CUE2016-Applied Energy Symposium and Forum 2016: Low carbon cities & urban energy systems

City Enhancement beyond the Notion of "Sustainable City": Introduction to Integrated Assessment for City Enhancement (iACE) Toolkit

Ali Cheshmehzangi[a]*

[a]The University of Nottingham Ningbo China, 199 Taikang East Road, Ningbo, 315100, China

Abstract

Over the course of past three decades, many researchers questioned the oxymoron characteristics of sustainable city. It is, therefore, uncertain that to what extend cities can actually be sustainable or are they sustainable at all. This study challenges the notion of "Sustainable City" and instead proposes for pathways towards city enhancement strategies, such as energy optimisation and low carbon development. As a result, the study introduces a holistic toolkit that is aimed to enhance the city's efficiency and optimise its performance.

Keywords: City Enhancement, Sustainable City, Sustainability Framework, Energy, Toolkit.

1. Introduction

When we started talking about the concept of "sustainable city" in the late 1980s, firstly coined by Richard Register, the idea was to consider building cities for a healthy future [1]. The emergence of three sustainability dimensions of 'environmental, 'economic', and 'social' came in to consideration soon after. These were also put in place in the renowned Brundtland Report of 1987, entitled "Our Common Future" [2]. The impacts of such [general] concept were further comprehended and compromised in attentive discussions of the 1992's Earth Summit in Rio de Janeiro, which led towards establishment of the eminent international programme of "Agenda 21". Divided in to four equally important sections, Agenda

---

* Corresponding author. Tel.: +86-1565-7876731; fax: +86-574-8818-0000.
E-mail address: Ali.Cheshmehzangi@nottingham.edu.cn

21 proposed for: i) social and economic dimensions, particularly for the context of developing countries; ii) conservation and management of resources for development as well as preservation of ecosystems and biodiversity; iii) strengthening the role of major groups; and iv) means of implementation, including several mechanisms for sustainable progress and development [3]. Many scientists and activists claim that Agenda 21 remains as a major milestone for contemporary research on sustainable development, reinforced in part by its holistic vision for the future. We can argue that this international programme also stimulated the start or the further development of major initiatives for city development, including, but limited to, the on-going concepts of 'eco-', 'green-', 'resilient-', 'low carbon-', and the currently popular 'smart-'. The term "sustainable city", however, remains central to all these initiatives, but yet partially politically-polluted in the global arena and partially unfeasible in many contexts. Nevertheless, there are major international programmes, such as the recent 'Sustainable Cities Programme (SCP)', which is a joint UN-Habitat/United Nations Environment Programme (UNEP) capacity-building and institutional strengthening facility for the purpose of supporting local governments, adaptation of environmental planning management (EPM) and integration of best practices into [local] legal frameworks and national policies. This programme currently supports +66 cities in 10 Asian countries. These are categorised as either SCP demonstration cities or potential replication cases. This and many other similar initiatives still apply Agenda 21 principles, whilst applying multilateral environmental agreements, conventions on climate change and low-carbon transitions at both local and national levels.

Over the course of past three decades, many researchers questioned the oxymoron characteristics of sustainable city [4]. It is, therefore, uncertain that to what extend cities can actually be sustainable or are they sustainable at all. While cities [currently] occupy only 3% of the global land surface, they consume more than 75% of the overall energy consumption and produce more than 50% of the global waste [5]. Nevertheless, as they generate more than 80% of the global GDP, it is inevitable to see the continuing progress of worldwide urbanisation and city expansions. More importantly, cities are major financial and economic hubs, and therefore, city development is considered as part of a progressive economic development pattern in the contexts where urbanisation rate is low or not at its peak. Besides, we cannot neglect the fact that we do not have any non-urbanized developed country. As a result, we anticipate further increase in size and number of cities as well as the growing urban population. These will continue to have significant impacts on higher energy consumption, further waste and pollution production, larger resource use, and more social pressures; none of which are sustainable by any means.

2. Challenges of Sustainable City

Despite sustainable city's comprehensive nature and its extended consideration for environmental and ecological protection, its overall framework encompasses a large scope for existing cities and city development. The concept of sustainable city may have initiated many sub-initiatives from various perspectives. Its broad framework has provided the platform to explore issues of ecological-friendly development (for eco-city), low impact development and green economy (for green city), adaptive capacity (for resilient city), carbon management and carbon reduction (for low-carbon city), enhanced performance and quality (for smart city), and many more. All these sub-initiatives have led to substantial action plans and regulatory strategies for new low impact development, city improvements and retrofits. The presence of sustainability frameworks in such plans and strategies indicate pragmatic concerns of integrated planning that include environmental issues and schemes for mitigation of climate change and reduction of GHG emissions. Nevertheless, in recent years, the city labelling of 'eco-', 'green-', 'resilient-', 'low carbon-', 'smart-' or combinations thereof (such as 'Smart Green Resilient (SGR)', smart-eco, smart-green and etc.), has become an inexplicable trend rather than widespread implementation of large scale change for city growth and development. For instance, many Chinese cities are put forward as pilot

cities for multiple initiatives of low-carbon, green, eco and smart at a same time; none of which have the capacity or yet the right strategies to achieving them all, even in a medium term. It is, therefore, doubtful how cities can achieve all targets in one go?

For developing cities, in particular, there remain general issues for such city labelling or often city branding. In most cases, the success stories are minimal or/and tangible accomplishments are at small scale or within the boundary of [attractive] demonstration zones. For city planners and policy makers, the challenges are based on four factors of: 1- lack of explicit vision; 2- minimal implementation and sometimes no implementation; 3- not meeting the action plans or targets; and 2- complication with costs and investment attraction. In contrast with the concept of sustainability, the lack of explicit vision is often derived from short-term planning and does not offer clear pathways for sustainable development. From the practical perspective, the lack of implementation and not meeting the action plans are both derived from ambiguous decisions for city growth and development. The cost factor also affects the direction from expectation(s) to reality; therefore, having significant impact on the quality and performance of action plans and targets. On the other hand, we also have many developing cities with no sustainability frameworks, which are still struggling to battle issues of poverty, economic growth, pollution, environmental degradation and etc.; therefore, are perceived to be in an urgent need for clear direction rather than labelling. The question is then how cities can go beyond survival and towards 'enhancement', which is the backbone of sustainability framework for city growth and development.

3. Objectives and Methodology: City Enhancement

More than three decades after its inception as a concept, sustainable city poses doubts in short and medium term implementation plans. Arguments about sustainability in the global South neglect the fact that sustainability indicators and frameworks should give clear directions for tangible city enhancement. Therefore, there remain many contradictions that avoid such progress to occur (i.e. environmental sustainability vs. economic sustainability). In the past three decades, there have been many city assessment toolkits, planning sustainability toolkits and environmental assessment tools. But most of these approaches look into 'weighting' and 'benchmarking' indicators rather than prioritising them. A prioritising method for city assessment offers possibilities for clearer planning and policy directions and helps to develop an analytical timeframe for the overall city enhancement.

A city enhancement approach can meet many objectives of sustainable city. In fact, we can argue that city enhancement was somehow embedded in the sustainability concept from the very beginning. While profitability factors of city development are complicated and contradictory in between the three dimensions of sustainable city (i.e. hence, its oxymoron characteristic), 'integration' plays a key role for the benefit of multiple stakeholders and multiple players of city growth and development. This requires coordination with the city governments and policy makers. Therefore, the integration – and not the combination - of 'eco', 'green', 'resilient', 'low carbon' and 'smart' would create a better possibility of meeting the goals of sustainable city.

The overall objective of this study is to support arguments against the notion of sustainable city and city labelling; and rather look towards methods of city enhancement from an integrated thinking/perspective. The fact that city labelling narrows down the holistic perspective of city enhancement is a major policy issue that needs to be addressed in practice. In oppose to weighting and benchmarking approaches, this study proposes for a holistic prioritising approach, which enables the argument of city enhancement. The method undertaken is through evaluation of various assessment toolkits and Key Performance Indicator systems. The proposal of the final toolkit is the result of finding commonalities and gaps in such systems and combining them into a holistic toolkit over a course of cross-evaluations and testing. The testing is undertaken for cities in two countries, for the purpose of validation of indicators and the toolkit, but is not presented in this paper.

4. Integrated Approach for City Enhancement (iACE): A Toolkit Introduction

As is already moderately taken place at the city planning development level, city policies should also cogitate and rationalise integrated thinking for the purpose of directing city growth and development. There are signs of change in planning frameworks and target plans but further practical implementation is required. One common approach is the use of Key Performative Indicators (KPIs) or KPI systems that are often used by city managers to track the information related to sustainability of the city. According to Fitz-Gibbon, KPI system is a performance measurement system [6]. And it can help us to evaluate the performance of the city (when applied in planning) and apply a management framework. Therefore, its nature of evaluation and measurement can be used as the foundation of city assessment for the purpose of enhancement. KPIs are often used at various levels and scales, such as, improvement of local governance for specific measures like transport [7] or waste management [8]. Moreover, there are effective approaches to 'City Prosperity Index' [9], linking indicators, analysis and policy, as well as STAR (Sustainability Tools for Assessing and Rating system) [10] that are considered as part of evaluating various approaches to achieving KPI system frameworks.

The downsides of KPIs, however, are mainly based on two factors of 'lacking integration between indicators' and 'complication in breaking down the indicators in practice'. Also, most current assessment toolkits do not provide a KPI-based system that allows for a holistic evaluation and measurement of performance of the city in various dimensions. On the other hand, it is argued that sustainability assessment '*can only be realistically applied for the purpose of land-use planning in this wider geophysical perspective*' [11]. Therefore, this partially undermines how sustainability assessment can be expanded in a holistic approach. As a result, in this paper, we argue that the combination of assessment toolkit and KPI system is a solution for defining and managing the city's growth and development patterns. This has led to the development of Integrated Approach for City Enhancement (iACE) toolkit (figure 1), which aims to support development of holistic frameworks or/and transition patterns of cities. In December 2015, iACE toolkit was introduced and launched in a major international event.
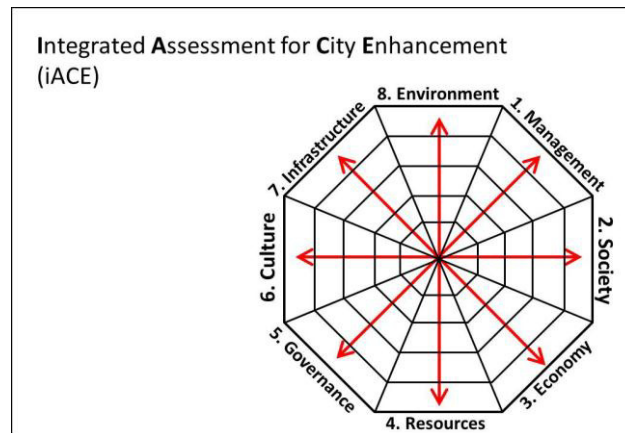

Fig. 1. The key structure and dimensions of iACE toolkit - Source: Author's own

Divided into eight dimensions, iACE provides a comprehensive evaluation of city performance. And it also pairs up each two dimensions as to break down the traditional setting of individual dimensions. The pairing up is done based on the commonalities between each two key dimensions, where more than 50%

of the indicators are shared between two dimensions. The eights dimensions are under the holistic themes of 'Management', 'Society', 'Economy', 'Resources', 'Governance', 'Culture', 'Infrastructure' and 'Environment'. While keeping the four key pillars of social, environmental, economic and governance, it also comprises new dimensions that are often less improved or not comprehensively evaluated in practice. This is particularly the case for the growing cities of the global South (i.e. governance, resources, management and culture). Furthermore, each dimension includes four elements, and each element is divided into four sub-elements or indicators; concluding at 128 quantifiable measures. The method undertaken is through evaluation of dimensions and indicators based on city labeling frameworks (e.f. smart, green, eco and etc.) and a variety of KPI systems. Having a large body of indicators is due to city's complexity for growth and development. Hence, comprehensive approach is a necessity.

In the framework for sustainable city, the consideration of resources is often considered as an element under the environmental dimension. In rapidly developing cities, however, this cannot be thoroughly applied. While the environmental dimension of iACE covers four wider elements of climate, pollution, ecology and waste, 'resources' dimension appear to be equally important and highlight four elements of natural environment, water, energy, and efficiency. Indeed, investment in new technologies is needed. But this can only resolve part of the problems of contemporary city development. In a long term, issues of resource use and resource efficiency have direct impact on environmental issues. This is already witnessed in cities where environmental degradation is widespread and resource use is fragile. Furthermore, infrastructure and transportation are usually combined together under one theme. Nevertheless, iACE introduces transportation as one of the four elements under the infrastructure dimension. Other three elements are public facilities, building industry and resilient facilities. And these four fully cover all aspects of physical infrastructure in the city development.

Similarly, many planners are confused about the differences between "urban ecology" and "green/blue infrastructure". This can cause major problems when it comes to planning the cities. As a result, we have many [so-called] green corridors in cities that are merely functioning as green spaces and also cannot be considered as part of the green infrastructure. Also while agriculture is part of the green infrastructure system in planning, it is often not considered as an independent element for the purpose of food production. In addition, city planners often do very little to solve issues of biodiversity and eco-system preservation. And there is often no distinguish between the natural environments and the ecological infrastructure of cities. These are primary factors – and no longer secondary by any means - that need to be addressed in city planning. All of these are explicitly addressed in iACE to fulfil the interdisciplinary requirements of city growth and development. iACE provides the nadir of integrated assessment for each of these elements in order to offer possibilities for scientific solutions and new directions to city enhancement. This can only be applied in a context-specific approach rather than mere prototyping. Unlike KPI systems, iACE works with grading and valuing systems. And it can assess the standards of any of the 128 indicators, from extremely low to very high in terms of performance and sustainability. The target users of this toolkit are city planners and policy makers. These remain as main body of decision makers for changing the nature of city's growth and development.

5. Enhancement beyond the Notion of Sustainable City

The city is neither a playground for small scale demonstration zones nor should it be considered as a system that can be modeled throughout. The city is an entity comprised of living environments; built and natural. The natural side of it is expected to emerge more dominating in the following years. We anticipate more nature-based solutions that can be integrated at city planning level.

Currently, we have sufficient technologies to make any built environment 'smart' (as it is now claimed), 'low-carbon' or 'green'. And there is enough knowledge and data to support that. Yet the two

poles of political will and financial instability continue to stretch our journey towards genuinely-sustainable solutions. The iACE toolkit, which is developed based on studies of several environmental targets, sustainability measures and agendas, is hopefully the start of moving away from the concept of 'sustainable city' and rather towards city enhancement for achieving sustainability. The measures will make clearer pathways to sustainability.

It is only in recent years that research on ecosystem is highlighted in climate change and increase of city environments. And it is only in recent years that we have become more determined about decarbonization of cities and implementation of advanced solutions in city planning. These may over time weaken the role of traditional city planning. And this will be an important move. As it is currently occurring in the concept of smart city, this will eventually open up more prospects for integrated solutions coming from scientific and advanced engineering knowledge. Yet, cities should not be fully engineered and nor should they become laboratories of research. The intention should be to provide solutions for necessary transitions, such as decarbonization of cities, maximization of energy efficiency, reduction of waste and etc. All of which are aimed for the sole purpose of increasing performance in various directions. The concept of 'city enhancement' considers just that.

As its application is widespread and beneficial to the existing cities, the iACE toolkit might establish new possibilities for changing the nature of city's growth and development. If this toolkit is further applied by city planners and policy makers in planning practice and decision making process, then the potential of a more integrated and holistic approach to evaluation of cities may be developed in terms of city enhancement. This will be particularly beneficial for the struggling cities of the global South where our focus should be in the coming years.

References

[1] Register R. *Ecocity Berkeley: Building Cities for a Healthy Future*. North Atlantic Books; 1987.
[2] The World Commission on Environment and Development (WCED). *Brundtland Report*. United Nations; 1987.
[3] United Nations Sustainable Development. *Agenda 21*. Rio de Janeiro; 1992.
[4] Blassingame, L. Sustainable Cities: Oxymoon, Utopia, or Inevitability?, *The Social Science Journal*, Vol. 35 (1), pp. 1-13; 1998.
[5] UNEP. *Global Initiative for Resource Efficient Cities*. Paris; 2012.
[6] Fitz-Gibbon CT. *Performance Indicators*. Vol 2. BERA Dialogues; 1990.
[7] Souza Santos, A. And Kahn Riverio, S. The role of transport indicators to the improvement of local governance in Rio de Janeiro City: A contribution for the debate on sustainable future, Case Studies on Transport Policy, Vol. 3 (4): pp. 415-420; 2015.
[8] Wilson, D. C. et al, 'Wasteaware' benchmark indicators for integrated sustainable waste management in cities, *Waste Management*, Vol. 35, pp. 329-342; 2015.
[9] Wong, C. A framework for 'City Prosperity Index', *Habitat International*, Vol. 45, pp. 3-9; 2015.
[10] Elert, L. The double edge of cutting edge: Explaining adoption and nonadoption of the STAR rating system and insights for sustainability indicators, *Ecological Indicators*, Vol. 67, pp. 556-564; 2016.
[11] Doughty, M. R. C. ad Hammond, G. P., Sustainability and the built environment at and beyond the city scale, Building and Environment, Vol. 39 (10), pp. 1223-1233; 2004.

Biography

Dr Ali Cheshmehzangi has qualifications, practice experience and a research profile in urban design, sustainable urban planning and development. He currently is Associate Professor of Architecture and Urban Design at The University of Nottingham Ningbo China. He is also a founder member and director of International Network for Urban and Rural Research (INURR) in China.