Reprint of: The adoption of strategies for sustainable cities: a comparative study between Newcastle and Florianópolis focused on urban mobility

José Baltazar Salgueirinho Osório de Andrade Guerra [a, *], João Marcelo Pereira Ribeiro [a], Felipe Fernandez [a], Christopher Bailey [a], Samuel Borges Barbosa [b], Samara da Silva Neiva [a]

[a] Universidade do Sul de Santa Catarina, Florianópolis, Santa Catarina, Brazil
[b] Universidade Federal de Santa Catarina, Florianópolis, Santa Catarina, Brazil

ARTICLE INFO

ABSTRACT

Cities have become important drivers in promoting strategies for sustainable development. The primary objective of this article is to analyze the differences between public transportation in Newcastle upon Tyne, the city considered the most sustainable in the United Kingdom, and Florianópolis, a city with great potential for sustainable policies located in southern Brazil. This comparison may provide models, ideas and actions for the development of Florianópolis as a model of sustainability in South America. Therefore, a comparative analysis is provided: to observe changes, build models, and verify similarities and differences, while seeking to discover which behaviors govern political and social phenomena in the area of urban sustainability. This paper provides a comparative description of social and economic indicators: gross domestic product (GDP) per capita, inflation, employment, as well as the historical population evolution of the two cities. This work contrasts the sustainable transport model used by Newcastle and the reality of the transport needs of Florianópolis. This article is the first in a series to analyze the indicators for sustainable cities, focusing mainly on the reality of the South American city.

1. Introduction

Cities have experienced several major changes during the last three hundred years, mainly in the evolution of infrastructure. During the 1990s, new concepts and ideas emerged regarding global warming, challenging the traditional development model and seeing the emergence of themes related to sustainability, including the effects of urbanization on climate change.

One estimate suggests that by 2055, 75% of the world population will be living in urban centers. Currently, 50% of the world population lives in large cities (Oliveira et al., 2013), and cities generate 70% of global GDP (Global City Indicators, 2012). These indicators will require cities to take into account climate change forecasts, in order to both limit future emissions and prepare for the disruptions that may result from environmental and economic decline.

Currently, cities are responsible for major environmental challenges: air pollution, water contamination, depredation of natural resources, excessive consumption of fossil fuels, devastation of forests, and the usage of consumables produced from non-renewable resources (Steward and Kuska, 2010). Neglecting the issue of sustainability will have global consequences in the long term, with poor countries — already lacking sufficient resources to address climate change — tending to suffer disproportionately (CSGG, 1996, p.159; Madlener and Sunak, 2011).

Cities are centers of social and economic interactions, where civil society comes together to express ideas and celebrate customs. Hubs for promoting creativity and sustainability, cities provide opportunities for innovation in the technological and social arena (Mccormick et al., 2014; Cao and Li, 2011; Scarpin and Slomski, 2007; Egger, 2006; Cohen, 2006). The construction of the sustainable city concept requires us to measure and commit to enhancing and preserving urban quality of life (EU, 2011; Eryildiz and Xhexhi, 2012).

* Corresponding author. Rua Trajano, 219 — Centro, 88010 010, Florianópolis, Santa Catarina, Brazil.
E-mail addresses: baltazar.guerra@unisul.br (J.B.S.O. de Andrade Guerra), joaomarceloprdk@gmail.com (J.M. Pereira Ribeiro), felipefernandez65@hotmail.com (F. Fernandez), chris.bailey.stx.ox@gmail.com (C. Bailey), Samuelibia@yahoo.com.br (S.B. Barbosa), Samara_neiva@hotmail.com (S. da Silva Neiva).

That concern has been discussed in international conferences, and within the UN Eight Objectives for the Millennium Development, the sustainability topic is presented simultaneously with quality of life and urbanism in the second millennium (UN, 2014).

Due to strong human influence, cities are very important for sustainability, and the political and administrative decisions they make have direct implications on ecosystems and society itself (Andersson, 2006; Mori and Christodoulou, 2012; Goode et al., 2011). The sustainable city model, or "eco city" (Eryildiz and Xhexhi, 2012) emanates as a new paradigm in analyzing conceptions of development.

Cities are defined by an administrative unit model that involves economic production and eco-efficient industry, while maintaining social harmony and culture with modern infrastructure, balanced with functional and vivid landscapes (Wang et al., 2011; Cao and Li, 2011). Therefore, sustainable cities are the path to effective policies consistent with the needs of future generations (CMMAD, 1991; Lachman, 1997; Costa et al., 2014). According to this objective, sustainable cities are those which meet specific requirements and characteristics structured within efficient and sustainable policies (Camagni et al., 1998; Black et al., 2002).

Per Lachman (1997, p.13), for the maintenance of a sustainable metropolis, there is a need to develop policies consistent with the core objectives of sustainable development by forming a solid and efficient executive administrative structure. The conduct of this structure is analyzed by objectives and indicators made up of a sustainable guiding principle which allows the implementation of activities related to sustainability.

In addition to alternatives developed by the UN, other important actions are already known to global civil society. Public transportation and cycling have been encouraged in Europe (Eryildiz and Xhexhi, 2012) and exemplify actions that provide a reduction in greenhouse gas emissions, an improvement in air quality, energy conservation, and the reduction of traffic jams in greater urban areas.

Urban transport became an important element in the promotion of strategies towards sustainability, because it provides freedom of movement, as well as allowing a range of mobility options when properly executed, and enables the control of emissions contributing to global warming, representing a strategic sector in promoting sustainable development (Haghshenas et al., 2014; Hidalgo and Huizenga, 2013).

As cities grow and expand, transportation systems should be periodically reviewed and adapted so that they function with dynamism and evolve in tandem, seeking to avoid imbalances between supply and demand. Furthermore, ideal systems provide for dynamic traffic management, allowing users to predict transit times and costs so they can rely on the system with greater certainty (SCIENCEJRANK, 2013).

One of the challenges posed by booming urban populations is the question of mobility. This is becoming an increasingly greater challenge in large cities located mainly in developing countries (Gakenheimer, 1999). In this research project, public transit systems are addressed as a set of elements that aim to facilitate passenger movement in an urban center. In a broader sense, public transport systems can also be described as a complex system of interrelationships, involving infrastructure, transport demand, economics, politics/public policy, and land use planning and regulations (Matulin et al., 2011). Careful reflection of urban mobility requires consideration of sustainable development, governance and behavior.

What are the similarities and differences between the existing transport infrastructure found in Newcastle and Florianópolis? To answer this question, this paper analyzes the transportation infrastructure in Newcastle upon Tyne, the city considered the most sustainable in the United Kingdom, and Florianópolis, a city with great potential for sustainable policies located in southern Brazil.

2. Theory

The objective of this project is to select, among high impact journals, indicators used by the authors to define models and best practices for sustainability in public transportation.

To achieve this goal, the authors have selected journals with an impact level above 3.5 in the area of sustainability and carried out a literature review and a subsequent choice of select indicators to compose the comparative table. Although the selection of indicators had a qualitative character, the basic criteria to include an indicator were citations in at least three articles published by different authors and proceeding from two distinguished journals.

Socio-economic indicators enable us to understand the patterns that result from city residents selecting different transportation options. Marquet and Miralles-Guasch (2015) inform us of the motivations behind transportation choices, and the means of transportation chosen depending on specific socio-economic situations. Besides, these provide information on the impact of mobility in a society.

Socio-economic indicators provide for an analysis of the evolution of variables related to human development aspects. This vision emphasizes that sustainable cities are not only connected with issues related to the environment, but exist within in a complex arrangement of indicators and policies that allow quality of life to evolve. For these reasons, four components have been chosen for the socio-economic indicator − unemployment rate, GDP per capita, inflation and number of inhabitants (Table 1).

Public transportation in Florianópolis is executed almost solely by bus. The large number of cars greatly contributes to periods of road congestion. The result is a norm of long, slow car trips, with negative effects on the economy through delayed delivery of goods, excessive fuel usage, and pollution (Santos et al., 2010; Elvik and Ramjerdi, 2014). Individual cars are one of the largest contributors to the domestic emissions of CO_2 (Barkenbus, 2010) (Tables 2 and 3).

The public transport shortcomings cause the population to search for small, more comfortable, and faster transportation, resulting in (especially in growing cities in developing countries) chaotic traffic, negative economic impacts, and contribution to climate change through greenhouse gas emissions (Santos et al., 2010; Madlener and Sunak, 2011).

In this article, readers can find a connection between mobility and urban planning, although several studies already confirm that relationship. Urban planning facilitates the concentration of people (high population density). At a point, if sufficient transport options are offered, people may not move to further outlying areas. In any case, the urbanization process must involve mobility and land use planning (Camagni et al., 2002; Handy, 1996).

A sustainable Transport Plan will emphasize the development of a long term vision, involving citizens and other interested parts along the process, specifying the objectives and adjustment goals related to all aspects of sustainability and development of an effective set of measures (May, 2013). Evaluating urban mobility in relation to sustainable development involves many sectors of an economy, such as government, population, and entrepreneurs (Black et al., 2002) (Tables 4 and 5).

After a selection of the indicators making up the table, it is necessary to establish the indicators' relative weights. With this purpose, questionnaires were sent to 23 researchers in the areas of sustainability, environment, economy, and engineering, posing the following question: "The indicators below were drawn out of articles published in journals with an impact factor of 3.5 or more in