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Urban Sustainability Strategies Guided by the SDGs—A Tale of Four Cities

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Abstract: The United Nations (UN) 2030 Sustainable Development Agenda, signed in 2015 and backed-up with its seventeen Sustainable Development Goals (SDGs), mentions cities as key players for evolving actively towards more sustainability. This underpins that living in the cities of the urban age is increasingly becoming the focus of sustainability discussions, which is particularly reflected in SDG 11 “Making cities and human settlements inclusive, safe, resilient and sustainable”. As urban sustainability strategies are playing a key role for the development of cities, this article sheds light on four cities’ sustainability strategies. The case studies highlight shortcomings, in terms of integrated visions, clear targets, and indicators in existing urban (sustainability) strategies. The article discusses these issues in light of an analytical framework, and stresses challenges and opportunities that SDG implementation involves.

Keywords: SDGs; urban sustainability transformations; comparative case study; strategic planning; Hamburg; Magdeburg; Milwaukee; St. Petersburg

1. Introduction

In the pursuit of balance between the needs of the present and those of future generations [1], it is important to acknowledge the reality of a predominantly urban future [2]. Cities are increasingly seen as drivers of sustainable development by applying sustainability targets [3], and have been identified “as a key for sustainable development and climate change” [4] (p. 2). Thereby, cities present multiple challenges but also hold a range of opportunities. Here, urban sustainability transformations (USTs) enter the discussion; USTs may be understood as pathways of cities to sustainable urban development, acknowledged as non-linear expressions of the complex interactions and consequences of a wide range of processes [4,5]. In accordance with the transformative UN 2030 Sustainable Development Agenda and its SDGs, adopted in 2015, planned fundamental changes towards more stable and sustainable conditions are to be pursued by cities [6]. Thus, there are still many questions on how cities can fulfil these duties and high expectations, and what can be learned and taken up from former and/or still ongoing sustainability efforts such as Local Agenda 21 processes or climate-related initiatives.

The SDGs, though not legally binding, can serve as a normative framework by which cities may achieve sustainability, as countries are expected to take ownership and implement them nationally and locally. Nevertheless, many challenges stand out when it comes to implementing SDGs in cities. This is due in particular to the concept that sees economic, social and environmental dimensions of sustainable development more integrated, which is necessary and goes in line with the policy framing of integrated urban sustainable development [7,8].

The role of the SDGs in guiding the implementation of sustainability in cities has been widely discussed in academia since their more recent adoption in the year 2015. For example, Finnveden & Gunnarsson-Östling [9] emphasize their importance in urban planning, where SDGs help to set city-specific targets, although not very concrete and in the need of contextualization, and narrow down uncertainties. Despite its implicit formulation, SDGs can serve as a basic model for cities to define the scope and context of sustainable development [9]. In particular, where city initiatives and innovative projects are not yet well coordinated and connected, SDGs can improve the clarity of local activities [10].

With SDG 11, urban development has become a prominent task of the Agenda 2030. Furthermore, several other SDGs are linked to cities' development. In this context, UN Habitat [11] (p. 10f) assumes that SDG 11 is directly related to at least eleven other SDGs and that one third of all 234 UN indicators can be assessed at the urban level. The targeted implementation of SDGs in cities thus has the potential to support the integration of sustainability into urban planning.

As this includes high complexity, given the many actors and issues involved, the planning process towards sustainable development calls not only for a clear vision, but also for concrete measures and monitoring criteria, in order to succeed [12]. Furthermore, urban sustainability strategies require the prioritization and selection of specific indicators to align with existing national and local development priorities and strategies [13]. In highly complex contexts, the articulation of a problem, creation of a vision (in particular, a sustainability vision), and construction of a plan to achieve the vision can accomplish a shift to a more desirable (sustainable) situation in comparison to the current one [14]. In spite of the long lasting existence of the sustainability concept, the action agenda UN Agenda 21 from 1992 and the many attempts of its implementation at the local level, challenges still exist in integrating broader expertise, which hinders city-level government pursuits of sustainability [15].

There is thus hope that the normative framing of the SDGs and its translation to the specific contexts of cities, as well as further developed techniques and tools from strategic planning, can support cities in their sustainability efforts. In order to shed light on how SDGs can be used to move forward urban sustainability transformations, this article looks at four different cities, i.e., Hamburg and Magdeburg (Germany), St. Petersburg (Russia), and Milwaukee (United States), which face distinct challenges and represent different stages of sustainability strategy and SDG implementation.

We ask first: How and in what respect do cities struggle with planning, implementing, and monitoring sustainability strategies?; in order to find the answer to the second question:

How can visions, targets and indicators from the SDGs support cities in order to generate the intended outcome without leaving anyone behind?

By answering these questions, this article seeks to provide insights into the variety of approaches with which cities strategize about sustainability, discover where the SDGs stand in urban planning practice, and provide examples where the SDGs can support sustainable urban development. Although works recognize the importance of SDGs [2], there are few academic publications dealing with the practice of SDG implementation in cities [16]. By examining four “new” cases which have not yet received much attention in scientific papers, we seek to contribute to this body of knowledge.

As a framework for transformations to sustainability in the presence of complex problems, the hierarchical five-level model for strategic sustainable development planning developed by Robèrt [17] and Broman & Robèrt [18] is used as the main guidance for the analysis. The Sustainable Development Solutions Network, “Getting Started with the SDGs in Cities guideline” [19], serves as a complement. Based on this, the developed analytical framework will be used to take a deeper look at the challenges the four case cities selected for this article are facing in terms of their sustainability strategies. This presents the basis by which to identify challenges and opportunities of SDG implementation, which then might become the starting point for urban sustainability transformations.

The following section outlines our methodological approach and provides insights on the four case cities with regard to their current sustainability performance, and the reasons and criteria for their selection. Section 3 establishes the analytical framework for analyzing the four cases in terms of their

sustainability performances and their potential for using SDGs in the overall sustainability planning process of cities. In Section 4, the sustainability strategies of the four cities are compared according to the analytical framework. Section 5 revolves around recommendations to support sustainability strategies in the case cities, addressing the lacks identified according to the different levels of the framework. Emphasis is given to the role of SDGs, with support provided by references to the SDSN framework. The article concludes by highlighting the main findings concerning the challenges and opportunities the four cities present in terms of moving forward their sustainability strategies.

2. Comparative Analysis of the Four Case Cities

Comparisons of completely different case studies have been highly criticized by a number of studies [20–22], but are supported by others [23–26]. This acknowledges the potential of empirical research stemming from dissimilarities to test hypotheses. The comparison of most different cases does not only add value to comparative urban studies but also provides diverse causalities and a ‘strong basis for generalization’ [27] (p. 298). Pierre (2005) adds that in spite of differences observed in cities as cases, demonstrated similarities makes comparison possible [24] (p. 458). Looking at the four cities, which at first view appear to be very different, we apply a comparative case study method in order to shed further light on their similarities and dissimilarities. This will help us to underpin, on the one hand, their singularities and the variety that exist in terms of sustainability performances and strategy approaches, and on the other hand, it will allow for certain generalization.

In pursuit of progress in integrating sustainability in urban development, the four cities are compared to each other using a six level analytical framework (see Chapter 3), which was developed based on the work of Broman and Robèrt (2017) and the SDSN (2015) [18,19]. For this purpose, one key urban development strategy document was selected from each city. To enhance comparability of the four cities’ strategies, key indicators were crafted by addressing the existence or nonexistence of the characteristics of each level of the framework. To enable the analysis, political and scientific publications, personal communication with representatives of the cities, as well as cities’ web pages were used.

The first case city is the Free and Hanseatic City of Hamburg. It is a federal state in northern Germany, located on the estuary of three rivers (Alster, Bille, and Elbe). It is the second biggest German city, with 1.8 million inhabitants [28] in the administrative borders and about 4.3 million in the metropolitan area. At \$72,960, Hamburg has the highest GDP per capita of all German federal states [29].

Scientific studies demonstrate Hamburg’s preemptive action to adapt its urban planning processes to climate change issues [30–32]. Thus, despite Hamburg’s documented efforts [33,34], several problems, particularly concerning social and environmental sustainability, still exist [34,35]. These include high NO_x and particulate matter levels, a high flood risk due to storms and sea-level rise, social divide, rising rents and a constantly growing city [36].

Today, sustainability is a key concept in Hamburg’s urban policy and planning processes [35]. Reports and plans linked to sustainability have been developed by both environmental and urban planning authorities in the city. The publication of “Metropolis Hamburg — Growing City” in 2002 [37] and the [34] “Hamburg 2030” development concept, which strives for a ‘green, inclusive and growing city by the water’ [38], represent over a decade of Hamburg’s vision for sustainable growth. Hamburg’s “Climate Plan” of 2015 is the only urban development plan in the context of sustainability to set clear goals to be achieved within a limited timeframe [39].

According to Schindler (2011), the inclusion of sustainability in urban development is the result of the influence of the “Future Council Hamburg”, a public forum that functions as a network for institutions, initiatives, associations and companies that work for a sustainable Hamburg [34]. Furthermore, civil society actively promotes SDG implementation in the city (For further information see: <http://www.2030hamburg.de>). Due to their engagement (personal communication, 2018), the Hamburg Senate developed a report to the Parliament to adopt the “Implementation of the

United Nations Sustainable Development Goals in Hamburg” in 2017 [40]. This document is the Senate’s first step towards addressing strategic influence of cities upon sustainable development by integrating the SDGs into their policies. Therefore, this document is used as the basis for the comparative analysis.

Nevertheless, these processes have not yet led to a sustainability policy that works across different authorities, leaves no one behind and promotes action towards sustainable urban development (personal communication, 2018). What is more, the city is one of the few German federal states that still have to develop a sustainability strategy. These discrepancies in Hamburg’s strategic approach to sustainable urban development and SDG implementation make Hamburg a complex and interesting case study for the comparative analysis.

The second selected case study in Germany is Magdeburg, which is the federal state capital of Saxony-Anhalt in the North German Plains, located on the Elbe river. Since 2009, the population is increasing, following a lengthy decline after the German reunification [41,42] (p. 19, p. 92). Currently, Magdeburg has 241.497 inhabitants [43]. With around \$37.288 GDP per capita, Magdeburg contributes 13.6% of the GDP of its Federal State Saxony-Anhalt [44].

In terms of sustainability challenges, urbanization and Global Environmental Change (GEC) present a risk of flooding and heat hazard. This is due to Magdeburg’s location on a river experiencing increasing runoff from changing rainfall patterns, and because of rising temperatures, which increase the heat load for the city [45,46] (p. 12, p. 16). Simultaneously, the city’s growing population, with an increased number of older (>65) and younger people (18–45) [41] (p. 19, 35), challenges urban development in the provision of infrastructure and services.

Lower-Saxony is part of two international agreements to sustainability: The Agenda 21 and the Sustainability Strategy of the European Union. In 1997, Magdeburg started creating the Local Agenda 21 with a focus on mobility, fair trade and health [47] (p. 27). It is predominantly managed by the Environmental Office Magdeburg [48]. The main sustainability actors in the city are the Environmental Office within the City Administration, the “One World Network Saxony-Anhalt”; a non-profit association working for the values of social, peaceful and environmental friendly development, on the level of the civil society; [49], and the Association Network Future Saxony-Anhalt [50]. Magdeburg’s Environmental Office is concerned with the impacts of GEC in the city and contributes with the plan: “Masterplan 100% Climate Protection for the Federal State Capital Magdeburg” (“Masterplan 100% Klimaschutz für die Landeshauptstadt Magdeburg”) [51]. The plan aims at decreasing greenhouse gas emissions by 2050 to 5% of the emissions in 1990 and reducing the final energy consumption of the city by 50% [51] (p. 1). In 2013, the Environmental Office commissioned the “Expert Report Climate Change for the Federal State Capital Magdeburg” [45]. In 2017, the Thuringia Institute for Sustainability and Climate Protection (ThINK) developed a climate adaptation strategy for Magdeburg: “Climate Adaptation Strategy for the State Capital Magdeburg”, which includes GEC risks for the city and the specific districts, and additionally offers concrete measures for every district to reduce threats [46].

The “Integrated City Development Concept Magdeburg, Magdeburg 2025” from the Urban Planning Office Magdeburg focuses on urban development both for the whole city [52] and for the city districts [53]. Some sustainability measures of the plan from the environmental office and ThINK are included in the Integrated City Development Concept. The SDGs are not mentioned, but a content overlap is recognizable. This Concept for the city districts [53] is used as the basis for the comparison of the sustainability strategy in Magdeburg.

As a third case study, St. Petersburg was chosen; located on the banks of Neva River that drains into the Baltic Sea. With 5.2 million inhabitants, it is the second biggest Russian city and the fourth biggest in Europe. For two hundred years, the city was the capital of Russia, which enhanced its fast economic, social and cultural development. With GDP per capita around \$10.000 it is in the top three Russian regions against this indicator [54].

Due to its coastal location, St. Petersburg has to deal with sea level rise, which leads to an increase in flooding and other natural hazards, such as erosion and abrasion [55]. As for social challenges,

St. Petersburg nowadays is facing challenges with its growing and aging population. The city's convenient location, and industrial and financial opportunities, make St. Petersburg an attractive point for migration. Active construction outside the city creates more living space but at the same time brings up new challenges, e.g., inadequate transport infrastructure and a shortage of schools and kindergartens [56].

The city is not involved in international networks or agreements related to sustainability. Moreover, St. Petersburg does not have a city-level sustainability department. Environmental and socio-economic functions are divided between two committees: the Committee for Nature Use, Environmental Protection, and Ecological Safety; and the Committee for Economic Policy and Strategic Planning. There are wide range of civil society organizations and NGOs working primarily on topics related to separate waste collection and environmental education. These two dimensions form the main poles of environmental activities in the city (expert correspondence, 2018).

Owing to the fact that St. Petersburg was not involved in Local Agenda 21 processes and does not have a sustainability strategy in place, the "General (Master) Plan", "Climate Adaptation Strategy" and "Strategy of Economic and Social Development of St. Petersburg until 2030" [57] can be considered as documents referring to environment and city development, with the latter serving as starting point of analysis in this article. It is the only strategic document supported by implementation programs that guides the strategic development of the city and sets clear goals and an indicator system.

The city of Milwaukee, Wisconsin, USA was chosen as the final case. It is located at the confluence of two rivers and Lake Michigan in North America's Great Lakes Region, and has around 600,000 inhabitants. The city is the largest by population and economy in its state, features a number of large universities, and has its power supplied by a large investor-owned utility [58]. Per-capita GDP is \$57,681, but this hides deep economic issues [59].

Milwaukee faces sustainability challenges not seen in the other case cities. It is battling a long industrial legacy, which has degraded its neighboring water bodies, which is now the focus of the city's new "Water-Centric City initiative" [58,60]. But perhaps most prominently in the minds of its citizens, Milwaukee has long been plagued by issues of poverty, inequality, and segregation [61]. Indeed, in the creation of its sustainability policy, the focus has been largely to solve these issues rather than environmental ones [62]. A recent comparative analysis found that Milwaukee was vulnerable to GEC due to poor adaptation strategies [63], and an analysis of Milwaukee's disaster preparedness found that networks between government officials and community organizations were poor, putting the city at risk [64]. This supports its inclusion in this comparison.

Milwaukee was one of the first five cities to join the UN Secretary General's Sustainable Energy for All initiative, joined the Global Compact Cities Program in 2009, the Global Covenant of Mayors in 2017, and the Mayor of Milwaukee, Tom Barrett, independently affirmed the Paris Agreement on Climate Change after President Trump reneged on the U.S. entry into the treaty [58,65]. Thus, the city has made significant commitments at the highest level to pursuing sustainability. The city created its Office of Environmental Sustainability in 2009, and published its "ReFresh Milwaukee Sustainability Plan" in 2013 [62]. The plan has been somewhat derailed in recent years by lack of clear targets and responsibilities, and annual reports were published only for a single year after implementation [66]. The ReFresh Milwaukee document is the subject of comparison in this study.

There are different reasons for selecting these four cases. One is their very different starting point of addressing sustainability in general, and the SDGs in particular: At a first glance, different actors are responsible for planning processes in each of the four case cities; only Hamburg addresses the integration of the SDGs, whereas the other cities still focus on broad urban development strategies, with some overlaps to SDG targets. However, all of the cities understand the potential of integrating sustainability into city planning and have begun to take steps toward addressing it, even if, in the cases of St. Petersburg and Milwaukee, the surrounding nation does not share the same approach. While Hamburg, Magdeburg, and Milwaukee all have assented to numerous international agreements

concerning sustainability (including the Agenda 21), St. Petersburg has not. Nevertheless, as a regional epicenter, it holds responsibility for sustainability planning, and is therefore included in this analysis.

Second, the selected cities present differences in legal powers, from a Federal State, to a capital of a Federal State, but all are the largest and most economically important in their respective regions. They are all located in the Global North, with GDPs in a range of approximately \$10,000 to around \$58,000 per capita. All four cities are located in areas where mortality or economic loss levels in the context of disasters (including floods, droughts, earthquakes, landslides, and volcanic eruptions) are relatively low [67], although flooding presents a challenge to all cities. These unifying points are important both for the purposes of comparability and to specifically examine the process of sustainable development in generally low-threat, reasonably prosperous areas.

Third, although major differences in institutional, cultural, and legal contexts stand out for the four cities, one key criterion for the selection was that the authors of this article are particularly familiar with those cities and their national characteristics. This makes it possible to focus on cities that have so far been understudied from a scientific point of view in terms of their sustainability performances, particularly, as the existing scientific literature on this topic for the cases is limited. It enables the integration of local knowledge, personal contacts and the necessary skills to delve into the details of policy documents written in the national language. Accordingly, the analysis undertaken brings new insights to the individual cities and, in addition, allows for comparisons in terms of indicator development, participation, and mutual learning. Following Simon, et al. (2016), the four cases attempt to provide some representation of the diversity of sustainability strategies extant in the Global North [16].

3. Analytical Framework

Considering the challenges identified for the selected case cities with regard to sustainability and pursuit strategies, we aim at further analyzing and comparing them in terms of indicators, SDG implementation and stakeholder involvement on the local level. In order to do so, we established an analytical framework by combining a) the strategic sustainability planning approach by Broman & Robèrt [18], and b) the SDSN Getting Started with the Cities Framework [19]. Breaking those down to the urban level and relating them particularly to contemporary integrated urban planning approaches is the focus of this section.

The framework by Broman & Robèrt [18] presents a systemic approach to planning and acting towards sustainability, according to a five-level model: 1. System, 2. Success, 3. Strategic Guidelines, 4. Actions and 5. Tools. It emphasizes a strategic approach to the process of sustainability planning and goal-setting; and calls for a thorough balance between reactive and proactive thinking in developing strategic plans towards sustainability. By extending this approach with the SDSN 'Getting Started with the Cities' (2016) guideline, we aim at following the transformative character of the UN Agenda 2030 and its 17 SDGs [19]. Thus, we intent to support defining and executing urban sustainability visions.

Integrated urban planning is seen as an essential part of particularly SDG 11: Target 11.b aims at "By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans", while leaving no one behind [6]. Target 11.3 propose to "By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries" [6]. Accordingly, these targets and indicators of SDG 11 show a strong relationship to urban, planning and policies, pointing at an integrated view for sustainable development.

With regards to SDG integration, the SDSN Guideline [19] gives some direction, providing cities with general principles and processes for implementing SDGs. However, those are rather broad and universal, and will need an adaptation and contextualization to the local contexts of individual cities. The guideline identifies four initial steps for getting started with SDG implementation: 1. Initiate an inclusive and participatory process, 2. Adapt the global SDGs into a local agenda, 3. Set up a goal-based planning that adopts a long-term, multi-sectoral perspective, supported by adequate implementation capacity and financial resources, and multi-stakeholder partnerships, and 4. Set up

a local monitoring and evaluation system [19]. Linking these four steps to the five-level strategic planning approach of Broman & Robèrt [18] in terms of SDG implementation supports the analytical framework that consist of six levels (Figure 1).

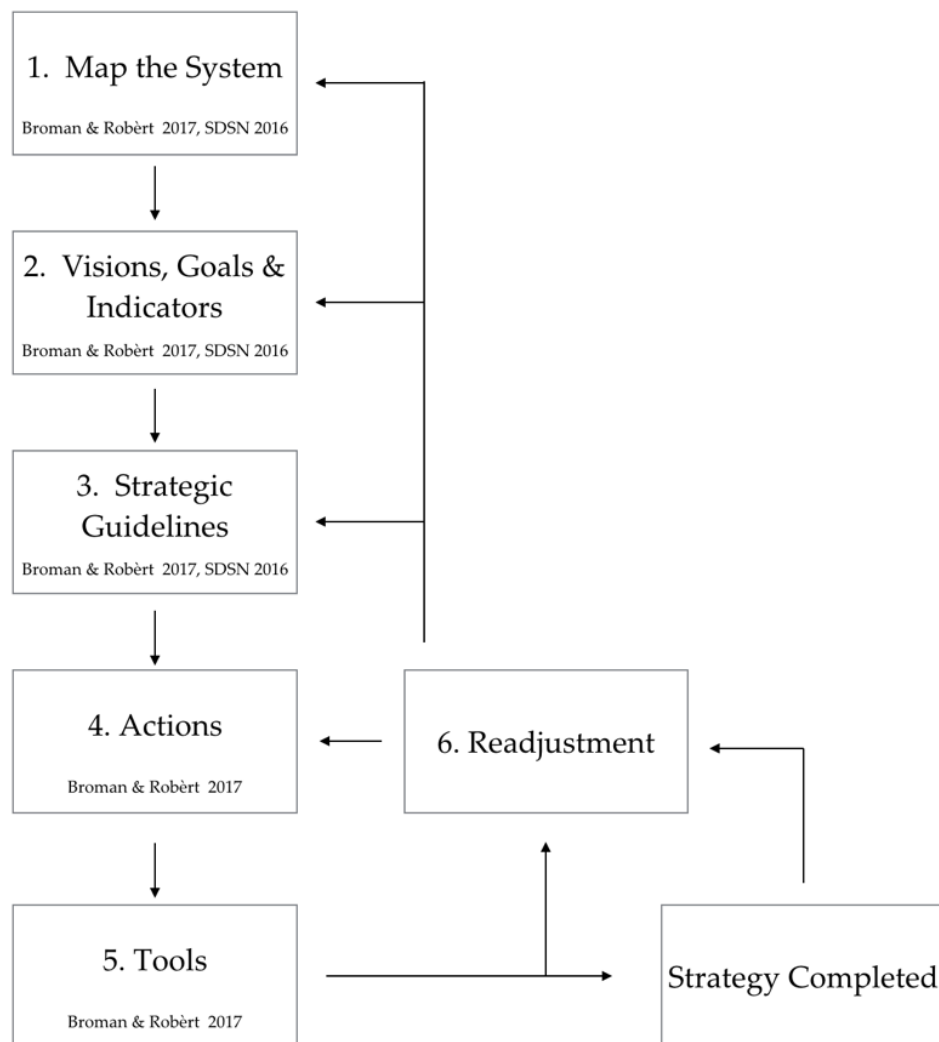


Figure 1. Analytical framework (Source: Authors' own presentation, based on Broman & Robèrt 2017 and SDSN 2016 [18,19]).

Key indicators have been identified, seen as essential for the pursuit of each levels that allow for a qualitative assessment of the plans and strategies under consideration. In the following, the different levels of the combined framework (cf. Figure 1) are outlined, with the identified indicators italicized.

3.1. Principles—Map the System

In order to allow for a better understanding of the singularities and challenges of individual cities in terms of sustainability strategies, the first level of the analytical framework constitutes the description of the given circumstances in the city under consideration. Given that the urban system is a product of social, physical, economic, ecological, political, cultural and historical factors [68], mapping the system includes a baseline analysis in light of these factors. This makes it possible to identify key *social, environmental, and economic sustainability challenges* to be part of the vision in level 2. The methods to be applied can include SWOT analysis for detecting strengths, weaknesses, opportunities, and threats of individual cities in terms of context specifics and sustainability. *Stakeholder involvement* is essential at this stage to create a full understanding of the breadth of sustainability challenges.

3.2. Vision with Goals and Indicators

Level 2 of the planning process involves the development of a sustainability *vision* against a certain *timeline* (see also level 4 and 6) with concrete *goals* and *indicators* for individual cities according to step 2 by the SDSN [19]. Visioning needs to involve a wide range of urban stakeholders identified in the first level. Following up step 3 of SDSN [19] and Broman & Robèrt [18], vision making should be based on a backcasting process that revolves around the *definition of a desirable (sustainable) future*, by identifying policies and programs that will connect that specified future to the present. Equally important is the early and thorough integration of public and civil society actors in order to guarantee transparency and legitimacy of the process. This can be achieved with surveys, workshops or online consultancies. Given the new developments that entered with the Agenda 2030, goal and indicator development should be based on the SDGs, and adopted/contextualized to the specific case cities. According to the SDSN, indicators must be limited in number, and goals should fulfill three criteria, i.e., they must be implementable in the context, applicable to all areas of sustainability, and yet provide a high potential for policy transformation [12] (p. 41).

3.3. Strategic Guidelines

This level is about integrating the vision in or linkage with existing strategies and plans, established upon different levels of decision-making (multi-level and multi-sectoral) and relevant for urban planning and development. This includes, in particular, *sustainability strategies at the international and national level* but also *parallel urban development or climate plans for the city*. Subordinate plans should additionally be integrated. Furthermore, financial means, human resources and capacities are important factors to be described. The outcome should be a strategic guideline of how to approach the sustainability vision of the individual city including intensive exchange between different stakeholders, to ensure an integrative character and the implementation of sustainability as a cross-cutting issue.

3.4. Actions

This level is about defining *concrete actions* to be undertaken for achieving the vision in implementing the strategic guideline, and is again taken from Broman & Robèrt [18]. The benefits and co-benefits of actions should be analyzed in decision-making. Actions should be tied to specific resources to enable their fulfillment such as *financial and human resources*. Furthermore, those need to be set against a certain *timeline* in order to allow for adjustment and monitoring (see also level 6). It will also be important to acknowledge those actions that are already ongoing, including projects from *responsible actors* such as different city departments or civil society and business. This calls for an overview of existing projects and their evaluation against the vision and the targets set within the former levels. Here, expert knowledge from different stakeholders gained from workshops etc. is needed in order to be able to gather the necessary information.

3.5. Tools

Based on the visions with goals and indicators developed in level 2, and the actions devised in level 4, this level calls for the elaboration of meaningful tools for implementation. For each action that is agreed upon, clear responsibilities among stakeholders need to be defined in terms of process, financing, fiscalization, and execution. In addition, a *monitoring framework* and *reporting system* has to be developed to allow for adjustment, transparency and self-reflection within the process of implementing the strategy in light of the action defined [19]. As with level 4, *responsible actors* for monitoring must be assigned, and the *provision of data* must be secured from relevant government bodies, research institutions, and other stakeholders. Setting clear *timeframes* is essential (see level 4).

3.6. Readjustment

Based on the monitoring and reporting system of level 5, *planned readjustment* of the indicators (level 2) or actions (level 4) might become evident within the process, if factors internal or external to the system are changing. This might also call for readjustment of other levels accordingly.

4. Supporting Sustainability Implementation in the Selected Cities

By applying the analytical framework to the four case cities' individual key sustainability strategies under consideration, we aim to compare the processes they are undertaking in terms of urban sustainability development and identifying challenges, opportunities as well as barriers those cities face in terms of SDG implementation, with the identified key indicators used as the elements of comparison; those are summarized in Table 1 at the end of this section.

4.1. Principles—Map the System

For Hamburg, the report that closest approximates a holistic and sustainable approach to city development and incorporates the SDGs is the "Implementation of the United Nations Sustainable Development Goals in Hamburg" in 2017 [40]. With this document, the city made efforts to map existing, ongoing, and future projects linked to the 17 SDGs, and thus, to sustainable urban development. Under the auspices of the Authority of Environment and Energy, an inter-agency working group "SDGs for Hamburg" conducted five workshops with government representatives and civil society actors to identify priority issues within the SDGs and related activities. The priority topics comprise "Environment and the City", "Sustainable Economic and Financial Policy", "Participation and Social Cohesion" as well as "Education and Science" are accompanied by cross-cutting topics such as "Hamburg's Global Responsibility" and "The Digital City". All in all, the document represents a list of official and unofficial, rather incoherent projects that were and are supposed to be implemented through various city stakeholders in the field of sustainability. In addition, the lack of a time frame indicates a rather small scope and impact of the report.

The urban planning office Magdeburg created the Integrated City Development Concept for Magdeburg 2025 in two parts. The first part focuses on the whole city with visions and ideas for the future [52], and in the second part, the different city districts are emphasized [53]. The data are based on previous expert studies and interviews with district inhabitants and employees of the urban planning office responsible for the specific district [53] (p. 2). The urban planning office used data from the districts and compared them to the whole city data to generate a SWOT analysis. Social data like the age and social situation of the inhabitants, the infrastructure situation (like educational and cultural facilities and transportation networks), and existing plans for each district are included in the analysis. Overall, Magdeburg integrates aspects of the social and economic sustainability, however, without connecting it to the term.

St. Petersburg's Strategy for Socio-economic Development until 2030 [57] is the main and most comprehensive document defining the future of the city. It contains a detailed analysis of the city's present challenges. The city administration has labelled this strategy as part of the sustainable development of St. Petersburg, which emphasizes its role as the city's primary sustainability document. However, environmental aspects are only randomly addressed within the 2030 Strategy. As for socio-economic dimensions, St. Petersburg conducted a SWOT analysis to set goals and indicators for the following strategic directions: human capital development, sustainable economic growth, quality of urban environment, governance and civil society. The only partial inclusion of environmental issues demonstrates that the entire system was not "perfectly" mapped by the city authorities during the Strategy 2030 development process.

The eight sections of the ReFresh Milwaukee plan (Buildings, Energy, Food Systems, Human Capital, Land and Urban Ecosystems, Mobility, Resource Recovery, and Water) parallel some SDGs, and have a timeline of 2025 (while the SDGs target 2030). In the creation of its 2012 Sustainability Plan,

ReFresh Milwaukee, the city pursued survey research among citizens and roundtable discussions with business and community leaders to determine which problems were most salient to the community. The main stakeholders include members of the city and county government, university representatives from the largest universities, business leaders, civil society, members of numerous environmental/sustainable NGOs, the energy company WeEnergies, and the State Government/Public Utilities Commission.

Each city has therefore made some attempt to organize itself with regard to sustainability through plans and reports. Most of the plans cover a limited time frame (2025 or 2030) and vary in their coverage of sustainability. Notably, Magdeburg emphasizes natural threats to the city as sustainability issues, while Milwaukee and St. Petersburg focus on human capital. Most strategies partially cover areas of the SDGs, but only Hamburg explicitly makes the tie, albeit without outlining a specific strategy. While Hamburg, Magdeburg and Milwaukee favored overall stakeholder involvement, St. Petersburg mostly consulted business interests. Hence, their strategy only partly includes the stakeholder-based system mapping which has occurred in the other cities.

4.2. Vision, Goals and Indicators

No vision and indicators have been developed for the Implementation of the United Nations Sustainable Development Goals in Hamburg, which somehow decreases the impact of the report, missing an overarching strategic approach. However, the report is based on all 17 SDGs and the identification of priority topics indicates a goal setting. An overarching timeline does not exist, but the organization around the SDGs does represent a definition of sustainability.

Magdeburg's Integrated City Development Concept gives a vision of the city for the year 2025 for everyone to follow and the city district concept shows a general orientation of the development process of individual districts. However, sustainability is not mentioned in the vision. Similar to the local Agenda 21 process where no indicators were created [47] (p. 78), there are no indicators for the city concept or the districts development plan.

In St. Petersburg, a scenario approach was chosen to create a vision for the city's economic development, with a timeline until 2030, following federal regulations [69]. The overall process of elaborating the vision, mission, goals and indicators involved consultations with different stakeholders including regional public organizations, surveys to the civil society, etc. According to its vision and mission, St. Petersburg plans to become comfortable, clean and green megapolis, following the examples of other European city. The Russian city is mainly concentrating on the improvement of living conditions and human capital development. This in turn leads to rather non-comprehensive formation of goals and indicators in the strategy, where environmental issues are considered only with regard to residents' needs. A separate assessment of environmental impacts would thus support a "full" concept of sustainability.

For Milwaukee, a common definition of sustainability, but no specific vision, was created for the ReFresh Milwaukee plan for the year 2025. Where data was available, city officials made absolute goals with quantifiable indicators, mostly with regards to the city's water system. Other indicators were created not by "quantitative research" but rather by picking "round numbers" (information based on personal consultancy in 2018). Priorities in goal-setting were set by stakeholders' reports.

The four cases show a diversity of approaches to the second level. With the exception of Hamburg, which has no sustainability indicators yet for the document under consideration, stakeholders were usually consulted for the process of indicator creation. An overarching vision is found only in Magdeburg, but a patchwork of goals and indicators can be found in some form in each city's documentation except for Hamburg. Each plan suffers from some insufficiencies, and most have an incomplete definition of sustainability. A focus on socio-economic concerns at the expense of the environmental is extant in at least half of the cities. This underscores the need for comprehensive indicator system and definition such as those provided by the SDGs, which target with the 17 SDGs all three "traditional" sustainability pillars, taking into account that SDG indicators need

to be contextualized to individual countries and cities, which might make comparison difficult in the end [70].

4.3. Strategic Guidelines

The Implementation of the United Nation's Sustainable Development Goals in Hamburg is explicitly oriented towards the Agenda 2030 and the SDGs, with the German National Sustainability Strategy and the UNESCO campaign "Education 2030" serving as baselines. At the city level, Hamburg has different strategies and plans in place which, taken together, do not yet present a comprehensive sustainability picture for the city (personal communication, 2018). Although the report unites individual projects toward sustainability, there is little coordination with or reference to other city plans. This could be related to a limited clout of the working group SDGs for Hamburg and the Unit of Policy Matters and Sustainability, both of whom are responsible for promoting urban sustainable development.

In Magdeburg, the City Development Concept is based on the Leipzig Charta but no other international or national plans is officially mentioned [53]. Additionally, it transparently integrates other outdated, and fragmented, already existing development plans for the city districts, like the "City District Development Planning" ("Stadtteilentwicklungsplanung") for the respective districts, the "Transportation Concept Downtown" ("Verkehrskonzeption Innenstadt") [71], and Urbanistic Framework Plans ("Städtebaulicher Rahmenplan"). The issue of sustainability is not a main concern in the Development Concept, but content related similarities between the Concept and the SDGs is recognizable. However, the Concept only presents actions for identified problems of the districts, rather than supporting sustainability overall. A holistic and transparent inclusion of the plan of the environmental office Magdeburg to reduce the greenhouse gas emissions by 2050 [51] (p. 1) and the climate adaptation strategy [46] cannot be identified. It is unclear to what extent different city departments and local actors were included in the definition of guidelines for the Concept.

It is worth noting that there are no current scientific papers evaluating St. Petersburg strategic documents. The most recent study from Shmelev (2011) about old version of St. Petersburg's Master Plan has revealed that sustainable development is considered in socio-economic context in the city [72]. The 2030 Strategy for St. Petersburg implies collaboration between city committees, but in practice, different committees are in charge of their own programs without interconnectedness. For instance, clean water is considered by three city departments belonging to different (environmental and socio-economic) areas of work and containing separate plans towards its implementation. This might lead to somehow overlapping and ineffective work. It is worth noting that the existing Climate Adaptation Plan for St. Petersburg addresses environmental goals that the socio-economic Strategy 2030 misses. Ignorance of environmental aspects still remains in city strategic documents and plans [73] which, therefore, seems to hinder balanced city development. The combination of Adaptation Plan and Strategy 2030 would cover all pillars of sustainability and would make a good basis for holistic sustainability strategy development, guiding ongoing city activities. However, more work on integration would be needed.

The ReFresh Milwaukee plan is not based on any national or international standard, although the city has committed elsewhere to different international agreements. The plan does not serve to unify multiple departments and units around a single comprehensive plan, although this initially may have been the intent of its designers. Since its adoption, other city government departments, including the Sewage District (forthcoming Resilience Plan), the Health Department (Elevate Health Improvement Plan), and the mayor's office (Growing Prosperity: An Action Agenda for Economic Development) have created parallel plans to address sustainability areas including environmental protection, food systems, and economic inequality, but the fragmented department system of the city means that these are not framed as sustainability plans. This signals a functional inadequacy of the plan for the city as a whole.

Overall, the four case cities struggle to organize their plans speak to the importance of involving key stakeholders from the beginning and assigning responsibilities clearly. Parallel integration is a challenge for all cities, and only Hamburg and Magdeburg attempt to integrate their plans with international activities, although St. Petersburg follows federal plans. The top-down approach of St. Petersburg misses the opportunity to allocate tasks, the limited commitment to the Hamburg plan renders the document superfluous, and the overlapping governmental structures in Milwaukee, Magdeburg and St. Petersburg create some confusion about who organizes which aspects of sustainability. Magdeburg has, to some extent, already learned its lesson regarding fragmentation, and has begun an integrated plan to streamline efforts. Hamburg and Magdeburg do, however, make some attempt to integrate subordinate plans.

4.4. Actions

The sustainability-related actions, projects, and programs in Hamburg, listed in the report under consideration, are linked to single city-wide projects that do not follow a holistic sustainability strategy. Nevertheless, the SDG implementation process includes a planned civil society Sustainability Forum to support the implementation of Agenda 2030 and a monitoring and reporting system to control sustainability progress. It remains to be seen whether measures will be implemented, and if so, what their scope will be.

The urban planning office of Magdeburg included measures for the development of the different districts in the Integrated City Development Concept Magdeburg, Magdeburg 2025, City Districts [53]. Nevertheless, these actions do not indicate responsible stakeholders or costs and resources necessary, which makes their implementation difficult. Sustainability actions taken by local actors and educational events for sustainability are not taken into account [74,75], nor are the complete number of measures recommended by the Climate Adaptation Strategy for Magdeburg [46] and the Masterplan 100% Climate Protection [51].

St. Petersburg city districts (municipalities) play an important role in the strategy implementation process. Initiatives and responsible actors are listed, along with funding sources. However, these are delegated from the superior body and it is not clear whether these have been carried out. Hence, the absence of feedback from bottom to top challenges the development of St. Petersburg, and does not sufficiently consider local (district) issues and difficulties that might exist.

In Milwaukee, certain measures have defined structures of action; most particularly, those involving the water system and housing stock upgrading. The Sewage District and University cooperate on the former initiatives, while the latter were encoded into a city policy and standard for energy-efficient renovation. Other measures have nebulous financial and institutional structures. Currently, the day-to-day activities of the city's sustainability managers has diverged from the plan somewhat. So far, individual stakeholders are all taking actions on their own, but cooperation is limited and frameworks would benefit from more concreteness.

In each of the four cities, sustainability activities are largely being undertaken by individual actors in spite of the existence of sustainability planning. The role of sustainability strategizing by city planners should revolve around coordinating existing efforts and spark new ones; all four plans are therefore, from the outset, limited at these tasks to varying degrees. Responsibility and financing structures, as well as communication channels between the actors performing sustainability and the officials planning for it might be enhanced. Overall, this leads to difficulties in identifying concrete actions in terms of sustainability enhancement for all cities.

4.5. Tools

Hamburg's SDG implementation report indicates that a monitoring framework based on targets and indicators is planned. This again is to serve as a basis for regular reporting on the progress of SDG implementation in Hamburg. However, as stated above, this monitoring and reporting framework still needs to be implemented.

In Magdeburg a renewing and updating of the Concept is planned. However, there are no official regular dates set. As the city of Magdeburg did not create any indicators for their Development Concept in the vision process, there are also no measurement tools set. The only official time frame the city set with the Concept is the envisioned time of 2025.

St. Petersburg has established a monitoring system and related reports are publicly available on the city administration web page, although the information is hard to detect. Overall, the 17 programs and committees responsible for implementation of the goals delegate the work on achievement of these goals and indicators to the district level. Each city district submits an annual report on implementation.

In terms of a monitoring and evaluation system, the Milwaukee plan was created in 2012 and has not been updated or monitored since 2014. Indicators lack a consistent structure and are nearing their expiry date as well. There are no specific reporting or responsibility structures outlined under the plan, except for a few measures. A lack of data is a significant hurdle in achieving sufficient monitoring for Milwaukee (stakeholder interview, 2018).

In all four cities, the plans or strategies under consideration are rapidly nearing their expiration dates, and only Magdeburg acknowledges the need to update the plan regularly. Monitoring and reporting is incorporated into some plans, such as in St. Petersburg and Milwaukee, but only in St. Petersburg has this been maintained.

4.6. Readjustment

A readjustment or revision of the Hamburg report is not planned, so that the city continues to refer to individual plans, programs and strategies that are not subordinate to a sustainability strategy.

For Magdeburg, a renewing of the concept in place is planned. For example, due to an unforeseen increase in population the city already had already to change the vision for the whole city. However, a readjustment seems more difficult, due to no existing monitoring system.

In St. Petersburg goals and indicators are reviewed and updated every three years even though some of them might benefit from greater ambitiousness. However, a refreshment of the entire city strategy itself is not planned or has not yet been announced.

The readjustment of Milwaukee's plan is being carried out in the city by alternate city departments. Rather than maintaining the current plan, effort has been funneled into a resilience plan for the city outlined by the Sewage District (Official Interview, 2018). However, this plan is not yet published and its scope is unclear. As the plan is published by a water-centric city body, it is unlikely to cover the full scope of the SDGs.

Although some of the cities have frameworks established to readjust indicators, the rather incompleteness of these plans makes the readjustments potentially insufficient. Overall, readjustment is an area of concern for each of the cities' plans.

What becomes apparent from assessing the case cities against the analytical framework is that each city struggles with implementing comprehensive, integrated sustainability strategies in different respects. Table 1 summarizes the state of the art of the four different cities in terms of fulfillment of the different levels according to the analytical framework. The key indicators identified for each level are taken as the basis for comparison, with "+" indicating fulfillment, "-/+" partly fulfilled, and "-" not yet fulfilled.

St. Petersburg has a socio-economic development strategy in place, where environmental aspects are only randomly included. In contrast, Milwaukee's ReFresh plan is mainly focused on water system aspects, to the neglect of others. Magdeburg has developed a comprehensive plan for the city, which does not explicitly target sustainability issues. Hamburg still lacks a sustainability strategy, but has developed a political document that addresses the 17 SDGs and maps existing projects towards them. This differentiates the comparison between cities from the beginning. As for level two of the analytical framework, cities used different methods and techniques, including surveys and workshops. When it comes to goal and indicator development, each city faces challenges. For example, Milwaukee and St. Petersburg demonstrate goal and indicator inclusion, but at the same time, poor achievement

for their efforts. Magdeburg has a detailed concept where city projects and strategies are integrated, but measuring tools for it are still missing. These three cities emphasize lack of coordination within city departments as a common challenge. For Hamburg, the lack of a holistic sustainability strategy includes missing vision, goals and indicators. In addition to that, weak stakeholder identification at initial steps, typical for each case study, hampers city performance and further sustainability strategy development. While St. Petersburg does attempt to provide monitoring and reporting, Hamburg, Magdeburg and Milwaukee do not seem to have pursued their own promised monitoring frameworks. These comparisons highlight the diversity of issues which cities may encounter, while also showing some similarities, particularly in terms of comprehensiveness and integration. The next section delves into some of the possible solutions that cities could pursue.

Table 1. Comparison between the four cities' current performance in implementing sustainability strategies.

Level/Key Indicators	HH	MD	SPb	MKE
1. Map the System				
Social aspects	+	+	+	+
Economic aspects	+	−/+	+	+
Environmental aspects	+	−/+	−/+	−/+
Stakeholder Involvement	+	+	+	+
2. Visions, Goals and Indicators				
Vision	−	+	+	−
Sustainability Definition	+	−	−	+
Timeline	−	+	+	+
Goals	−/+	−	−/+	−
Indicators	−	−	−/+	−/+
3. Strategic Guidelines				
Global/National Strategy Integration	+	−	−	−
Parallel City Strategy Integration	−	+	−/+	−
Subordinate City Strategy Integration	+	+	+	−
4. Actions				
Specific Measures	+	+	−/+	+
Responsible Actors	−	−	−	−/+
Funding Sources	−	−	+	−/+
Timelines	−	−	−	−
5. Tools				
Monitoring Framework	−	−	+	+
Responsible Actors	−	−	+	−
Reporting Framework	−	−	+	−
Data Provision	−	−	−/+	−
Timeframes	−	−/+	+	−/+
6. Readjustment				
Planned readjustment	−	−/+	−/+	−

Source: the Authors. HH = Hamburg, MD = Magdeburg, SPb = St. Petersburg, MKE = Milwaukee; “+” fulfilled, “−” not yet fulfilled, “−/+” partly fulfilled.

5. Discussion

By consolidating the complex systems approach of Broman and Rob  rt, and the SDG-specific outlook of the SDSN, the analytical framework outlines the challenges of each city in terms of strategic sustainability implementation, as well as providing a glimpse of the diversity of city approaches to sustainability strategizing extant in the Global North. Based on the state of the art of the different cities in terms of their sustainability strategies (Section 4), this section addresses these lacks, and provides suggestions, again according to the different levels of the framework, as this allows for a systematic evaluation and a certain comparison between the cities. Emphasis is given to the role of SDGs, with support provided by references to the SDSN framework [19].

5.1. Map the System

The SDSN guideline suggests an ‘inclusive and participatory process’ [19] (p.21) as an initial step for SDG localization to raise awareness of SDGs and ‘promote clear and accountable leadership’; including all stakeholders in the whole cycle of SDG planning, implementation and evaluation. This acknowledges also the inclusion of marginalized groups to powerful corporations and the representation of neighborhoods and localities to address the needs and concerns of all stakeholder groups. As for the analyzed cities, this is the level at which most of them are the strongest; each of them has undertaken efforts to map their threats and include stakeholders, although to different ranges. The two German cities prioritize environmental threats to a greater extent than the Russian and U.S. city, whereas economic development is in the focus of St. Petersburg. The inclusion of mostly government actors with consultation from outside actors offers room for improvement for most cities, perhaps in the pursuit of a comprehensive stakeholder mapping and stakeholder integration [19] (p. 25).

5.2. Visions, Goals, and Indicators

In this stage, the cities begin to show their individual strengths more clearly. No city satisfies all of the comparative indicators at this level, but in general, the plans of Milwaukee, Magdeburg and St. Petersburg constitute robust attempts to accomplish specific goals, while the Hamburg plan is largely descriptive of extant activities. According to SDSN (2016) deploying goal-based planning principles is a basic step to plan SDG implementation. The guideline stresses that local priorities of the SDG targets are selected based on development gaps, identifiable with a baseline assessment [19] (p. 36). However, all three pillars of sustainable development need to be equally prioritized [19] (p.33). This process includes significant revision of city’s existing policies and an inclusion of stakeholders as partners in the development of visions, goals, and indicators.

5.3. Strategic Guidelines

Here, too, cities differentiate their foci in terms of integration. The Magdeburg plan represents the most concrete attempt at parallel and subordinate plan integration, and all but Hamburg do not integrate global and national strategies in their plans. According to the SDSN, a careful review of existing national, municipal, and sectoral policies and plans supports a comprehensive strategic guideline [19] (p. 34).

5.4. Actions

Concrete plans with actions, responsible actors, and financing structures are a struggle for all cities. The SDSN guideline stresses sound financial management as inevitable part of strategic planning and SDGs implementation in the cities [19] (p. 49). The SDSN guideline suggests high-level political leadership as this increases the probability of actions receiving financial and human resources to support implementation [19] (p. 30).

5.5. Tools

St. Petersburg is the only city which has successfully implemented and pursued its monitoring framework. While others have proposed such frameworks, these have failed to be instituted or pursued in half of the cases, potentially signifying that this is an area of particular struggle for some cities. The SDSN guideline stresses the need of a robust monitoring and evaluation for a successful SDG achievement [19] (p. 54). Important sources for a monitoring mentioned in the SDSN are city statistics from national censuses, departmental surveys and administrative data, and new technologies that can be deployed by local governments [19] (p. 55). Monitoring plans supported by evaluation from government independent offices play a central role at this step in order to track progress and ensure accountability [19] (p. 55).

5.6. Readjustment

Hamburg and Milwaukee did not plan a readjustment of their respective strategy. Magdeburg planned for readjustment; however, a realization is not yet evident. St. Petersburg has updated its socio-economic strategy in 2019 expanding the timeframe to 2035 [76]. The SDSN guideline emphasizes a reflexive and responsive policy making to enable a strategy that can adapt to changes in the local conditions [19] (p. 43). This requires a periodic re-evaluation of the development of the city specific features and the planning framework, as well as its possible readjustment [19] (p. 43). Especially as Magdeburg's and Milwaukee's plans are nearing their expiry dates, the inclusion of the SDGs at this juncture could be helpful in guiding the cities towards a more comprehensive understanding, and realization, of sustainability.

6. Conclusions

The comparison of the four selected case studies enabled us to answer in what respect cities struggle with planning, implementing, and monitoring sustainability strategies. It is notable that although the four selected cities are so different in population size and administrative importance, they share many of the same struggles with sustainability strategizing. Most of the plans and/or strategies are insufficiently participatory, inadequately ambitious, and/or competing or overlapping with other city initiatives at some stage. All of the cities lack overarching political leadership that is held accountable for sustainability strategies and long-term commitments. In this context, we found that cities that do not yet have a department for sustainable development have problems in allocating the necessary human resources to pursue such an approach. This means, first of all, that without clear commitment and human as well as financial resources allocated to sustainability at the city level, SDG implementation will most likely not result in an integrative attempt, but in fragmented initiatives.

Half of the cities struggle with the creation of indicator systems, which consequently leads to a lack of monitoring. Indicator development seems to be very challenging, which has also been highlighted by other scholars [77]. Even in the cities with indicator systems in place, a high capacity of monitoring is not always evident. Only one city managed to successfully monitor its indicators; however, its unbalanced focus on economic indicators makes it a deficient sustainability strategy.

Besides their struggles, the four cities show different strengths in the sustainability planning as well. Hamburg offers sustainability and SDG integration, Magdeburg a holistic integration of urban development plans, St. Petersburg demonstrates effective use of a monitoring framework, and Milwaukee excels in the creation of a coherent sustainability plan with stakeholder involvement.

With respect to the support of the SDGs for urban sustainability planning, the analysis shows that the cities can expand their already existing capacities of urban sustainability planning. The SDSN guidelines help to integrate SDGs into the current plans, although the context specifics of the cities are of course not reflected, and need to be individually worked out and negotiated. As the SDGs are designed to create a common vision and targets towards a sustainable world, their adoption by cities can help to focus on the specific indicators and actions that they require to achieve their goals, and to undertake the necessary urban sustainability transformations according to the transformative character of the Agenda 2030. In the end, it is in the responsibility of each city to translate, contextualize, and finally, to implement SDGs. That this involves major challenges in terms of contextualization etc., as has been stated by other scholars [78].

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