SUSTAINABLE CITY DEVELOPMENT – A REVIEW

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Abstract

A fundamental change is sweeping the global economy today, the transition towards clean, innovative, low carbon technologies and infrastructures. Sustainability requires the reconciliation of environmental, social equity and economic demands which are referred to as three pillars of sustainability. Sustainability interfaces with economics through the social and environmental consequences of economic activity. Moving towards sustainability is also a social challenge that entails international and national law, urban planning and transport, local and individuals lifestyles and ethical consumerism.Cities are facing a host of environmental problems, from air pollution to wastewater management and green space degradation.This paper investigate factors that are responsible for sustainable city development in developed countries, compare to the statu quo of Johannesburg city development using past literatures. Finally, some suggestions and implications beneficial to the sustainable city development were drawn from theoretical models and a systematic model was proffered for sustainable city development in Johannesburg and Africa at large.

Keywords City, Developement, Johannesburg, Models and Sustainability

1. Introduction

Sustainability is the capacity to endure. In ecology the word describes how biological systems remain diverse and productive over time. For human, sustainability is the potential for long term maintenance of well being which has ecological, economic, political and cultural dimensions. Sustainability requires the reconciliation of environmental, social equity and economic demands which are referred to as three pillars of sustainability.

Since the 1980s sustainability has been used more in the sense of human sustainability on planet Earth and this has resulted in the most widely quoted definition of sustainability and sustainable development, that of the Brundtland

Commission of the United Nations on March 20, 1987: "sustainable *development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*"

At the 2005 World Summit it was noted that this requires the reconciliation of environmental, social and economic demands - the "three pillars" of sustainability. This view has been expressed as an illustration using three overlapping ellipses indicating that the three pillars of sustainability are not mutually exclusive and can be mutually reinforcing.

The Sustainable city is a relatively recent concept which has gained increasing attention the last decades, both through the international community and through grass root movements (Svensson, 2007). Cities are the most dramatic manifestations of human activities on the surface of the earth ((Yigitcanlar & Kamruzzaman, 2015).

The aim of this paper is to increase the understanding and fill the gaps in the literature by identifying what factors affect sustainable cities and find probable solutions, also to increase understanding how sustainable are constructed and create a value for its stakeholders.

2. **Sustainable development**

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (United Nations, 1987, p. 43). This report laid path for The United Nations' Earth Summit in 1992 which issued a report called Agenda 21 in which stated that parties at local, national and global levels should work together and commit to reach common agreements about biodiversity and climate change, with the aim of creating a sustainable century (Desai, 2010; United Nations, 1992). The second definition used to define sustainable development takes a more process oriented view. It has its base on the fact that certain activities in private, public and non-governmental organizational sectors are related to each other (Desai, 2010). Three pillars of sustainability were identified and characterized as economic, social and environmental (Elkington, 1997; Desai, 2010; Kajikawa, 2008). They inspired the development of the triple bottom line (TBL) and they were also a starting point for corporate social responsibility (CSR) (Desai, 2010). Common for all descriptions of sustainable development in a society is that collaboration among actors such as government, businesses and NGOs (Non-Governmental Organizations) is required (United Nations, 2010).

Healthy ecosystems and environments are necessary to the survival and flourishing of humans and other organisms (Wadhhwani, 2014). There are a number of major ways of reducing negative impacts. The first of these is environmental management. This approach is based largely on information gained from earth science, environmental science and conversation biology. The second approach is management of human consumption of resources, which is based largely on information gained from economics. A third more recent approach adds cultural and political concerns into the sustainability matrix.

Sustainability interfaces with economics through the social and environmental consequences of economic activity. Sustainable economics involves ecological economics where social aspects including culture, health related and monetary aspects are integrated. Moving towards sustainability is also a social challenge that entails international

and national law, urban planning and transport, local and individual lifestyles and ethical consumerism. In accordance with the growing interest and consent of the importance of sustainable development, Alusi, Eccles, Edmondson and Zuzul (2011) explain how governments and companies in different countries have started acknowledging and exploring a new type of city that will be able to handle all factors required to house and take care of the growing number of citizens, while at the same time placing much emphasis on sustainable development. These cities can be referred to in terms of "Eco cities" or "sustainable cities" (Alusi et al., 2011). "Smart Cities", is another term used to characterize a city with the aim of sustainable development, however, the focus is mainly put on how information and communication technology is used to achieve the sustainability goals (Caragliu, del Bo & Nijkamp, 2011) as well as advocating innovation and coordination (Herrschel, 2013). As found by Joss (2010), it is very difficult to define exactly what a sustainable city is, or is not, with regard to how diverse and dispersed the Decision Making in a Sustainable City K. Werder & K. Wojtkowiak current work with sustainable societies around the world actually is. In lack of a generally agreed upon definition of a sustainable society, the one proposed by the Ecocity World Summit in 2008, although somewhat loosely defined, serves the purpose of this report well:"An ecocity is an ecologically healthy city. Into the deep future, the cities in which we live must enable people to thrive in harmony with nature and achieve sustainable development. People oriented, ecocity development requires the comprehensive understanding of complex interactions between environmental, economic, political and socio-cultural factors based on ecological principles. Cities, towns and villages should be designed to enhance the health and quality of life of their inhabitants and maintain the ecosystems on which they depend.Ecocity development integrates vision, citizen initiative, public aefficient industry, people's needs and aspirations, harmonious culture, and landscapes where nature, agriculture and the built environment are functionally integrated in a healthy way."Similar sources can be consulted for additional definitions, but they all share the same common denominators of having both social and environmental components included, while also stressing the importance of urban factors, such as city planning and its management (Alusi et al., 2011).

2.1 Sustainable cities

There is no definite definition of cities as it varies between different circumstances, both locally and nationally (Haughton & Hunter, 1994). A city could be called civilization, however, it also constitutes an economic, social and political creature (Pierre, 2011).Cities are the most dramatic manifestations of human activities on the surfaceof the earth (Yigitcanlar & Kamruzzaman, 2015). These consequential impacts of human activities, originated from population increase, rapid urbanization, high private motor vehicle dependency, deregulated industrialization and mass livestock production, are increasing exponentially and causing great deal of environmental, social, and economic challenges both at global and local scales (Yigitcanlar & Kamruzzaman, 2015). In such a situation, the establishment of sustainable cities, through sustainable urban development practices, is seen as a potential panacea to combat these challenges responsibly, effectively, and efficiently. In 2010, more than 50% of the world's population lived in cities and according to forecasts, this percentage will continue to increase to approximately 60% and 70% as of 2030 and 2050 respectively (GHO, 2014). According to the United Nations (2012), today's total population will increase with 2.3 billion people to reach the level of 9.3 billion in 2050 (United Nations, 2011). Within the same time frame, it is predicted that the population of the world's urban areas will increase by 2.6 billion

people (United Nations, 2012). This implies that cities will attract the entire future population growth, while also absorbing parts of the existing rural population. Hence, the number of people living in rural areas will diminish despite the overall population growth. Also, although cities with less than half a million inhabitants have been most common so far, by 2030, almost 50% of all urban citizens are likely to live in cities with megacities around the world, i.e. cities with more than 10 million inhabitants (United Nations, 2012).

Cities are not only home to the majority of the population, but are also the engine rooms of the South African economy – an estimated 57% of the formal economy is generated in the city-regions alone. South Africa's cities play key roles as gateways to and/or anchors of spatial networks – connecting people, places, freight, logistics, financial, service, learning and institutional networks (ESPON, 2014). Cities are core to global production, innovation and trade, making urbanization a "transformative force" that, if well managed, offers significant opportunities for (UN Habitat, 2016: 27):

• Improving economic prospects and quality of life for the majority

• Alleviating poverty

• Driving innovation and productivity

• Working towards social inclusion

• Contributing to national and regional development.

The sustainable cities encompasses measures of the social, environmental and economic health of cities (Archadis, 2016), as illustrated in Figure 1

PEOPLE
SOCIAL

PLANET
ENVIRONMENTAL

PROFIT
ECONOMIC

Measures social performance including quality of life

Captures 'green' factors like energy, pollution & emissions

Assesses business environment & economic health

The People sub-Index rates health (life expectancy and obesity), education (literacy and universities), income inequality, work-life balance, the dependency ratio, crime, housing and living costs. These indicators can be broadly thought of as capturing "quality of life".

The Planet sub-Index ranks cities on energy consumption and renewable energy share, green space within cities, recycling and composting rates, greenhouse gas emissions, natural catastrophe risk, drinking water, sanitation and air pollution. These indicators can broadly be thought of as capturing "green factors".

The Profit sub-Index examines performance from a business perspective, combining measures of transport infrastructure (rail, air and traffic congestion), ease of doing business, tourism, GDP per capita, the city's importance in global economic networks, connectivity in terms of mobile and broadband access and employment rates. These indicators can broadly be thought of as capturing "economic health".

Figure 1: Three Pillars of Sustainblility (source: Archadis, 2016)

2.2 Factors that affect sustainable city

Cities has better economies and thus offer increased job opportunities, improved health and education facilities, a good quality of life with better services and facilities. These are factors that attract more people in the cities (Bansal et al., 2015). Factors affecting sustainable city will be discussed below

•**Environmental challenges:** The development of a sustainable city needs to respond to expected and anticipated challenges of the environment through design and innovation in the city infrastructure and processes taking the local characteristics into consideration (Joss, 2011). Environmental issues will increase with the city development. City environmental awareness not only in the interests of humanity and human objectives, but also in harmony with nature and human development as the goal. The sustainability of human life on Earth is closely related to the sustainability of the earth life system, human activities cannot exceed the carrying capacity of ecosystems (Liu, 2013). There are a lot of success cases of solution to solve the urban environment pollution as an example：Singapore is a very good example. The universally recognized "National Garden City" was a very poor living conditions, urban congestion unbearable, where serious environmental pollution. 1960 early, Singapore formulated the "overall planning, rational distribution, integrated, energy conservation," the environmental and economic policies, follow the principles of sustainable development, environmental protection is put in a prominent position in the planning, Government separated the industrial area and residents District strictly. Conducive to the concentration of pollutant treatment.The Singapore government has implemented strict environmental standards to ensure environmental protection investment, and strengthen the enforcement of environmental regulations, actively promote non-polluting and less polluting products, promote a green lifestyle. People living there now almost completely feel environmental pollution.

•**Socio-economic pressures**: The rapid urbanization puts pressure on expanding existing cities and building new ones. Further on, it also relates to redeveloping business to become more knowledge-based, innovative and use green technology (Joss, 2011). For all its challenges, urbanization offers many benefits to many people: economic options, better education and health, and access to improved infrastructure and services. The top 600 cities in the world account for a fifth (20%) of the global population and generate 60% of global gross domestic product (GDP), while the top 100 cities in the world are responsible for 38% of global GDP (MGI, 2011). The inability of city government to manage the relationship between economic growth and population dynamics, places the urban social and economic system at risk (State of South African cities report 2016).

•**Informality and Vulnerability:** Slums are proliferating, as a result of high population growth and movement (Awumbila, 2014). As urban residential informality increases, so does the vulnerability of the poor. These vulnerable livelihoods, compelled by poor living conditions affect the well-being in urban areas.

•**Cultural branding**: Reaching for sustainability can become an opportunity of branding a city towards other cities and actors and, thus, a way of signifying innovation and competitiveness. The sustainable initiatives can further be marketed through education and cultural activities, such as museums and demonstration sites.

•**Political leadership**. The way of translating a vision of a sustainable city into a tangible plan and carry out its implementation requires political coordination and leadership, and its form depends on the governance system. For example, sustainable development can be a "signature project" of a Mayor, initiated by an elected council or regional government, include influences from the public or simply a project decided upon by national governments.

•**International co-operation**. Through cooperation with other countries' knowledge can be exchanged and businesses can be developed as a joint effort. A 2014 analysis conducted by EDD and the CSIR (2014), which was based on a range of municipal and functional city area indicators, highlighted the critical role of cities as international, regional, and more localized networks.

2.3 Sustainable city models

It is vital to understand a city's sustainability as a broader concept which integrates several factors; social development, economic development, and environmental management. According to Marzukhi, Karim and Latfi (2012), Sustainable city is crucial in controlling the development of a town based on the quantity and quality of infrastructure and facilities are sufficient to avoid other problems. Sustainable city lies at the heart of urban development concerns. In this section, examples of countries that has exhibited a sustainability city model will be explained.

Singapore is often cited as an example of a city that has got the fundamental rights (Singapore tourism board, 2016). Singapore is ranked 2nd overall index ranking (Archadis, 2016). Fifty years ago, when Singapore was newly independent, access to fresh water was limited and importing from neighboring Malesia could be costly. Singapore took advantage of three waster management innovation; reuse of reclaimed water, rain water catchment system and salt water destination. Singapore has received awards for its efforts and has used various platforms to assume a leadership role for others to emulate. Also, Singapore has taken steps towards sustainability by cultivating the concept of meaningful transportation. This philosophy has restricted car ownership among Singaporeans, resulting in both reduced pollution and crowding. The third way towards sustainability by Singapore is a commitment to ''green planning''. Due to Building and Construction Authority (BCA), several thousand buildings in Singapore have received the BCA green mark since 2005, enroute to a city wide goal to be 80% green by 2030.

In 2007, Sydney launched its sustainable Sydney 2030 strategy, which comprises a set of goals such as reducing carbon emissions by 70% and operating the city entirely on renewable energy by 2030. The road map is unique because it was produced by gathering feedbacks from ten thousands of Sydney residents and visitors through several public consultation exercises rather than just a few elite policy makers dictating the projects. Initiatives, the city has implemented include Smart green business program, which helps small and medium business improve their environmental performance and save money.

Zurich was selected as the most sustainable city ranked in a new sustainable index (2016). Zurich has a strong reputation as a liveable, contemporary city known for its focus on environmentalism. The 2000-watt society by 2050 is the Zurich approach to tackling climate change and resource scarcity. As a global economic hub, the city is not only able to attract business, but people, with a good quality of life, attractive educational and employment opportunity as well as a leading health ranking on the index.

3. Case study

South Africa city has followed a resource- intensive growth path, and suffers from inefficiencies across sectors such as energy, waste, food and transport (State of South African cities report 2016). The city of Johannesburg remains the core and historical business node within the city, notwithstanding the periods of economic 'boom and bust' that it has endured. Since the decline and eradication of apartheid and specifically the dismantling of its legal framework, which precluded non-white occupancy of the inner city, central districts such as Hillbrow and Berea have become a favored home and destination for predominantly black job-seekers from within and beyond the national borders of South Africa. The proximity to social amenities (such as clinics, schools, support networks) and numerous provincial, national and international transportation hubs are additional attributes that make the inner city an attractive location. However, the comparatively high unemployment rate and low skills base of many of the migrant job seekers and residents has altered the socioeconomic dynamics of the inner city.

In more recent decades, the inner city has been complemented by numerous satellite business/administrative nodes within the current municipal boundary. The historic monocentricity of the city as described by Bertaud (2001) has transformed into a profile that is increasingly polycentric. Within the Spatial Development Framework (City of Johannesburg, 2010), numerous nodes within a conceptual hierarchical classification (defined as Metropolitan, Regional, District and Neighborhood) have been identified, delineated and monitored.

4. Findings

The cities that attained sustainability integrates social development, economic development and environmental management. There must be efficiency across all sectors (energy, waste, food and transport) as evidence from the literatures in the cities that rank in the recent sustainability index.

Sustainable development is about the people not just the infrastructures. As shown from the past literature, Sydney city involved the public from the planning phase to implementation by consulting the public.Sustainable cities improve economic prospects, quality of life, alleviate poverty, driving innovation and productivity, and contributes to national and regional development.

5. Conclusion

This paper has outlined factors that affect sustainable city development, examples of cities that has attained sustainable as attested in the recent sustainable rank index, how the city implement and reach sustainability. It has stressed the importance of sustainable city development, thus contribute to the growing body of the literature in the research field.

This paper is limited to past literatures, further study should be made to get feedbacks from the public. Proper sustainable city development cannot be attained without involvement of the public (people), sustainable city development is about meeting the need of the present without compromising the need of the future.

Acknowledgement

Reference

Alussi, A., Eccles, R., Edmondson, A. and Zuzu. T (2011). Sustainable cities; Oxymorron or the shape of the future: working paper of the Havard Business school.

Arcadis. Sustainable Cities Index 2016: Putting People at the Heart of City Sustainability. 2016. Available online: https://www.arcadis.com/en/global/our-perspectives/sustainable-cities-index-2016/ (accessed on 7 August 2017).

Awumbiha, M (2015). Linkages between urbanization, Rural urban Migration and Poverty outcome in Africa.

World migration report.

Barker, A. (2010). City of Johannesburg (2010) Growth and Development Strategy 2040. Submission to the City of Johannesburg, on behalf of iProp, SOJO Business and Tourism and KlipSA (the Klipriviersberg Sustainability Association). 5 October 2011

Brundtland G.H. Our common future- Call for Action. Environmental Conservation 1978; 14; 292.

Caragliu A, Del Bo C and Nijkamp P (2011) Smart cities in Europe, Journal of Urban Technology, 18 (2):65-80.

Desai, P. (2010). One Planet Communities: A Rea-Life Guide to Sustainable Living, United Kingdom: John Wiley & Sons.

GHO [Global Health Observatory] (2014). UrbanPopulatioGrowth,AvailableOnline:http://www.who.int/gho/urban_health/situation_trends/urban_population_growth_text/en/ [Accessed6 February

Herrschel, T (2013). Competitiveness and Sustainability: Can 'Smart city Regionalism" Sqaure the circle? Urban studies Vol. 50, Issue 11 pp. 2332-2348.

Haughton, G. & Hunter, C. (1994). Sustainable Cities, London: Jessica Kingsley Publishers Ltd

Joss, S. (2010). Eco-Cities -A global Survey 2009, WIT Transactions on Ecology and The Environment, vol.129, pp.239-250

Joss, S. Eco-cities (2011): the mainstreaming of urban sustainability; keycharacteristics and driving factors. *International Journal of SustainableDevelopment and Planning*, 6(3), pp. 268-285, 2011.

Marzukhi, M. A., Karim, H. A., & Latfi, M. F. (2012). Evaluating the Shah Alam City Council Policy and Guidelines on the Hierarchy of Neighborhood Open Space. Procedia - Social and Behavioral Sciences, 36(June 2011), 456–465. doi:10.1016/j.sbspro.2012.03.050

Pierre, J. (2011). The Politics of Urban Governance, UK: Palgrave Mcmillan

SACN. 2016. State of South African Cities Report 2016 Johannesburg: SACNISBN No. 978-0-620-71463-1

Svensson G. (2007), "Aspects of sustainable supply chain management (SSCM): conceptual framework and empirical example", Supply Chain Management, vol. 12, n. 4, pp. 262-266.

Tessema, F., Taipale and Bethge, J (2009). Sustainable Building and constructin in Africa, Federal Ministry for the environment.
UN-Habitat. State of the World's Cities 2010/2011: Bridging the Urban Divide; Earthscan: London, UK, 2010.

UN-Habitat. Cities and Climate Change. Global Report on Human Settlement. 2011. Available online: http://mirror.unhabitat.org/content.asp?typeid=19&catid=555&cid=9272 (accessed on 7 August 2017).

United Nations, 2011, Sustainable development in the 21stcentury: implementation of Agenda 21 and the Rio principles, detailed report on the implementation.

United Nations, 2012a, United Nations Conference on Sustainable Development Outcome Document: The future we want. A/CONF.216/L.1, 19 June 2012.

WCED (1987) Our Common Future: Report of the World Commission on Environment and Development Oxford University Press, Oxford. (1987), pp. 1–300, especially point, particularly chapter 2, III, 7.73 online via http://www.un- documents.net/wced-ocf.htm

Yigitcanclar, T & Kamruzzaman, M. (2015). Planning, development and management of sustainable cities. A commentary from the guest editors. Sustainability, 7 (11). Pp. 14677-146.

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