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# Dynamic Study on Urban Development and Ecological Efficiency in Northern Xinjiang

## -Take urumqi, hami and turpan for Example

Yu Hao

Shaanxi normal university

Xi' an, shaanxi, China 710062

1450428098@qq.com

***Abstract*—Based on the area of northern xinjiang urumqi, hami and turpan city of the relationship between the ecological efficiency of economic development and environmental analysis, for the development of the region ecological environment resource consumption and usage, to explore the influence of the main causes of regional ecological changes, through to the three urban development and analyzes the different influence factors of ecological footprint, and used the 2010-2015 urban development index and ecological footprint calculation, analysis of three cities in the urban development index, the condition of interannual variability of the ecological footprint and ecological efficiency and their interactions between close contact.**

***Keywords—Urban development index; Ecological footprint; Ecological efficiency; Resource efficiency; Environmental efficiency***

## I. INTRODUCTION

The northern xinjiang region refers to the area north of tianshan, xinjiang. With the development of xinjiang, the problems of ecological environment destruction and ecological overload are also revealed. Compared with other economic belts, the economic belt of the "tianshan north slope economic belt" has a weak economic drive, low ecological efficiency, and challenges to the sustainable development of the northern xinjiang region based on natural resources. This paper choose the north is located in the "" in the Northern Slope economic zone development good three cities, urumqi, hami and turpan as the research object, analyzes the three changes in urban development and the ecological efficiency of the city. The paper introduces City Development Index (CDI) as the evaluation Index system of urban sustainable Development. Using the Ecological Footprint (Ecological Footprint, EF) to calculate the consumption of social development on the Ecological environment and occupy, this method can measure required by the activities of population in the area of resources and absorb wastes arising from the activities need the biological productive land area. The combination of the two can evaluate the sustainable development of urban social economy [1]. This article through to the urban development and three cities in 2010-2015 urban development index (CDI) and the calculation of ecological footprint (EF), analysis of three cities CDI, EF and ecological efficiency of interannual change trend and influence each other relations.

## II. THEORETICAL BASIS

### *A. Urban development index*

According to the UN - Habitat CDI index system, combining xinjiang autonomous region statistical caliber, set up index system of city development index (CDI) is composed of five dimensions, including infrastructure, waste management, health, education and city level output five indicators, each dimension accounted for 20% of urban development index, agv is: [0-100] (as shown in table 1) [2]. CDI can reflect the status of the regional urban social and economic development, among them, the city GDP directly reflect the city's economic level, health, education, directly reflect the regional level of public service, infrastructure facilities, waste disposal and urban value directly reflects the urban basic management level.

TABLE I CDI INDICATIONS

| | United Nations CDI index system | CDI index system |
|---|---|---|
| Level indicators | The secondary indicators | The secondary indicators |
| Infrastructure | Water connections | Urban water penetration rate |
| | Sewerage | Sewage pipe network coverage |
| | Electricity | Urban gas coverage |
| | Telephone | Mobile phone penetration |
| Waste disposal | Wastewater treated | Sewage rate |
| | Formal solid waste disposal | Comprehensive utilization of industrial solid waste |
| Health | Life expectancy | Life expectancy |
| | Child mortality | Under-5 mortality rate. |
| Education | Literacy | Non-illiteracy rate for people over 15 |
| | Combined enrolment | Comprehensive admission rate |
| City output | City product | GDP per capita |

The urban development index (CDI) is calculated as shown in table 2:

TABLE II CDI CALCULATION FORMULA

| Index | Formula |
|---|---|
| Infrastructure | Urban water penetration rate * 25+ sewage pipe network coverage * 25+ urban gas coverage * 25+ mobile phone penetration rate * 25 |
| Waste disposal | Sewage treatment rate * 50+ solid waste disposal rate * 50 |
| Health | (population average life expectancy -25) x 50/60+ (child mortality under 32-5 years old) * 50/31.92 |
| Education | Literacy rate * 25+ comprehensive enrollment rate * 25 |
| Education | (log (per capita gross product) -4.61) x 100/5.99. |
| City output | (infrastructure + waste disposal + health + education + urban output) /5. |

*B. Ecological footprint*

Also known as the "ecological footprint" ecological footprint ", is a kind of measure, is under the condition of existing technology, production of a certain population unit production and living consumption of resources and absorb the corresponding waste (a person, a city, a country or a mankind) required by the biological productive land (in productive land) and water area, is a quantitative reflection method of human demand on ecosystems and natural resources.

EF is composed of ecological footprint of biological resource consumption and ecological footprint of energy consumption [3]. The calculation formula is as follows:

The calculation formula of ecological footprint of biological resources is: $\mathrm{EF} = \sum \mathrm{EF}_n = \sum(\mathrm{r}_n \times C_n/P_n)$

In the formula, n is the category of consumer goods and input, $Pi$ is the average productivity of n kinds of consumer goods, $C_n$ is the average consumption of n kinds of goods, and $\mathrm{r}_n$ is the equilibrium factor, and $\mathrm{EF}_n$ is the EF of the n-class consumer goods.

Energy resource calculation formula of the ecological footprint is to account of the energy resources of crude oil, raw coal, natural gas, electricity and other resources, the heat released by burning the average calorific value according to the fossil energy, convert fossil energy productive land area.

$$A_m = C_m \times K_m / AE_m$$

In the formula, $A_m$ is the EF of the m energy; M for energy; $C_m$ is the consumption of the m energy; $K_m$ is the conversion coefficient of the m energy; $AE_m$ is the average calorific value of the fossil energy land area of the global unit.

### C. *Ecological efficiency*

The eco-efficiency model defined by the organization for economic cooperation and development is:

$$E = S / I$$

Among them, is ecological efficiency, is the product service value, is the ecological occupation. The value of product service can be expressed in terms of urban output value and basic public service level. Ecological footprint can be represented by resource consumption and waste discharge. Ecological footprint includes resource and environmental footprint, ecological efficiency includes resource efficiency and environmental efficiency. Resource efficiency represents the ratio between product service value and resource occupancy, and environmental efficiency represents the ratio of product service value to environmental occupation.

For unified dimension to facilitate comparison, according to the formula and take up the measure of CDI and resource environment selection, calculation formula of CDI and per capita EF adopt multiples to measure benchmark year, urban ecological efficiency in the available the following formula[4]:

$$CE = \lambda(CDI) / \lambda(EF)$$

$$CR = \lambda(CDI) / \lambda(EFr)$$

$$CP = \lambda(CDI) / \lambda(EFp)$$

In the formula, CE is ecological efficiency, CR is resource efficiency, CP is environmental efficiency; λ( CDI) is the change multiple of regional CDI compared with the base year; λ( EF ) is The change of the ratio of the per capita EF to the base year; λ( EFr) is the change multiple of the per capita resource EF compared with the base year; λ( EFp) is a multiple of the per capita pollution EF compared with the base year.

## III. RESEARCH OBJECTS AND DATA

### A. *Research object*

Xinjiang uygur autonomous region, China's western development main position. The article selected the three cities of northern xinjiang, urumqi, hami and turpan.

### B. *Data source and arrangement*

Index of CDI, in terms of infrastructure, the sewage pipe network coverage in each city, xinjiang uygur autonomous region statistical yearbook and statistical gazette is not found in the related data and there is no alternative indicators, unified data related to 0; The "household electricity rate" has not been found in the statistical yearbook and statistical bulletin of various cities, xinjiang uygur autonomous region and statistical gazette, and it is replaced by "urban gas penetration rate". Mobile penetration rates are calculated by the number of mobile phone households/resident population. In health, because "life expectancy" census 10 years, in the local cities could not find the related data, adopt the xinjiang uygur autonomous region in 2010 census, the population life expectancy to replace; The "under-five mortality rate" did not find the relevant data, all of which used national data as an example. In terms of education, the "comprehensive enrollment rate" is calculated by (primary school enrollment rate + middle school enrollment rate) 1/2. "Urban production value" is converted into us dollar by "GDP per capita", the average exchange rate between 2010 and 2014 [4].

## IV. ANALYSIS OF DATA CALCULATION RESULTS.

### A. *Analysis of urban development index.*

According to the calculation, the city development index (as shown in table 1) is obtained from 2010 to 2015. In comparison with 2010, urumqi, turpan and hami increased by 15.41%, 15.71% and 4.24% respectively in 2015. Compared with the data of the three cities in the same year, the CDI of urumqi was the highest in 2010 and 2015, and the CDI of each city was different, and the fluctuation was relatively large. The growth of CDI in urumqi and turpan area is relatively fast.

TABLE III CDI OF THE THREE REGIONS FROM 2010 TO 2015

| | | | | | | |
|---|---|---|---|---|---|---|
| urumqi | 51.73 | 54.97 | 59.03 | 59.33 | 60.17 | 59.71 |
| turpan | 48.05 | 51.96 | 56.16 | 53.47 | 52.78 | 55.60 |
| hami | 48.55 | 49.61 | 49.10 | 52.12 | 49.66 | 50.61 |

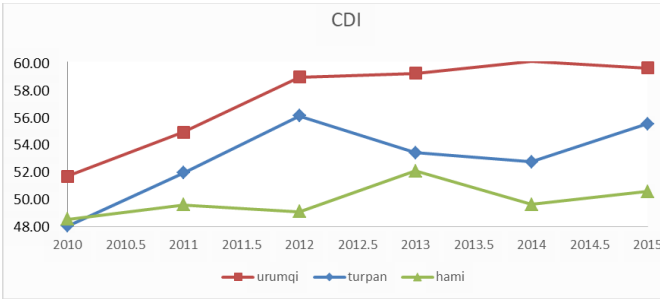


Fig. 1 Change of CDI in the three cities from 2010 to 2015.

### B. *Efficiency analysis*

With 2010 as the base year, the resources, environment and ecological efficiency multiples of the cities from 2010 to 2015 are calculated (as shown in table 2):

TABLE IV TABLE 2 THE EFFICIENCY MULTIPLE OF THE THREE CITIES FROM 2010 TO 2015

| City | Category | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|
| | CR | 0.32 | 0.38 | 0.32 | 0.31 | 0.29 | 0.28 |
| urumqi | CP | 7.48 | 8.16 | 7.88 | 7.30 | 7.47 | 7.13 |
| | CE | 1.00 | 0.96 | 1.06 | 1.17 | 1.15 | 1.23 |
| | CR | 1.09 | 1.11 | 1.10 | 1.09 | 1.13 | 1.14 |
| turpan | CP | 5.71 | 6.88 | 7.74 | 8.42 | 7.38 | 6.78 |
| | CE | 1.00 | 0.87 | 0.92 | 0.79 | 0.89 | 1.01 |
| | CR | 1.18 | 1.22 | 1.31 | 1.21 | 1.52 | 1.95 |
| hami | CP | 4.31 | 4.98 | 5.78 | 8.30 | 7.74 | 6.15 |
| | CE | 1.00 | 0.79 | 0.77 | 0.64 | 0.61 | 0.68 |

The three efficiency analyses are as follows:

Resource efficiency: from biological resources and fossil energy and resource efficiency evaluation on the three aspects of construction land, the figure 2 shows that in 2010-2010, the three cities and resource efficiency generally presents the rising trend, among them, the hami area from 2010 to 2015 a more obvious increase in the efficiency of resource, hami region rose sharply in 2013-2013. The resource efficiency of the city in turpan has leveled off.

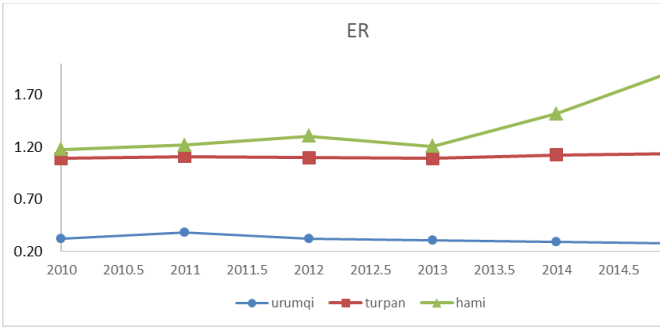


Fig. 2 Change of resource efficiency in the three cities from 2010 to 2015.

Environmental efficiency: as can be seen from figure 3, the environmental efficiency of hami is the lowest, and the environmental efficiency of hami area is relatively large in 2010-2015. The hami region experienced a significant upward trend in 2012-2013, and there was a significant decline in 2013-2015. The turpan region is similar to the hami region, and the environmental efficiency reached its peak in 2013, and it also showed a decline in 2013-2015. The environmental efficiency of urumqi has been slowly rising and falling slowly in the middle of 2010-2015.

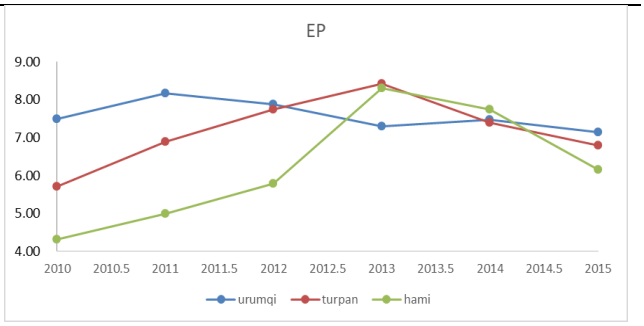


Fig. 3 Environmental efficiency changes in the three cities from 2010 to 2015.

Ecological efficiency: according to figure 4, in general, there is a slight upward trend in comparison with 2015 and 2010. Overall, as the growth of the economy, the improvement of economic indicators, in economic growth at the same time, reasonable control energy, that improves the energy efficiency, optimize energy structure, gradually get rid of the extensive mode of development. Overall, the three cities and the development of social economy of resources consumption growing, constantly improve the ecological environment pressure, three towns of resource and environment load growth is greater than that of social and economic growth.

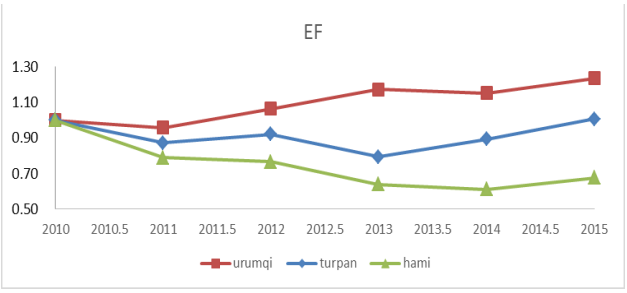


Fig. 4 Ecological efficiency changes in the three cities from 2010 to 2015.

## V. RESEARCH CONCLUSIONS AND POLICY RECOMMENDATIONS.

### *A. Research conclusions*

(1) the various cities and urban development index starting point is different, its development speed varies, from the overall perspective, presents the twists and turns upward trend, but the three urban development speed is not the same, for the three cities, keep the stable economic development in the general trend for the better, the configuration and perfect, continue to strengthen infrastructure, improve the level of education, the response country new urbanization construction.

(2) the three areas of the per capita ecological footprint change main show is given priority to with diversity and imbalance, the characteristics of the overall growth of the difference between three areas is not big, but from a global perspective, showing a rising trend.

### *B. Policy recommendations*

*1) Encourage the development of a low-carbon economy.*

Arguments on the basis of investigation and make nine cities expected future low carbon industry development roadmap, proposed the key development areas and promotion of technology, to various cities and key industry enterprise of low carbon economy practice provides basis and guidance.

The development of low-carbon industry requires the innovation of policy system. First of all, the intensive development of non-ferrous industry. We will support private enterprises to strengthen strategic cooperation with large groups, establish the spot and futures trading center of products, and gradually realize unified planning and supervision. Secondly, we should give full play to the guiding role of the government, guide enterprises to introduce new technologies, new equipment and new technologies, and carry out technological transformation of energy conservation and emission reduction. In addition, for some enterprises with large consumption of resources, serious pollution and poor technology, they should be ordered to stop the reform.

*2) Deepen opening-up and improve the investment and financing environment.*

We will actively attract foreign investment and promote cooperation between China and foreign countries. We should actively guide and increase the way of foreign investment and expand the channels of foreign investment through mergers and acquisitions and equity participation. Government to give foreign investment policy support, will be able to offer foreign leasing way, such as workshop, equipment, land, or, to increase foreign investment, including property in money and property in technology, etc. While attracting foreign investment, we should pay attention to developing the private economy. The private economy is now an important economic force in China, allowing private capital to invest, which can be invested in a joint venture, sole proprietorship, equity participation, etc. Governments at all levels should gradually improve their investment and financing policies, and improve the investment environment with fair, notarial and open standards. We will gradually lower the investment threshold and absorb more capital for urban transformation.

*3) Transform government functions and strengthen the introduction and cultivation of talents.*

With the support of the party and the national policies, we will formulate feasible policies, provide policy support and improve the policy environment in line with the transformation of the local economy, industry and people's livelihood services. Second, build a soft environment. Including service environment, legal environment and so on. All departments of the government should actively respond to the call of policy, actively deal with the related issues of transformation, and set up an efficient and standardized service system to provide important guarantee for economic development. Third, we should strengthen cooperation between government and enterprises, improve the use of resources and establish a circular economy.

To develop education, we should enhance education level and enhance the overall level of culture. On the other hand, we should set up training institutions in the professional field. Secondly, the government and enterprises should pay attention to the introduction of talents, introduce the conditions of talents, and attract talents and retain talents with favorable economic treatment, welfare and perfect promotion mechanism. Thirdly, while introducing and cultivating talents, we should pay attention to scientific and technological innovation, promote the improvement of resource utilization through scientific and technological innovation means, prolong the industrial chain and increase the effective efficiency.

## VI. CONCLUSION

Based on three different influence factors of urban development and the ecological footprint analysis, and used the 2010-2015 urban development index and ecological footprint calculation, analysis of three cities in the urban development index, the interannual variability of the ecological footprint and ecological efficiency and the interaction between them. The results show that the ecological efficiency of the three cities has increased and the environmental efficiency has not changed much. Second, resource efficiency is the main reason for the change of ecological efficiency, which is basically in line with the change of ecological efficiency. Third, the main reason for the decline in resource efficiency is the expansion of the building area and the constant consumption of fossil energy. Fourthly, the continuous development of urban social economy, resulting in resources and occupation, makes the ecological environment pressure increase continuously, and the development of sustainable economy and development of environmental protection tourism become the focal point of the region.

## REFERENCES

[1] WBCSD. Eco-efficient Leadership for Improved Economic and Environmental Performance[M].Geneva:WBCSD,1996.3-16.

[2] Grossman G M, Krueger A B . Economic Growth and Environment[J]. The Quarterly Journal of Economics , 1995,110:353-378.

[3] Cheng jinhua, sun qiong, guo mingjing, xu wenyun. Regional differences and dynamic evolution of ecological efficiency in China [J]. China's population, resources and environment, 2014,24 (1) : 47-54. (In Chinese)

[4] Yang yi, xu delong, zhang jinggan. Research on regional development and ecological efficiency of the southern foot of shaanxi qinling [J]. Journal of environmental science,2016-11-21[EB/OL]. (In Chinese)

[5] Luo yingsheng, li jiajia, luo fuzheng. An empirical study on the relationship between China's urbanization process and regional ecological efficiency [J] China's population, resources and environment, 2013,23 (11) : 53-60. (In Chinese)

[6] Shi huichun and wang lu lu. Comprehensive evaluation of ecological stress and ecological efficiency of China's provincial-based ecological footprint method [J]. System engineering.2016,8 (1) :44-45.(In Chinese)