capita	(in litres/day)						
	B Compliance rate of drinking water quality	(in %)						
	C Median price paid per 1000 liters of water in US dollar	(in US$ or PPP/10						
	D Number of household connections and ratio to numb	(in %)						
	E Average annual hours of water service interruptions	(in h/year)						
	F Share of budget spent on operations and maintenanc	(in %)						
	G Level of water stress: freshwater withdrawal as a pro	(in %)						