

PAPER • OPEN ACCESS

## Guilin Sustainable Development City Construction Countermeasure and Idea Design for SDGs in 2030

To cite this article: Yanjiao Zhang *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **310** 052005

View the [article online](#) for updates and enhancements.

# Guilin Sustainable Development City Construction Countermeasure and Idea Design for SDGs in 2030

Yanjiao Zhang <sup>a)</sup>, Chaofeng Shao and Yanmin Shi

College of Environmental Science and Engineering, Nankai University, Tianjin, 300050, PR China

<sup>a)</sup> Correspondence: Zhangyj199210@163.com

**Abstract.** The GDP-driven urban development has created serious resource and environmental issues, and how to achieve sustainable urban development has become the focus of the world. Based on the 17 SDGs identified in the “2030 Agenda for Sustainable Development”, the connotation and index system of sustainable cities are analyzed. Then, focusing on the new situation for constructing the National Sustainable Development Agenda Innovation Demonstration Zone in Guilin City, it identifies the key index of sustainable city in Guilin from three aspects, which are economy, society, and environment. And considering the scale of tourism and its support for the local economy, some popular tourist cities, like Tianjin, Guangzhou, Shanghai, and Hangzhou, are selected for comparative analysis to diagnose the bottleneck of sustainable city construction in Guilin. Finally, this paper proposes the Countermeasures and ideas for building sustainable city in Guilin with the theme of sustainable utilization of landscape for SDGs.

## 1. Introduction

The emergence of cities is an important symbol of the maturity of human civilization, and it means better materials and resource conditions, urbanization is an inevitable process of economic and social development. However, due to the rapid development of China's traditional urbanization, it has brought a series of negative effects on the development of cities while promoting the rapid growth of GDP and the coordinated development of urban and rural areas, such as energy consumption, shortage of resources, imperfect of infrastructure, traffic congestion and so on. Therefore, the implementation of sustainable development is the only way for urbanization in China [1].

Sustainable development was presented in the “Our Common Future” report, and the United Nations Conference on Environment and Development, held in 1992, was a breakthrough after that, and it encourages countries to work towards sustainable development. In 2015, the United Nations adopted the Global Sustainable Development Goals (SDGs) for 2016-2030 that contains 17 targets, 169 sub-goals and 232 indicators from economic, social and environmental aspects, which means that sustainable development will continue to guide the development of all countries in the next 15 years [2]. SDGs specifically cover poverty reduction, health, education, and environmental protection. Among them, SDG11 proposed that “Make cities inclusive, safe, resilient and sustainable” [3], which provides a comprehensive guiding target for the construction of sustainable cities in China.

China attaches great importance to the “2030 Agenda for Sustainable Development”. So the Development Plan of China's Innovation Demonstration Zone for the implementation of the 2030 Agenda for Sustainable Development proposes that local governments should be the main body of implementation, crack the key bottlenecks that restrict China's sustainable development, and create a



batch of replicable and promotable models of sustainable development facing the real needs of sustainable development [4]. Guilin, as a tourism city with rich natural resources, but relatively backward social and economic development in China, was approved by the State Council to build an innovation demonstration zone for national sustainable development agenda with the theme of sustainable use of landscape resources in 2018. Based on the actual needs of creating a national sustainable development innovation demonstration zone, this paper takes the SDGs system as reference, systematically analyzes the connotation and index system of sustainable development city, identifies and diagnoses the bottlenecks of sustainable development, and puts forward the ideas and countermeasures for the construction of sustainable city in Guilin.

## 2. Connotation and index system of sustainable city based on SDGs

Table 1. Connotation of urban sustainable development.

Aspects	Sources	Definitions of the Concept	SDGs [3]
Economic	WHO	Sustainable urban development should make the urban economy evolve towards more stable and innovative on the premise of minimum utilization of resources, build livable cities, and provide affordable education, housing and transportation for residents	Goal 9 .Industries, Innovation and Infrastructure
			Goal 11. Sustainable Cities and Communities
Society	UN-Human Settlements Programme	Sustainable development of human settlements covers economic, social and environmental; respectful of human rights, transparent, representative and accountable, and effective participation of the public are essential for realizing sustainable development	Goal 6.Clean Water and Sanitation
			Goal 4. Quality Education
			Goal 8. Decent Work and Economic Growth
Resources and Environment	Herman E. Daly	Put forward three minimum requirements: the speed of renewable resources used by the society should not exceed the speed of renewable resources renewal; the speed of the use of non-renewable resources shall not exceed the speed of their substitutes or sustainable renewable resources; the speed at which pollutants are discharged by society shall not exceed the absorption capacity of the environment to absorb pollutants[5]	Goal 7. Affordable and, Clean Energy
			Goal 12.Responsible Consumption and Production

At present, there is no highly recognized concept for sustainable development. But the widely accepted concept is: Sustainable development is development that meets the needs of the present without compromising the ability to meet the needs of future generations. As an extended concept of sustainable development, sustainable urban development involves many aspects such as economy, society, resources and environment. In line with the 17 SDGs, different government agencies, social and environmental activists abstracted multiple connotations of sustainable urban development from the above three aspects. Table 1 lists the connotations of sustainable urban development align with SDGs in different aspects.

By establishing a comprehensive index system to evaluate the sustainable development of a city, it can comprehensively reflect the development level and coordination degree of the natural, economic and social subsystems of a city [6]. So this text combined with the 17 Goals and the existing practices and research results [7], we fully consider the targets and needs of sustainable urban development in the future, form an index system [8] of sustainable city which consisting of 49 indicators in Table 2, and determine the core indicators for achieving sustainable urban development based on the characteristics of different types of cities.

Table 2. Index system of sustainable urban development.

System layers	Index layers	Types		SDGs [3]
		City types	Core indicators	
Economic indicators	GDP growth rate, Per capita GDP, Proportion of three industries, Growth rate of added value of agriculture, Energy consumption per unit of	Resource-based city	GDP growth rate, Per capita GDP, Proportion of three industries, Per capita disposable income	Goal 2, Goal 9, Goal 11, Goal 12

	industrial added value, Energy consumption per unit of GDP, Per capita disposable income, Growth rate of industrial added value, Proportion of industrial structure, Comprehensive communication capacity, Transportation capacity, The proportion of tertiary industry in GDP, Inbound tourism income	Tourism city	GDP growth rate, Per capita GDP, Proportion of three industries, Energy consumption per unit of industrial added value, Energy consumption per unit of GDP, Per capita disposable income, Transportation capacity, Inbound tourism income	
		Resource-exhausted city	Per capita GDP, Proportion of three industries, The proportion of tertiary industry in GDP	
Social indicators	Engel's coefficient, Gini coefficient, The urban and rural income ratio, Enrollment rate of school-age children, Poverty rate, Birth rate, The urban population proportion, Average life expectancy, The proportion of consumer spending, The average level of education, The ratio of education spending in GDP, The number of college students per million population, The proportion of cultural expenditure in total consumption, Number of doctors per thousand population, Number of hospital beds per thousand population, The proportion of urban structure, The per capita housing area, The number of financial insurance institutions, Visitor arrivals	Resource-based city	Engel's coefficient, Gini coefficient, The proportion of consumer spending, The ratio of education spending in GDP, Number of doctors per thousand population, The per capita housing area	Goal 3, Goal 4, Goal 8, Goal 11
		Tourism city	Engel's coefficient, Gini coefficient, The urban and rural income ratio, Enrollment rate of school-age children, Poverty rate, The proportion of cultural expenditure in total consumption, Number of doctors per thousand population, The per capita housing area, Visitor arrivals	
		Resource-exhausted city	Engel coefficient, Gini coefficient, Poverty rate, The urban population proportion, The proportion of consumer spending, The average level of education, The per capita housing area	
Resource and environmental indicators	Emissions per unit of GDP of PM <sub>2.5</sub> , PM <sub>10</sub> , CO <sub>2</sub> , SO <sub>2</sub> , Suspended particle density, The proportion of environmental investment in GNP, Emission intensity of major pollutants (Four total amount control indicators*), Water qualification rate of drinking water, Consumption of urban water resources, Consumption of land resources, Harmless disposal rate of garbage, Urban green coverage rate, Land utilization rate, Per capita cultivated land area, Forest coverage rate, Per capita energy reserves, Per capita hold of energy, Per capita energy consumption, Energy utilization rate, Energy consumption per unit of GDP	Resource-based city	Per capita energy reserves, Per capita hold of energy, Per capita energy consumption, Energy utilization rate	Goal 6, Goal 7, Goal 11, Goal 13, Goal 15
		Tourism city	Emissions per unit of GDP of PM <sub>2.5</sub> , PM <sub>10</sub> , CO <sub>2</sub> , SO <sub>2</sub> , The proportion of environmental investment in GNP, Emission intensity of major pollutants (Four total amount control indicators*), Consumption of land resources, Urban green coverage rate, Per capita cultivated land area, Forest coverage rate, Energy consumption per unit of GDP	
		Resource-exhausted city	Emissions per unit of GDP of PM <sub>2.5</sub> , PM <sub>10</sub> , CO <sub>2</sub> , SO <sub>2</sub> , Urban green coverage rate, Per capita cultivated land area, Forest coverage rate, Per capita energy reserves, Per capita hold of energy, Energy utilization rate	

Note: Four total amount control indicators\*: COD、NH<sub>3</sub>-N、SO<sub>2</sub>、NO<sub>x</sub>

### 3. Objective and problem diagnosis of sustainable urban development in Guilin

Guilin is located at the center of Guangxi, Guangdong, Hunan, and Guizhou provinces. As an important node connecting South China and Central China, the West and the East, and the inland and coastal areas, Guilin is an important hub radiating from the coast of Guangxi to Association of South-East Asian Nations, and an important gateway to connect the “One Belt One Road”.

#### 3.1. Establishment of Guilin Sustainable Development Index System Based on SDGs

Combining the actual needs of the Guilin innovation demonstration zone for sustainable development and the connotation and index of sustainable cities, considering the resource endowment conditions, the index system of sustainable urban development in Guilin is divided into three major aspects: economic, social, and environmental index. In view of the development status and characteristics of

Guilin city as an undeveloped tourism city in the west of China, a core index system suitable for evaluating the sustainable development of Guilin is constructed, as showed in Table 3 below.

Table 3. Evaluation index system of Guilin city

Target Layers	System Layers	Index Layers	SDGs[3]
The Level of Sustainable Development Urban	Economic Index	Per capita GDP	Goal 9, Goal 11, Goal 12
		GDP growth rate	
		Energy consumption per unit of industrial added value	
		Energy consumption per unit of GDP	
		Proportion of three industries	
		Transportation capacity	
		Per capita disposable income	
		Inbound tourism income	
	Social Index	The per capita housing area	Goal 3, Goal 8, Goal 11
		Poverty rate	
		Enrollment rate of school-age children	
		Engel's coefficient	
		Gini coefficient	
		The urban and rural income ratio	
		Visitor arrivals	
		The proportion of cultural expenditure in total consumption	
		Number of doctors per thousand population	
	Environmental Index	Energy consumption per unit GDP	Goal 6, Goal 7 Goal 15
		Emission intensity of major pollutants (Four total pollutant control indicators <sup>*</sup> )	
		The proportion of environmental investment in GNP	
		Urban green coverage rate	
		Forest coverage rate	
		Per capita cultivated land area	

Note: Four total pollutant control indicators<sup>\*</sup>: COD、NH<sub>3</sub>-N、SO<sub>2</sub>、NO<sub>x</sub>

### 3.2. Bottlenecks in the construction of sustainable urban development in Guilin city

As a major tourist city in the underdeveloped areas of western China, Guilin has a certain gap with the other tourism-oriented cities in terms of tourism, economic development, and people's living standards. Therefore, Tianjin, Shanghai, Guangzhou, Hangzhou are selected according to the ranking of hot tourist cities in China released by China's tourism administration in 2018. In combination with some core index for the construction of sustainable cities in Guilin selected above, a comparative analysis is conducted between these cities and Guilin. The results are shown in the figures below.

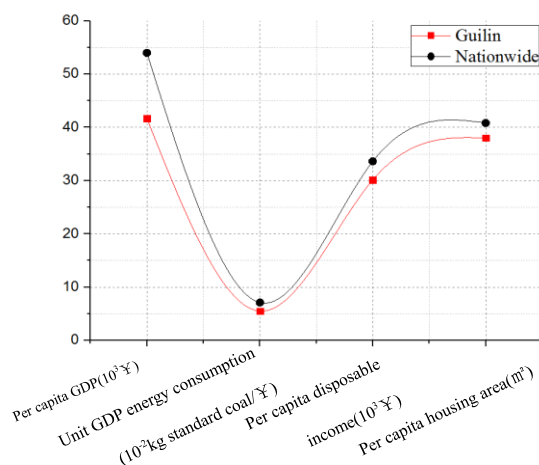


Figure 1. A comparative analysis chart of Guilin City and the national indicators in 2017.

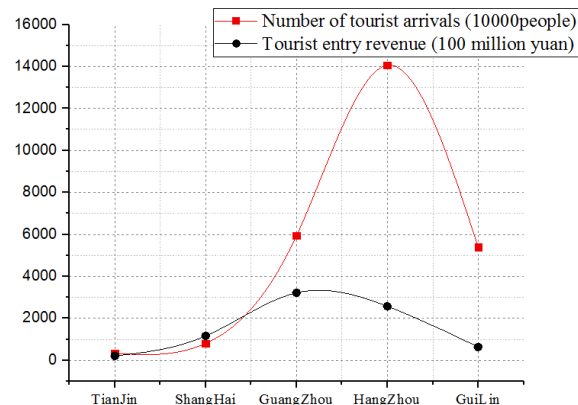


Figure 2. Comparison of the number of arrivals and immigration income between Guilin and cities in 2017.

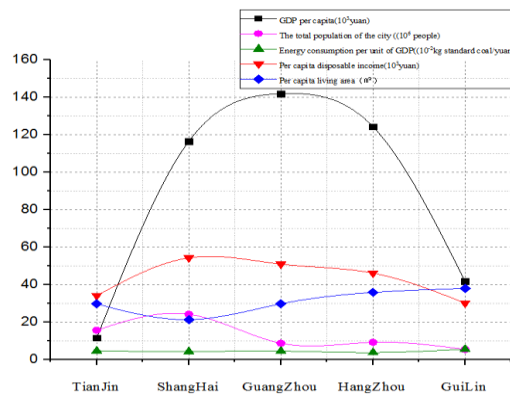


Figure 3. Comparison analysis of indicators between Guilin and cities in 2017.

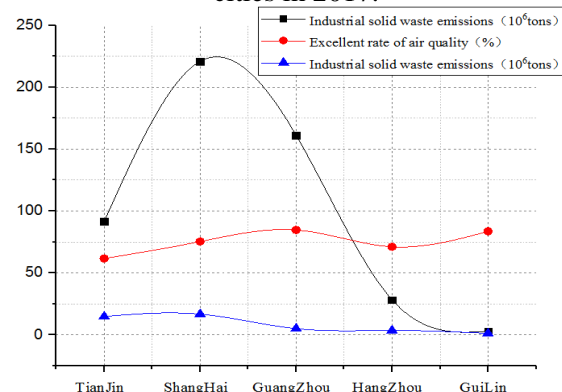


Figure 4. Comparative analysis of environmental indicators in Guilin and cities in 2017.

Data source: City statistical yearbook in 2018 and the bulletin of environmental quality in 2017.

According to Fig 1 and Fig 3, in 2017, all index in Guilin are lower than the average level of our country and other cities, while the energy consumption per unit GDP was relatively high. Fig 2 shows that there is no positive correlation between the number of inbound tourists and inbound tourism income. The number of inbound tourists in Guilin and Guangzhou are similar, but there is a five-fold difference in income. The number of tourists in Guilin is about 6 times that of Shanghai, but the income is nearly twice that of Guilin. As can be seen from Fig 4, the environmental quality in Guilin is relatively good.

“Landscape in Guilin” is the wealth endowed by nature of Guilin and the whole country. From the comparison analysis of Guilin and other tourism-type cities, the tourism resources of Guilin have not driven the economic development, social progress. Combined with the development status, Guilin city is faced with bottlenecks such as insufficient landscape resource conservation capacity, insufficient innovation capacity of ecological industry and lagging economic development, which restrict the construction of sustainable urban development with the theme of sustainable landscape utilization.

#### 4. Ideas and countermeasures for the sustainable urban development in Guilin

##### 4.1. The basic ideas of the construction of sustainable urban development in Guilin

Focusing on the bottleneck of Guilin's sustainable urban construction, adhering to the basic principles put forward in the "China's Innovative Demonstration Zone Construction Plan for Implementing the Agenda for Sustainable Development 2030", setting the overall objective and establishing effective safeguard measures to accomplish the main tasks, we should improve Guilin's ecological environment, accelerate economic development and realize the ecological environment and green industry. The coordinated development will transform Guilin's "Lucid waters and lush mountains into invaluable assets", and promote Guilin's construction of "inclusive, safe, disaster-resistant and sustainable cities and human settlements" suitable for the local area [3]. Figure 5 lists the basic ideas of Guilin's sustainable development city construction with the theme of sustainable utilization of landscape resources.

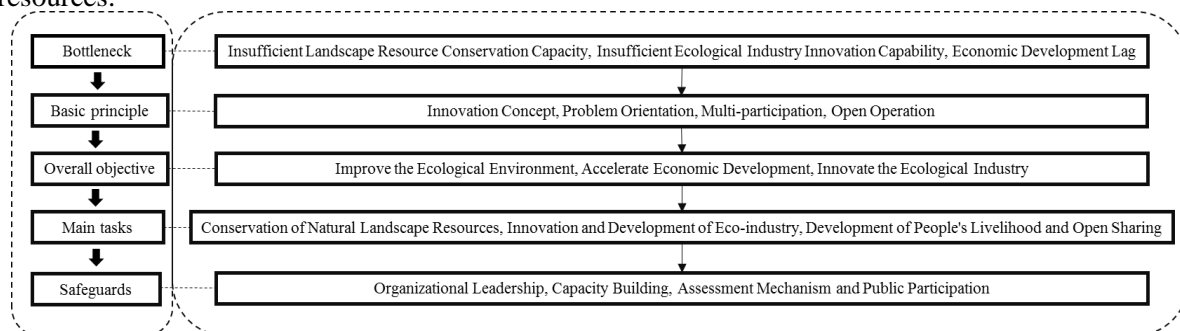


Figure 5. Ideas of the construction of sustainable urban development in Guilin city.

#### 4.2. Countermeasures for the Sustainable Urban Development in Guilin

In combination with the development characteristics of Guilin City and the basic ideas of sustainable urban construction, Guilin will be built into a "Make cities inclusive, safe, resilient and sustainable" [3]. Specific organizational countermeasures are shown in the table 4.

Table 4. Countermeasures for sustainable urban development in Guilin city.

Bottleneck Problems	Countermeasures
The task of landscape resources conservation is arduous	Perfect the infrastructure of regional waters; accelerate the construction of urban infrastructure; strictly control the development intensity to protect urban green ecological space in Guilin.
Lag of economic development	Promote the development of urban and rural public rental housing and improve the housing security system to ensure that everyone gets the proper, safe and affordable housing; promote the construction of sustainable urban transportation system, improve the utilization rate of public transportation, reduce traffic pollution; improve the protection level of intangible cultural heritage to meet the public's demand for diversified cultural life.
The inadequacy of innovation ability of ecological industry	Build regional characteristic scenic spots; integrate urban and rural tourism, realize the transformation of scenic spots tourism to the whole region; link eco-tourism and eco-agriculture to promote the transformation and upgrading of eco-tourism channels; strengthen the construction of agricultural infrastructure, and promote agricultural economic growth.

Guilin should open up and share with the rest of the world, actively explore the development mode that can be applied to the sustainable development of Guilin city construction.

## 5. Conclusion

Facing the 2030 SDGs, the construction of sustainable urban development in Guilin is in line with the needs of the development of the times.

(1) The rapid development of urbanization in China not only brings convenience to people's life, but also brings negative impacts on the environment. In order to find a way of harmonious coexistence between people and the environment, the United Nations has proposed Goal 11 in the 2030 Agenda

for Sustainable Development, which provides a pivot for the coexistence and balance between human society and the environment.

(2) Facing the three aspects that guide the direction of sustainable development city construction in China in the 2030 agenda for sustainable development: economy, society and environment, and defines the connotation and index system of sustainable development city in China.

(3) According to the sustainable urban construction index system, we screen out the core index, compare it with several popular tourism cities in China to diagnose the bottleneck of sustainable urban construction with the theme of sustainable use of landscape in Guilin. By focusing on restricting bottleneck problems and connecting SDGs, the ideas and countermeasures for the construction of sustainable urban development were further determined for Guilin.

### Acknowledgement

This study was supported by Tianjin Science and Technology Development Strategic Research Plan (Key Tendering Projects) (NO.17ZLZDZF00220).

### References

- [1] Jansson, J. (2013) Reaching for a sustainable, resilient urban future using the lens of ecosystem services. *Ecological Economics*, 86, pp 285-291.
- [2] Lu Y L, Wang Y C, Yuan J J, et al. J. (2018) Some thoughts on promoting the implementation of sustainable development goals in China. *China population, resources and environment*, 28(1), pp 1-9.
- [3] The General Assembly.R.(2015).Transforming our world: the 2030 agenda for sustainable development.
- [4] The State Council. R. (2016) China implements the 2030 Sustainable Development Agenda Innovation Demonstration Zone Construction Plan.
- [5] Huang L, Wu J, Yan L. J. (2015)Defining and measuring urban sustainability: A review of indicators. *Landscape Ecology*, 30(7), pp 17-19.
- [6] Amy J. Lynch. (2011) Sustainable urban development indicators for the United States.
- [7] Dizdaroglu, D. J. (2017) The Role of Indicator-Based Sustainability Assessment in Policy and the Decision-Making Process: A Review and Outlook. *Sustainability*, 9(6), pp 10-18.
- [8] Braulio-Gonzalo, M., Bovea, M. D. Ruá, M. J. J. (2015) Sustainability on the urban scale: Proposal of a structure of indicators for the Spanish context. *Environmental Impact Assessment Review*, 53, pp 16-30.