

# The Variety and Analysis of Ecological Footprint in Recent Years in ChongQing



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# Chongqing in severe drought





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# **1. *Introduction***

**What is “Ecological Footprint ” ?**

**Ecological footprint is a method for measuring sustainable development.**

**It is a measurement of the land area required to sustain a population of any size.**

**It was proposed and developed by William and Wackernagel in 1992.**



# Some concepts about Ecological Footprint

## *I. Bioproductive Areas*

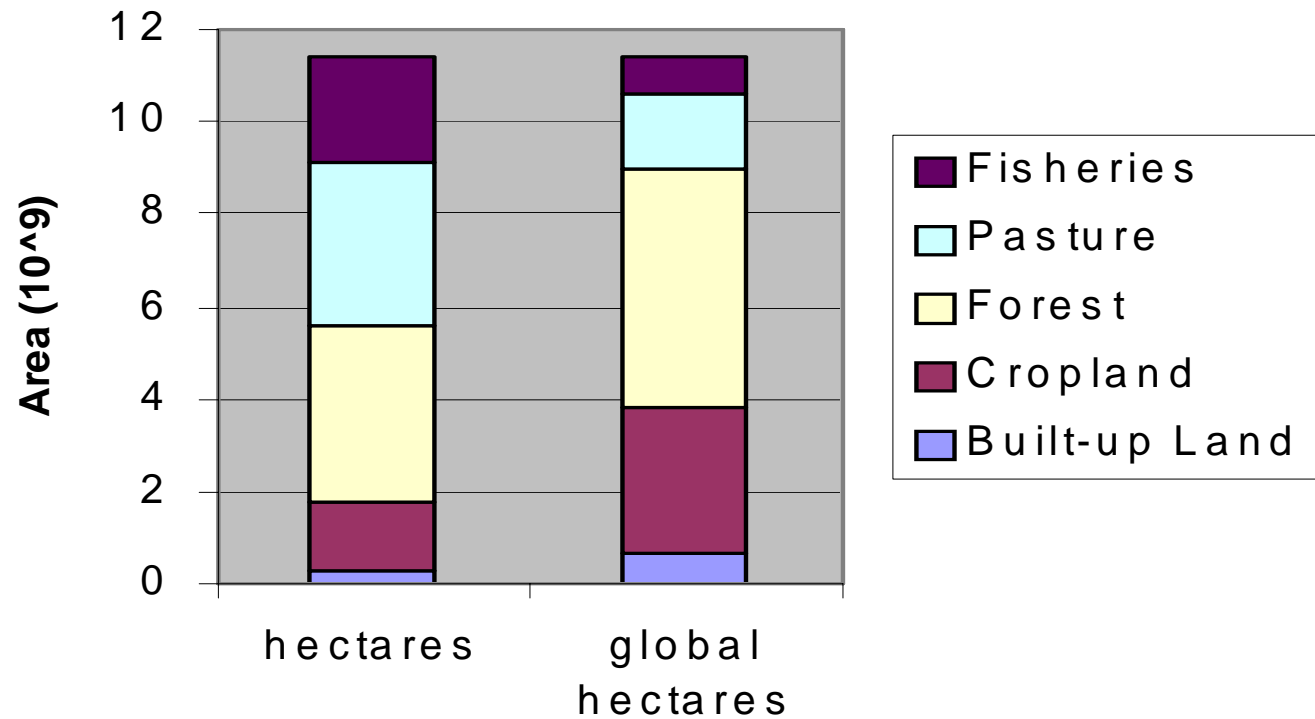
- **Globally we identify 11.2 billion hectares of distinct bioproductive areas—cropland, forest, pasture, fisheries, and built-up land—that provide economically useful concentrations of renewable resources.**

# Some concepts about Ecological Footprint

## *II. The Common Unit: Global Hectare*

- **Ecological Footprint accounts express the use of built-up areas, and the consumption of energy and renewable resources in standardized units of biologically productive area, termed global hectares (gha).**

## Global Bioproductive Areas



■ *Fig. 1. Quantity of global hectares and actual hectares*



# Some concepts about Ecological Footprint

## *III. Equivalence Factors*

- **Equivalence factors represent the world's average potential productivity of a given bioproductive area relative to the world average potential productivity of all bioproductive areas.**
- **The equivalence factors of Chongqing are listed in Table 1.**



■ **Table 1: Equivalence Factors (Chongqing)**

<b>Bioproductive area</b>	<b>global hectares/ha</b>
<b>Cropland</b>	<b>= 2.9</b>
<b>Pasture</b>	<b>= 0.6</b>
<b>Forest</b>	<b>= 1.1</b>
<b>Fisheries</b>	<b>= 0.2</b>
<b>Built-up area</b>	<b>= 2.9*</b>
<b>Hydropower area</b>	<b>= 1.0</b>
<b>Fossil Fuels (Forest)</b>	<b>= 1.1</b>




# Some concepts about Ecological Footprint

## *IV. Yield factors*

- **Yield factors (table 2) describe the extent to which a biologically productive area in a given country or region is more (or less) productive than the global average of the same bioproductive area.**

## Table 2: Chongqing's Yield Factors (1996)

<b>Bioproductive Area</b>	<b>Equivalence Factor [gha/ha]</b>	<b>Yield Factor [-]</b>
<b>Primary Cropland</b>	<b>2.9</b>	<b>1.82</b>
<b>Forest</b>	<b>1.1</b>	<b>0.61</b>
<b>Permanent Pasture</b>	<b>0.6</b>	<b>0.98</b>
<b>Inland Water</b>	<b>0.2</b>	<b>1.0</b>
<b>Built</b>	<b>2.9</b>	<b>1.82</b>



## ***2. The purpose and meaning of this research***

- **measure the degree of sustainable development in Chongqing**
- **Evaluate the influence of environment in quick urbanization of Chongqing.**



### ***3. Analytical methods***

**The analytical methods of ecological footprint: compound and component-based methods**

**This research uses the component-based method.**

**The component-based approach sums the Ecological Footprint of all relevant components of a population's resource consumption and waste production.**



## **4. Data source**

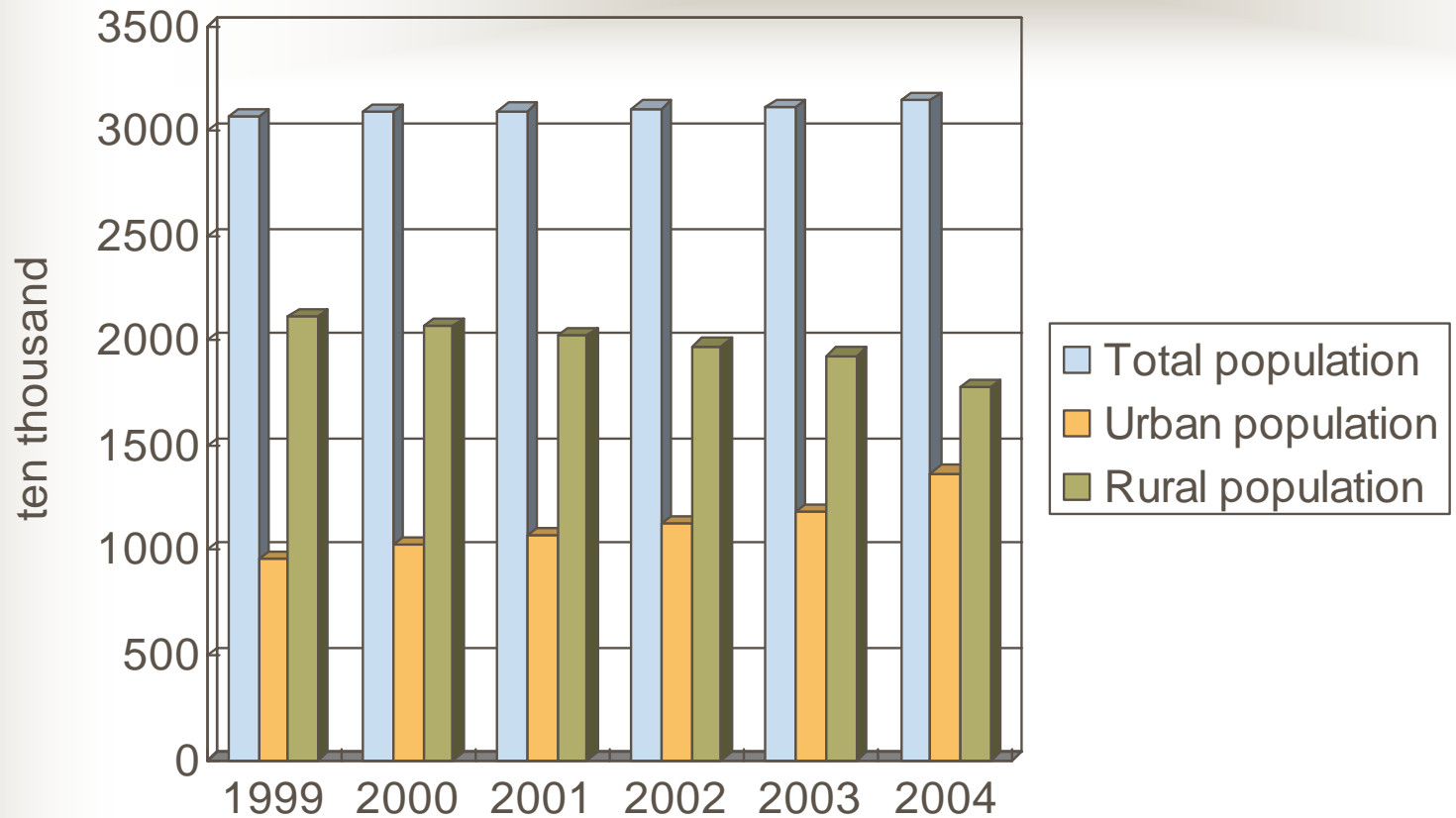
**In this research all consumption of resident have been divided into six kinds of items: food, residence, traffic, merchandise, service and waste. The total footprint comes from the summation of each item; Biocapacity has been deducted by 12% for the protection biological variety.**

**All data come from <Chongqing statistical yearbook 2000-2005 >.**

**Table 3: the change of population in Chongqing from 1999 to 2004.**

**Unit: Ten thousand people**

years type	2004	2003	2002	2001	2000	1999
Total population	3144.23	3115.40	3107.00	3097.00	3090.45	3072.34
Urban population	1367.74	1186.97	1130.95	1074.66	1022.78	960.71
Country population	1776.49	1928.43	1976.05	2022.34	2067.67	2111.63

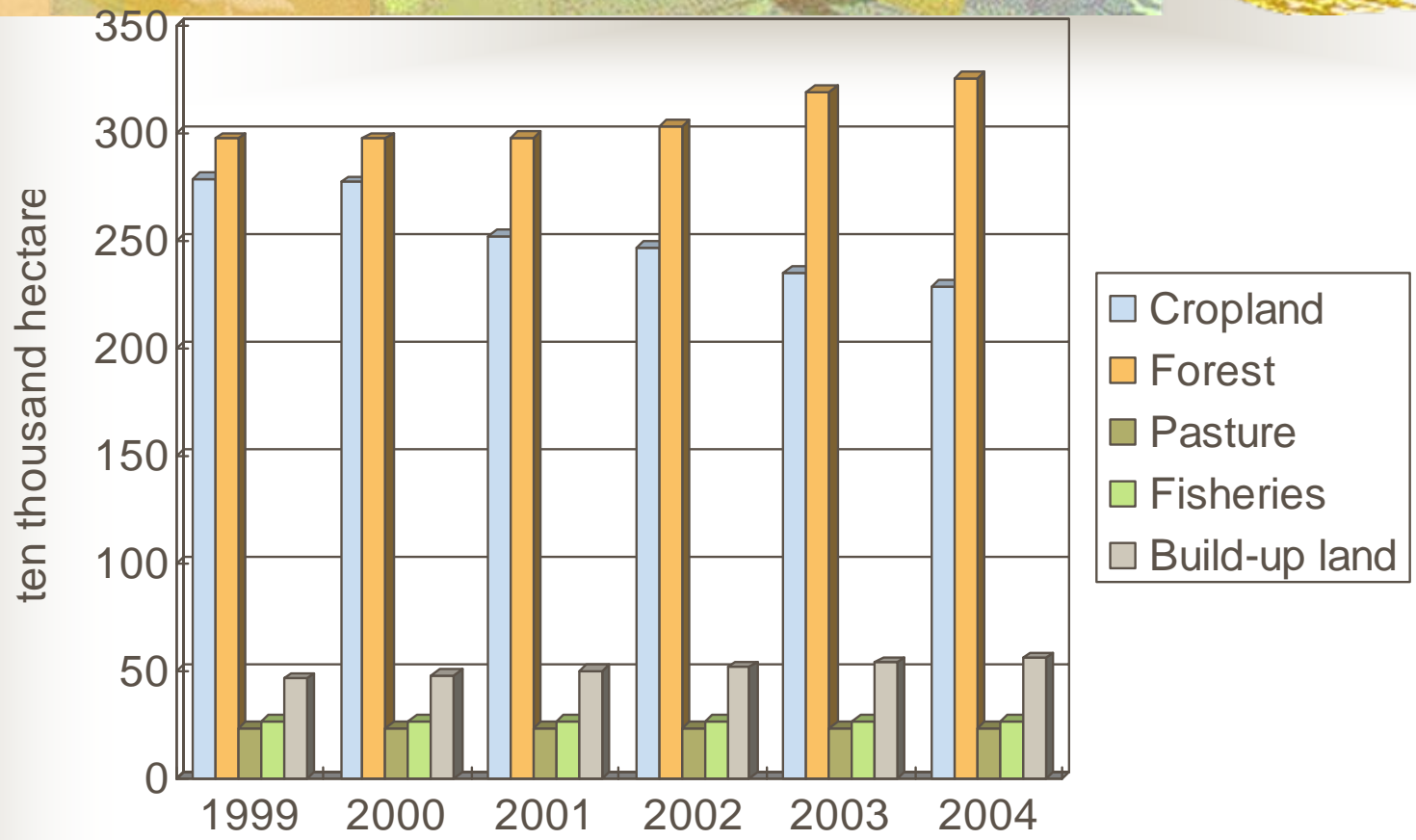


**Fig. 2. The change of population in Chongqing from 1999 to 2004.**

**Table 4: the change of various land area in Chongqing from 1999 to 2004.**

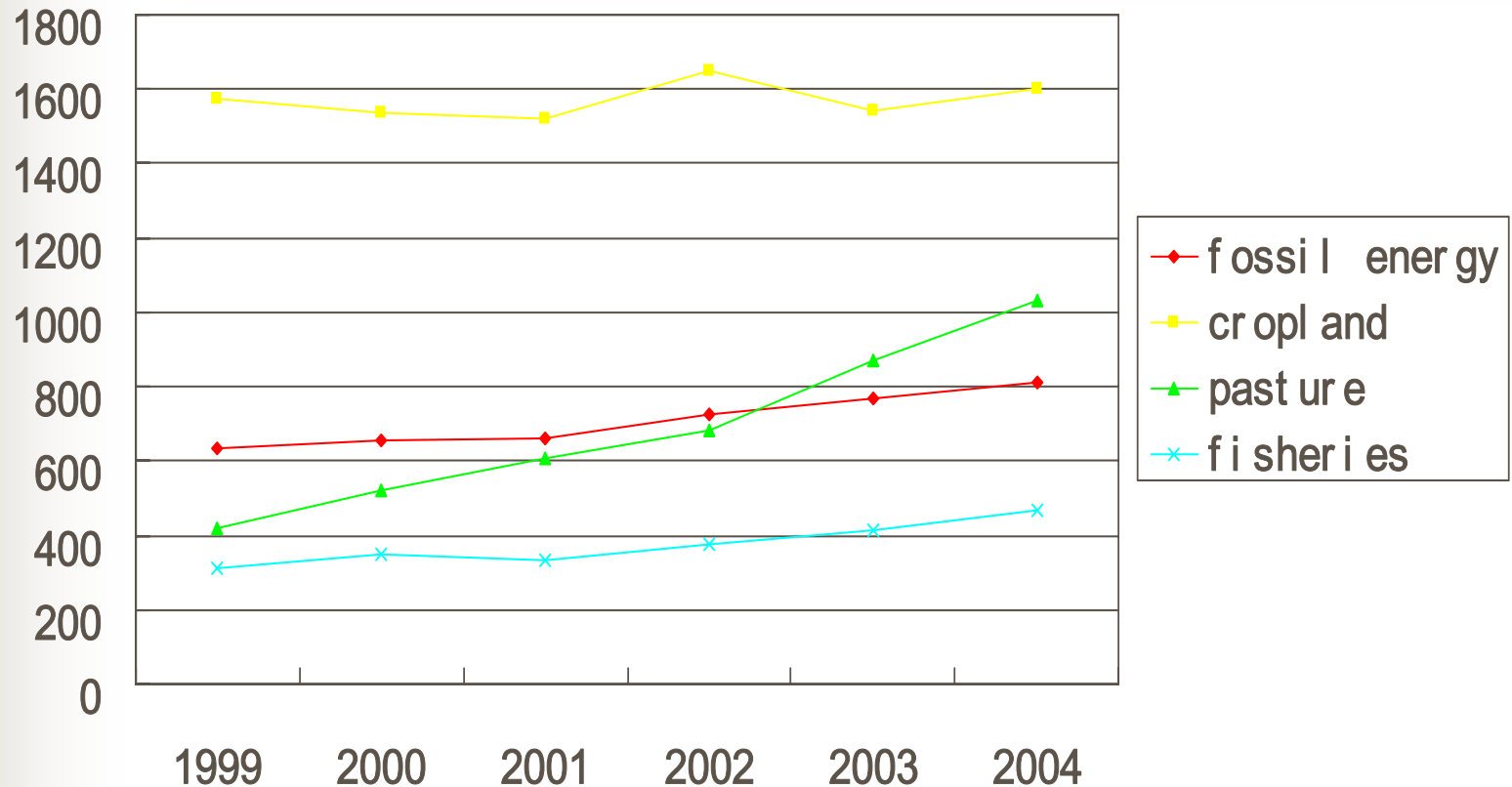
Unit: Ten thousand hectare

years type	2004	2003	2002	2001	2000	1999
Cropland	228.74	234.76	246.58	251.72	277.12	278.70
garden plot	22.09	21.00	18.25	23.81		
Forest	325.13	319.02	303.02	297.77	297.40	297.07
Pasture	23.81	23.84	23.85	23.84	23.86	23.71
Fisheries	26.73	26.73	26.73	26.73	26.74	26.67
Build-up land	55.89	54.00	51.95	49.92	48.27	46.45
Unused land	72.39	73.30	77.32	150.01	150.61	151.40

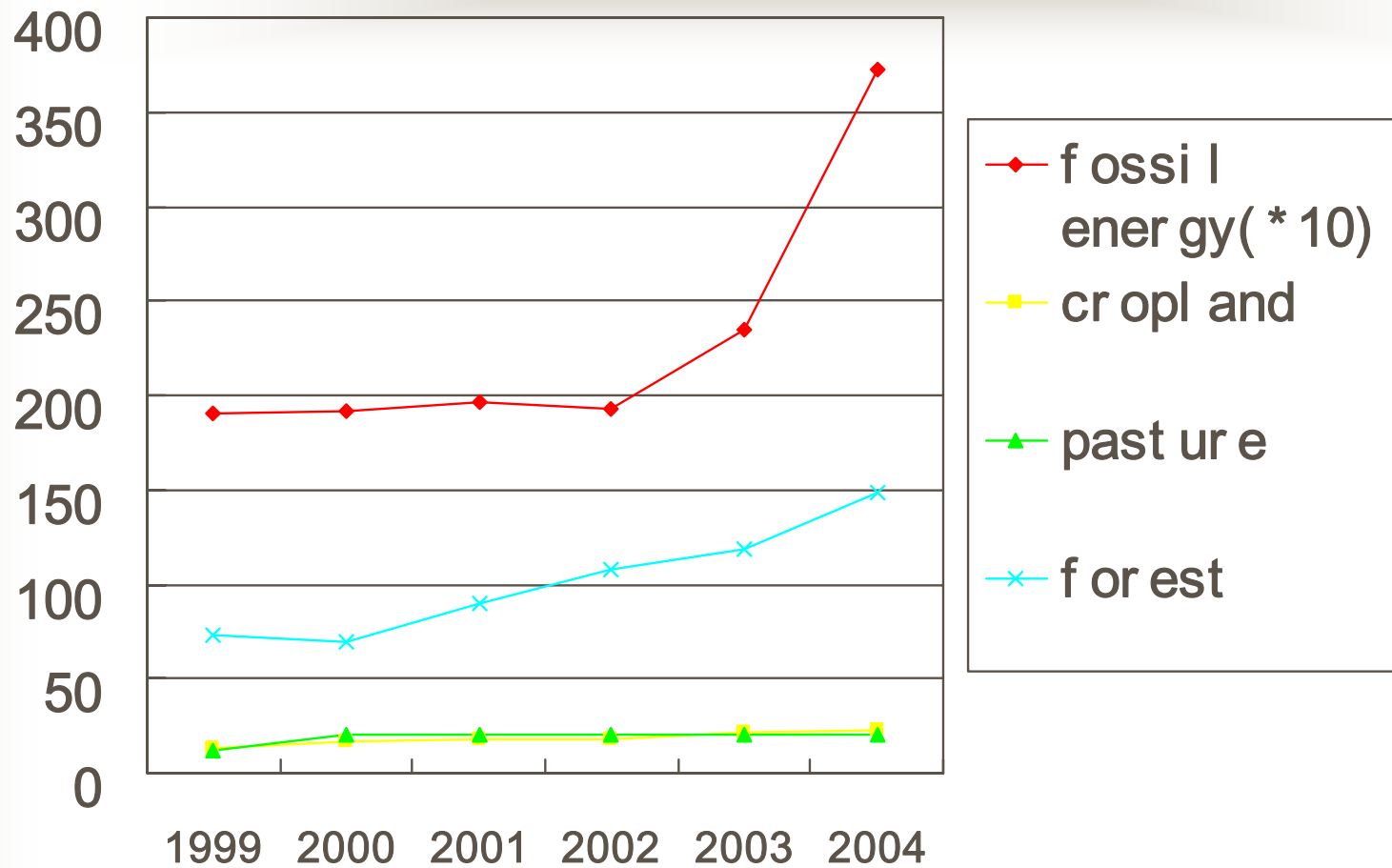


**Fig. 3. The change of various land area in Chongqing from 1999 to 2004.**

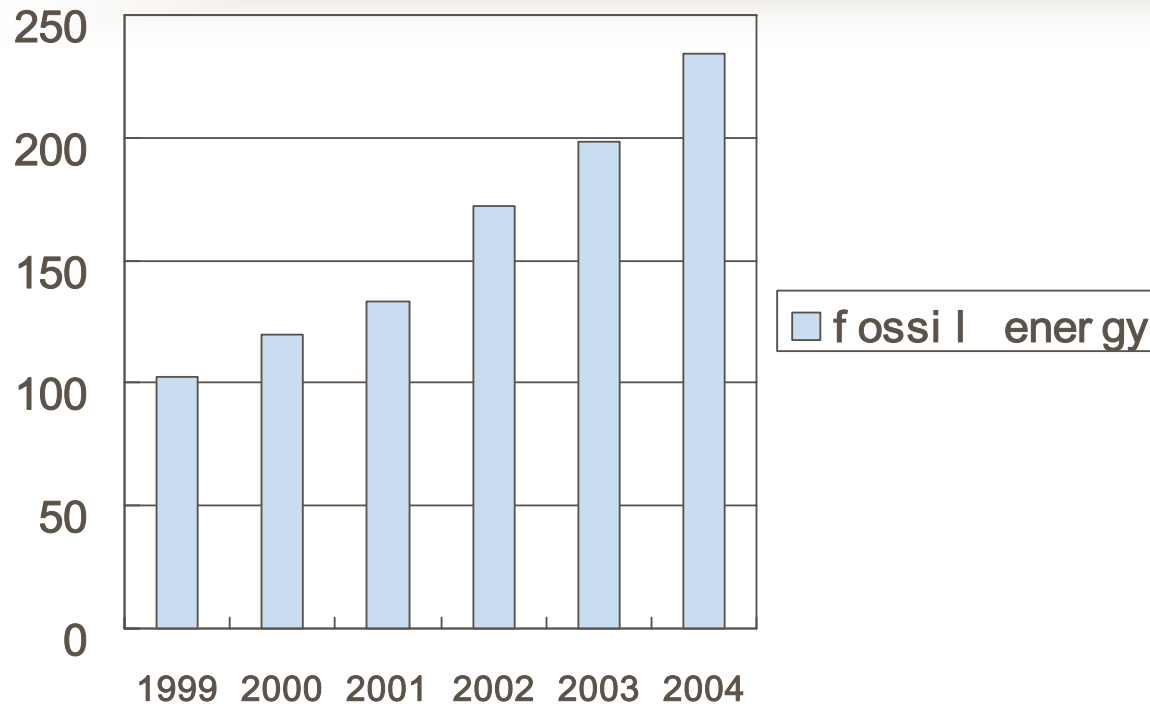
## 5. Calculation results



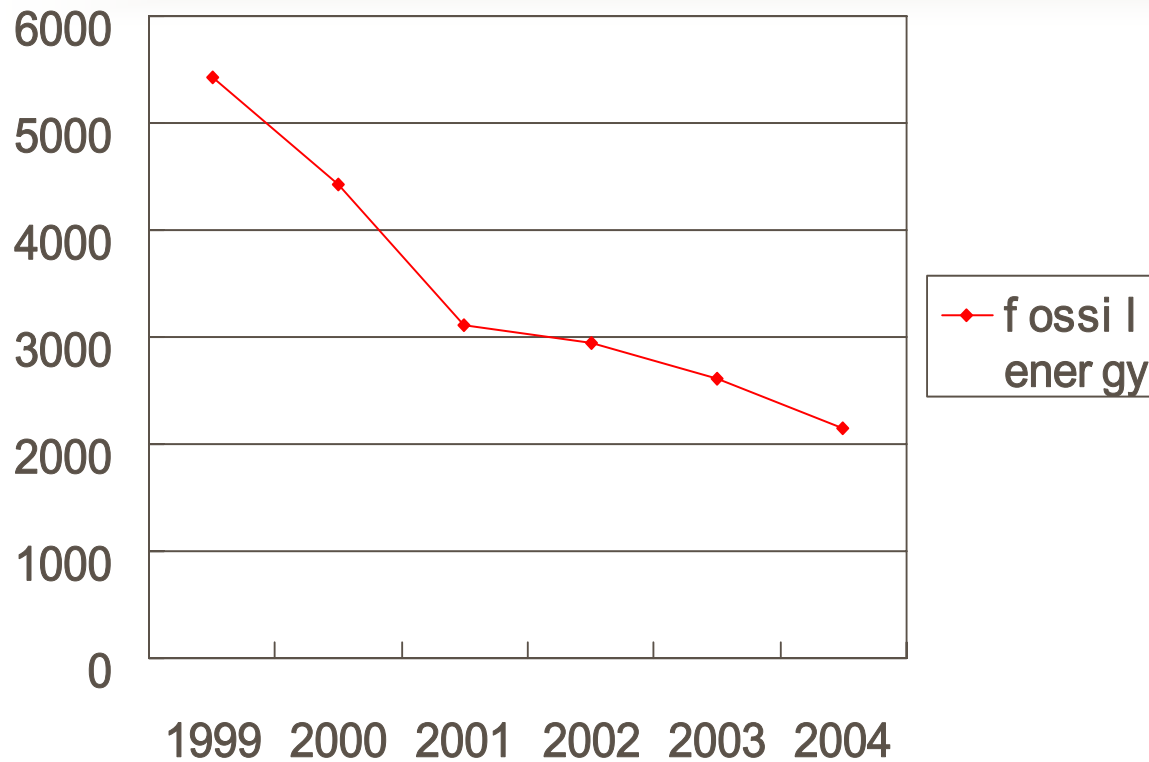
**Fig .4. The change of ecological footprint of food account in ChongQing from 1999 to 2004.**



**Fig .5. The change of ecological footprint of merchandise account in ChongQing from 1999 to 2004.**



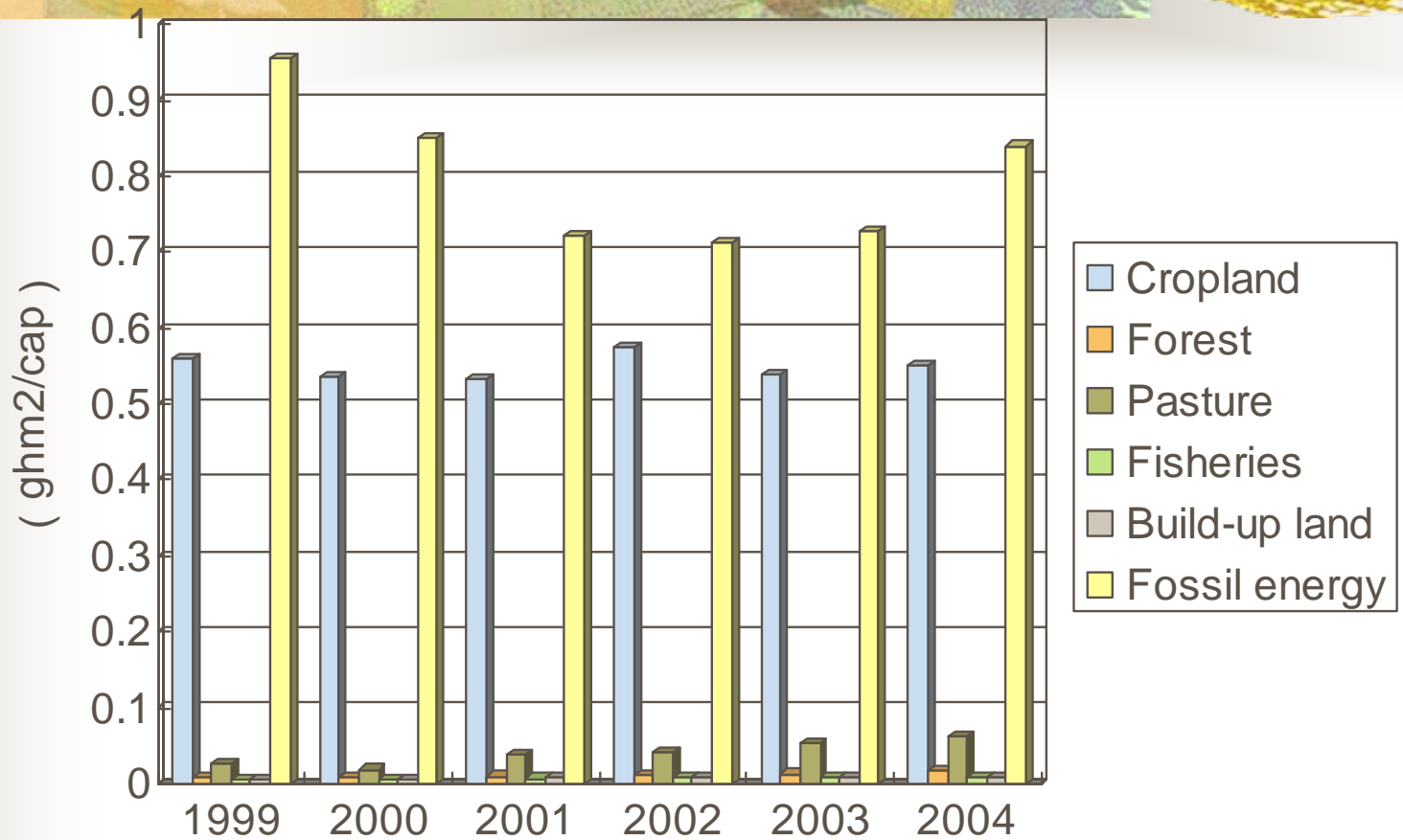
**Fig .6. The change of ecological footprint of service account in ChongQing from 1999 to 2004.**



**Fig .7. The change of ecological footprint of waste account in ChongQing from 1999 to 2004.**

**Table 5: the calculation result of the total ecological footprint in Chongqing from 1999 to 2004.**

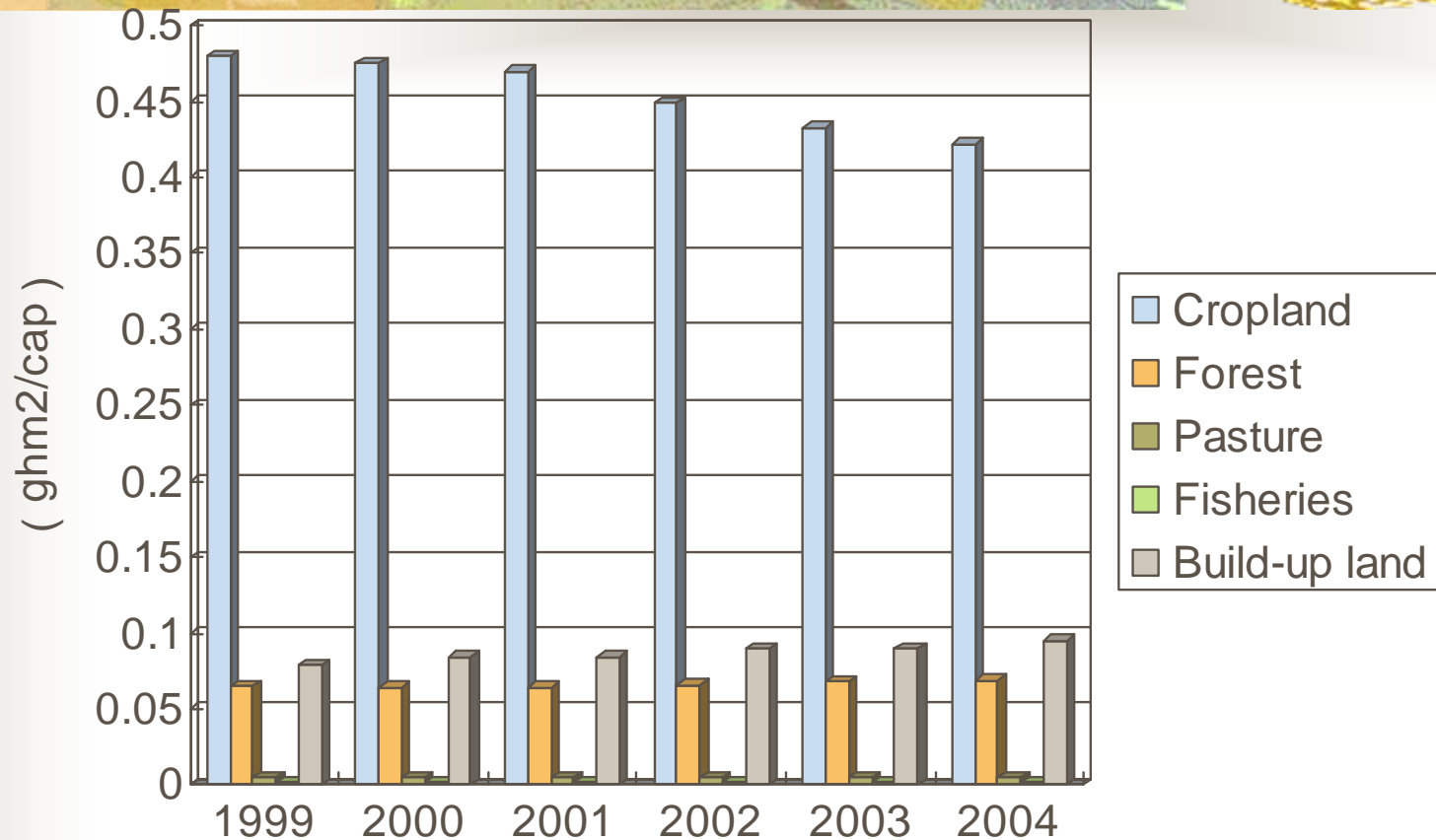
type	Equivalence factors	Equivalence area (ghm <sup>2</sup> /cap)					
		1999	2000	2001	2002	2003	2004
Fossil energy	1.1	0.955	0.851	0.721	0.712	0.728	0.840
cropland	2.9	0.560	0.537	0.534	0.574	0.539	0.551
pasture	0.6	0.026	0.019	0.038	0.042	0.053	0.063
forest	1.1	0.008	0.008	0.010	0.012	0.013	0.017
Build-up land	2.9	0.006	0.006	0.009	0.009	0.009	0.009
fisheries	0.2	0.006	0.006	0.007	0.008	0.008	0.009
Total ecological footprint		1.558	1.427	1.319	1.357	1.350	1.489



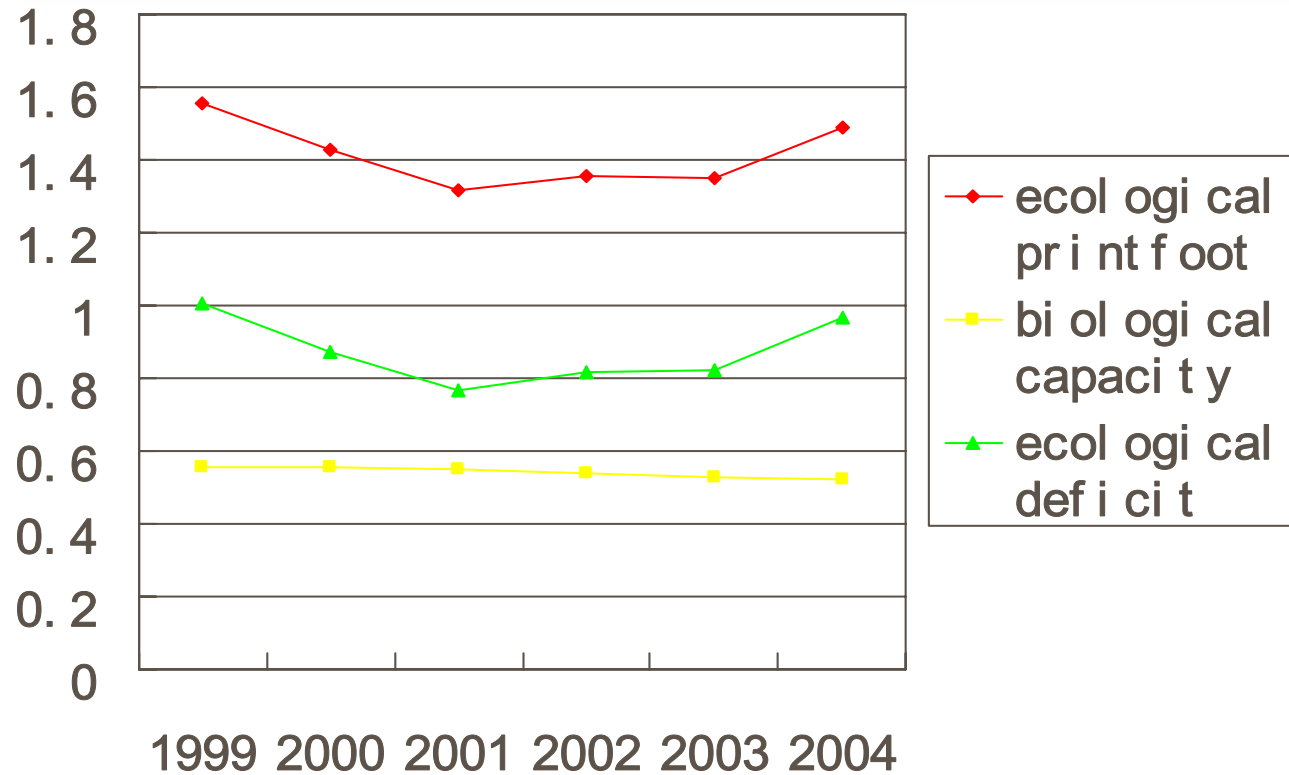
**Fig. 8. The change of ecological footprint in Chongqing from 1999 to 2004.**

**Table 6: the calculation result of total biological capacity in Chongqing from 1999 to 2004.**

type	Yield factors	Equivalence area ( ghm <sup>2</sup> /cap )					
		1999	2000	2001	2002	2003	2004
cropland	1.82	0.480	0.475	0.470	0.449	0.433	0.422
pasture	0.94	0.005	0.005	0.005	0.005	0.005	0.005
forest	0.61	0.065	0.064	0.064	0.066	0.068	0.069
Build-up land	1.82	0.079	0.084	0.084	0.090	0.090	0.095
fisheries	1.00	0.002	0.002	0.002	0.002	0.002	0.002
<b>total biological capacity</b>		0.631	0.630	0.625	0.612	0.598	0.593
After deduction 12% for protection biological variety		0.555	0.554	0.550	0.539	0.526	0.522



**Fig. 9. The change of biological capacity in Chongqing from 1999 to 2004.**



**Fig .10. The change of total ecological footprint, total biological capacity and ecological deficit in Chongqing from 1999 to 2004.**



## ***7. conclusion***

**(1) In composing of ecological footprint in Chongqing, the fossil energy land possess the most proportion, it has achieved to 57% on average. Cropland is the second, it has achieved to 40%. But the pasture, forest, fisheries land and build-up land are very small on proportion.**

**In composing of ecological footprint , the change of fossil energy land is the most obvious, it mainly reflects to waste account.**

( 2 ) The ecological footprint of Chongqing is Less than the average of China (1.8 gha), it is also less than the ecological footprint of developed country and region, but it is bigger than the ecological footprint of India.

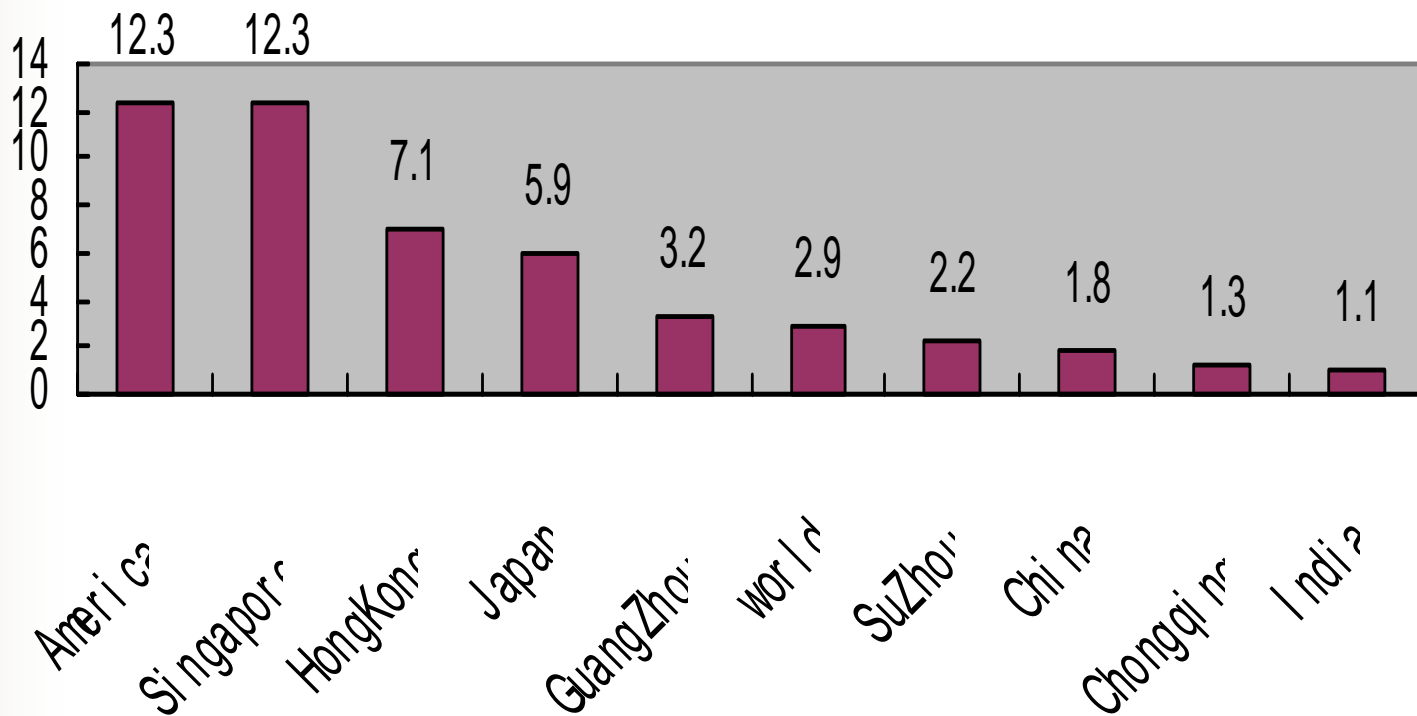
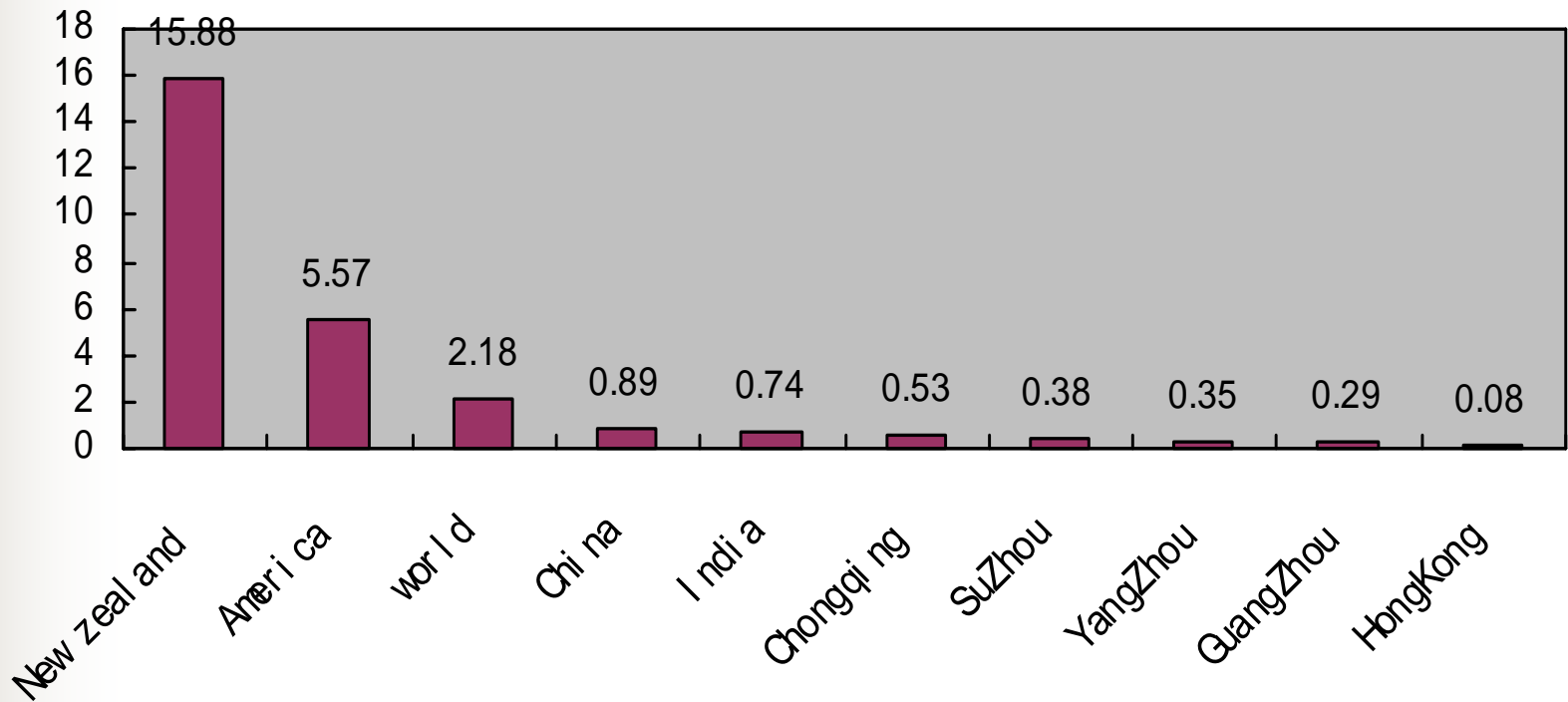


Fig .11. The compare of ChongQing's ecological footprint with other country or region.

**( 3 ) The biological capacity of Chongqing is small, it hasn't achieved to 0.6 gha/cap and it is less than the average of world and china. But it is bigger than the biological capacity of Chinese east.**



**Fig .12. The compare of Chongqing's biological capacity with other country or region.**

*That's all*



*Thank you!*