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Article information:

To cite this document:
Khee Giap Tan Tongxin NIE Shinae Baek , (2016),"Empirical assessment on the liveability of cities in the Greater China Region", Competitiveness Review, Vol. 26 Iss 1 pp. 2 - 24
Permanent link to this document:
http://dx.doi.org/10.1108/CR-11-2015-0087

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Received 1 November 2015
Accepted 1 November 2015

Empirical assessment on the liveability of cities in the Greater China Region

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Abstract

Purpose – This paper aims to apply a comprehensive Liveability Cities index to rank the liveability of 100 cities in the Greater China Region. Against the backdrop of the ongoing trend of rapid and extensive urbanisation observed in China, "liveability" is being given an increasingly higher priority by the Chinese government. However, there has been no attempt to empirically measure this concept and to examine its nexus to the narrower concept of competitiveness.

Design/methodology/approach – The index is based on 96 indicators across five environments, namely, economic vibrancy and competitiveness; environmental friendliness and sustainability; domestic security and stability; socio-cultural conditions; and political governance.

Findings – The empirical results show that Hong Kong, Macau and cities in Taiwan generally perform well in overall liveability rankings, while first-tier cities in mainland China (Beijing, Shanghai, Guangzhou and Shenzhen) do not find a place among the top ranks.

Originality/value – The rankings and simulation exercise aim to provide Chinese policy makers with a framework to assess the liveability of China's cities and suggests indicative policy suggestions that can be taken to improve overall liveability.

Keywords China, Competitiveness, Cities, Liveability

Paper type Research paper

1. Introduction

Since the economic reforms initiated in 1978 by Deng Xiaoping, China has recorded impressive and sustained economic growth as well as undergone a rapid urbanisation process. The speed and scale of urbanisation in China is unprecedented and is described by some observers as the largest peacetime movement of people in history (Murphy, 2002). According to the China National Bureau of Statistics, the urban population ratio grew from only 10.6 per cent in 1949 to 17.9 per cent in 1978 and further to 53.7 per cent in 2013. To understand the significance of China's transformation, one only needs to compare this to the urbanisation in Europe, which took 150 years for its urban population ratio to increase from 12 to 51 per cent (Clark, 2013). China essentially achieved the same level of growth in less than half of Europe's time.

The rapid pace of urbanisation is expected to continue in the next few decades. The "National New-type Urbanisation Plan" released by China's State Council in March 2014 estimates that the urban population ratio of China will reach 60 per cent by 2020, while the World Bank (2013) projects that China's urban residents in the total population will climb to two-thirds by 2030. In the context of rapid urbanisation, there is an obvious trend of a shifting focus from the sole pursuit of quantitative economic growth and

Competitiveness Review
Vol. 26 No. 1, 2016
pp. 2-24
© Emerald Group Publishing Limited
1059-5422
DOI 10.1108/CR-11-2015-0087

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qualitative economic development to the achievement of higher overall quality of life, standard of living and better city liveability by both the general public and the government.

Indeed, the Chinese leaders have noted that the economy is now entering a "New Normal Era" of slower but more sustainable and inclusive growth. President Xi Jinping also stressed in a speech delivered to party leaders on 29 June 2013 that economic growth is no longer the only key performance indicator to evaluate the performance of the leaders. He noted that the welfare improvement, social development and environmental indicators should all be taken into consideration when evaluating leaders (*Forbes*, 2013; *Xinhua*, 2013). Thus, in a way, this hiatus due to the global financial crisis to a New Normal can be more constructively construed as a blessing in disguise, to spread the gains from wealth and minimise the costs of a fast growth trajectory.

These changes in China's societal sentiments and political priorities mean that "liveability" is increasingly being pushed up the Chinese government's list of agenda. However, despite the interest in addressing the liveability conditions, there has been no attempt to evaluate this subjective concept of liveability. To that end, this paper presents a way of ranking cities in Greater China so as to provide a framework for policy makers to assess and compare the liveability conditions of major cities in the Greater China Region. The primary aim of the so-called "Greater China Liveable Cities Index" (GCLCI) is to help identify the strengths and weaknesses of each city so as to facilitate a more informed policy formulation process that can result in a greater improvement in the liveability of China's cities.

This paper adopts and updates the liveability framework first introduced by Tan *et al.* (2012) and applies it to the context of 100 cities in the Greater China Region. The paper is organised as follows. Section 2 explains the adopted liveability framework. Section 3 describes the research methodology to construct the GCLCI, including the selection of cities, the ranking algorithm and data sources. Section 4 presents the empirical results on the ranking and simulation studies. Section 5 concludes with a discussion on the results and the some policy implications.

2. Concept of liveability

Over the past few decades, a broad understanding of "liveability" appears to have emerged. Although there is still no consensus on the exact definition, liveability in many ways can be viewed as encompassing a wide range of issues relating to one's overall quality of life and well-being (Tan *et al.*, 2014a, 2014b). The differences in views among scholars (Khoo, 2012; West and Jones, 2009; Vuchic, 1999) originate from the detailed elements that constitute "liveability".

For instance, Khoo (2012) envisions a liveable city by three outcomes, which are competitive economy, sustainable environment and a high quality of life, while West and Jones (2009, p. 8) claim that "the achievement of liveability requires conditions which enhance social, environmental, economic, cultural and governance goals and outcomes". Vuchic (1999, p. 7) provides a working definition for urban liveability that "[…] generally understood to encompass those elements of home, neighbourhood, and metropolitan area that contribute to safety, economic opportunities and welfare, health, convenience, mobility and recreation". As such, a number of indices that have been developed to rank the liveability of cities in different geographical regions are conducted

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based on their respective beliefs in the constituents of liveability which inevitably tend to be narrow[1].

The liveability framework adopted in this paper was first introduced by Tan *et al.* (2012), and it is further developed and explained in the papers by Tan *et al.* (2014a and 2014b). As previous works have noted, the framework draws its philosophical inspirations from the US President Franklin D. Roosevelt. In his 1941 State of the Union address, President Roosevelt mentioned four essential human freedoms: the freedom from want, the freedom from fear, the freedom to worship and the freedom of speech.

The "freedom from want" captures the right to have a decent livelihood. More broadly, this dimension emphasises people's craving for creature comforts and material abundance. The degree that this craving is satisfied is, in large part, determined by the income level and the growth rate of income: two issues that are central to the field of economics. The terminology adopted in the liveability framework to represent this dimension is "Economic Vibrancy and Competitiveness".

The "freedom from fear" stresses the natural right of people to live in safety through the maintenance of law and order, the alleviation of natural disasters and the prevention of wars by the state. The absence of such psychological pressure in a city increases its liveability in the same way that an improvement in the economic prospects of a city increases its liveability. The terminology adopted in the liveability framework to represent this dimension is "Domestic Security and Stability".

The "freedom to worship" is subsumed within the broader dimension of "Socio-Cultural Conditions". For a city, this dimension emphasises the social comfort of living there (e.g. degree of income inequality, social harmony and social mobility); the physical ease of living there (e.g. adequacy of mass transit, healthcare and education) and the cultural richness of living there (e.g. amount of social diversity, acceptance of different religious beliefs and access to museums and cultural performances). The terminology adopted in the liveability framework to represent this dimension is "Socio-Cultural Conditions".

The "freedom of speech" is subsumed within the broader dimension of "Political Governance". This dimension covers the effectiveness of the government in providing public services (e.g. extent of corruption and quality of judiciary system), the responsiveness of the government (e.g. degree of transparency and accountability) and the openness to political participation (e.g. regular elections that are free and fair). The terminology adopted in the liveability framework to represent this dimension is "Political Governance".

The framework is further supplemented by including another important dimension of city liveability, which is "Environmental Friendliness and Sustainability". This dimension captures not only the desire of people for responsible stewardship of the environment for the welfare of future generations but also the aesthetic appreciation of nature by people. Furthermore, biological survival of the human species requires that the selfish gene in the human species restrains itself adequately because of its understanding of systemic sustainability and the inter-connectedness of life across species.

In a nutshell, the liveability framework conceptualises liveability under the following five environments:

(1) economic vibrancy and competitiveness;

(2) environmental friendliness and sustainability;

(3) domestic security and stability;
(4) socio-cultural conditions; and
(5) political governance.

We use this framework to rank and compare cities in Greater China.

The liveability index offers a comprehensive, transparent and standardised methodology that allows for comparison across cities on key aspects of urban life. For instance, the World Bank plans on using the GCLCI as a reference as part of an overall plan to become much more focused on some of the indicators identified by GCLCI and have even advised local government in China to adopt GCLCI as an important input in making policies going forward (Hofman, 2014; *Zaobao*, 2014).

3. Research methodology

3.1 Selection of cities

To provide a comprehensive coverage of major cities in the Greater China Region, the 100 Greater China cities covered in the paper (Table I) are selected based on the following two criteria:

(1) the capital cities of 34 Greater China economies; and
(2) cities with highest gross regional domestic product (GRDP) in 2011, the most updated data available when this study was initiated in 2013.

3.2 Ranking algorithm

As illustrated in Section 2.2, the liveability framework has defined liveability according to the following five environments:

(1) economic vibrancy and competitiveness;
(2) environmental friendliness and sustainability;
(3) domestic security and stability;
(4) socio-cultural conditions; and
(5) political governance.

These five environments have the same impact on overall liveability, i.e. that each environment counts for 20 per cent of liveability index. There are in total 18 sub-environments under the aforementioned five environments. Each of the five environments contains three to five sub-environments (Table II). Each sub-environment under its respective environment has the same weightage as the rest.

Each sub-environment further consists of indicators. The indicators serve as the fundamental building elements of the GCLCI. Theory would suggest a list of ideal indicators, which best reflects the liveability of a city. However, because of data unavailability and cost constraints, a large number of ideal indicators are reduced to a set of practical indicators. In this study, 96 practical indicators are used in the ranking and simulation analysis. The complete list of indicators can be found in Appendix.

The computation procedure to produce the GCLCI is described below for a general case of N cities, M practical indicators and C environments, with each environment comprising S sub-environments:

(1) Compute the mean value of practical indicator j ($j = 1, \ldots, M$):

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No.	City
1	Shanghai
2	Beijing
3	Hong Kong
4	Guangzhou
5	Shenzhen
6	Tianjin
7	Suzhou
8	Chongqing
9	Hangzhou
10	Chengdu
11	Wuxi
12	Wuhan
13	Qingdao
14	Foshan
15	Dalian
16	Nanjing
17	Ningbo
18	Shenyang
19	Changsha
20	Tangshan
21	Taipei
22	Zhengzhou
23	Yantai
24	Dongguan
25	Jinan
26	Quanzhou
27	Harbin
28	Shijiazhuang
29	Nantong
30	Changchun
31	Kaohsiung
32	Xi'an
33	Daqing
34	Fuzhou
35	Hefei
36	Changzhou
37	Xuzhou
38	Weifang
39	Wenzhou
40	Shaoxing
41	Zibo
42	Taichung
43	Ordos
44	Baotou
45	Jining
46	Taizhou, Zhejiang
47	Handan
48	Yancheng

(*continued*)

Table I.
List of 100 Greater China cities in the study[a]

No.	City
49	Linyi
50	Luoyang
51	Nanchang
52	Jiaxing
53	Dongying
54	Yangzhou
55	Cangzhou
56	Xiamen
57	Kunming
58	Jinhua
59	Baoding
60	Taizhou, Jiangsu
61	Anshan
62	Macau
63	Zhenjiang
64	Tai'an
65	Yulin
66	Nanning
67	Jilin City
68	Nanyang
69	Zhongshan
70	Hohhot
71	Yichang
72	Xiangyang
73	Weihai
74	Huizhou
75	Taiyuan
76	Dezhou
77	Liaocheng
78	Yueyang
79	Jiangmen
80	Binzhou
81	Changde
82	Zhangzhou
83	Maoming
84	Hengyang
85	Zhanjiang
86	Urumqi
87	Huai'an
88	Wuhu
89	Langfang
90	Xuchang
91	Liuzhou
92	Zhuzhou
93	Zaozhuang
94	Heze

(*continued*)

Table I.

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No.	City
95	Guiyang
96	Lanzhou
97	Yinchuan
98	Xining
99	Haikou
100	Lhasa

Table I.

Notes: [a] The sequence of the cities in the table is based on gross regional domestic product (GRDP) in 2011

Category	Sub-category
Economic vibrancy and competitiveness	Economic performance
	Economic openness
	Infrastructure
Environmental friendliness and sustainability	Pollution
	Depletion of natural resources
	Environmental initiatives
Domestic security and stability	Crime rate
	Threat to national security
	Civil unrest
Socio-cultural conditions	Medical and healthcare
	Education
	Housing, sanitation and transportation
	Income inequality and demographic burden
	Diversity and community cohesion
Political governance	Policy making and implementation
	Government system
	Transparency and accountability
	Corruption

Table II.
Environments and sub-environments under the liveability framework

$$\bar{X}_j = \frac{1}{N}\sum_{i=1}^{N} X_{ij}$$

where X_{ij} represents the value that city i ($i = 1, \ldots, N$) takes for practical indicator j.

(2) For each practical indicator j ($j = 1, \ldots, M$), calculate its standard deviation (SD):

$$SD_j = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(X_{ij} - \bar{X}_j)^2}$$

(3) Compute the standardised value of indicator (SVI) that each city i ($i = 1, \ldots, N$) takes under each of the practical indicators j ($j = 1, \ldots, M$),

$$SVI_{ij} = \frac{X_{ij} - \bar{X}_j}{SD_j}$$

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(4) Compute the "ranked" standardised value of indicator (RSVI) that each city i ($i = 1, \ldots, N$) takes under each of the practical indicators j ($j = 1, \ldots, M$):

$$RSVI_{ij} = \begin{cases} SVI_{ij}, \textit{if a higher value is better} \\ -SVI_{ij}, \textit{if a lower value is better} \end{cases}$$

(5) For each of the practical indicators j ($j = 1, \ldots, M$), a ranking can be obtained for cities: cities with a higher value of RSVI for indicator j are ranked ahead of those with a lower value.

(6) For each city i ($i = 1, \ldots, N$), calculate the RSVI for each sub-environment k ($k = 1, \ldots, S$) belonging to environment l ($l = 1, \ldots, C$):

$$Raw\_RSVI_{i,lk} = \frac{1}{y_{lk}} \sum_{p=1}^{y_{lk}} RSVI_{i,j_{lk,p}}$$

$$Mean\_RSVI_{lk} = \frac{1}{N} \sum_{i=1}^{N} Raw\_RSVI_{i,lk}$$

$$SD\_RSVI_{lk} = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (Raw\_RSVI_{i,lk} - Mean\_RSVI_{lk})^2}$$

$$RSVI_{i,lk} = \frac{Raw\_RSVI_{i,lk} - Mean\_RSVI_{lk}}{SD\_RSVI_{lk}}$$

where y_{lk} is the total number of practical indicators under sub-environment k of environment l, and ($RSVIi,jlk, 1, \ldots, RSVIi,jlk,ylk$) are the RSVIs for city i that make up sub-environment k of environment l.

(7) For each city i ($i = 1, \ldots, N$), calculate the RSVI for each environment l ($l = 1, \ldots, C$):

$$Raw\_RSVI_{i,l} = \frac{1}{S_l} \sum_{k=1}^{S_l} RSVI_{i,lk}$$

$$Mean\_RSVI_{l} = \frac{1}{N} \sum_{i=1}^{N} Raw\_RSVI_{i,l}$$

$$SD\_RSVI_{l} = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (Raw\_RSVI_{i,l} - Mean\_RSVI_{l})^2}$$

$$RSVI_{i,l} = \frac{Raw\_RSVI_{i,l} - Mean\_RSVI_{l}}{SD\_RSVI_{l}}$$

where ($RSVIi,l1, \ldots, RSVIi,lS$) are the RSVIs for the S sub-environments under each environment l.

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(8) Overall rank score of city i ($i = 1, \ldots, N$):

$$Raw\_R_i = \frac{1}{C}\sum_{l=1}^{C} RSVI_{i,l}$$

$$Mean\_R = \frac{1}{N}\sum_{i=1}^{N} Raw\_R_i$$

$$SD\_R = \sqrt{\frac{1}{N}\sum_{i=1}^{N} (Raw\_R_i - Mean\_R)^2}$$

$$R_i = \frac{Raw\_R_i - Mean\_R}{SD\_R}$$

A city with a higher R_i is ranked ahead of one with a lower value of R_i, and the city with the highest $R_i$is the most liveable city.

Step 5 of the ranking algorithm provides the ranking of each city for each individual practical indicator. To achieve this ranking, Step 4 of the ranking algorithm adjusts the value of the SVIs so that a lower value will lead to a better ranking in terms of liveability. Depending on the nature of the indicator in question, a higher or lower value may reflect a more liveable city. Take, for instance, the practical indicators "1.1.01 GRDP per capita" and "1.1.07 Unemployment Rate". A higher "GRDP per capita" but a lower "unemployment rate" suggest better economic performance which makes a city more liveable. In most cases, a higher value is better (e.g. GRDP per capita). However, for indicators where the inverse is true (e.g. unemployment rate), the SVI itself is compared between cities, and a lower SVI value will lead to a better ranking. Step 4 of the ranking algorithm thus seeks to make all standardised values of all practical indicators consistent for ranking purposes.

Step 6 of the ranking algorithm determines the sub-environment rankings of each city. The average RSVI of all the indicators in the sub-environment is calculated and compared to other cities. Cities with a higher average RSVI rank better in the sub-environment. To arrive at the city ranking for each environment, the RSVIs of the sub-environments are aggregated as detailed by Step 7 of the ranking algorithm.

Finally, Step 8 of the ranking algorithm requires the RSVI values of each environment to be totalled to determine the overall ranking of the city. Although the number of sub-environments and indicators varies for each environment, the aggregate score for each main environment is given an equivalent weighting – 20 per cent of the GCLCI. Identical weights are assigned to each environment, as they represent equivalent significance to the computation of the GCLCI. This method is repeated and applied consistently across all the cities to ensure precision of the rankings.

3.3 Data sources, constraints and proxies

The GCLCI is based on both hard data and survey data. Among all 96 indicators used to construct the GCLCI, 69 indicators are hard data and 27 indicators are survey indicators. The hard data are 2012 data gathered from publicly available

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sources, including China Statistical Yearbook, China City Statistical Yearbook, China Urban Construction Statistical Yearbook, Hong Kong Annual Digest of Statistics, Macau Yearbook of Statistics, Taiwan Statistical Data Book, Taiwan Urban and Regional Development Statistics, etc. For the survey data, we engaged external institutions to conduct random phone surveys from May to October in 2014 across all 100 Greater China cities covered in the study. Three hundred successful responses were gathered from each city. The responses of a relatively large group of city residents were used to avoid the potential biases introduced by using the opinions of a small group of experts.

The construction of ranking indices for cities brings with it more challenges than one might face for country level due to the critical lack of data availability and questions about their quality or accuracy, which means that for certain indicators, regardless of how relevant they are, sub-national or provincial data have to be used as proxy values representing the local conditions. Although less than ideal, this practice may continue for some cities until such time that data become available[2].

4. Empirical findings

The GCLCI allows us to examine the overall liveability conditions in 100 Greater China cities as well as assess the relative strengths and weakness in each of the five environments. At the same time, what-if simulation result is able to reveal the gaps between cities and each city's potential for improvement in terms of liveability.

4.1 Overall liveability ranking

The overall liveability ranking (Table III) places Macau as the most liveable city among the 100 Greater China cities covered in this study, followed by Weihai and Hong Kong. In terms of standardised scores, Macau with a score of 4.5544 is also well ahead of the rest of the cities. The standardised scores of Weihai and Hong Kong are 2.8669 and 2.6151, respectively.

Generally speaking, Hong Kong, Macau and cities in Taiwan perform well in overall liveability ranking. Among all 100 Greater China cities studied, Macau is ranked first, Hong Kong is ranked third, Taipei is ranked sixth, Kaohsiung is ranked 25th and Taichung is ranked 47th. This reveals some gaps in liveability between the majority of mainland China cities and Hong Kong, Macau and cities in Taiwan.

The first-tier cities in mainland China (Beijing, Shanghai, Guangzhou and Shenzhen) are not among the top-performing cities in terms of overall liveability. On the contrary, the top-ranking cities for mainland China are mostly from Shandong, Jiangsu and Zhejiang provinces. Seven cities from Shandong (Weihai, Yantai, Weifang, Dongying, Binzhou, Qingdao and Tai'an), six cities from Jiangsu (Nantong, Changzhou, Nanjing, Wuxi, Yangzhou and Taizhou) and two cities from Zhejiang (Hangzhou and Ningbo) are in the top 20 positions.

The mediocre performance of first-tier cities in mainland China can be examined (Table IV) through a closer look at their rankings according to the five environments. It is clear that all the first-tier Chinese cities rank highly for economic vibrancy and competitiveness but poorly in domestic security and stability. Beijing, Shanghai, Guangzhou and Shenzhen rank very highly for economic vibrancy and competitiveness (6th, 16th, 8th and 4th, respectively). However, they rank poorly for domestic security and stability (71st, 53rd, 89th and 87th, respectively). The divergence of performance

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Rank	City	Economy	Score
1	Macau	Macau	4.5544
2	Weihai	Shandong	2.8669
3	Hong Kong	Hong Kong	2.6151
4	Yantai	Shandong	1.4956
5	Xiamen	Fujian	1.4660
6	Taipei	Taiwan	1.2570
7	Weifang	Shandong	1.1977
8	Nantong	Jiangsu	1.1226
9	Changzhou	Jiangsu	1.1189
10	Nanjing	Jiangsu	0.9566
11	Hangzhou	Zhejiang	0.9288
12	Dongying	Shandong	0.9179
13	Binzhou	Shandong	0.9114
14	Qingdao	Shandong	0.8720
15	Wuxi	Jiangsu	0.8692
16	Yangzhou	Jiangsu	0.7496
17	Tai'an	Shandong	0.6799
18	Taizhou, Jiangsu	Jiangsu	0.6702
19	Lhasa	Tibet	0.6567
20	Ningbo	Zhejiang	0.6419
21	Zibo	Shandong	0.5474
22	Linyi	Shandong	0.5303
23	Zhongshan	Guangdong	0.4917
24	Zhuzhou	Hunan	0.4833
25	Kaohsiung	Taiwan	0.4754
26	Wuhu	Anhui	0.4711
27	Jiaxing	Zhejiang	0.4634
28	Suzhou	Jiangsu	0.4566
29	Fuzhou	Fujian	0.4326
30	Haikou	Hainan	0.3937
31	Shanghai	Shanghai	0.3816
32	Jinan	Shandong	0.3788
33	Hefei	Anhui	0.3755
34	Changde	Hunan	0.3612
35	Shenzhen	Guangdong	0.3581
36	Dalian	Liaoning	0.3493
37	Zhangzhou	Fujian	0.3358
38	Xuchang	Henan	0.3064
39	Taizhou, Zhejiang	Zhejiang	0.2930
40	Shaoxing	Zhejiang	0.2884
41	Jinhua	Zhejiang	0.2681
42	Nanning	Guangxi	0.2576
43	Dezhou	Shandong	0.2239
44	Beijing	Beijing	0.1923
45	Jining	Shandong	0.1773
46	Ordos	Inner Mongolia	0.1726
47	Taichung	Taiwan	0.1509
48	Zhenjiang	Jiangsu	0.1226

(*continued*)

Table III.
Overall liveability ranking for 100 Greater China cities

Rank	City	Economy	Score
49	Yueyang	Hunan	0.1118
50	Yichang	Hubei	0.1079
51	Quanzhou	Fujian	0.1071
52	Yinchuan	Ningxia	0.0331
53	Yancheng	Jiangsu	0.0209
54	Huai'an	Jiangsu	−0.0186
55	Xuzhou	Jiangsu	−0.0376
56	Chengdu	Sichuan	−0.0436
57	Luoyang	Henan	−0.0775
58	Liaocheng	Shandong	−0.0990
59	Chongqing	Chongqing	−0.1045
60	Baotou	Inner Mongolia	−0.1111
61	Guiyang	Guizhou	−0.1636
62	Liuzhou	Guangxi	−0.1664
63	Kunming	Yunnan	−0.1864
64	Jilin City	Jilin	−0.2495
65	Daqing	Heilongjiang	−0.3105
66	Changsha	Hunan	−0.3362
67	Guangzhou	Guangdong	−0.3644
68	Heze	Shandong	−0.3884
69	Zaozhuang	Shandong	−0.4790
70	Nanchang	Jiangxi	−0.5132
71	Tianjin	Tianjin	−0.5437
72	Jiangmen	Guangdong	−0.5908
73	Cangzhou	Hebei	−0.6035
74	Shenyang	Liaoning	−0.6379
75	Xi'an	Shaanxi	−0.6422
76	Huizhou	Guangdong	−0.6674
77	Taiyuan	Shanxi	−0.7039
78	Xiangyang	Hubei	−0.8188
79	Xining	Qinghai	−0.8678
80	Changchun	Jilin	−0.8895
81	Langfang	Hebei	−0.8937
82	Wenzhou	Zhejiang	−0.8969
83	Anshan	Liaoning	−0.9228
84	Dongguan	Guangdong	−0.9275
85	Zhengzhou	Henan	−0.9370
86	Foshan	Guangdong	−0.9714
87	Wuhan	Hubei	−1.0222
88	Shijiazhuang	Hebei	−1.1436
89	Tangshan	Hebei	−1.1747
90	Urumqi	Xinjiang	−1.1809
91	Handan	Hebei	−1.2396
92	Hengyang	Hunan	−1.2587
93	Harbin	Heilongjiang	−1.4460
94	Yulin	Shaanxi	−1.4473

(*continued*)

Table III.

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among the first-tier cities is further observed in environmental friendliness and sustainability, socio-cultural conditions and political governance. For instance, Shenzhen's environmental friendliness and sustainability ranks a stellar 9th, whereas Beijing is only ranked 71st. In contrast, Beijing's socio-cultural conditions ranks a decent 13th, while Guangzhou and Shenzhen are in the high 50s and 60s. Similarly, Shanghai stands out in terms of political governance at 18th, while the other three cities all rank below 50.

4.2 What-if policy simulation results

While rankings are useful as a reference for policy makers, a notable innovation of the adopted liveability framework lies in the policy simulations, which allows them to project the extent to which the city will be able to improve its liveability. Policy simulations are "experimental" as in under scientific laboratory conditions to deduce results before the actual implementation happens. This ensures the policy makers a degree of freedom and certainty in that they can "trial" policies in a controlled setting before directly launching them out for public scrutiny and so pre-empt potential problems and loss of credibility. This exercise not only enables them to understand the magnitude of the impact of their policy choices but it also helps them to prioritise their goals, ultimately streamlining and enhancing the policy-making process.

The what-if policy simulation is based on the assumption that to improve, each city will work on areas where their rankings are worst. This is identified by their weakest (worst-performing) 20 per cent of the indicators which are selected from the entire list of indicators, regardless of which environment they belong to. After identifying the 20 per cent most lagging indicators, the scenario examined is where the city is able to raise its scores to the "average" score of a particular indicator for all cities (computed using the original data). As the what-if policy simulation is static, where the ranks are computed assuming only a particular city improves at a time holding all other cities' scores constant, all cities' rankings after the simulation will never decline.

The simulation results (Table V) further confirm that there is a wide gap between Macau and the rest of the cities in terms of overall liveability. Of the five environments, Macau ranks first in three of them, namely, economic vibrancy and competitiveness, socio-cultural conditions and political governance. At the same time, Macau ranks second on environmental friendliness and sustainability and sixth on domestic security and stability. Even after the "what-if" simulation, the second- and third-ranking cities, Weihai and Hong Kong, are unable to surpass Macau.

Rank	City	Economy	Score
95	Baoding	Hebei	−1.4487
96	Nanyang	Henan	−1.4494
97	Zhanjiang	Guangdong	−1.5535
98	Hohhot	Inner Mongolia	−1.6465
99	Lanzhou	Gansu	−2.1154
100	Maoming	Guangdong	−2.3776

Table III.

Table IV. Rankings of first-tier cities by environments

Economies	Overall liveability	Economic vibrancy and competitiveness	Environmental friendliness and sustainability	Domestic security and stability	Socio-cultural conditions	Political governance
Beijing	44	6	71	71	13	64
Shanghai	31	16	65	53	38	18
Guangzhou	67	8	69	89	62	77
Shenzhen	35	4	9	87	59	59

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City	Rank		Score	
	Before	After	Before	After
Macau	1	1	4.5544	5.0213
Weihai	2	2	2.8669	3.1049
Hong Kong	3	2	2.6151	3.5392
Yantai	4	4	1.4956	1.7807
Xiamen	5	4	1.4660	1.7515
Taipei	6	4	1.2570	2.1959
Weifang	7	5	1.1977	1.4833
Nantong	8	6	1.1226	1.4132
Changzhou	9	6	1.1189	1.3420
Nanjing	10	7	0.9566	1.2300
Hangzhou	11	6	0.9288	1.3730
Dongying	12	6	0.9179	1.2707
Binzhou	13	7	0.9114	1.2031
Qingdao	14	10	0.8720	1.0786
Wuxi	15	7	0.8692	1.1974
Yangzhou	16	10	0.7496	1.0183
Tai'an	17	10	0.6799	0.9791
Taizhou, Jiangsu	18	11	0.6702	0.9395
Lhasa	19	4	0.6567	2.3168
Ningbo	20	8	0.6419	1.1170
Zibo	21	13	0.5474	0.9091
Linyi	22	14	0.5303	0.8722
Zhongshan	23	15	0.4917	0.8658
Zhuzhou	24	16	0.4833	0.8496
Kaohsiung	25	6	0.4754	1.4274
Wuhu	26	14	0.4711	0.8772
Jiaxing	27	14	0.4634	0.8711
Suzhou	28	16	0.4566	0.8594
Fuzhou	29	17	0.4326	0.7155
Haikou	30	10	0.3937	1.0544
Shanghai	31	10	0.3816	1.0699
Jinan	32	16	0.3788	0.7701
Hefei	33	17	0.3755	0.7114
Changde	34	16	0.3612	0.8181
Shenzhen	35	8	0.3581	1.1602
Dalian	36	17	0.3493	0.7286
Zhangzhou	37	17	0.3358	0.7203
Xuchang	38	17	0.3064	0.7200
Taizhou, Zhejiang	39	16	0.2930	0.7788
Shaoxing	40	17	0.2884	0.7143
Jinhua	41	17	0.2681	0.6998
Nanning	42	21	0.2576	0.5942
Dezhou	43	21	0.2239	0.5970
Beijing	44	10	0.1923	1.0686
Jining	45	22	0.1773	0.5365
Ordos	46	8	0.1726	1.1427
Taichung	47	8	0.1509	1.1384
Zhenjiang	48	23	0.1226	0.4886
Yueyang	49	21	0.1118	0.5617

(*continued*)

Table V.
What-if policy simulation result for 100 Greater China cities

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City	Rank		Score	
	Before	After	Before	After
Yichang	50	29	0.1079	0.4421
Quanzhou	51	25	0.1071	0.4775
Yinchuan	52	16	0.0331	0.8136
Yancheng	53	37	0.0209	0.3417
Huai'an	54	25	−0.0186	0.4773
Xuzhou	55	42	−0.0376	0.2572
Chengdu	56	29	−0.0436	0.4406
Luoyang	57	30	−0.0775	0.3958
Liaocheng	58	39	−0.0990	0.2924
Chongqing	59	43	−0.1045	0.2318
Baotou	60	20	−0.1111	0.6358
Guiyang	61	22	−0.1636	0.5231
Liuzhou	62	44	−0.1664	0.2151
Kunming	63	38	−0.1864	0.3052
Jilin City	64	30	−0.2495	0.3854
Daqing	65	16	−0.3105	0.8358
Changsha	66	44	−0.3362	0.1951
Guangzhou	67	21	−0.3644	0.6247
Heze	68	52	−0.3884	0.0539
Zaozhuang	69	52	−0.4790	0.0959
Nanchang	70	52	−0.5132	0.0991
Tianjin	71	49	−0.5437	0.1145
Jiangmen	72	53	−0.5908	0.0249
Cangzhou	73	55	−0.6035	−0.0395
Shenyang	74	52	−0.6379	0.0811
Xi'an	75	54	−0.6422	0.0085
Huizhou	76	47	−0.6674	0.1425
Taiyuan	77	48	−0.7039	0.1264
Xiangyang	78	65	−0.8188	−0.2790
Xining	79	52	−0.8678	0.0238
Changchun	80	54	−0.8895	0.0095
Langfang	81	66	−0.8937	−0.3168
Wenzhou	82	52	−0.8969	0.0484
Anshan	83	60	−0.9228	−0.1139
Dongguan	84	23	−0.9275	0.4920
Zhengzhou	85	65	−0.9370	−0.2831
Foshan	86	53	−0.9714	0.0193
W−uhan	87	54	−1.0222	−0.0243
Shijiazhuang	88	67	−1.1436	−0.3714
Tangshan	89	66	−1.1747	−0.3325
Urumqi	90	54	−1.1809	−0.0198
Handan	91	68	−1.2396	−0.3942
Hengyang	92	72	−1.2587	−0.5984
Harbin	93	71	−1.4460	−0.5367
Yulin	94	74	−1.4473	−0.6281
Baoding	95	76	−1.4487	−0.6691
Nanyang	96	70	−1.4494	−0.5106
Zhanjiang	97	64	−1.5535	−0.2118
Hohhot	98	70	−1.6465	−0.5116
Lanzhou	99	80	−2.1154	−0.9089
Maoming	100	72	−2.3776	−0.5992

Table V.

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The simulation results also illustrate that there is a huge potential for mainland Chinese cities to catch up. Take Shanghai for example, "what-if" simulation identifies the weakest 20 per cent indicators, or altogether 19 indicators, which include attitude towards non-local population, average number of fire accidents per 100,000 population and real GRDP growth rate as the three worst performing indicators. If Shanghai channels resources into and improve its performance on these 19 indicators to the average of 100 cities, Shanghai's ranking will rise from 31st to 10th.

On the contrary, the weakest 20 per cent indicators for Beijing show that the capital city faces different challenges. For instance, the three worst performing indicators for Beijing are satisfaction with housing conditions, proportion of days with air quality equal to or above grade II and housing affordability. At the same time, "what-if" simulation also reveals the potential of Beijing to become more liveable, with its ranking leapfrogging from 44th to 10th after the simulation.

5. Conclusions

The theme of liveability is indisputably relevant to China against the backdrop of the ongoing trend of rapid and extensive urbanisation observed in China. Through the construction of the GCLCI, this paper has attempted to provide a framework for Chinese policy makers to assess the liveability conditions of their cities. The GCLCI goes well beyond GDP growth and competitiveness to take into account service delivery, environment and quality of government. In many ways, GCLCI's concept of liveability is closely related to China's concept of "people's oriented urbanisation".

The results from the liveability ranking show that economic competitiveness is a necessary but insufficient condition to ensure that a city is liveable. For instance, the top-ranking cities such as Hong Kong, Macau, Weihai and Xiamen, while high on the list for the economic vibrancy and competitiveness, would not be so highly ranked if not for the high scores they attained for the other environments. In contrast, Shenzhen, Beijing and Guangzhou are all among the top 10 rankings for economic vibrancy and competitiveness, but their overall liveability rankings are not even among the top 30 because of their lagging performances in other environments.

The first-tier cities as hubs for talent and capital could ensure the sustainability of their status as first-tier cities in the long run by learning from their counterpart provinces, which have demonstrated a strong track record in the other environments. The simulation exercise not only reveals the potential of cities to make improvements in liveability but also provides constructive suggestions on how to improve liveability based on the 20 per cent weakest indicators identified during the process. As cities face constraints on financial and manpower resources, it is imperative that policy makers channel these resources into the most efficient use. For instance, Beijing ought to focus efforts particularly in the area of environmental friendliness and sustainability by tackling their pollution levels. In contrast, Shanghai needs to address socio-cultural conditions by looking into issues of inequality expressed by its residents. Guangzhou and Shenzhen ought to explore strengthening its domestic security and stability by checking on the controls in place for civil safety.

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Liveability essentially begs the question of balance. For human beings to enjoy work, life and play in any given location, the sole pursuit of economic gains by the upper echelons would mean a likely negligence of the other parts that collectively make up a holistic living. For China, this is becoming an increasingly relevant notion to address, as more and more of its cities move up the development ladder and face challenges that follow suit. Given the relative strengths and weaknesses of each Chinese city, an exercise to achieve greater liveability and balance can be aided and expedited by the collaboration and cross-learning of cities, perhaps through a system of sharing of best practices and enabling tools.

Notes

1. Examples of such indices include: Quality of Living Survey by Mercer; Global Liveability Index by Economist Intelligence Unit; Most Liveable Cities Index by Monocle Magazine; and Liveability Ranking of Chinese cities by Chinese Academy of Social Sciences.
2. In this study, around 15 per cent of the indicators use provincial level data as a proxy. These indicators are mostly clustered in environmental friendliness and sustainability as well as socio-cultural conditions.

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Appendix

1	*Practical indicators for economic vibrancy and competitiveness (24 indicators)*	
1.1	Economic performance	Units
1.1.01	Gross regional domestic product (GRDP) per capita	Yuan, current market prices
1.1.02	Real GRDP growth rate	%
1.1.03	Tertiary industry as percentage of GRDP	%
1.1.04	Inflation rate (Urban household consumer price index)	%
1.1.05	Investment in fixed assets as percentage of GRDP	%
1.1.06	Average annual wage of employed persons in urban units	Yuan, current market prices
1.1.07	Unemployment rate in urban area	%
1.1.08	Satisfaction with economic development (survey)	Rating
1.2	Economic openness	Units
1.2.01	Utilised foreign capital as percentage of GRDP	%
1.2.02	Total value of imports and exports as percentage of GRDP	%
1.2.03	Number of foreign tourists arrivals per capita	Person-times
1.2.04	Foreign exchange earnings from international tourism per capita	USD
1.2.05	Number of star-rated hotels per 10,000 population	Number
1.2.06	Hotel room occupancy rate	%
1.2.07	Foreign funded enterprises as percentage of total industrial enterprises above designated size	%
1.2.08	State-owned enterprises as percentage of total industrial enterprises above designated size	%
1.3	Infrastructure	Units
1.3.01	Persons per internet subscriber	Persons
1.3.02	Persons per mobile phone subscriber at year-end	Persons
1.3.03	Computers per 100 urban households	Number
1.3.04	Length of urban roads per capita	Metres
1.3.05	Highway passenger traffic per capita	Persons
1.3.06	Railway passenger traffic per capita	Persons
1.3.07	Waterway passenger traffic per capita	Persons
1.3.08	Civil aviation passenger traffic per capita	Persons
2	*Practical indicators for environmental friendliness and sustainability (13 indicators)*	
2.1	Pollution	Units
2.1.01	Proportion of days with air quality equal to or above Grade II in the whole year (air quality index smaller than 100)	%
2.1.02	Particulate matters 10 (PM10) concentration	Milligrams/Cubic metre
2.1.03	Sulphur dioxide concentration	Milligrams/Cubic metre
2.1.04	Nitrogen dioxide concentration	Milligrams/Cubic metre
2.1.05	Average noise value	dB(A)
2.1.06	Satisfaction with air quality (survey)	Rating
2.2	Depletion of natural resources	Units

(*continued*)

Table AI.
List of indicators in Greater China liveable cities index

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2.2.01	Energy consumption per 10,000 Yuan of GRDP	Metric tons of standard coal equivalent (TCE)
2.2.02	Satisfaction with quality of natural environment (survey)	Rating
2.3	Environmental initiatives	Units
2.3.01	Green coverage rate of built district	%
2.3.02	Domestic garbage harmless treatment rate	%
2.3.03	Waste water treatment rate	%
2.3.04	Area of nature reserves as percentage of the region	%
2.3.05	Government expenditure on environmental protection per capita	Yuan
3	*Practical indicators for domestic security and stability (8 indicators)*	
3.1	Crime rate	Units
3.1.01	Satisfaction with police services (survey)	Rating
3.1.02	Sense of safety (survey)	Rating
3.2	Threats to national stability	Units
3.2.01	Average number of fire accidents per 100,000 population	Number
3.2.02	Direct loss from fire accident per capita	Yuan
3.2.03	Number of death in traffic accident per 10,000 population	Persons
3.2.04	Direct loss from traffic accident per capita	Yuan
3.2.05	Direct loss from natural disaster per capita	Yuan
3.3	Civil unrest	Units
3.3.01	Society cohesion and harmony (survey)	Rating
4	*Practical indicators for socio-cultural conditions (40 indicators)*	
4.1	Medical and healthcare	Units
4.1.01	Life expectancy	Years
4.1.02	Government expenditure on medical and healthcare per capita	Yuan
4.1.03	Percentage of population covered by basic medical care insurance	%
4.1.04	Number of doctors (licensed doctors and assistant doctors) per 10,000 population	Persons
4.1.05	Number of beds in hospitals and health centres per 10,000 population	Number
4.1.06	Satisfaction with healthcare facilities (survey)	Rating
4.1.07	Rating on healthcare affordability (survey)	Rating
4.2	Education	Units
4.2.01	Illiteracy rate	%
4.2.02	Government expenditure on education (local government general budget expenditure) per capita	Yuan
4.2.03	Number of higher education institutions per 10,000 population	Number
4.2.04	Number of primary and secondary schools per 10,000 population	Number

Table AI. (*continued*)

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4.2.05	Teacher student ratio in primary schools	Ratio
4.2.06	Teacher student ratio in regular secondary schools	Ratio
4.2.07	Student enrolment in higher education institutions per 10,000 population	Number
4.2.08	Satisfaction with education conditions (survey)	Rating
4.2.09	Rating on education affordability (survey)	Rating
4.3	Housing, sanitation and transportation	Units
4.3.01	Living space per capita	Square metres
4.3.02	Income-to-housing price ratio	Ratio
4.3.03	Gas coverage rate	%
4.3.04	Water coverage rate	%
4.3.05	Number of public transportation vehicles per 10,000 population	Number
4.3.06	Number of taxis at year-end per 10,000 population	Number
4.3.07	Number of private vehicles per 10,000 population	Number
4.3.08	Number of wholesale and retail enterprises above designated size per 10,000 population	Number
4.3.09	Number of public toilets per 10,000 population	Number
4.3.10	Cleanliness of public toilet (survey)	Rating
4.3.11	Satisfaction with housing conditions (survey)	Rating
4.3.12	Rating on housing affordability (survey)	Rating
4.3.13	Satisfaction with transportation conditions (survey)	Rating
4.3.14	Rating on transportation affordability (survey)	Rating
4.3.15	Satisfaction with tap water quality (survey)	Rating
4.3.16	Rating on food safety (survey)	Rating
4.4	Income equality and demographic burden	Units
4.4.01	Population aged 65 and above as percentage of city population	%
4.4.02	Urban children and old-age dependency ratio	%
4.4.03	Urban household Engel's coefficient	%
4.4.04	Percentage of population covered by basic pension insurance	%
4.4.05	Percentage of population covered by unemployment insurance	%
4.4.06	Satisfaction with income disparity (survey)	Rating
4.5	Diversity and community cohesion	Units
4.5.01	Attitude towards non-local population (survey)	Rating
4.5.02	Tolerance towards different religions (survey)	Rating
5	*Practical indicators for political governance (11 indicators)*	
5.1	Policy making and implementation	Units
5.1.01	Local government general budget expenditure per capita	Yuan
5.1.02	Tax revenue as percentage of public budgetary revenue	%
5.1.03	Rating on government efficiency (survey)	Rating

(*continued*)

Table AI.

	5.1.04	Rating on regulatory quality of government (survey)	Rating
	5.2	Government system	Units
	5.2.01	Number of employed by government agencies per 10,000 population	Persons
	5.2.02	Ratio of civil servant wage to average wage	Ratio
	5.2.03	Rating on service-oriented government (survey)	Rating
	5.2.04	Rating on judicial system (survey)	Rating
	5.3	Transparency and accountability	Units
	5.3.01	Rating on transparency of government (survey)	Rating
	5.3.02	Public trust in government (survey)	Rating
	5.4	Corruption	Units
	5.4.01	Free from corruption of government (survey)	Rating

Table AI.

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