



## Research note

# Evaluating cities' vitality and identifying ghost cities in China with emerging geographical data



Xiaobin Jin <sup>a,c</sup>, Ying Long <sup>b,c,\*</sup>, Wei Sun <sup>a</sup>, Yuying Lu <sup>a</sup>, Xuhong Yang <sup>a</sup>, Jingxian Tang <sup>b</sup>

<sup>a</sup> School of Geographic and Oceanographic Sciences, Nanjing University, China

<sup>b</sup> School of Architecture and Hang Lung Center for Real Estate, Tsinghua University, China

<sup>c</sup> Natural Resources Research Centre of Nanjing University, Nanjing University, China

## ARTICLE INFO

## Article history:

Received 23 June 2016

Received in revised form 21 December 2016

Accepted 11 January 2017

Available online xxx

## Keywords:

Residential development

Road junction

Points of interest

Social network

Urban vitality

## ABSTRACT

With the rapid urbanization of China, plenty of new urban lands have been developed with the great expectation to deal with all kinds of issues in old urban areas such as high population density, great demand on limited land resources, and decaying environment. However, a great proportion of vacancy in these newly developed units leads to the undesired observation of ghost cities. Lacking of clear and effectively evaluation criterion, the understanding of ghost cities in China is then rather limited. Considering the fact of ghost cities, we borrow the theory of urban vitality to identify and evaluate ghost cities in this paper. We argue that ghost cities are associated with very low urban vitality. In the light of big/open data, we are able to profile ghost cities of China based on 535,523 recent project-level residential developments from 2002 to 2013. We use the national-wide and million magnitude road junctions, points of interest and location based service records of 2014/2015 for measuring the morphological, functional and social vitality of each residential project. We then aggregate the project level evaluation results into the city level and thirty ghost cities are then identified by comparing the residential projects' vitality in the old (developed before or in 2000) and new (developed after 2000) urban areas in each city. Our profiling results illustrate the big picture of China's past residential developments, and then of ghost cities. We find the average vitality of residential projects in new urban areas is only 8.8% of that in old urban areas, denoting the potential existence of ghost cities in newly developed areas in Chinese cities. We have also benchmarked our identified ghost cities with existing rankings, the Baidu searching engine and night-time light images. Although we admit that ghost cities may exist in the particular urbanizing phase of China and that some ghost cities now may be well developed in the future, this study provides a thorough evaluation on the ghost city condition in China. This may shed light on policy implications for Chinese urban development.

© 2017 Elsevier Ltd. All rights reserved.

## 1. Introduction

Urbanization in China has attracted much attention from around the world and is regarded as one of the most important events in human civilization (Liu, He, Zhang, Huang, & Yang, 2012; Montgomery, 2008). With the rapid urbanization of China, plenty of new urban lands have been developed with the great expectation to deal with all kinds of issues in old urban areas such as high population density, great demand on limited land resources, decaying environment, and etc. In China, urban areas increased from 12,253 km<sup>2</sup> in 1990 to 40,534 km<sup>2</sup> in 2010 (Wang et al., 2012). In recent years, real estate developments are the main form of urban spatial development in China and they generally cover over 20% of total urban development in terms of area (see Section 2.2 for more details). With the massive migrants from rural to urban areas, residential land developments have been one of the main

forms of urban development in China. However, some of these developments do not match with the local residential demand and economic developments, thus leading to the increasing housing vacancies in some Chinese cities (so called "ghost cities"). The occurrence of these ghost cities has been widely criticized for debilitating the suitability of urban land as habitats, lowering the functioning effectiveness of urban system, hurdling the immigration trend of urban land, leading to disordered increase of urban land, messing up the whole plan of urbanization, and etc. (Chi, Liu, & Wu, 2015). Although there is unneglectable media coverage on ghost cities, which are supposed to be associated with wasting land resources and deteriorating healthy city development (Batty, 2016), the understanding on ghost cities in China is rather limited by lacking of clear and effectively evaluation criterion. This has been emphasized during the Central Urban Work Conference of China which is held at the end of 2015.<sup>1</sup>

\* Corresponding author at: School of Architecture, Tsinghua University, China.  
E-mail address: [yulong@tsinghua.edu.cn](mailto:yulong@tsinghua.edu.cn) (Y. Long).

<sup>1</sup> <http://www.citymetric.com/politics/so-what-happened-habitat-iii-2555>.

Up to now, there has still been no widely recognized definition of ghost cities. The term 'ghost estate' was first proposed for describing empty or unfinished housing developments in Ireland by economist David McWilliams in 2006. O'Callaghan, Boyle, and Kitchin (2014) focused their analysis on Ireland's ghost estates: residential developments left abandoned or unfinished after a property crash and their treatment within mainstream media. In Shepard's book "Ghost Cities of China", he defines "ghost city" as "a new development that is running at significantly under capacity, a place with drastically fewer people and businesses than there is an available space for" (Shepard, 2015). Nie and Liu (2013) summarize the reasons for ghost cities: wars, natural disasters, as well as urban planning driven high housing vacancies and even abandonment. They have classified ghost cities into various types, ranging from disaster ghost cities and decaying ghost cities to planned ghost cities.

There are no common accepted standards of ghost cities either. The vacant housing rate is one of the most important indicators to evaluate the health of real estate in a city. This indicator can also be used to identify the "ghost cities". Besides using the vacant housing rate, there are two other definitions for defining a ghost city. The Ministry of Housing and Urban-Rural Development of China establishes a standard of 10,000 residents per 1 km<sup>2</sup> of urban area. Based on this standard, Su (2014) ranks and identifies ghost cities as those with less than half of this standard. Chen (2014) proposes an alternative equation to calculate an indicator of "ghost cities":  $(S-D)/n$ , where  $S$  is the supply of new houses in the following five years,  $D$  is the demand of new houses in the following five years, and  $N$  is the number of houses at present. This equation reflects the proportion of current houses that should be removed to satisfy the balance between the supply and demand. Xiao, Wang, Feng, Zhang, and Yang (2014) detect and analyze China's urban expansion during the past 30 years using the Defence Meteorological Satellite Program/Operational Linescan System (DMSP-OLS) nighttime light images. They develop a method for extracting China's urban expansion pattern and analyze the dynamics of urban areas in China to explain the phenomenon of 'ghost cities'. These aforementioned standards are at the city level and do not take the inner city spatial structure and developments into account. An exception is that Chi et al. (2015) use the location based service (LBS) data from Baidu, for deriving home locations of users and calculating population density for each 100 by 100-m grid. They identify more than 50 ghost cities in China and distinguish between ghost cities and towns that are seasonally empty in China.

Considering the fact of ghost cities, we borrow the theory of urban vitality to identify and evaluate ghost cities in this paper. We argue that ghost cities are associated with very low urban vitality. Kevin Lynch believes that the primary criterion in the quality assessment of urban space form is the vitality, which is defined as a settlement (the dimension urban morphology) that supports the vital functions (the dimension urban function) and the biological requirements and capabilities of human beings (the dimension urban society), and how to protect the continuation of the species (Lynch, 1984). It is usual to say that, under these circumstances, people have 'quality of life'. Urban vitality is then an essential element to achieve urban quality of life, originating from a good urban form, well developed urban functions as well as sufficient urban activities. Jane Jacobs argued that human activity and life place intertwined constitute the diversity of city life, the vitality is the performance of the diversity in the city life (Jacobs, 1961). This is also consistent with Lynch's theory. The both theories inform us decomposing urban vitality into three components, urban morphology, urban function and urban society, which is also in a sequential order for the life course of a city. The components are then employed in our paper for calculating urban vitality using fine-scale data.

In this paper, we have opportunities to access all the residential developments of China from recent years, enabling us to detect ghost cities from a bottom-up approach considering residential lands as the main

form of urban developments and the main contribution to ghost cities. Moreover, the new data environment formed by the emerging big data and open data make it possible to evaluate the vitality of these residential projects from various dimensions, for example, the morphological, functional and social dimensions. We focus on a comparison between the so-called old developments and new developments to profile the ghost level of each city. The research questions of this paper are, how is the vitality of recent residential projects? What are ghost cities in China and the driving forces for them? This study is timely in that about 1/3 Chinese cities are experiencing population shrinkage but with rapid urban expansion (Long & Wu, 2016). This makes it different with their counter parts in western countries, thus extending our knowledge on ghost cities in the literature.

This paper is structured as follows. Section 2 discusses the necessary dataset used in the study. The next section describes the adopted methodology. The analysis results are described in Section 4. Sections 5 and 6 give discussion and concluding remarks on this study, respectively.

## 2. Data

### 2.1. The Chinese city system

The Chinese city system has long been defined from the administrative view, and most statistical data corresponds to Chinese cities' administrative areas. There are 653 Chinese cities in 2014<sup>2</sup> (Fig. 1). On the basis of the Chinese administrative system, there are mainly five levels of cities classified in this way, including: municipalities (MD) directly led by the nation (with 4 cities, tier 1), sub-provincial cities (SPC) (with 15 cities, tier 2), other provincial cities (OPCC) (with 17 cities, tier 3), prefecture-level cities (PLC) (with 250 cities, tier 4), and county-level cities (CLC) (with 367 cities, tier 5). We focus on all cities in this paper and aim to identify ghost cities from these. The administrative boundaries shown in Fig. 1 are used for extracting our data for each historical urban development.

We assume that the formation of ghost cities is generally due to the newly developed areas, thus making it necessary to define the relevant boundaries. Considering the study period and data availability, the interpreted urban areas from remote sensing images in the year 2000 are used to differentiate the so-called old developments (from within the year 2000's urban areas) and new developments. The data are from the Institute of Geographic Sciences and Natural Resources Research of the Chinese Academy of Sciences (Kuang, Liu, Dong, Chi, & Zhang, 2016; Tian et al., 2005). The urban areas are interpreted from remote sensing images, and the overall accuracy is 94.3%. There are 9128 patches within 33,148 km<sup>2</sup> in total, and the mean patch size is 3.6 km<sup>2</sup>.

### 2.2. Land transactions during 2002–2013

We collect all land transactions during 2002 to 2013 from the online system: Land Market Monitoring System, developed by the Ministry of Land and Resources of China (<http://jcjg.mlr.gov.cn/>). Residential land transactions are used for the basic data of this study since they are the direct proxy for Chinese residential land development in the last years. They are also the direct contribution to the potential "ghost cities" in China. In total, there are 535,523 residential projects within a total area of 7770.2 km<sup>2</sup> from 2002 to 2013 (Table 1). We see an increasing trend of residential transactions in terms of both count and area. The specific location, transaction date, land supply type,<sup>3</sup> land use type, as well as land supply area in ha attributes are available in each transaction record. We geocode all records using the Baidu online geocoding service using the detailed address of each record and derive the GIS ShapeFiles layer for further analysis in the study. It should be mentioned that almost all land transactions, especially residential type, mean complete

<sup>2</sup> Due to changes in the urban system, several inconsistent cities have been excluded.

<sup>3</sup> In China, land supply types mainly include agreements, bidding and auctions.

Download English Version:

<https://daneshyari.com/en/article/5108124>

Download Persian Version:

<https://daneshyari.com/article/5108124>

[Daneshyari.com](https://daneshyari.com)