

GOVERNING MAJOR CITIES IN THE CONTEXT OF NEW ENVIRONMENTAL CHALLENGES

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Abstract: *The management of large cities is an area that is gaining importance in relation to new complex challenges. Among them there is also the issue of environmental quality in agglomerations. The paper points to the changing nature of the challenges (especially the so-called bad problems) that the management of large cities have currently been facing, and to the need to approach tackling of these challenges in new ways. It presents a comparison of the traditional and modern models. Using the example of selected European cities for the SDG 11 - sustainable development goals within the UN program (focus is on indicators related to environmental pollution – especially PM2.5 particles), it points out the non-optimal situation of some cities, including Slovak ones. Effective management of cities and efforts to solve new "wicked" challenges also require the ability to find consensus from city management and stakeholders. Traditional approaches to solving new complex challenges can cause upheavals in the functioning of large cities, weaken their resilience, and thus threaten their further development.*

Keyword: *governance, resilience, new complex challenges, environment, cities*

JEL Classification: O18, Q50, R11

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1 Introduction

The issue of exploring various aspects of urban development is becoming increasingly relevant in the context of some of the new challenges. These include the issue of urban vulnerability and, at the same time, their resilience to various types of threats. Significant types of threats include, for example: vulnerability of urban infrastructure, social tensions, and the spread of communicable diseases or environmental degradation. The main objective of the article is to evaluate the range of threats to cities, to identify a set of factors contributing to the emergence and resolution of these threats, and to emphasize the need for a more comprehensive approach to these challenges on the part of cities. In addition, we provide a comparison of the situation in some European cities (including Slovak cities) in terms of air quality measured by the significant indicator of air pollution $PM_{2.5}$. Cities can only be resilient and thrive if their governance structures are able to respond effectively and efficiently to traditional as well as emerging challenges. Flexibility, effective multilevel governance, economic performance, and social cohesion are some of the characteristics of successful cities. The successful operation and development of cities requires a comprehensive understanding of urban structures, their actors, the potential for urban development as well as policies and institutions. In addition to normal situations and day-to-day operations, cities also must deal with emerging challenges with the potential for a major negative impact on their day-to-day operations. Different types of situations requiring urgent solutions can be distinguished, some of which will be mentioned below.

Cities are currently facing a diverse range of new challenges in the area of the environment: (1) it is a set of factors that directly affect the environment and (2) it is an increase in the number of actors/processes that represent limitations to the easy and quick solution of negative impacts of the functioning of the city community on the environment. The existence of “wicked” challenges that do not have easy solutions and require a lot of time and effort to master them is also related to both points. Other challenges related to the environment include: (3) the choice of appropriate indicators for sustainability monitoring programs and (4) their use.

There is a fundamental difference between the old and new challenges, not only in the quantity, but also in the nature of these challenges. From a quantitative point of view, the number of actors who are directly or indirectly involved in

generating the state of environmental deterioration is increasing. The number of factors that directly or indirectly change (deteriorate) the environment is also increasing. Examples include the number of chemical substances present in the environment, the intensity of resource use or the degree of availability of substances harmful to health. The tightening of standards also leads to an increase in the number of tested substances, the limits of which must be complied with.

2 Literature and methods

Regarding the topicality of the researched processes, there is a relatively large amount of literature in the subject area. In the context of this paper, the literature can be divided into the following areas: (a) the concept of difficult to solve or so-called wicked problems², (b) urban resilience, development, and governance, (c) wider environmental issues and their link to urban functioning. In terms of literature survey results, the following findings can be considered the most significant. A study of many relevant publications, several of the most important ones are mentioned in the Table 1, has confirmed that cities are exposed to a range of traditional as well as new challenges, many of which have the character of “wicked” problems. Four important types of situations requiring urgent solutions can be identified: (1) natural disasters (e.g., climate, epidemic); (2) challenges related to unexpected external factors (e.g., power outages, resources, collapse of transport networks); (3) financial stability of cities, and (4) failures in urban management and administration (e.g., inefficient dispute resolution, inadequate timing and prioritization decisions, and corruption).

² The so-called “wicked” problems are challenges that are very difficult to solve with standard problem-solving procedures. They have some specific characteristics. The existence of such challenges has been mentioned long ago in literature. Nevertheless, their importance only grows at a time when the number and size of cities is growing and urban business and social structures are becoming more complex. This requires changes in the governance of large cities and better matching of various interests and more efficient generation of priorities.

Table 1: Literature review

Group	Sources (selected)	Notes (content focused on)
A	Moser, Williams and Boesch (2012); Head (2008); Batty (2013) and Termeer, Dewulf and Breeman (2013)	The concept of difficult to solve or so-called wicked problems
B	Australia State of the Environment (2020); Kooiman et al. (2008); Kooiman (2008); Francis and Bekera (2014); Corfee-Morlot et al. (2009); Torfing et al. (2012); UN (2017); Fuerth (2009); OECD (2006, 2020a); Allam (2020); Cutter (1996); Elsheshtawy (2009, 2019); EUROSTAT (2016); Glaeser (2012); Shen, Feng and Peng (2016); Tanner et al. (2009); OECD/UN-HABITAT/UNOPS (2021); Pelling (2003); UN HABITAT (2016); Hutter (2017); Brzica et al. (2020); Brzica (2014) Brzica, Waszkiewicz and Belof (2014); and Head (2008).	Resilience of cities, their development and management, governance
C	Bowler et al. (2010); Douglas and Philip (2014); Barth (2014); Hagan (2014); OECD (2020b); Weitzman (2009) and OECD (2021).	Broader issues related to the environment and their connection with the functioning of cities

Source: own processing.

The sources mentioned above provide a set of stimulating opinions from the point of view of identifying the scope of problems in the subject matter. Their advantage is a relatively detailed analysis of individual areas characteristic of individual groups A–C. In particular, the works of international organizations (OECD, Eurostat, UN) include a range of quantitative and qualitative analyses and reviews. The work of individual researchers and smaller teams, in turn, brings interesting conceptual perspectives and case studies.

Table 2 provides an overview of some selected city-related environmental challenges. It should be emphasized that many cities in the world face similar problems. Sometimes it is a single significant negative factor, other times it is even an accumulation of several problems.

Table 2: Types of current environmental challenges

City	Type of challenge	Note
Napoli	Communal waste/ garbage	The problem is related to city governance and logistics.
Mexico City	Soil erosion	
New Orleans	Floods	Creation of marshes can mitigate the risk
Amsterdam, Lagos (Nigeria), Abidjan (Ivory Coast)	Potential damage from rising sea levels	Creation of dune barriers can mitigate the risk
Hong Kong, Singapore	Potential damage from rising sea levels	Use urban drainage system to reduce water run-off during heavy rain periods, costly measure
Ho Chi Minh City (Vietnam), Bangkok (Thailand), Chennai, Mumbai, Kolkata (India)	Floods	Potential of economic harm due to the risk of flooding in the coming decades
Venetia, Jakarta (Indonesia)	Potential damage from rising sea levels	Man-made physical barriers built to mitigate the risk, costly measure
Odisha (India)	Cyclone in 2013	
London	Water supply Floods	- Non-structural solution as an option, green infrastructure - Existing man-made barriers need to be enhanced
Los Angeles, Boston	Potential damage from rising sea levels	
Mexico City	Dysfunctional city governance	The capital city is under the governance of two federal entities (Estado de México and the Federal District). Most projects need to be endorsed and monitored by these two federal entities. This situation leads to governance inefficiencies.
Miami, New York, Houston	Floods, potential damage from rising sea levels	Construction of physical barriers as an option
Big Chinese cities (Beijing, Shanghai), Tokyo, London, Los Angeles	high levels of air pollution (mostly particulates). Health risks as the cities are affected by the presence of substances of the PM2.5 type	Modernization of production, transport regulation, modern transportation

Big Chinese cities (e.g., Chennai, Guangzhou, Zhanjiang, Xiamen Shenzhen, Tianjin)	Floods	Potential of economic harm due to the risk of flooding in the coming decades
Tokyo	high levels of air pollution	
Fukuoka, Kitakyushu, Osaka, Kobe, Nagoya (Japan)	Floods	Potential of economic harm due to the risk of flooding in the coming decades
Washington D.C.	Water supply	Non-structural solution as an option, green infrastructure
Toronto	Water supply	Non-structural solution as an option, green infrastructure
Yokohama (in 2000s)	Waste/garbage	In the period 2003-2010 a 30 % reduction of garbage.

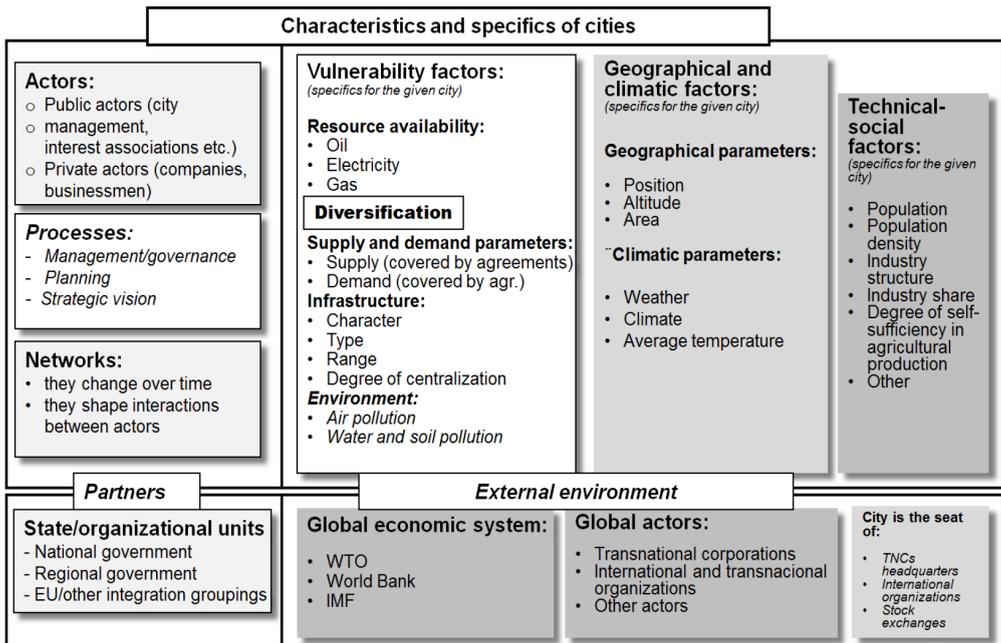
Source: own processing.

In our paper, we have used several approaches to analysis and analytical methods (constructed regional advantage concept, contextual analysis, system domain analysis, stakeholder analysis, comparisons). Among other things, we use schematic representations that allow us to identify the main components of the investigated objects (system and elements) and the processes associated with them. Only the most important selected elements and links are shown schematically, as the incorporation of less important components would impair the clarity of the schemes. The reason for choosing this approach is the complexity of the description to briefly cover the important relationships between the elements within the analyzed system. We use mixed methods of analysis, including the use of a parallel comparison approach. In terms of size, we consider in the text (according to the OECD classification) cities of size M (100,000-250,000), L (250,000-500,000), XL (500,000-1 m), XXL (1 m-5 m) and global cities (more than 5 m). From the point of view of comparing cities in the section dedicated to SDG, we then compare selected cities in categories M to XXL.

3 Results

Cities face new challenges with different intensities and scopes. The reason is not only the different nature of the challenges and their intensity, which are specific to each city, but also the specific nature of a particular city (see Figure 1).

Figure 1: Cities - characteristics and specifics



Note: In the text we deal in more detail with the areas mentioned in this diagram such as “Processes” and “Environment”.

Source: own processing.

In the diagrams below, we present the “traditional” approach Model 1 (Figure 2) and the “modern” approach Model 2 (Figure 3). The fundamental difference between the two approaches is that successful city management: (1) seeks to find appropriate approaches to solving “wicked” problems; (2) works with strategic development plans and (3) applies multi-level governance with the participation of a heterogeneous group of actors involved in resolving conflict situations and “wicked” problems. Moser, Williams and Boesch (2012), Fuerth (2009) or Head (2008), e.g., address “wicked” problems. Head (2008) states that some challenges are very difficult to address and indicates which

areas these challenges cover. These are, e.g., climate change, poverty, or the physical/virtual security of the population. However, in the context of large cities, it may be a matter of deciding on significant investments, organizing costly events (e.g., Olympic Games), etc. Addressing these challenges by conventional methods is, according to Head, difficult and therefore some fundamental reforms are needed to address these challenges. Fuerth (2009) also states that public policy is increasingly burdened with “wicked” problems – i.e., challenges of managing situations characterized by nonlinear dynamics, complex positive and negative feedbacks, and highly complicated links between numerous variables. It is a new dimension of public policy issues that reflects the axioms and postulates of complexity theory.

Thus, tackling the “wicked” problems of urban policy may require a range of inputs and insights that go beyond the normal specialization of individual departments or agencies. There are several city-governance models. The reason for finding solutions for urban governance issues is, e.g., that the functional area does not correspond to the existing boundaries of local/regional governance, and yet many strategic decisions and service delivery must be made at this level. Few experiments have been conducted in this regard, mainly due to rejection by other levels of governance (OECD, 2006). Even the most advanced cities have gained only limited autonomy (e.g., London and Montreal). Examples are given in the OECD (2006):

- the most radical solutions involve the creation of new bodies at the functional level, either by adding an additional level of government (e.g., London) or by expanding the boundaries of existing cities (e.g., Montreal or Istanbul);
- there are also various forms of cooperation between existing bodies (specialized agencies, informal cooperation agreements, etc.);
- there is diversity in scope - some collaborations are multifunctional (e.g., Lyon) and others are designed for individual services such as transport (e.g., Athens, Philadelphia).

Routine challenges can be addressed in a conventional way. This means that there are certain procedures and guidelines for their solution - examples of so-called best practice are often given. Finding them can take more or less time according to the volume of allocated resources (financial, material and human), but it is always possible to assume finding these solutions within

an acceptable time horizon. In contrast, a characteristic feature of “wicked” problems is their complexity and complicatedness. It turns out that, unlike common challenges, there is no one or more optimal solutions. “Wicked” problems do not have a stable form or a simple structure that can be broken down into elements addressed separately. Each of the solutions to the “wicked” problem has certain advantages and disadvantages, and each of the solutions suits only some of the stakeholders. The solution of these problems is possible only through numerous actors and at the same time the point of view of the problem is different at each level of governance. Finding consensus in such cases is often very difficult and finding an agreement is time-consuming and costly. In the context of “wicked” problems, it is concluded that the limiting element is the inability to determine which solution is correct and thus to decide on the legitimate claims of one of the many stakeholders with different interests.

Today’s big cities are dynamic complexes of multi-dimensionally structured systems. Their dynamics is different from those in the “closed” systems of traditional cities. In the past, systems were characterized mostly as closed and static representing a system in balance. Modern cities, with their high openness and considerable dynamics, represent non-linear and non-equilibrium systems. Similarly, city actors have incomplete information and use learning, adaptation and “trial-and-error” processes in their activities. In addition, with the growing population of cities and the increasing number of different actors, the complexity of urban governance is also increasing. Networks of relationships between actors are changing dynamically and, in addition to traditional coordination mechanisms (market transactions), they also appear outside of market interactions (de)formed by increasingly complex networks of relationships. Therefore, the current challenges need to be addressed through:

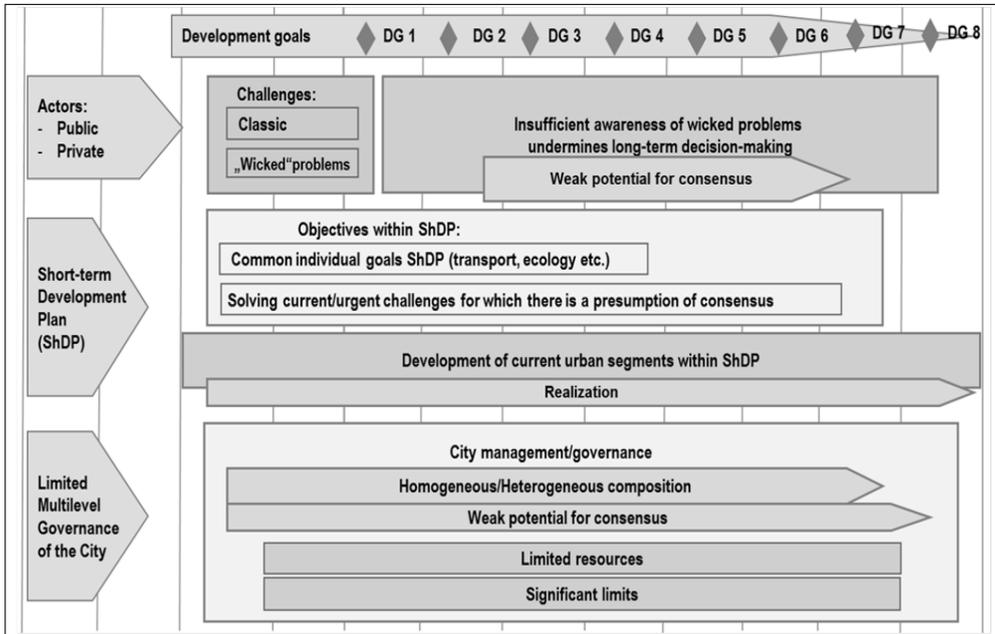
- better communication between city leaders and residents;
- cities need to create a culture that can respond to change;
- cities need to make changes that support their resilience and the resilience of the people and other actors in their territory;
- city leaders (and other actors) need to prepare themselves for existing as well as future challenges (including “black swan” events).

City management is responsible for setting short- and medium-term goals and long-term strategies (development plans) and for implementing its programs and policies in such a way that the goals are successfully met and the strategy is implemented. Effective urban governance is a key prerequisite for sustainable economic and social development of cities. Development plans are continuous. They represent not only a stabilizing factor, but also an expression of longer-term structural change, which should increase urban development potential, social stability, and greater resilience to negative unforeseen effects. Scheme 1 shows a set of some important elements that affect the scale and intensity of the challenges (including direct threats). It will be possible to respond to some of the challenges with existing structures, procedures, and staffing capacities. In other cases, changes in the configuration of these components will need to be considered.

As a result of changing conditions and the growing presence of “wicked” problems, there are also changes in the ideal model of large cities. The traditional model is receding and is being replaced by a development model. The differences between the two models of functioning of large cities lie in structurally different mechanisms of governance and strategic decision-making. Both models have different potentials to address the challenges. Not only the parameters of the model but also the parameters of a specific city play an important role here. Cities have different characteristics and various specifics. These include (1) geographical and climatic factors (location, altitude, proximity of watercourses, area), (2) technical and social factors (population and population density, population growth dynamics, structure and share of industry), and (3) vulnerability factors (availability of resources, supply and demand parameters, capacities, interconnections, interdependency, nature, type and scope of infrastructure, property, national/social structure of the population, resilience of the population). There are combinations of both models, which results from the specific conditions of individual cities (e.g., composition of their councils, size, organizational structure, number of political parties and interest groups operating in the city authorities). The broader context of the predominance of Model 1 or Model 2 is also due to the nature of the links between local, regional, and national levels of governance. All these specifics can modify the functioning of cities and lead to the “predominance” of Model 1 or Model 2. The models were compiled based on the analysis of processes that take place in systems characterized by a high degree of complexity. Expansion of the total number of actors in the city entity,

the need to involve a set of new actors (community) and consideration of long-term targeting are inevitable needs related to current challenges characterized as wicked problems.

Figure 2: Model 1 - traditional

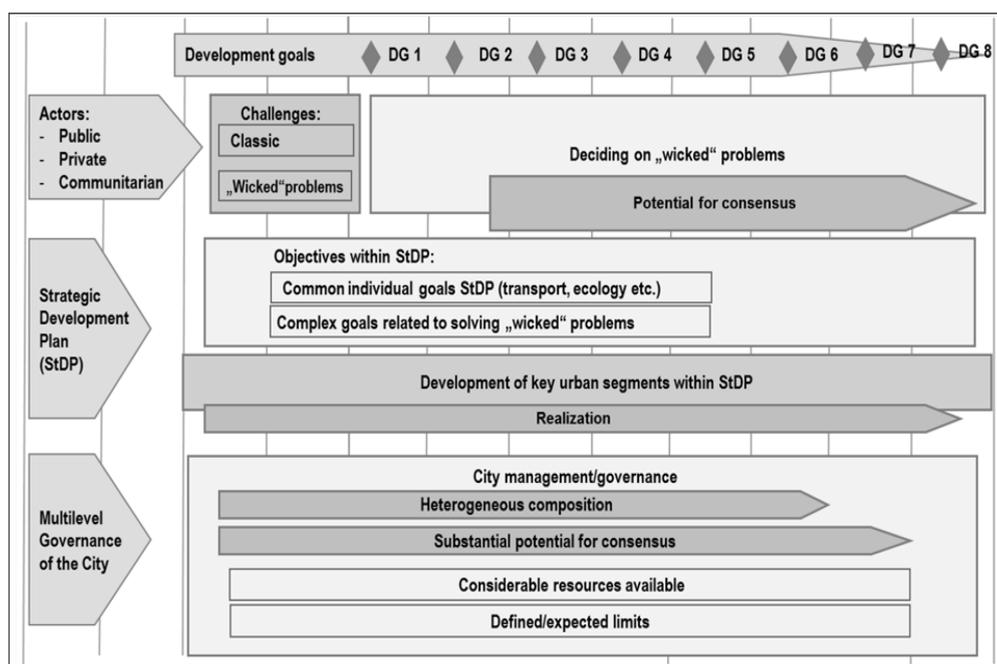


Source: own processing.

The above schemes provide a partial view of the composition of the governance and decision-making segments along with the dimensions of the implementation of development goals. Development goals can be implemented not only gradually, but also in parallel, depending on their scope and content. Sensitivity to the demand and supply side is important in the context of the city's economy and its material, technological, raw material, energy, and human (intellectual) resources. The weak potential of the consensus in Model 1 is a significant deficit, which may be further accentuated by the fact that more challenges are emerging at the same time. Over time, it became clear that traditional tools for management and governance, e.g., results-based management, goals achievement matrix, management by objectives, distinct components analysis, program evaluation and review techniques or critical path analysis procedures are not fully suitable for solving current highly complex challenges. They require a lot of time and resources and in some

cases abstract from some important aspects. Logical framework analysis (LFA) is a successor of the former tools and methods. The LFA monitor and evaluate input to a wide range of project schemes. Nevertheless, even this tool assumes that problems we discuss here are not “wicked” or complex in their nature. To solve “wicked” problems, it is important to use sets of approaches based on elements of adaptability, gradual changes, new forms of governance (decentralized, interactive, etc.) and on a range of different types of capital (structural capital, development capital, etc.).

Figure 3: Model 2 – modern



Source: own processing.

Traditional view of current challenges in terms of urban governance (Model 1): In terms of the traditional approach to current challenges, two important aspects can be seen. The first aspect is the underestimation of the importance and scope of the challenges and the second is the non-estimation of the nature of these challenges. However, both aspects are important to a timely and adequate solution. In the traditional view, challenges are problems that usually need to be addressed according to the intensity with which they manifest themselves. Such an approach is not always appropriate, especially because in a complex world, phenomena do not take place linearly and not always

large changes on the input side bring great negative/positive effects and vice versa. In addition, waiting for a situation where large development breaks occur (increase in pollution, increase in the number of patients in a pandemic, etc.) may mean that the situation is already difficult to manage or requires much higher costs for the solution.

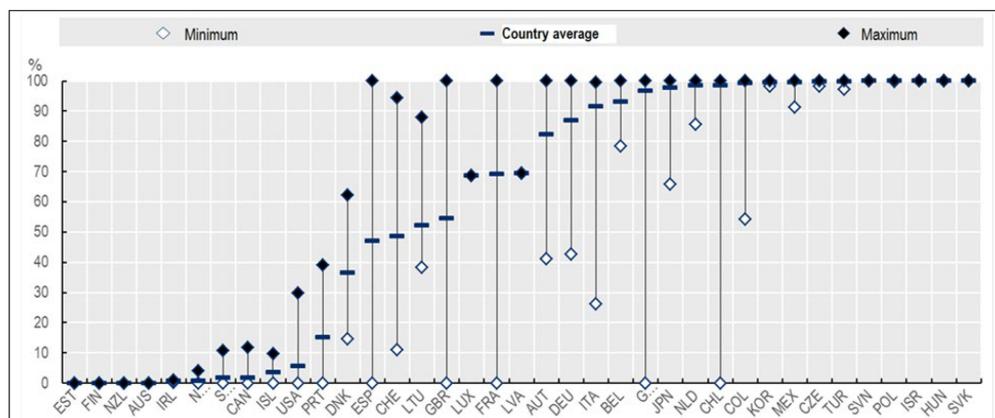
A modern view of current urban governance challenges (Model 2): There is currently a global wave of interest for a modern view of urban construction and transformation, considering the need to achieve a quality environment, energy efficient buildings, a quality and safe transport network and overall attractiveness. The current changes are characterized by new specifics and the growing intensity of their effects. These include the following new specific characteristics of the urban environment in terms of governance (Head, 2008):

- *Uncertainty* - in city governance environment, there is a growing uncertainty of boundaries regarding individual actors and various administrative units.
- *Specialization* - there is a specialization in the functioning of management units and various actors.
- *Number of actors* - the number of actors involved in projects and other events of large cities is growing significantly.
- *Interdependence* - with increasing specialization, interdependence and the risk of clashes and coordination failures also increase.
- *Multi-level decision-making* - different sources of financing of different components of urban functioning and the related different regulations complicate the implementation of individual investment actions and other objectives; financing e.g., from European Union sources may further complicate the situation in the European context.
- *Timeline and policy cycle* - large cities must consider many events and actions in different time horizons and consider the effect of the political cycle (especially in the context of large publicly-financed investments).

There is a need on the part of cities to respond to several environmental challenges. Graph 1 and Graph 2 are examples of the challenges our country and cities are facing - in this case it is the category of environmental threats.

Graph 1 shows the situation in terms of air pollution (in this case $PM_{2.5}$)³. Graph 2 provides an overview of the situation of selected cities in terms of the values of indicators for development objectives in the group SDG 11 (specifically SDG 11.1 - 11.7). The intention in the case of the Slovak cities (Bratislava and Košice) should be to achieve environmental parameters corresponding to the most developed regions and cities in Europe. However, this will require modern approaches to urban governance and sufficient resources. Among other things, it will therefore be necessary to reach a consensus between the various actors, and this may be the fundamental challenge that poses a 'wicked' problem.

Graph 1: Percentage of population exposed to a value higher than $10 \mu g/m^3$ $PM_{2.5}$, large regions (TL2) (in %, 2019)



Note: The position of the Slovak Republic (SVK) is shown in the right part of the graph. The minimum, average and maximum in this case reach 100 %. Some other countries are also in the same situation - e.g., Hungary. The Czech Republic has similar parameters as the Slovak Republic - the minimum value in its case is 98.1 %, the average is 99.7 % and the maximum value reaches 100 %. The countries Estonia, Finland and New Zealand have zero values. Australia (0.004%), Ireland (0.6%), Norway (0.8%), Sweden (1.6%), Canada (1.8%) and Iceland (3.5%) have low average values. $PM_{2.5}$ is an example of secondary organic aerosols. Other pollutants are e.g., NO_2 or PM_{10} . Table 1 below lists indicators C110602 and C110602b (within SDG 11) related to $PM_{2.5}$ secondary organic aerosol pollution.

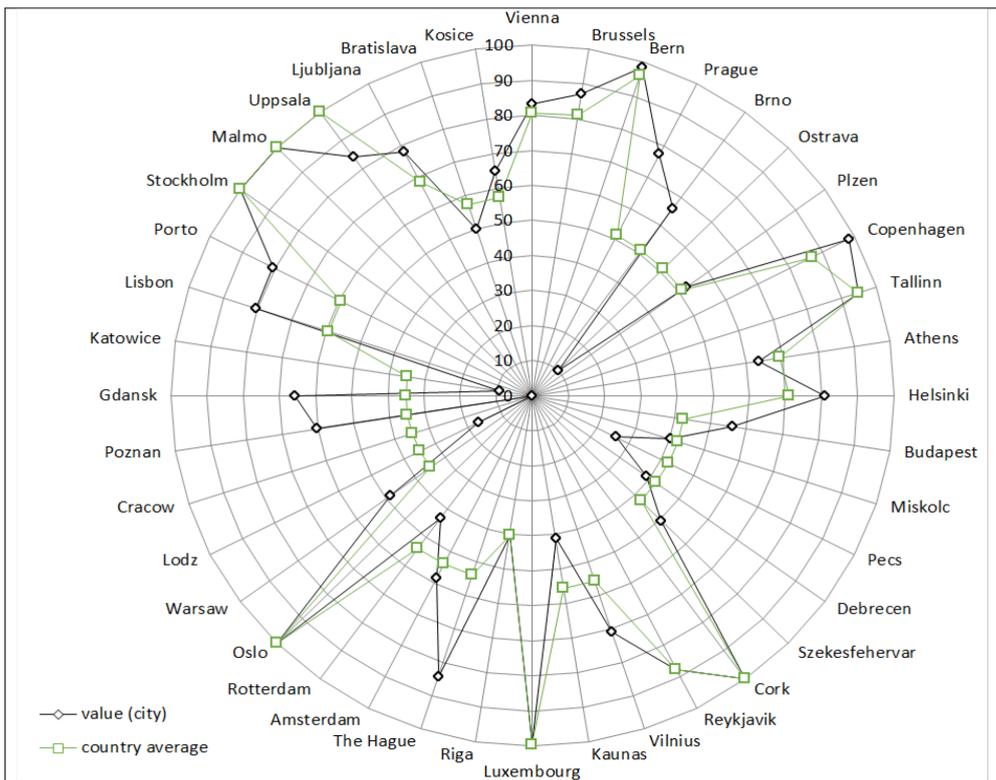
Source: OECD data, 2021.

The above example illustrates a wide range of challenges that cities currently face. As the statistics in this section suggest, the situation of many cities is a challenge for their leaders to reconsider approaches to transforming their

³ The environmental indicator $PM_{2.5}$ was used in terms of its significant impact on health, especially in large cities. Microscopic particles may enter the human body and impose damage on various organs (e.g., lungs). Such pollution contributes to human mortality from respiratory, cardiovascular, and other forms of diseases. The largest cities (Beijing, Tokyo, London, Los Angeles) are affected by the presence of substances of the $PM_{2.5}$ type (e.g., oxides of Sulphur).

cities into modern and environmentally stable areas with good conditions for family and working life. This requires effective governance of these cities and ambitions to address new challenges. The results of the analysis show that the situation in the countries of Central and Eastern Europe (CEE) is not optimal. This applies to various aspects of evaluation. In our case, we focused on the comparison of ten indicators within the objectives SDG 11. The level of the position of individual cities, as indicated by the comparison of the above indicators, is significantly different, while the compared values are significantly worse for cities from CEE countries. A look at the situation of two Slovak cities indicates the need for more significant changes. Graph 2 provides a more detailed comparison of the position of selected European cities and Table 3 shows the structure and description of the individual categories of indicators for the analyzed objectives SDG 11.

Graph 2: Position of selected capitals and countries for SDG 11 (SDG 11.1 - 11.7)



Note: Index is created from values of indicators for SDG 11.1 - 11.7. A higher number of points (obtained from aggregation of points from individual SDG 11 indicators) represent a better position of the city in terms of these indicators. See Tab. 1 for more details. SDG 11 is a "Sustainable Cities and Communities" category under the UN Program.

Source: own processing based on OECD data, 2020.

Although Amsterdam, e.g., has had a comprehensive vision of innovation in the past, focusing on four areas of urban life (governance, economy, social inclusion, and quality of life), its position among European cities in terms of SGD 11 assessment is not substantially positive.

Table 3: Overview of indicators for SDG 11 "Sustainable cities and communities" (SDG 11.1 - 11.7)

SDG goal	Indicator	Abbreviation	Indicator - description
11.1	C110100a	hcost	Percentage of households' expenses dedicated to housing costs
11.1	C110100b	affordh	Percentage of population satisfied with affordability of housing
11.2	C110200a	transpsat	Percentage of population satisfied with the quality of public transportation systems
11.2	C110201a	perfhosp_pt	Performance of public transport network, ratio between accessibility and proximity to hospitals
11.2	C110201b	perfhosp_car	Performance of car transport network, ratio between accessibility and proximity to hospitals
11.3	C110301	builtup	Difference between built-up area growth rate and population growth rate (percentage points)
11.6	C110602	airp	Exposure to PM _{2.5} in µg/m ³ , population weighted (micrograms per cubic meter)
11.6	C110602a	airsat	Percentage of population satisfied with quality of air
11.6	C110602b	sh_exppm25	Percentage of people exposed to more than 10 µg/m ³ (micrograms per cubic meter) of PM _{2.5}
11.7	C110701a	green_walk	Percentage of population with access to at least 1 hectare of green urban areas (parks) and forests within 15 minutes of walking
11.7	C110701b	recre_bike	Percentage of population with access to at least one recreational opportunity (theatres, museums, cinemas, stadiums, or cultural attractions) within 15 minutes of cycling

Note: Indicators C110602 and C110602b, related to PM_{2.5}, secondary organic aerosol pollution, are highlighted. Graph 1 above also applies to this indicator.

Source: Author; OECD data, 2020.

Choosing appropriate approaches to addressing the relationship between economic performance and quality of life in cities is not a trivial matter. The proposed solutions often meet with resistance from some of the parties

involved. It is common for challenges of this type to represent the “wicked” problems described above. New forms of urban governance mechanisms increase the potential of cities in terms of their resilience to the adverse effects of natural forces and to the negative effects of human activity. Only a comprehensive parallel strengthening of all components of the resilience of large cities, together with a long-term effort to implement transformation processes towards the long-term goal of environmental sustainability, can lead to the attractiveness and security of large cities. The resulting effect can be the acquisition of long-term economic and social effects at the city level, which will be reflected in the positive effects for society.

4 Discussion and conclusions

Understanding the complexity of emerging “wicked-nature” challenges allows cities to focus on finding ways to respond to these challenges quickly and effectively. In this regard, it is possible to assess individual cities and countries as they approach these new and complex “wicked” challenges. Based on a comparative analysis of the two models (traditional and modern), we indicated the differences and possible starting points. Cities are organized into an increasingly comprehensive complex of interconnected components, which poses major challenges for smart solutions. However, the possibility of these solutions is limited by the fact that many challenges fall into the category of “wicked” problems, where finding the optimal solution and the possibility of reaching a consensus of various stakeholders is problematic and sometimes very limited. This prolongs decision-making processes and ultimately a stalled situation can lead to temporary or longer-term delays in making crucial decisions - e.g., about large constructions or regarding the holding of major sporting and other events (e.g., Olympic Games or EXPO).

Addressing the many challenges that large cities currently face in the environmental field and in the face of the need to strengthen their resilience is a difficult task. Nevertheless, the issue of urban environmental sustainability and urban resilience is becoming increasingly relevant with growing economic activity and technological change. Existing “wicked-type” challenges are serious not only in their content and scope, but also in their difficulty in finding solutions. The responsibility of top city officials is considerable in this regard. However, it is related not only to the micro-management of everyday problems, but to the strategic conceptual planning of urban development aiming – among

others - to reduce the environmental burden. Effective urban governance and efforts to address new challenges also require urban management to be sufficiently qualified and able to find some consensus in addressing important challenges related to a wider range of stakeholders. The aim of the paper was to point out the importance of good governance and decision-making in the area of difficult-to-solve “wicked” challenges in contrast to normal situations. It has been pointed out that there are different approaches to looking at the challenges of the new type. Using the traditional model can cause shocks in the functioning of large cities, weaken their resilience, and thus jeopardize their further development.

As the example of the position of the selected cities indicated, the leaders of the large cities will have to reconsider the traditional approaches to urban governance and management soon. The reason for this is the real concern that an increasing number of “wicked” challenges can be expected soon. These will need to be addressed quickly and efficiently, considering the justified needs of urban dwellers. The results of this research may contribute to broadening the approaches of other authors and to considering new aspects hitherto considered partial or insignificant.

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REFERENCES

- [1] Allam, Z. (2020). *Urban governance and smart city planning: Lessons from Singapore*. UK: Emerald Group Publishing. <https://doi.org/10.1108/9781839821042>
- [2] Australia State of the Environment. (2020). Resilience. Australia State of the Environment Report. Available at: <https://soe.environment.gov.au/theme/built-environment/framework/resilience>
- [3] Barth, B. (2014). Curitiba: the greenest city on earth. *Los Angeles Times*, 3 June.
- [4] Batty, M. (2013). An outline of complexity theory. Available at: <http://www.spatialcomplexity.info/files/2013/02/Complexity-Lecture-1.pdf>
- [5] Bowler, D. E., Buyung-Ali, L., Knight, T. M., & Pullin, A. S. (2010). Urban greening to cool towns and cities: A systematic review of the empirical evidence. *Landscape and*

- Urban Planning*, 97(3), 147 – 155. <https://doi.org/10.1016/j.landurbplan.2010.05.006>
- [6] Brzica, D. (2014). Challenges of the (governance) complexities: Bratislava-Vienna functional urban area. In: Karabon, M. et al. *Laboratories of multi-level governance: analysis of possibilities of implementing multi-level governance instruments in four chosen urban functional areas in the Czech Republic, Hungary, Poland and Slovakia*. Wrocław: The Society of Polish Town Planners, Green Press, s. 45 – 53.
- [7] Brzica, D., Kačirková, M., Ostrihoň, F. & Vokoun, J. (2020). *Atraktivita územia a mobilita talentov: Veľké mestá priťahujú talenty*. Bratislava: EÚ SAV, VEDA.
- [8] Brzica, D., Wasziewicz, J. & Belof, M. (2014). Multi-level governance: a model not only for today, but also for tomorrow? In: Karabon, M. et al. *Laboratories of multi-level governance: analysis of possibilities of implementing multi-level governance instruments in four chosen urban functional areas in the Czech Republic, Hungary, Poland and Slovakia*. Wrocław: The Society of Polish Town Planners, Green Press, s. 9 – 16.
- [9] Corfee-Morlot, J., Kamal-Chaoui, L., Donovan, M. G., Cochran, I., Robert, A., & Teasdale, P. J. (2009). *Cities, Climate Change and Multilevel Governance*. OECD Environmental Working Papers, No. 14, 2009, Paris: OECD Publishing. <https://doi.org/10.1787/220062444715>
- [10] Cutter, S. L. (1996). Vulnerability to environmental hazards. *Progress in Human Geography*, 20(4), 529 – 539. <https://doi.org/10.1177/030913259602000407>
- [11] Douglas, I., & Philip, J. (2014). *Urban Ecology: An Introduction*. London: Routledge. <https://doi.org/10.4324/9780203108703>
- [12] Elsheshtawy, Y. (2009). *Dubai: Behind an urban spectacle*. London: Routledge. <https://doi.org/10.4324/9780203869703>
- [13] Elsheshtawy, Y. (2019). *Temporary cities: Resisting transience in Arabia*. London: Routledge. <https://doi.org/10.4324/9780429457838-1>
- [14] EUROSTAT. (2016). *Urban Europe – statistics on cities, towns and suburbs – green cities*. Luxembourg: Publications office of the European Union. <https://doi.org/10.2785/594675>
- [15] Francis, R., & Bekera, B. (2014). A Metric and Frameworks for Resilience Analysis of Engineered and Infrastructure Systems. *Reliability Engineering and System Safety*, 121, 90 – 103. <https://doi.org/10.1016/j.ress.2013.07.004>
- [16] Fuerth, L. (2009). Cyberpower From the Presidential Perspective. In: Kramer, F. D., Starr, S. H., & Wentz, L. K. (Eds.) *Cyberpower and national security*. Washington, DC: Center for Technology and National Security Policy. <https://doi.org/10.2307/j.ctt1djmhl.29>
- [17] Glaeser, E. (2012). *Triumph of the city: How our greatest invention makes us richer, smarter, greener, healthier, and happier*. London: Penguin.

- [18] Hagan, S. (2014). *Ecological urbanism: the nature of the city*. London: Routledge. <https://doi.org/10.4324/9781315761480>
- [19] Head, B. W. (2008). Wicked Problems in Public Policy. *Public Policy*, 3(2), 101 – 118.
- [20] Hutter, B. M. (Ed.). (2017). *Risk, Resilience, Inequality and Environmental Law*. Northampton, MA: Edward Elgar Publishing. <https://doi.org/10.4337/9781785363801>
- [21] Kooiman, J. (2008). Exploring the Concept of Governability. *Journal of Comparative Policy Analysis*, 10(2), 171 – 190. <https://doi.org/10.1080/13876980802028107>
- [22] Kooiman, J., Bavinck, M., Chuenpagdee, R., Mahon, R., & Pullin, R. (2008). Interactive Governance and Governability: An Introduction. *Journal of Transdisciplinary Environmental Studies*, 7(1), 1 – 11.
- [23] Moser, S. C., Williams, J. S., & Boesch, D. F. (2012). Wicked challenges at land's end: Managing coastal vulnerability under climate change. *Annual Review of Environment and Resources*, 37, 51 – 78. <https://doi.org/10.1146/annurev-environ-021611-135158>
- [24] OECD. (2006). *Territorial Reviews: Competitive Cities in the Global Economy*. OECD: Paris. <https://doi.org/10.1787/9789264027091-en>
- [25] OECD. (2020a). Metropolitan areas, OECD Regional Statistics (database), OECD, Paris.
- [26] OECD. (2020b). *A Territorial Approach to the Sustainable Development Goals*. Paris: OECD. <https://doi.org/10.1787/e86fa715-en>
- [27] OECD. (2021). *OECD Regional Outlook 2021: Addressing COVID-19 and Moving to Net Zero Greenhouse Gas Emissions*. Paris: OECD Publishing, Paris. <https://doi.org/10.1787/17017efe-en>
- [28] OECD/UN-HABITAT/UNOPS. (2021). *Global State of National Urban Policy 2021: Achieving Sustainable Development Goals and Delivering Climate Action*. Paris: OECD Publishing. <https://doi.org/10.1787/96eee083-en>
- [29] Pelling, M. (2003). *The Vulnerability of Cities: Natural Disasters and Social Resilience*. London: Earthscan Publications Ltd.
- [30] Shen, S., Feng, X., & Peng, Z. R. (2016). A framework to analyze vulnerability of critical infrastructure to climate change: the case of a coastal community in Florida. *Natural Hazards*, 84(1), 589 – 609. <https://doi.org/10.1007/s11069-016-2442-6>
- [31] Tanner, T., Mitchell, T., Polack, E., & Guenther, B. (2009). *Urban governance for adaptation: assessing climate change resilience in ten Asian cities*. IDS Working Papers, 2009(315), 01 – 47. https://doi.org/10.1111/j.2040-0209.2009.00315_2.x
- [32] Termeer, C., Dewulf, A., & Breeman, G. (2013). Governance of Wicked Climate Adaptation Problems. In: Knieling, J., Leal Filho, W. (eds). *Climate Change Governance. Climate Change Management*. Berlin: Springer, s. 27 – 39. https://doi.org/10.1007/978-3-642-29831-8_3

- [33] Torfing, J., Peters, B. G., Pierre, J., & Sørensen, E. (2012). *Interactive Governance: Advancing the Paradigm*. Oxford: Oxford University Press.
- [34] UN HABITAT. (2016). *Habitat III: New Urban Agenda*. Quito: UN Habitat.
- [35] UN. (2017). New Urban Agenda. Available at:
<https://habitat3.org/the-new-urban-agenda>
- [36] Weitzman, M. L. (2009). On modeling and interpreting the economics of catastrophic climate change. *The Review of Economics and Statistics*, 91(1), 1 – 19.
<https://doi.org/10.1162/rest.91.1.1>