



Original Articles

Sustainability indicators for municipalities of megacities: Integrating health, safety and environmental performance



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ABSTRACT

The sustainability assessment of public sector organizations including municipalities, with a focus on the integration of health, safety, and environmental (HSE) issues in the context of sustainability performance indicators, has almost remained underexplored. Moreover, since a large number of the activities of megacities' municipalities have directly to do with HSE issues, there seems to be a substantial gap in the study of megacities and corresponding local public administrations. The present study is aimed at developing a performance evaluation tool, supported by indicators, to monitor the HSE aspects of sustainable development in the municipalities of megacities. To put the proposed tool into practice, a set of performance evaluation indicators is proposed to be adopted in Iranian municipalities, integrated in the megacity of Tehran. The selection process was conducted by employing Delphi technique. In doing so, a 2-round questionnaire was responded by qualified experts to select the most robust indicators of HSE performance and evaluate the priority of each indicator. A total of 80 indicators were generated and grouped into 13 categories, 29 sub-categories, and 7 themes (Health (H), Safety (S), Environment (E), Health-Safety (HS), Health-Environment (HE), Safety-Environment (SE), and Health, Safety and Environment (HSE)). Findings indicate that amongst the overall average score of the 13 categories, "Fire and emergency response" is the most important category, closely followed by "Waste", "Transportation", and "Natural systems" categories. Moreover, among the 7 proposed themes, the integrated "HSE theme", nearly followed by "safety theme", plays the most significant role in enhancing the HSE performance of sustainability in Tehran municipalities. It is concluded that in the HSE context of the megacities municipalities under scrutiny, social aspects of sustainability gain more attention in comparison with the environmental ones. Furthermore, in municipalities of megacities, the indicators related to health and safety could be considered as 'key indicators' and should be thus classified into independent categories so that their roles can be highlighted in the management and assessment of municipal sustainable development.

1. Introduction

Urbanization as one of the most significant social processes plays a key role on local and global scales (Hiremath et al., 2013). Nowadays, more than half of the world population lives in cities (Dempsey et al., 2012; ISO 37120, 2014), from which approximately 580 million people are resident in the total 34 "mega-cities" of the world in total (Demographia world Urban Areas, 2015b). Megacities are defined as a metropolitan or an urban area with a total population more than 10

million inhabitants (Westfall and Villa, 2001), in which the main economic, social and environmental processes are one of the main concerns of local governments (Michael et al., 2014). Continued and rapid growth of urbanizations (Huang et al., 2016) and development of megacities, as well as their harmful consequences on citizens associated with sustainability problems (Singh et al., 2012), call for managing, assessing, and reporting municipal sustainability.

The concept of sustainability has led to various definitions and understandings (Visvaldis et al., 2013). This concept was first explored

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at regional and national levels, but more recently, it has been also highlighted at a local level (see [United Nations, 2015](#); [ICLEI, 2017](#); [C40 Cities, 2013](#)). Global networks such as C40 Cities– Climate Leadership Group– and ICLEI– International Council for Local Environmental Initiatives– also focus on sustainability at a local level and provide guidance about effective ways to achieve local, national, and global sustainability objectives. ICLEI has highlighted a commitment to sustainable development by supporting local governments in implementing sustainable principles and goals at a local level ([Bhagavatula et al., 2013](#); [ICLEI, 2017](#)), including low carbon and climate neutral cities, resilient communities, green infrastructure, green urban economy and jobs, and healthy and happy communities ([Jamil et al., 2015](#)). C40 is also increasingly calling on local governments to actively support and develop a sustainable future by focusing on reducing greenhouse gas emissions and climate risks, while increasing the health, wellbeing and economic opportunities of urban citizens ([C40 Cities, 2013](#)). On the other hand, the 11th goal of the 17 new goals of the post-2015 UN Millennium Development Goals (MDG) ([United Nations, 2015](#)) also focuses on sustainable cities and communities as well as on the importance of integrating sustainability at a municipal level. Therefore, the specific context of “municipal sustainability” puts emphasis on the interrelationship between municipal structure and citizenship life ([Michael et al., 2014](#)). The goals and approaches mentioned show that in recent years, local public administrations such as municipalities have particularly been part of a wider sustainability movement in collaboration with other private actors and regional and national public authorities ([Smedby and Neij, 2013](#)). Therefore, at local level, local public administrations are becoming widely recognized as ‘sustainability leaders’, advocating with other levels of government ([Domingues et al., 2015](#)).

Much effort has been made by municipalities to keep a balance among all aspects of activities in line with the triple bottom-line of sustainability ([Huang et al., 2016](#)). Moreover, a large number of municipalities’ activities in megacities are directly related to Health, Safety and Environmental (HSE) issues. While health and safety sustainability aspects have acquired adequate dominance at occupational level ([Cunningham et al., 2010](#); [Koskela, 2014](#); [IPECA et al., 2015](#)), some studies in the field of municipal sustainability indicate that there are also interlinking associations between municipal sustainability and health aspects ([Badland et al., 2014](#); [Rapport and Singh, 2006](#)), as well as safety ([Dempsey et al., 2012](#)) and that there are parallel challenges in this regard. Moreover, the state of environment has direct and indirect impacts on human health. So it is reasonable to consider health and environmental in an integrated way ([Tanguay et al., 2010](#)). In the same way, other authors ([Cunningham et al., 2010](#)) also show that environmental conditions and safety indicators are interlinked so that each one affects all the others.

Local governments have a key role in performing environmental protection for sustainable development, a good example of which is the role of cities in fighting against climate change issue ([Balaban, 2012](#); [Ahvenniemi et al., 2017](#)) by adopting preventive measures and mitigating the causes of climate change including greenhouse gas emissions ([Ahvenniemi et al., 2017](#)), fossil fuel consumption ([Trencher et al., 2016](#)), land-use change and deforestation ([Balaban, 2012](#)), among many others. On the other hand, since all environmentally friendly behaviors aim to protect human health, health and sustainably are undeniably intertwined ([Bartlett, 2013](#)) and health issues are increasingly affecting sustainable development ([Pan American Health Organization, 2013](#); [Department of economic and social affairs, 2015b](#)). Some examples of this relationship are the effects of environmental conditions on mental health and a rise in diseases such as asthma and allergies which are exacerbated by air pollution and fumes from vehicles. In addition, it is important to note that environmental risks such as exposure to air and water pollution have a decisive effect on health ([Big and Small, 2009](#)), as one of the parallel lines of sustainability ([Pan American Health Organization, 2013](#)). Well-being has also been

correlated with sustainability goals in such a way that happy people are more environmentally friendly ([Bartlett, 2013](#)). Health is thus a central issue in all the three dimensions of sustainable development ([Pan American Health Organization, 2013](#)) and subsequently the third goal of Sustainable Development Goals (SDGs) is focused on health issues ([Department of economic and social affairs, 2015a](#)).

However, there is yet no clear understanding of how exactly the safety and sustainability domains can be related ([Rodríguez-Navas et al., 2015](#)). Safety and sustainability can be considered as very closed and interrelated goals at local level ([Gilding et al., 2002](#)). Both safety and sustainability concepts are often regarded as people-centered ([Gilding et al., 2002](#)), despite numerous views and definitions. Another aspect of the relationship between safety and sustainability is natural hazards and disasters such as earthquakes, droughts, floods, storms and fires that cause major loss of human lives and the destruction of economic and social infrastructures ([United Nations International Strategy for Disaster Reduction, 2002](#)). Moreover, although both health and safety have a positive and direct effect on economic situation ([Gilding et al., 2002](#)), many organizations underestimate the real cost of illness and injuries ([Cooper 2014](#)).

Therefore, sustainability approaches and initiatives in the municipalities of megacities will be more robust when the interaction between health, safety and environmental issues is taken into consideration in an integrated way, as well as in line with the triple bottom-line of sustainability. Viewed hence, the municipalities authorities should manage and evaluate organizational sustainability through integrated organizational performance tools ([Scipioni et al., 2009](#); [Mascarenhas et al., 2010](#)), weighting HSE aspects within the main sustainability dimensions.

Due to the fact that every municipality has specific sustainability features, arising from its geographic location and also from its political, social, physical, economic, and cultural circumstances ([Jones, 2010](#)), tailored approaches are needed. In many cases, megacities include a large number of municipalities, and each municipality pursues sustainability in different ways, implying that any sustainability management or evaluation tools should be tailored to the needs of local circumstances. Therefore, such approaches are required to identify the profile of the main municipality activities and services and their given impacts so as to integrate all dimensions and aspects of municipal sustainability ([Rapport and Singh, 2006](#)), taking into account the interrelations among these components ([Braulio-Gonzalo et al., 2015](#)) by focusing on health, safety and environmental aspects of sustainability.

In order to analyze the state of municipal sustainability performance, different tools are employed by local public administrations ([Hiremath et al., 2013](#)). One of the most common methods adopted by several municipalities around the world is sustainability indicators ([Zoeteman et al., 2015](#); [Braulio-Gonzalo et al., 2015](#); [Tanguay et al., 2010](#); [Huang et al., 2016](#); [Nogueiro and Ramos, 2014](#)). Sustainability indicators intend to collect specific qualitative or quantitative bits of information ([Moreno Pires and Fidélis, 2015](#)) that assess organizational performance and bring together multiple areas of sustainability that are generally comparable ([GRI and ISO, 2014](#); [GRI, 2011](#)). Indicators contribute to municipal sustainability through two major roles: i) reducing the amount of the data required, and ii) facilitating communication with the organizational stakeholders, including the local community ([Hiremath et al., 2013](#)). They also help local administrations to integrate sustainability aspects in performance management, improving support for their decision making processes ([Rahdari and Anvary Rostamy, 2015](#)) or public awareness programs ([Michael et al., 2014](#)). When developing municipal sustainability indicators, some features should be taken into consideration ([Michael et al., 2014](#)), including the ability of summarizing issues, relevance to the subject matter, and supporting the municipalities goals and strategies ([Scipioni et al., 2009](#)). Nevertheless, one of the most important features should be the “multidimensionality” in which an indicator system should describe different aspects of sustainability ([Scipioni et al., 2009](#)).

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