

ASSESSING URBAN SUSTAINABILITY: MODELS AND OPTIONS FOR CITY GOVERNMENTS

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Abstract

Following the quest of cities worldwide for sustainable development, numerous cities and localities in Romania have developed local development strategies or master plans that incorporate the concept of sustainability. While these strategic planning efforts are commendable, it is not very clear how the municipalities will monitor the progress made, if any, toward reaching sustainability. This paper strives to offer some clarity with regard to various measurement systems of urban sustainability. Our goal is to provide a list of steps cities and city governments in Romania and elsewhere might consider in light of designing and implementing measurement/assessment systems of urban sustainability.

1. Introduction

Several months ago we came across an intriguing title in a national newspaper, stating: *The Republic of Moldavia: The unhappiest place (country) on this planet* (Evenimentul Zilei, 14 May, 2009). We are relatively familiar with the problems this neighboring country faces, ranging from an underdeveloped economy and a low quality of life to a non-democratic regime and widespread corruption. However, in the back of our minds, we couldn't stop thinking that there have to be other places where people are even unhappier. What about Nord Korea or some of the African Third World countries? We immediately started to look for the study used as a reference by the newspaper article because we were interested in knowing how the concept of unhappiness was operationalized and measured and by whom. It eventually turned out that Moldavia was in fact the unhappiest place in Europe and among the unhappiest places on the planet. This newspaper article got us started in thinking about other rather broad, abstract concepts that are sometimes measured and offered to the general public as rankings. Sustainability is one of these concepts. The paper thus strives to understand if and how sustainability (more precisely urban sustainability) can be measured. Moreover, we focus on the issue of how sustainability assessments can be used by city governments to guide their future developmental decisions.

2. The 'journey' from sustainability and sustainable development to sustainable cities and sustainable urban planning

Sustainability has been for the last three decades a 'buzz' word in the environmental and planning literature, conveying a multitude of meanings, that are often divergent, to a variety of individuals, professions, interest groups, governmental agencies and political leaders, and NGOs and grassroots organizations. The concept has evolved over time, being socially constructed through a sustained period of conflict negotiation and resolution (Campbell, 2003, p. 444), and much of what the term conveys today is considerably different from what it conveyed a decade ago (Portney, 2003, p. 1); the 'image' of a sustainable future is yet to be produced, and it will nonetheless be the result of social interactions. As the broad concept of sustainability has evolved, so, too, have several of its derivatives – sustainable communities, livable communities, and sustainable cities. In addition, the concept of sustainable urban planning appears as a logical corollary of sustainable cities, implying a long-term approach to decision-making, a holistic outlook integrating various disciplines, interests, and analytic approaches, a questioning of traditional models of growth and acceptance that limits to these exist, a new appreciation of the importance of place, and proactive involvement in healing societies and ecosystems (Wheeler, 2004, p. 35).

This section briefly discusses several concepts that may be considered the 'predecessors' of sustainable cities/communities. It also explores how the discussion about measuring sustainability and assessing policy/planning efforts aimed at creating sustainable cities/communities has evolved over time in close connection with the expanding conceptual framework underlying the broad concept of sustainability.

The concept of “sustainability” in its modern sense emerged in the early 1970s in response to a dramatic growth in understanding that modern development practices were leading to worldwide environmental and social crises (Wheeler, p. 19). The term is nonetheless very broad and abstract, thus creating confusion and cynicism as well as positive environmental change (Portney, 2003, p. 3). Various authors have tried to categorize the existing approaches to sustainability. Kidd (1992) argues that there are at least six branches of sustainability (he discusses in depth the ecological/carrying capacity root, the natural resource root, the biosphere root, the critique of technology root, and the eco-development root) while Brown *et al.* (1987) suggest six possible strains of thought (sustainable biological resource use, sustainable agriculture, carrying capacity, sustainable energy, sustainable society and economy, and sustainable development). The two classifications are relatively similar but there are also overlaps between the categories in each classification. Each of these strains of thought could be used as the theoretical paradigm underlying the construction of an assessment framework of the sustainability of cities.

The concept that seems to be deeply embedded in several of the intellectual roots of sustainability is carrying capacity. In its broadest sense, carrying capacity refers to the finite ability of a system to support an activity or feature at a given level. The term “carrying capacity” does not have a single precise definition; rather, it is a broad term that covers a range of different concepts (Arrow *et al.* 1995; Carter, 1989; Rees, 1992; Sowman, 1987). These concepts have in common the idea that systems have certain limits or thresholds (a distinction is sometimes made between maximum carrying capacity and optimum carrying capacity). Establishing precise thresholds is nonetheless problematic, since there are both objective and subjective elements to consider. For example, the literature on tourism discusses about social carrying capacity. This is essentially a measure of crowding tolerance. It has been defined as “... the maximum visitor density at which recreationists still feel comfortable and uncrowded” (De Ruyck *et al.*, 1997, p. 822). In the absence of additional changes, beyond this density visitor numbers start to decline. The social carrying capacity can, however, be influenced by factors such as the recreational infrastructure, visitor attitudes, and socio-cultural norms (MacLeod and Cooper, 2005, p. 226). This alludes to the challenges posed by measuring the sustainability of cities, which are extremely complex ecosystems, characterized by numerous intra- and inter-system dependencies.

While sustainability is more directly related to biology and ecology, the concept of sustainable development (or sustainable economic development) brings elements of economic activity more explicitly into the equation (Portney, 2003, p. 7). It is a catchword for alternative development approaches that could be envisioned as continuing far into the future (Wheeler, 2004, p. 19). Economic practices that degrade the environment and deplete natural resources are no longer considered harmful only for the environment but, also, on the long run, for the economic growth itself. The relationship between economic growth and the environment became a topic for debate in the early 1970s, when several programs run by international donors such as World Bank, IMF, USAID were

criticized for promoting and supporting economic activities in Third World countries which were hurting the indigenous environments and were depleting the natural resources of these countries. International NGOs pointed out the fact that while some unsustainable economic activities offered short-term financial relief for these needy populations in the Third World countries, they were by no means strategies that could be supported over the long run (Fox and Brown, 1998). Cross-generation concerns and the idea that economic development needs to be viewed over a longer period of time than it is usually practiced were the key highlights of the Brundtland Report in the late 1980s; the definition of sustainable economic development put forth by the report quickly became known and accepted by a variety of actors, despite the fact that it is rather short on details on how to pursue “economic development activity that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987).

One important question that arises is whether or not sustainability is opposed to economic growth. Most authors argue that mainstream sustainability advocates are in favor of a peaceful coexistence between environmental protection and economic growth (Portney, 2003; Gillham, 2002). This seems to be supported by recent developments concerning other concepts that are interrelated with sustainability and sustainable development. The original emphasis of urban growth management was on preserving environmental resources by setting limits on new developments. More recently, it has evolved into a more broadly focused planning and governmental approach – it is sometimes referred to as smart growth, aimed at supporting and coordinating the development process (Gillham, 2002, p. 155).

The concept of sustainable communities emerged in the context of a better understanding of the role played by local governments and grassroots efforts in promoting the goals of sustainability. The slogan “Think globally, act locally” illustrates this shift which was acknowledged also by Agenda 21 (and respectively Local Agenda 21) a resolution which emerged out of the Earth Summit held in Rio de Janeiro in 1992 and which became quickly a point of reference in the quest of local governments for sustainability. Worldwide, cities and localities are at the forefront of the sustainability movement, promoting cutting-edge environmental initiatives that go beyond what is mandated by national governments and national legislation (Selman, 1996). The term community in this context usually refers to small geographical areas, but it can also apply to bigger regions, programs or interest groups (Portney, 2003).

Ideally, sustainable cities should operate according to the concept of balanced, circular ecocycles, thus maintaining a better balance between the flows of inputs and outputs (Beatley, 2000, p. 232). The idea of comparing sustainable cities to other living organisms from nature emphasizes the fact that in natural ecosystems nothing is wasted (i.e. dead plants serve as nutrients for the soil) (McDonough and Braungart, 2002). According to this view, sustainable cities would resemble the metabolism of living creatures. Most of nowadays cities, however, operate based on linear flows, requiring enormous quantities of inputs in the form of food, raw materials, fuels, land and generating mostly non-recyclable and non-reusable waste.

There is a great deal of controversy regarding whether or not cities are the most appropriate unit or scale at which sustainability should be sought after. The arguments go both ways. On the one hand, cities are in most countries the administrative level closest to the individuals; they are also the places where the power and the ability to promote policy initiatives directed at sustainability rest. On the other hand, the jurisdictional limits of cities rarely coincide with the boundaries of the ecosystems and many of the problems that fall under the general topic of sustainability are cross-jurisdictional in nature.

If cities are to become more sustainable, urban planning needs to undergo a shift in paradigm. Planning for sustainability would be based on the following principles: harmony with nature, livable built environments, place-based economy, equity, polluters pay, and responsible regionalism (Berke and Conroy, 2000). Other additional principles may include: fundamental ecological limits to development, reduced consumption of nonrenewable resources, a restorative and regenerative approach to development, quality of life, community, equity, and full cost accounting (Beatley and Manning, 1997).

The concept of sustainability and its derivatives, aside from being broad and ambiguous, carry an inherent conflict that arises from the clashing of the three competing claims that are considered the key of sustainability: economic growth, environmental protection, and social justice (Campbell, 2003). Balancing these priorities is extremely complicated and in many cases almost impossible. Which realm of sustainability gets more attention is a question of negotiation among various groups in the society. At the EU level, this main flaw of sustainability is illustrated by the Lisbon strategy. Although the EU has explicitly stated that sustainable development is the over-arching principle of all EU policies, in reality, the issue of Europe's economic competitiveness in the face of globalization has come to dominate the political agenda. The refocused Lisbon strategy for growth and jobs has become the main objective of the Barroso Commission. The three pillars of the Lisbon strategy (economic competitiveness, social inclusion and environmental protection) have been compared to "three children", one of which - competitiveness - needs more attention. In this process, the sustainable development strategy is sometimes even reduced to the environmental pillar of the Lisbon strategy (EurActiv LinksDossiers on Sustainable Development).

3. Different approaches and models for measuring urban sustainability

The definitions of sustainability should be regarded as more than mere theoretical, abstract constructs. How one defines sustainability further translates into how the measurement framework of sustainability is designed and how the indicators/indexes are selected. Though performance measurement is not a new idea, assessing sustainability at the local/city level implies several major barriers (Wheeler, 2000). Because sustainable development is such a broad concept, sometimes too many different issues are being put under the umbrella of the SDS, therefore taking attention away from the most unsustainable trends. There is also a general lack of good indicators and future targets (EurActiv LinksDossiers on Sustainable Development).

Before even considering which aspects should be assessed under the umbrella of sustainability, one question needs to be answered: What is it that we are really trying to measure? There are two main options available for local governments, researchers and/or other interested groups. First, one may assess how seriously cities are pursuing sustainability. This assessment option is based on whether issues of sustainability can be said to be clearly and unambiguously on the public agenda. The emphasis here is not on the extent to which cities have actually achieved particular environmental result; it rather focuses on the existence, or lack thereof, of a set of policies and programs aimed at increasing sustainability (Portney, 2003, pp. 32-33). The main planning documents to be taken into consideration are local sustainable development master plans or strategies that most cities have or are in the process of developing them. This policy option has several major advantages. In the first place, it allows for at least some sort of measurement in locales where sustainability efforts are still in early phases and therefore observable benefits are hard to identify and measure as yet. Second, local governments are not 'penalized' for negative developments related to sustainability that are out of their control – there are factors such as global warming or the decrease in the number of certain species that are impacted by broader phenomena than the ones controllable at the local level. The main disadvantage is that neither the conceptual nor the empirical work on sustainability has been able to link, with any confidence, specific actions, policies, or programs to an improving environmental quality (Portney, 2003, p. 34). Despite this disadvantage, Portney's model is based on the work of other scientists, who, at least partially, incorporated into their measure of sustainability indicators measuring leadership, institutional capacity, and/or strategic planning for sustainability. For example, Etsy's "Environmental Sustainability Index", computed for nations, includes among its 67 variables, data referring to the capacity of nations to promote and advance sustainability (i.e. stringency and consistency of environmental regulations, the degree to which environmental regulations promote innovation) (Portney, 2003, p. 33).

The second option available for cities is to build measurement systems that directly assess the state and the quality of the environment and/or of other dimensions such as economic growth, social equity, and quality of life that may be brought under the umbrella of sustainability. Sustainability indicators are at the core of designing and implementing a measurement system of urban sustainability. Indicators are bits of information that reflect the status of large systems (Huang *et al.*, 1998). Tanguay *et al.* (2009, p. 3) consider that it is important to clarify the nuance between indicators and data or variables. A datum becomes an indicator only once its role in the evaluation of a phenomenon has been established (i.e. the number of green buildings in a community becomes an indicator once it is established that an increase in the number of such buildings represent a strong commitment toward sustainability). Another distinction made is between environmental and sustainability indicators. Maclaren (1996) distinguishes urban sustainability indicators from simple environmental, economic and social indicators by the fact that they are not only integrating but forward-looking, distributional, and

with input from multiple stakeholders. Opschoor and Reijnders (1991) argue that sustainability indicators, as opposed to mere environmental ones, do not simply reflect environmental conditions or pressures on the environment, but indicate interactive characters between socioeconomic and ecological systems. A final distinction needs to be made between indicators and indexes. An index (or a composite indicator) is a synthesis of indicators. Formalization of an indicator that necessitates the aggregation of several data or variables results in an index. The use of indices in the field of sustainable development facilitates the understanding and interpretation of a given phenomenon, particularly for the public (Tanguay, 2009, p. 3). Indicators and indexes are designed with a direction, good or bad, which indicates whether the trend is evolving towards sustainability or whether it is moving away from it. Beatley and Manning (1997, p. 205) argue that indicators come with benchmarks or targets, as their natural extensions, which provide a tangible and specific goal for sustainable places and an ability to know when a community is being successful and when it is falling short.

Designing the assessment system of urban sustainability for any given city should start with taking into consideration at least the following questions (Perkins *et al.*, 1999, p. 6):

- (a) Which indicators are best? And how many should one include?
- (b) Are the indicators entirely based on the natural environment, or should they include social and economic factors?
- (c) Are these indicators transportable across cities/nations/the globe? Is it useful to know that a certain city is ranked the 37th most sustainable city in the world, for example?
- (d) Who should initiate and lead the process? Should the public sector be credited with the leading role or is a partnership among interested stakeholders, usually led by an NGO, better?

(a); (b) Is there really an answer to the question which sustainability indicators are best? Literature points out that there is a lack of consensus with regard to which sustainability indicators to use (Munda, 2001; Beinat and Nijkamp, 1998; Portney, 2003). In their 2009 study, Tanguay *et al.* reviewed an important number of journal articles addressing the issue of urban sustainability indicators. Their most important findings were: there is a lack of consensus on the optimal number of indicators (between 10 and 86); very few indicators are found in more than five studies (72% indicators apply to only one or two studies), a phenomenon that is even more striking given that the studies reviewed cover cities of western countries that share many of the same values and characteristics; the environmental dimension is characterized by a larger variety of indicators – hence less consensus, whereas the social, economic and institutional components comprise indicators that are more consensual and therefore more frequently used. This conceptual entanglement is translated into practice – cities worldwide use a variety of indicators to measure urban sustainability. Textboxes 1 and 2 offer two examples in this sense.

Textbox 1: Sustainability indicators in Minneapolis, US	Textbox 2: Sustainability indicators in Prague, Czech Republic
<p>A healthy life</p> <ul style="list-style-type: none"> Healthy infants Teen pregnancies HIV and Gonorrhoea Asthma Lead poisoning <p>Green-print</p> <ul style="list-style-type: none"> Climate change Renewable energy Air quality Bikeways <p>Target: Add 44 miles of bike trails and bike lanes by 2015</p> <ul style="list-style-type: none"> Green jobs Downtown transportation alternatives Airport noise Tree canopy Combined sewer overflow Permeable surfaces Water quality <p>A vital community</p> <ul style="list-style-type: none"> Affordable housing Homelessness Block clubs Brownfield sites Homicides Students in the arts Graduation rates Workers earning a livable wage 	<ul style="list-style-type: none"> Annual consumption of fuel and energy per inhabitant after the conversion Annual electricity consumption per capita Annual vehicle-kilometers traveled per capita Total number of vehicles per capita Air emissions NOx Air emissions SO2 Quality of local air – Number of exceedances of PM10 limit value Average household water consumption Waste production per capita Percentage of waste disposed by land filling Percentage of waste disposed by incineration Percentage of reused waste Noise – percentage of population exposed to noise Water quality of surface watercourses The number of respiratory diseases hospital admissions per 1,000 inhabitants Percentage of inhabitants connected to the public sewage system Percentage of waste water treated Waste water treatment – percentage of pollution removed as BOD Life expectancy at birth Area of protected areas as percentage of the City total area Length of marked bicycle paths and cycling routes

Source textbox 1: Minneapolis sustainability indicators, [Online] at <http://www.ci.minneapolis.mn.us/sustainability/indicators.asp>.

Source textbox 2: Sustainability indicators of the City of Prague, [Online] at [http://envis.praha-mesto.cz/\(zrm0vvyrdg1d1dvqlzmzmfy2\)/default.aspx?ido=5943&sh=8746579.15](http://envis.praha-mesto.cz/(zrm0vvyrdg1d1dvqlzmzmfy2)/default.aspx?ido=5943&sh=8746579.15).

It can be easily depicted that the first city adopted a broad vision of sustainability while the second focuses on a more narrow vision, with an emphasis on environmental elements. Minneapolis opted for a more easily to understand framework, using composite indexes. In the case of Prague, more ‘technical’ indicators are used, without aggregating them into a more ‘legible’ umbrella concept.

Corson (1993) suggests that urban sustainability indicators fall into five fairly different categories: ecological, environmental, natural resources issues; local economic performance and economic equity; ethical consideration; social-cultural issues, and political-governmental functions. Whenever quality of life indicators are integrated under the umbrella of a sustainability index, attention must be paid to the relation

between quality of life and impact on the environment. In other words, it is quite possible to have amenities and services that enhance the quality of life for individuals – libraries, museums, etc; however, if these buildings do not recycle their waste, use non-renewable energy, and are built on green fields, they are not advancing the agenda of sustainability. In these cases these inherent conflicts between the various priorities of sustainability have to be publicly discussed and weighted prior to being included into a sustainability measurement system.

Whether the selected indicators accurately measure what they are intended to measure – namely sustainability, ultimately depends on the meaning attributed to sustainability. Should one expect sustainability to retain a relatively homogenous definition across time and jurisdictions/places? Or rather, should sustainability be seen as being socially produced and redefined over time? Tanguay *et al.* (2009, p. 13) argue that in order to obtain a less superficial approach to the design of sustainable development indicators, sustainable development should not be systematically redefined when adapted to a particular territorial context. Moreover, the interpretations of sustainable development should be consistent with the Brundtland report by reflecting the economic, social, and environmental components as well as the overlaps between them. Campbell (2003, p. 447) argues that instead of trying to set limits on what sustainability means, the concept should be made even broader. If crisis, Campbell claims, is defined as the inability of a system to reproduce itself, then sustainability is the opposite: the long-term ability of a system to reproduce. This criterion applies not only to natural ecosystems, but to economic and political systems as well. In light of Campbell's view, indicators such as literacy, social capital measured as involvement in civic organizations, percentage of voters who voted in local elections, etc make now sense. They may not be directly related to 'traditional' sustainability issues but it is nonetheless simple to observe how these indicators impact the overall ability of the system to reproduce itself. Campbell (2003) is quite confident in the ability of the system to reproduce itself at the political and economic level. Society's shortcoming is that as it strives to sustain its political and economic systems, it often neglects to sustain the ecological system (p. 447).

(c) Another issue that raises considerable debate is whether certain sustainability measurement systems can be used in different national/regional contexts. Moreover, what is the significance for policy-makers of knowing that their city ranked higher than another city 5000 kilometers away? From a technical point of view, it is feasible to build measurement systems that can be applied in a variety of settings. Some basic, already standardized indicators (economic indicators – GDP per capita, unemployment rates, consumption of local products; environmental indicators: water and air quality, level of certain particulates, CO₂ emissions, lead poisoning; social indicators: infantile mortality, life expectancy, adult literacy) are collected in most countries/regions and can be used toward computing a sustainability index. However, because in these cases the meaning of sustainability is not socially produced through a process of negotiation and conflict resolution among various groups within the society, the resulting rankings

are usually not accepted by national governments and their populations as a reflection of 'reality' and very rarely make it to their policy agenda as priorities.

Sustainability rankings are useful for policy makers and local governments if they tell them which are the sectors that are unsustainable and how they can move toward being more sustainable. For most indicators used in sustainability assessment exercises no clear reference point is available (for GNP nobody knows the ideal value; it is usually compared with other countries' GNP, while the US value is sometimes considered the ideal). One solution, in order to get the ideal sustainable city profile, would be to define the reference points by choosing the best values reached in any single indicator (Munda, 2001, p. 12). The resulting ideal profile thus depends on the set of cities included in the assessment. If they are comparable, the chances of getting a realistic ideal sustainability profile increase. Presuming that the profile is somewhat accurate, the city will know how it is performing. In areas where performance is poor, policy priorities should be set and implemented.

(d) One final aspect discussed refers to the process of building sustainability indicators. Numerous authors argue that broad public participation, usually fostered by grassroots organizations, is a key part of any sustainability effort. This approach goes hand in hand with the notion of sustainability being a social construct (Zachary, 1995; Kline, 1995). Other authors claim that there are numerous 'objective' conditions that describe the state of a city. This calls for a professionally-driven, technical process. The assessment system, Brugman claims, should be judged according to the relation it bares to the objective ecological conditions in the city and not according to the broad social acceptance it receives. These two approaches seem irreconcilable, as they are based on two divergent views of the world. However, in practice, there are ways to combine them. For example, it is possible for city governments to decide to base their assessment of city sustainability on the efforts previously carried out by grassroots organizations. While the definition of sustainability is socially constructed through consultation, negotiation and conflict resolution, the actual indicators used are technical, and established through expert-driven activities.

The assessment models described above imply the use of some version of multicriteria analysis; by this meaning that the measurement system is based on a set of indicators and/or indexes, whose importance is sometimes weighted, organized into dimensions or categories. It is however possible to base the assessment of sustainability on a single measure or criterion. Perhaps the two most well-known such measures are carrying capacity (already discussed in section 2) and ecological footprint. These approaches offer the alluring promise of not having to deal with all the hassle and the entanglement implied by the construction of an assessment system based on various dimensions and a multitude of indicators.

Rees (1992) and Wackernagel and Rees (1995) argue that the demands that humans place on the earth can be translated into an amount of land necessary to meet those demands. The actual measurement starts from the assumption that every category

of energy and material consumption and waste discharge requires the productive or absorptive capacity of a finite area of land or water. If one sums up the land requirements for all categories of consumption and waste discharge by a defined population, the total area represents the ecological footprint of that population, whether or not this area coincides with the population's home region (Munda, 2001, p. 3). Wheeler (2000, p. 94) argues that the ecological footprint model has a great deal of appeal as a way to dramatize the impacts of resource consumption or changes in materials use over time. Ordinary citizens can run on-line versions of footprint models to calculate the impacts of their own lifestyles, and some analysts have attempted to calculate footprints for large urban regions or entire nations. However, in Wheeler's opinion, ecological footprint analysis remains an education tool at best, with only a limited role to play in planning decisions. From a technical point of view, the computations underlying the ecological footprint model sometimes simplify processes or relationships that exist in the framework of certain ecosystems (reductionism) or exclude certain aspects from the computation altogether (for example, only CO₂ is transformed into a land requirement and not other waste such as domestic or radioactive waste). In the case of cities, which are complex systems, based on a hierarchy of nested levels, this type of model and computations could yield very different results depending on the scale of analysis – local, metropolitan, regional or national (Munda, 2001, pp 4-5).

4. Certification of sustainability: from green building certification to community certification

Green buildings (loosely defined here as any building that is sited, designed, constructed, operated, and maintained for the health and well-being of the occupants, while minimizing impact on the environment) are usually discussed in the context of sustainability and environmental protection as positive elements. In the last two decades there has been a growing interest in the certification of green buildings according to different certification standards. Green buildings certification is reviewed in this paper in close connection with measurement systems of urban sustainability because building construction and operation have a significant environmental impact as they account for: 40% of global energy use, 30% raw materials consumption, 55% of timber harvests, 35% of global carbon dioxide emissions, 40% of municipal solid waste sent to landfill (World Watch Institute apud Fenner and Ryce, 2009). Also, more recently, certain certification systems are moving away from assessing merely individual building to assessing entire neighborhoods (see Textbox 3). In our opinion, green building and green neighborhood certification methods have the potential to become alternative assessment systems of urban sustainability.

According to Fenner and Ryce (2009, pp. 4) building rating systems are intended to: foster sustainable building design, construction and operation; promote integrated, whole building design practices; raise awareness of green building benefits. The main disadvantage is that setting targets for specific certification levels can lead to 'points

hunting' which in turn can be detrimental to the project. This happens because instead of focusing on an integrated sustainability vision, the design team focuses only on those individual aspects that bring the most points.

There are numerous such systems worldwide, some of them providing certification for buildings in other countries as well. Some of the most well-known are: **LEED** in North America (Leadership in Energy and Environmental Design) designed by USGBC (U.S. Green Building Council), **BREEAM** in UK (Building Research Establishment Environmental Assessment Method), **HQE** in France, Casbee (Japan), **Nabors** in Australia, **HK-Beam** in Hong Kong, etc. In Romania there is no national system in place; however, there is a branch of the U.S. Green Building Council established, called Romanian Green Building Council. Buildings in our countries could be certified under any of the aforementioned schemes which offer certification for non-domestic buildings as well.

At the EU level, under the Energy Performance of Building Directive (EPBD), Europe has made a mandatory energy certification since January 4th, 2009. A mandatory certificate called the Building Energy Rating system (BER) and a certification Energy Performance Certificate (EPC) is needed by all buildings that measure more than 1000 Sq meters in all the European nations. This will lead to the development of such schemes in the EU member states.

As opposed to the other measurement systems discussed in the previous section, building rating systems focus more on 'objective' features that quantify the ecological footprint of buildings. There are, however, differences between the different building certification systems, with LEED emphasizing the quality of life for the occupants of buildings while BREEAM is focused more on the environmental component. The standards used for building ratings are designed by private, not-for-profit organizations, which bring together numerous stakeholders from architects and real estate developers to community organizations. Certification is voluntary and carried out by third party organizations. The role of the public sector (city governments) is more limited – municipalities and other governmental organizations can endorse such systems by deciding to require for all the newly built public buildings to meet at least a certain level or ranking, by offering expediting permitting process, or by offering other facilities and access to grants for LEED certified neighborhoods. One should keep in mind that these standards are intended to be cutting edge, thus higher than the provisions to be found in building codes. Also, while they can guide the development of new buildings and neighborhoods, they are harder to use in redevelopment or retrofitting projects (with the exception of LEED standards for neighborhoods). Therefore, their role in guiding planning decisions in these instances is lower than in the case of other sustainability measurement systems.

Textbox 3: LEED standards for neighborhoods

Description: LEED for Neighborhood Development places emphasis on the design and construction elements that bring buildings together into a neighborhood, and relate the neighborhood to its larger region and landscape (p. 7).

Smart Location & Linkage - 30 Possible Points

- Prereq 1 Smart Location Required
- Prereq 2 Proximity to Water and Wastewater Infrastructure Required
- Prereq 3 Imperiled Species and Ecological Communities Required
- Prereq 4 Wetland and Water Body Conservation Required
- Prereq 5 Agricultural Land Conservation Required
- Prereq 6 Floodplain Avoidance Required
- Credit 1 Brownfield Redevelopment 2
- Credit 2 High Priority Brownfields Redevelopment 1
- Credit 3 Preferred Locations 2-10
- Credit 4 Reduced Automobile Dependence 1-8
- Credit 5 Bicycle Network 1
- Credit 6 Housing and Jobs Proximity 3
- Credit 7 School Proximity 1
- Credit 8 Steep Slope Protection 1
- Credit 9 Site Design for Habitat or Wetlands Conservation 1
- Credit 10 Restoration of Habitat or Wetlands 1
- Credit 11 Conservation Management of Habitat or Wetlands 1

Neighborhood Pattern & Design - 39 Possible Points

- Prereq 1 Open Community Required
- Prereq 2 Compact Development Required
- Credit 1 Compact Development 1-7
- Credit 2 Diversity of Uses 1-4
- Credit 3 Diversity of Housing Types 1-3
- Credit 4 Affordable Rental Housing 1-2
- Credit 5 Affordable For-Sale Housing 1-2
- Credit 6 Reduced Parking Footprint 2
- Credit 7 Walkable Streets 4-8
- Credit 8 Street Network 1-2
- Credit 9 Transit Facilities 1
- Credit 10 Transportation Demand Management 2
- Credit 11 Access to Surrounding Vicinity 1
- Credit 12 Access to Public Spaces 1
- Credit 13 Access to Active Public Spaces 1
- Credit 14 Universal Accessibility 1
- Credit 15 Community Outreach and Involvement 1
- Credit 16 Local Food Production 1

Green Construction & Technology 31 Possible Points

- Prereq 1 Construction Activity Pollution Prevention Required
- Credit 1 Certified Green Buildings 1-3
- Credit 2 Energy Efficiency in Buildings 1-3
- Credit 3 Reduced Water Use 1-3
- Credit 4 Building Reuse and Adaptive Reuse 1-2
- Credit 5 Reuse of Historic Buildings 1
- Credit 6 Minimize Site Disturbance through Site Design 1

Credit 7 Minimize Site Disturbance during Construction 1
Credit 8 Contaminant Reduction in Brownfields Remediation 1
Credit 9 Stormwater Management 1-5
Credit 10 Heat Island Reduction 1
Credit 11 Solar Orientation 1
Credit 12 On-Site Energy Generation 1
Credit 13 On-Site Renewable Energy Sources 1
Credit 14 District Heating and Cooling 1
Credit 15 Infrastructure Energy Efficiency 1
Credit 16 Wastewater Management 1
Credit 17 Recycled Content in Infrastructure 1
Credit 18 Construction Waste Management 1
Credit 19 Comprehensive Waste Management 1
Credit 20 Light Pollution Reduction 1
Innovation & Design Process 6 Possible Points
Credit 1 Innovation in Design 1-5
Credit 2 LEED Accredited Professional 1
Project Totals 106 Possible Points

Source: U.S. Green Building Council (2007, pp. 2-8)

5. Questions to be considered by city governments in the process of assessing urban sustainability

There are several questions that need to be taken into account by city governments or other organizations who want to design and implement an assessment system of urban sustainability (Munda, 2001).

- The meaning attributed to sustainability and the epistemological approach underlying it should be clearly specified. In this way it becomes clear for all the stakeholders involved in the process of designing and implementing a measurement system which are the boundaries of sustainability (if any) and who can modify them and how.
- The role of the measurement system needs to be also clearly specified. Cities may be interested in obtaining input for future changes in their policy; but they may also seek recognition as the most sustainable city (or among the most sustainable cities in the nation or even worldwide). Depending on the purpose of assessment, a different type of measurement may be chosen. Cities may look for the existence of other organizations who are interested in measuring urban sustainability in their area/city. In many cases cities either partner with not-for-profit organizations or endorse their efforts toward measuring and enhancing the community's sustainability.
- Choose a set of relevant indicators based on the operational vision of sustainability. It is important that the criteria used for assessment match the operational definition of sustainability. Otherwise, the obtained score will perhaps measure the performance of the city government in certain areas but not its efforts toward reaching sustainability.
- Use the data available to compute the scores for each indicator. When data are publicly presented, take into account the audience. The general public may benefit more from a non-technical presentation.

- Define the reference points for each indicator. With regard to certain environmental indicators, the reference points could be the minimum standards mandated by law or higher. For other indicators define an ideal reference point.
- Link indicators with specific policy proposals on how to become more sustainable. This offers various groups in the community with specific ideas on how they could act in a more sustainable way.
- Compile a report comprising the result of the sustainability assessment and disseminate it. For each indicators or for the most relevant ones the trend should be presented – it shows the evolutionary tendencies with regard to specific sustainability issues.

One final remark emphasizes the fact that many of these questions are political in nature and not technical. They involve decisions that ultimately depend on the role attributed to civic participation in the local decision-making, the strategic vision for the community, and the purpose of the assessment system.

6. Conclusions

The concept of sustainability and its derivatives sustainable economic development, sustainable cities, and sustainable planning, despite being broad and ambiguous, convey the alluring promise that better developmental practices in cities are possible. Measurement systems strive to quantify whether or not cities are headed in the right direction in their quest for a more sustainable urban future. There are numerous possibilities ranging from reductionist systems (i.e. systems that take into account just one feature, such as the carrying capacity analysis) to multidimensional analysis, which uses several dimensions and a broad set of indicators. The type of measurement systems selected ultimately depends on how sustainability is defined. Define in this context refers to the broader process through which one awards a certain meaning to a concept. In essence, there are two main approaches: on the one hand, sustainability can be seen as a given, objectively defined based on a set of criteria put forth by the Bruntland report (or other similar documents); on the other hand, sustainability can be envisioned as being socially produced through negotiation among different groups, thus its meaning is constantly subject to redefinitions. The former view is usually associated with a belief in the existence of measurement systems that can be used in multiple contexts and which are usually expert driven while the latter favors broad public participation and emphasizes non-technical approaches that better convey the community's take on sustainability. In practice, compromises between these two views can be reached. Municipal governments interested in setting up and implementing measurement systems of urban sustainability should first consider several questions before proceeding with the actual design and implementation in order to make sure that the chosen assessing system matches their goals and expectations.

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