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## PRACTICAL APPROACH TO THE SUSTAINABLE DEVELOPMENT IN CITIES

### Abstract

The concept of sustainable development increasingly affects cities and the challenges they face. At the present stage of sustainability awareness it is desired that the discussion about the city development combines the financial aspects and harmonious social relationships with the natural environment. The role of local authorities in implementation processes is undeniable. The objective of the paper is to verify theoretical assumptions regarding sustainable development governance in cities. A special attention is paid to transport and logistics solutions as supported measures but also as barriers of implementation. The detailed questionnaire in the form of the survey was chosen to examine how local governments practice the concept of the green urban economy to strengthen the sustainable development in different cities. Results prove that Scandinavian cities, in comparison to other European and some North American cities, are indisputable leaders in the development and implementation of sustainability strategies. They extensively involve stakeholders and facilitate open dialogue approach, create public-private partnerships and stimulate more sustainable behaviour through variety of financial incentives.

**Keywords:** sustainable urban development, questionnaire survey in cities, local governments practice

### Introduction

Cities meet many challenges during their development related to their infrastructure, citizen's lifestyles and protection of the natural environment (Seto, Ramankutty, 2016). As noticed by Cadenasso and Pickett, there are five ecological

principles addressed to cities (Cadenasso, Pickett, 2008). The first principle underlines the city as a combination of the environmental, spatial and social form. The second principle refers to the city as a spatially heterogeneous urban system, where physical and organisational networks and facilities interact with vegetation. The third principle accent the dynamic nature of cities affected by natural disturbances, climate events, or the infrastructure expansion. Similarly, the fourth principle emphasises the role of interactions between humans and environment. Furthermore, the fifth principle remains about the importance of the ecological processes concerning the ecosystems that should be in focus for urban designers and city managers planning the city's development.

Therefore, the discussion about the city development should place the concept of sustainability as the primary base of green city's actions and start to combine the financial aspects and harmonious social relationships with the natural environment. This association was defined by the Brundtland Commission while forming a framework of Agenda 21 and formalised the recommendations for cities taking sustainable development challenges. United Nation's Agenda 21 underlined participation and cooperation of local governments as a determining factor for sustainable development (UN, 1992). A city can achieve sustainability by integration of the four pillars of sustainability such as social and economic development, environmental management and urban governance (Department of Economic and Social Affairs, 2013).

Johnston underlines the role of the local authorities in the transition process as well as accentuate the ultimate objective of sustainable urban development in increasing a green consciousness, creating of a green culture and spirit among communities (Johnston, Nicholas, Parzen, 2013). Continuously growing population requires from city's authorities adequate resource management to ensure resident's proper access to suitable municipal facilities, the green public spaces, ecological urban transport, and overall availability of citywide social services (Zimmermann, Simpson, 2013). Furthermore, the appropriate strong governance should provide a variety of plans, frameworks or strategies, as well as financing instruments to advance the sustainable transformation (UN Environment, 2018).

The objective of the paper is to verify theoretical assumptions regarding sustainable development governance in several cities. A special attention is paid to transport and logistics solutions as supported measures but also as barriers of implementation. The detailed questionnaire in the form of the survey was chosen to examine how local governments practice the concept of the green urban economy to strengthen the sustainable development in different cities.

## 1. Geographical scope of the study

Several geographic areas have been adopted, which include countries with diverse conditions and achievements in the field of sustainable development. Therefore, Scandinavian, Central European and North American context is discussed below (6 countries are taken into consideration: Sweden, Denmark, Norway, German, Poland and the United States).

The analytical background is based on the results of the Sustainable Development Goals Index for 2018 (SDG adopted by all member states of the United-Nations, have been designed to support the governments in the identification of the economic, social and environmental priorities of sustainable development and to measure the progress of the transition).

Table 1. The results of the ranking of Sustainable Development Goals Index in 2018

Rank	Country	Score
1	Sweden	85,0
2	Denmark	84,6
3	Finland	83,0
4	Germany	82,3
5	France	81,2
6	Norway	81,2
7	Switzerland	80,2
8	Slovenia	80,0
9	Austria	80,0
10	Netherlands	79,5
... 32	Poland	73,7
... 35	United States	73,0

Note: The SDG Index score signifies a country's position between the worst (0) and the best or target (100) outcomes. A score of 100 represents technical optimums corresponding to full SDG achievement. Source: (SDG Index and Dashboards Report 2018 Global Responsibilities Implementing the Goals, 2018)

The Scandinavian countries are recognised as the leaders of transition towards sustainable development. That was confirmed at the United Nations Sustainable Development Goals ranking in 2018 where they reached the top places. As shown in Table 1, the highest scored Sweden (1<sup>st</sup>), followed by Denmark (2<sup>nd</sup>), Finland (3<sup>rd</sup>) and then Norway on the 6<sup>th</sup> place.

The detailed results reveal the significant advantage of Scandinavian cities in the field of gender equity, clean energy, infrastructure and innovation, as well as judicature and established partnerships.

Consequently, the Scandinavian achievements for sustainable development have been noticed by the European Commission. Stockholm became awarded with Green Capital Award: Stockholm in 2010, Copenhagen in 2014 and Oslo has recently been accepted for 2019 (European Green Capital, 2018).

## The Central European context

Continuity of the EU climate policy requires from the Central European cities integration of the all aspects of urban development concerning of the green technologies, energy efficiency solutions, or the resilient mobility systems in all sectors of city's economy. It also demands the active participation of the represents of local governments, other public institutions, business, research environment, and non-governmental organisations in the planning process.

While Germany respectively took 6<sup>th</sup> place in the Sustainable Development Goals Index (SDG Index and Dashboards Report 2018 Global Responsibilities Implementing the Goals, 2018), the country became together with other Scandinavian cities the leaders of the sustainable transition. Figure 1 shows the primary power production and consumption in Germany. The energy generation is mainly based on renewable energy systems, which are often owned by local municipalities (Hockenos, 2017). The country is also internationally recognised as a manufacturer of the photovoltaic installations.

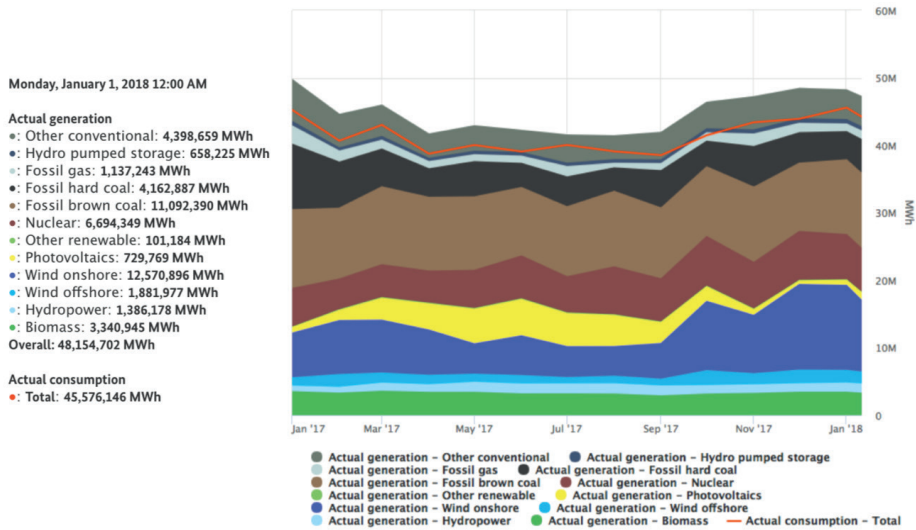


Figure 1. Energy consumption and production in Germany in 2017

Source: ("SMARD | SMARD – Market data," 2018)

Moreover, the results from SDG Index revealed some of the challenges essential for the future transformation, concerning the improvements in the field of the responsible consumption and production. Furthermore, Germany scored low concerning the establishment of strategic partnerships to obtain financial resources or expertise for sustainable investments. Despite the high renewable energy share, Germany has also been struggling to achieve its goals for the greenhouse gas emissions. While the emissions in the energy sector declined because of the decarbonisation of the energy sector, the emissions in the transport sector are systematically increasing (Green house gas emissions 2017 on the decline, slightly | Umweltbundesamt, 2017). That place the challenges for public mobility, local traffic, and heavy transport as a priority for the future national, regional and local actions for sustainable development.

Poland with its almost 38 million residents is one of the most famous cultural and academic centres in Europe, with the well-established educational system and tourist traditions. The country scored the 27<sup>th</sup> place in the Sustainable Development Goals Index and became recognised for its actions for poverty, quality of education, clean water and sanitation.

## **The North American context**

The United States achieved the 42<sup>nd</sup> position in the Sustainable Development Goals Index and is falling behind the Scandinavian and Central European cities in the ranking. The North American cities are experiencing enormous challenges related to the hunger, domestic inequalities, irresponsible consumption and production, weak institutional legislation and environmental management. While on the one hand, the United States is the world's leader in technology and dynamism, the country is continuously bothered by the relatively high number of carbon emissions that is a challenge towards implementation strategies in American cities. Therefore, the North American cities have been seeking the relevance of integration of the holistic concept of sustainable development to their urban context and initiated the transformation process through consultations, reviewing the existing priority strategies and engagement of the various stakeholders in local urban development (Prakash et al., 2017). San Francisco, for example, decided to embed a comprehensively sustainable lens to improve neighbourhood development, housing, public transport and protect the natural environment (Makolska, 2018).

## **3. Survey results**

The research aimed to examine how the local governments practice the concept of the green urban economy to strengthen the sustainable development in different cities. It was part of the doctoral research (Makolska, 2018). The detailed questionnaire in the form of the survey was chosen for conducting this research, because of its broad geographical reach. The targeted group of respondents consisted of the members of local governments representing individual cities. The study was distributed online in the period starting from the 15. Mai 2017 to the close date on 15. September 2017.

The survey was designed to specify the features and phenomena necessary for the identification of the individual process stages of the normative model for the green urban economy and obtainment of the essential information for its subsequent verification. The questionnaire was divided into five parts. The first part has been directed towards the analysis of city's current situation and the general understanding of sustainable development. In the beginning, the characteristics associated with sustainability had to be chosen. Then, the respondents were asked to identify who in their opinion is the primary in charge for the broadly understood sustainable urban development. Furthermore, it has been proposed to indicate the relevance of three pillars of sustainability for city's action. The last set of questions brought together respondents' motivation for sustainable actions and knowledge on implementation barriers. The second part focused on policy issues. First, the respondents had to declare whether the sustainability was included as a goal in their city's agenda. Then, the elaboration of sustainable strategy had to be stated. The next set of questions explored on the knowledge about city's sustainable strategy and its environmental, social and economic efforts. The third part examined the process related to strategy development, the cooperation. The next

set of questions gathers the information about the use of the policy instruments such as financing mechanisms and public procurement. First, the respondents were asked about the different financing incentives used by respondents to stimulate the sustainable implementations in their city. Then, the next set of questions explore the various procurement-related issues related to established guidelines for contractors as well as required environmental criteria for tenders. This section ended with an indication of city's areas where the green products are purchased such as construction materials, outdoor and office equipment, waste and fleet management, electrical appliances or catering. In the fourth part, the respondents were asked about their sustainable infrastructure implementations related to buildings and energy efficiency, transport, waste or water management. In the last part, the respondents were asked about the reporting and measurement of the sustainability progress. Additionally, respondents had to rate the effectiveness' of their sustainable performance.

The survey was initially sent to ten largest cities in Norway, Denmark, Sweden and Poland and received 13 responses. Furthermore, to enlarge the targeted group, the location criteria were removed, and the survey became additionally forwarded to 40 individually selected cities. The study received five further responses. For the research purposes, the participant cities have been divided into three groups by the region of origin: Scandinavian, Central European, and North American. Finally, it is worth to mention that the conducted research has been burdened with some limitations related to the confidentiality, availability of data and the risk for multiple interpretations of the questionnaire questions.

Table 3. Infrastructure barriers

Division	Country of origin	Cities	Availability of sites and buildings	Lack of infrastructure
Central European	Poland	Gdansk		
		Gdynia		x
		Cracow	x	
		Lublin	x	x
		Sopot	x	
		Szczecin		x
		Warsaw		x
	Wroclaw	x		
	Germany	Berlin		x
Scandinavian	Norway	Bergen	x	
		Oslo	x	
		Sandnes		
		Stavanger		x
	Denmark	Aarhus		
		Copenhagen		
	Sweden	Stockholm	x	
North America	USA	Charleston		
		Denver		

Source: (own elaboration)

The research revealed some of the legislative, cooperative and infrastructural challenges of urban development, mostly significant in Polish cities. Additionally, the research findings highlighted that the majority of cities experience implementation barriers related to the lack of infrastructure as well as the deficiency of sites and buildings (Table 3). The municipalities struggle with the chronic budgetary problems related to a contribution to the safeguarding of cultural heritage as well as restoration and development of public infrastructure. The other challenges are associated with the high-grade level of regional imbalances and increase of the air pollutions in urban areas. The information gathered through the extended interviews reveal the autonomy difficulties as well as the lack of cohesion between different political levels. The environmental legislative requirements and plans are often prepared on a national level and not leave the local authorities enough of flexibility to efficiently leverage the potential of their city's economic, environmental and social capital. The analysis of the strategy documents shows the weaknesses related to the lack of a particular sustainable vision and understanding of the green urban development. Subsequently, the infrastructure delays and cost escalations affect the proposed municipal actions and make them focus mostly on the economic growth. Furthermore, the strategic priority for solving the problems of social nature locates the environmental issues in the last place.

The next set of question aims to explore the issues concerning the budget allocation and use of financing instruments in the studied cities. First respondents were asked about the dedicated budget resources for sustainability. The findings reveal that the majority of respondents have separate financial resources for issues related to sustainable development in their city. It was found in 12 of responses. The relatively low share of the local governments does not have the dedicated budget because the financial resources are located together with other budget positions. Furthermore, the respondents were asked to identify what kind of financing instruments that are used in their city to advance sustainability (Figure 2).

Finding reveals that taxes most commonly finance the sustainable investments, what was found in 11 of respondents. 10 of cities also declared financing of their projects directly with funds from the budget. Use of fees and charges were also reported by 9 of respondents. 7 of cities claim the use of grants for financing their investments, and similarly 6 of them – subsidies. Also, 6 of respondents declare the establishment of public-private partnerships to finance sustainable projects. It seems surprising that none of responding cities use the cost recovery and revolving fund to finance their sustainable investments. There are also many of financing incentives that are less common among participating cities.

The adequate budget resources are the key to achieve city's sustainability goals. The majority of cities still depend just on the funding from the budget and taxes. Furthermore, the findings confirmed that local governments have insufficient knowledge about relevant financing instruments available for sustainable investments. Therefore, local governments should set up a task force specifically to explore the opportunities to gain more capital through the use of various financing sources to encourage the public and private investors and in this way, stimulate the growth in the sector. Consequently, the budget allocation and use of financing instruments were chosen as essential components of the normative model for the green urban economy.

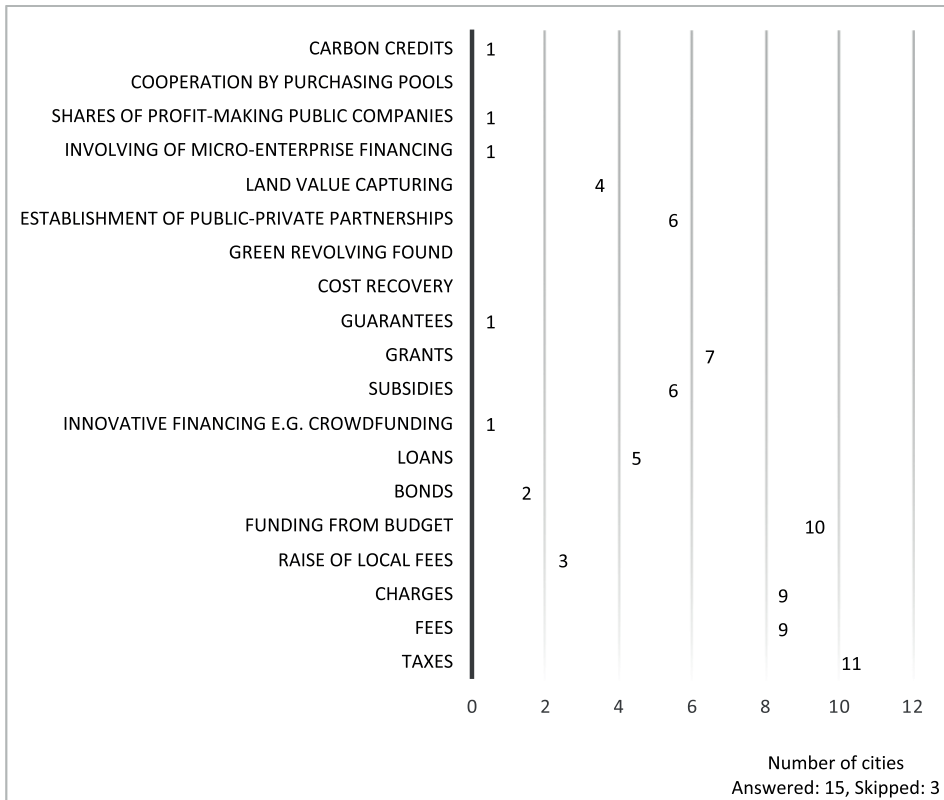


Figure 2. Use of financing instruments

Source: (own elaboration)

Then, the respondents were asked about the sustainable infrastructural implementations that were carried out by their city (Table 4). Findings reveal that the majority of cities have established actions for the recycling encouragement, increased energy efficiency, expansion of public transport, bicycle access, installation of charging stations for electric vehicles, and the water and wastewater systems upgrades. It can be underlined that promoting green transport plays a very significant role.

Then, respondents were also asked to identify the cooperation's areas (Figure 3). The finding reveals that the majority of cities collaborate regarding transport and environmental protection that was found in 12 of responses. Only 9 of local governments established the collaboration in the area of land use and climate change. Only eight of cities cooperate with other partners concerning funding and grants.



Table 4. Sustainable implementations

Actions for green buildings	No of cities	Actions to reduce energy consumption in the community	No of cities	Actions to promote green transport	No of cities	Actions for waste management	No of cities	Actions for water management	No of cities
Tax incentives for environmental friendly expansion	3	Conduct energy audits	11	Electric vehicle charging stations	11	Instituted internal government recycling programs	11	Upgrade water or sewer system pumps	10
Community gardening	9	Upgraded or retrofitted facilities to higher energy efficiency office lighting in public buildings	7	Public transport – geographical accessibility	12	Community-wide recycling collection programs for paper and plastic and glass for residential and commercial properties	15	Own drinking water utility	9
Life-cycling public construction	6	Upgrades to heating/air conditioning in public buildings	11	Improvement of quality and interconnectivity in public transport	15	Recycling of household hazardous waste	15	Use pricing to encourage water conservation	6
Open space zoning	7	Install solar panels on government facility	7	Low-carbon mobility/eco-mobility promotion	11	Recycling of household electronic equipment (e-waste)	15	Use of greywater and/or reclaimed water use systems	7
Require all new and renovation public building structures based on green design principles	6	Upgraded streetlights or other ext. lighting	10	Bicycle access plan/strategy	15	Pay-as-you-throw (PAYT) program with charges based on the amount of waste discarded	7	Use of g grey or reclaimed water to water the landscape of public facilities, such as parks and buildings	6
Permit higher density development near public transit nodes and where infrastructure is already in place (utilities and transportation)	9	Upgraded traffic signals	7	Maximum parking regulation	8	Community-wide collection of organic material for composting	12	Reuse of grey water on the landscapes of private homes or businesses	6

Residential zoning codes to allow solar installations, wind power, or other renewable energy production	6	Generated electricity through municipal operations such as refuse disposal, wastewater treatment, or landfill operations	6	Bicycle parking	13	Building waste-to-energy-plants	10
Residential zoning regulations to permit higher densities through ancillary dwelling units or apartments (such as basement units, garage units, or in-house suites)	8	Installed geothermal systems	4	Carpool	6	Waste management's guideline for suppliers	7
Recycling of solid waste (including paper, plastic, metal, e-waste, etc.)	12	Use of renewable energy in public buildings	10	Bike Pool	6	Greenhouse Gas Reporting	9
Encourage energy efficient site design (shaded/recessed windows and building entrances, east-west axis building orientation, reduce the amount of east-west facing windows)	8	Public utility regulation, including tariff regulation, renewable energy targets	4	Alternative fuel/electric parking spaces	8		
Discourage dark, heat-absorbing roof materials	3			Fuel efficiency target for the government fleet of vehicles	6		
				Take mass transit to work plan/strategy	8		
				Walk to work plan/strategy	6		

Source: (own elaboration)

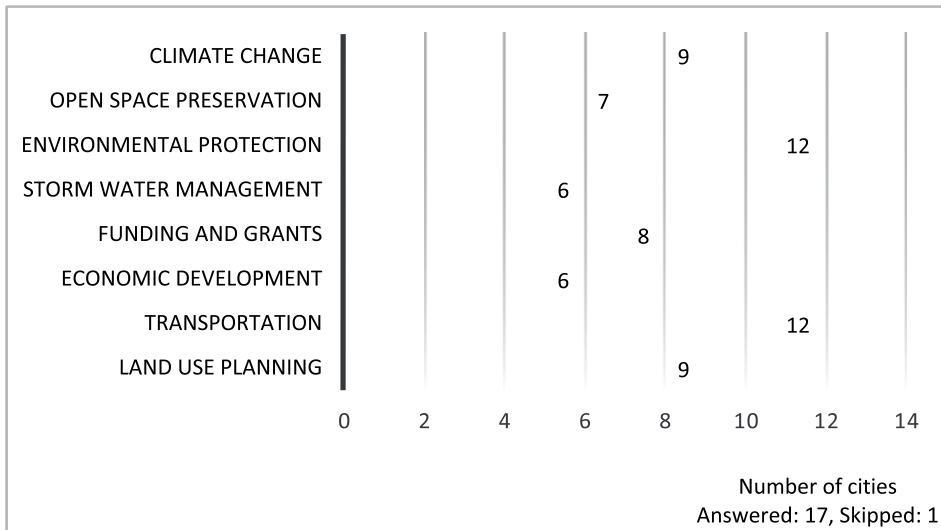


Figure 3. Areas of cooperation  
Source: (own elaboration)

The review and analysis of primary and secondary data point out the essential role of cooperation of all stakeholders to improve the chances to exploit the potential for sustainable modifications against climate change. The outcome of such collaboration can be achieved in the form of knowledge, technology, innovations, financing and human resources, etc.

Then, the respondents were asked about the evaluation of sustainable actions in their city (Figure 4). The findings reveal that 12 of cities systematically evaluate their activities, compared to 6 cities that do not do it.

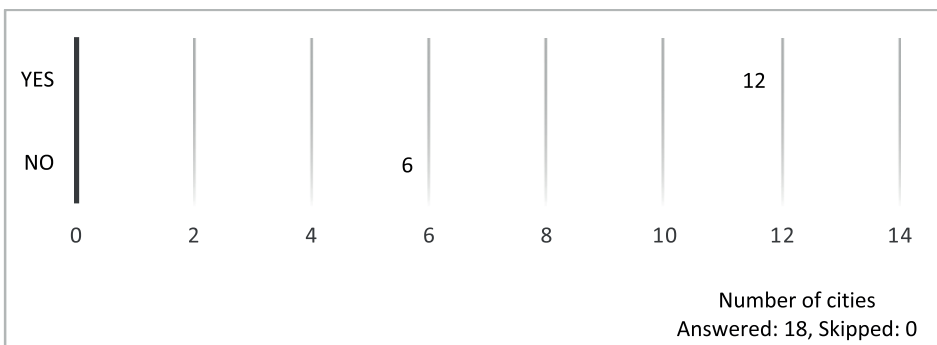


Figure 4. Evaluation of activities  
Source: (own elaboration)

Finally, the respondents were also asked about their perception of effectiveness related to their efforts for achieving sustainable urban development (Figure 5). Findings reveal that 10 of governments declare their achievements as effective.

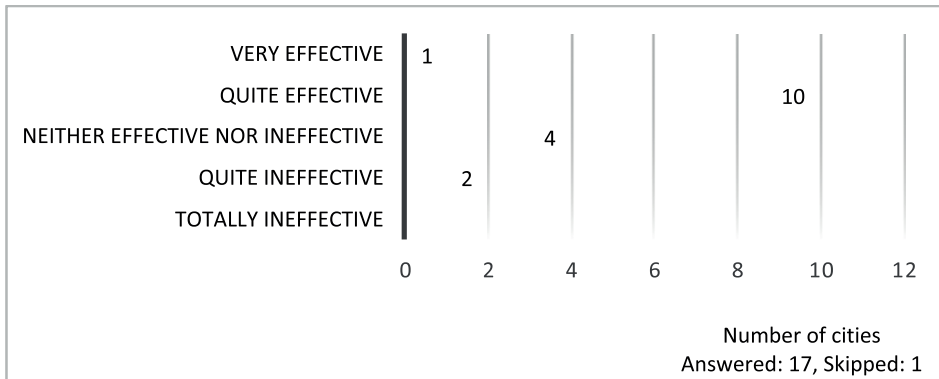


Figure 5. Rating for the effectiveness of sustainability efforts  
Source: (own elaboration)

The monitoring and evaluation of the progress of the implementation of sustainable development concerning adopted strategy and city's goals are essential in the strategic planning process. The review and analysis of primary and secondary data, as well as the information received from the conducted interviews, confirm the use of the key performance indicators and the monitoring systems to measure city's sustainable performance. Therefore, the monitoring and evaluation were chosen as components for the development and verification of the normative model for the green urban economy.

The implementations in the field of the green transport were chosen for analysis (Table 5). The findings reveal that the majority of cities actively promote actions for the sustainable urban transport.

The city of Stavanger has taken the initiative together with the Forus Industrial Park for the creation of the bicycle-sharing system and by the establishment of the cooperation with the GoBike supplier to provide 300 electric bicycles gradually. Also, the City of Berlin is planning to upgrade by 2025 the existing bike-lane network and create parking spots located at central commuter hubs. Subsequently, in the last two years, the City of Gdansk has been actively working on city's Sustainable Urban Mobility Plan to improve the walking and cycling conditions in the city. The City Council of Bergen, based on the cooperation between local and national governments, has been supporting the alignment for the construction of the light rail transit line to increase the interconnectivity of all parts of the community and encourage the use of public transport. Furthermore, The City of Warszawa has been actively integrating the public procurement function in the governmental operations to replace the bus fleet of municipal bus operator with the 130 electric buses to step towards electric mobility and reduce the CO<sub>2</sub> emissions in the transport sector. As mentioned before, the City of Oslo similarly to the other cities in Scandinavia, to meet the CO<sub>2</sub> reduction goals has established the fuel efficiency targets and gradually upgraded the municipal fleet into the electric or the low emissions one and supporting the development of the charging infrastructure for the electric cars. In conclusion, it can be speculated that the actions to advance the green urban transport are well-established among all participating cities.

Table 5. Actions to promote green transport

Area															
	Country	City	Bicycle access plan / strategy	Bicycle parking	Bike Pool	Walk to work plan / strategy	Public transport to/from all parts of the community / geographical accessibility	Take mass transit to work plan / strategy	Improvement of quality and interconnectivity in public transport	Low carbon mobility/eco-mobility promotion	Fuel efficiency target for the government fleet of vehicles	Electric vehicles charging stations	Alternative fuels/electric parking spaces	Carpool	Maximum parking regulations
Central European	PL	Gdansk	x	x		x	x	x	x	x		x			x
		Gdynia	x	x			x		x	x					
		Cracow	x	x	x	x	x	x	x	x		x	x		x
		Lublin	x	x	x		x		x	x				x	x
		Sopot	x	x					x	x					
		Szczecin	x	x			x		x	x	x	x	x		
		Warsaw	x	x					x			x	x		
		Wroclaw	x				x	x	x	x		x	x		
	DE	Berlin	x	x	x	x	x	x	x	x	x	x	x	x	x
Scandinavian	NO	Bergen	x				x	x	x	x		x			
		Oslo													
		Sandnes													
		Stavanger	x	x	x	x	x	x	x	x	x	x	x	x	x
	DK	Aarhus	x	x	x	x	x	x	x	x	x	x	x	x	x
		Copenhagen	x				x		x						x
North American		Stockholm	x	x	x	x	x	x	x	x	x	x	x	x	x
	US	Charleston	x	x				x	x		x	x	x	x	
		Denver													

Source: (own elaboration)

## Conclusions

Transport and logistic solutions are only parts of sustainable strategies but play an important role in the implementation processes in studied cities. Results prove that Scandinavian cities are indisputable leaders in this field. Characterizations of Scandinavian sustainability management contains the extensive stakeholder's involvement, creation of public-private partnerships, as well as the role of strong institutions practising the participatory consensual leadership and open dialogue. All Scandinavian cities that were participating in the research study have actively been promoting the sustainable development and smart city concept with the high level of digital technology and innovation. They also have declared the general commitment to environmental issues. Although to counteract the pressing challenges of climate change, the Scandinavian governments set up the economic driving forces for sustainability. By exploring the potential of the variety of financial incentives and the public procurement process, the cities have initiated the stimulation of more sustainable behaviour and continued improvement of the local development.

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