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Global city indicators: towards a holistic view of low carbon city dimensions

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Abstract

Global cities are the central nodes in global networks through which commodities, information, capital and people flow. Many governments have announced plans to assist their cities to become "global cities". At the same time, the development of low carbon cities is widely considered an important strategic goal of leading cities in tackling the challenges of climate change. However, little attention has been given to the compatibility of the two development goals. It is necessary to understand the relationships of various critical dimensions of global city rankings and the city's carbon emission need to be understood. This study shows that although a city's carbon emission is an indicator with very low weight in the five global city rankings analyzed in the study, the top ranked global cities are among the cities with the lowest carbon emission. The currently high carbon emission cities can also lead to lower carbon emission by optimizing economic structure, improving R&D sector and quality of life to enhance their global rankings.

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1. Introduction

The idea of "global city" was popularized by Saskia Sassen in her 1991 work, The Global City: New York, London, Tokyo [1]. A global city, also called world city, is a city generally considered to be an important node in the global economic system. They are the central nodes in global networks through which commodities, information, capital and people flow. The increasing volume of research on global cities over the last 20 years has influenced a wider public discourse, creating a buzz among those wanting to promote their cities. Governments and entrepreneurs are motivated by the prestige of having their cities appear in the top of global city rankings [2]. Many Asian cities have announced the goal of becoming global cities, especially large Chinese cities. For instance, after quick climbing up in global city rankings during the past decade, in 2014 Shanghai has announced its goal of becoming a "competitive and influential global city in 2040". [3]

At the same time, the effects of rapid urbanization, coupled with global warming, increasingly threaten our quality of life and social stability. Cities contribute to between 40 to 70 percent of global greenhouse gas emission [4]. The world's leading cities have begun to promote reductions in greenhouse gas (GHG) emission as major coping strategies to strengthen cities' adaptability. Exploring how major characteristics

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of global leading cities related to cities' greenhouse gas emission are crucial for cities to prioritize their development goals and strategies. Particularly because most of the rapid urbanization is taking place in developing countries, these emerging global cities present great potential of mitigating the impacts of climate change and simultaneously improve the efficiency of their social and economic functions.

Global city rankings and indicators are developed to enable a comparison among cities worldwide by which lessons learned from development can be shared and discussed based on a set of defined dimensions and measurements. Indicators and rankings of cities thus are an essential instrument to guide policy-making and support city positioning [5]. But whether the global city ranking and related policy will stimulate low carbon city development in the long run, has not been discussed yet.

Therefore, the paper addresses the following questions: 1) what is the role of carbon emission as an indicator in global city rankings; 2) Can a city's global power and low carbon goal be achieved at the same time; 3) What is the relation between cities' global rankings and their levels of carbon emission.

2. Material and methods

2.1 Global city rankings and indicator systems

We examined five major global city rankings and their indicator systems: Global Power City Index (GPCI) [6], Cities of Opportunity (COO) [7], Global Cities Index (GCI) [8], Global City Competitiveness Index (GCCI) [9], and Sustainable Cities Index (SCI) [10]. We compared these rankings and indicators in terms of their dimensions and definitions that critically determine how the rankings can be interpreted and meaningfully used. Also we calculated the weight of "carbon emission" (if it was included in the ranking as an indicator) in each global city ranking.

We have also studied another two widely cited global city rankings: The world according to GaWC by Globalization and World Cities Research Network (GaWC) and Global Financial Centers Index (GFCI). These two rankings focus on specific aspects rather than a set of multifaceted dimensions. Therefore we used them as supplement materials.

As they are based on specific aspect or analysis perspective, we would not compare their indicator system with the comprehensive ones, but use the city's ranks as a reference.

The GaWC inventory identifies three levels of global cities and several sub-ranks in 2012 based on their connectivity through four "advanced producer services"[11];

The Global Financial Centers Index (GFCI) is to examine the major financial centers globally in terms of competitiveness. The GFCI has been published every six months by the Z/Yen Group since 2007[12];

2.2 Carbon emission of global cities

There is a paucity of reliable and published carbon emission data at the city level [13]. We collected carbon emission data of 29 global cities. Any of these 29 cities has at least been selected in two of the above five global city rankings.

The data of carbon emission, defined metropolitan area, and population of 25 of the 29 cities are retrieved from the interactive data of C40 official website by Oct. 2015[14]. The data of the remaining 4 cities (Zurich, Taipei, Shanghai and Beijing) are acquired from CDP 2014 report [15], ICAP 2015 report [16] and the city's official website. GDP per capita of all 29 cities are acquired from Brookings 2014 Global Metro Monitor Map [17].

3. Results and discussion