Sustainable development ability of state-owned forest region in Heilongjiang Province, China

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Abstract: To bring sustainable development ability of state-owned forest region in Heilongjiang Province into line with the process of quantification, the basic principles for establishing the sustainable development indicators system were set. They are scientific principle, integrality, layer, operability, combination of stability and dynamic. The sustainable development indicator system of state-owned forest region in Heilongjiang Province was established according to the theory of the compound system: Society-economy-resources-environment, which includes three levels, four systems and more than 13 elements. If CEI (comprehensive evaluating index) ＜0.80, it belongs to non-sustainable; If 0.80≤CEI＜0.90, it belongs to basic-sustainable; If 0.90≤CEI≤1, it belongs to sustainable. 36 forestry bureaus were calculated according to above standard. They are divided into 3 kinds. Taoshan Forestry Bureau and other 8 forestry bureaus belong to non-sustainable. Shuangfeng Forestry Bureau and other 16 forestry bureaus belong to basic-sustainable. Dailing Forestry Bureau and other 9 forestry bureaus belong to sustainable. [World Rural Observations 2009;1(2):12-24]. ISSN: 1944-6543 (print); ISSN: 1944-6551 (online)

Key words: Sustainable development, Indicators system, Comprehensive evaluating index, State-owned forest region

1. Introduction

State-owned forest region belonging to Heilongjiang Forest Industry Group occupies 10.054 million hm^2. The geographical coordinates is 120º40´-135º5´E and 43º41´-53º5´N. There are 40 forestry bureaus. The area is 8.893 million hm^2, which contains forbidden-cutting area 2.683 million hm^2, restricted-cutting area 3.878 million hm^2, and commercial forest area 2.332 million hm^2. Volume of standing tree is 567.09 million m^3, which contains forbidden-cutting forest 152.31 million m^3, restricted-cutting forest 247.68 million m^3, and commercial forest 166.73 million m^3. Many plantations of this area have been in the harvest-cutting period at the beginning of this century.

This large area of forest is a protective screen of ecological safe in northeast of China. It guaranteed many years' good agricultural harvest of this region. But after 50 years' cutting and exploiting, forest resources has been damaged seriously. The distribution of natural forest resource is not reasonable. There is no old growth forest left for many forest bureaus. Forest sustainable management has been a serious problem. These forestry bureaus should combine or change their management direction. This study will provide basic reference data to do so.

2. Methods

2.1 Basic consideration

Sustainable development indicators system reflects the development level and present condition of the four subsystem of the compound system: society-economy-resources -environment, and the coordinated condition among four subsystems (Cai, 2005;Gao et al, 2005). To establish sustainable development indicators system of state-owned forest region in Heilongjiang Province should be from these four aspects. The established indicators system should considerate the basic thought and manifest the scientific principle, integrality, operability, layer, combination of stability and dynamic. In detail, the indicators system must highlight the following functions: First, it must be able to reflect the quality and scale of economic development(Cao, 1999). Second, it must pay high attention to the utilization and exploration of the main resources and richness of the existing resources (Qian et al, 2000). Third, it must reflect the natural ecological environment capacity and the sustainability of region(John et al, 1996). The basic consideration is as following figure 1.

2.2 Formation of the indicators system of sustainable development ability

According to the basic consideration of establishing indicators system and essential factors consideration of the regional system, indicators system of sustainable development of state-owned forest region in Heilongjiang Province is designed, which includes the following three levels, four systems, thirteen elements (Figure 2).

2.3 **Indicators calculating methods**

1) To choose the evaluating indicators and to establish the system of evaluating indicators;

2) To select synthetic formula without dimension, according to the development condition;

3) To fix the relevant threshold value and reference value of the chosen indicators;

4) To translate the practical value of the indicators into the evaluating value of the indicators;

5) To decide the weight in the evaluation;

6) To calculate the comprehensive evaluation index.

According to the influence of indicators on the object of the research and their affecting orientation, the calculating method is:

$$F=C_i/S_i$$

Where: F is evaluating value of indicators; S is reference value; C is practical value.

2.4 Calculation of indicator level value

2.4.1 Percentage of staff

Percentage of staff is an important factor reflecting poor or rich in forest region. Reference value is 27.32%. The result is showed in table 1.
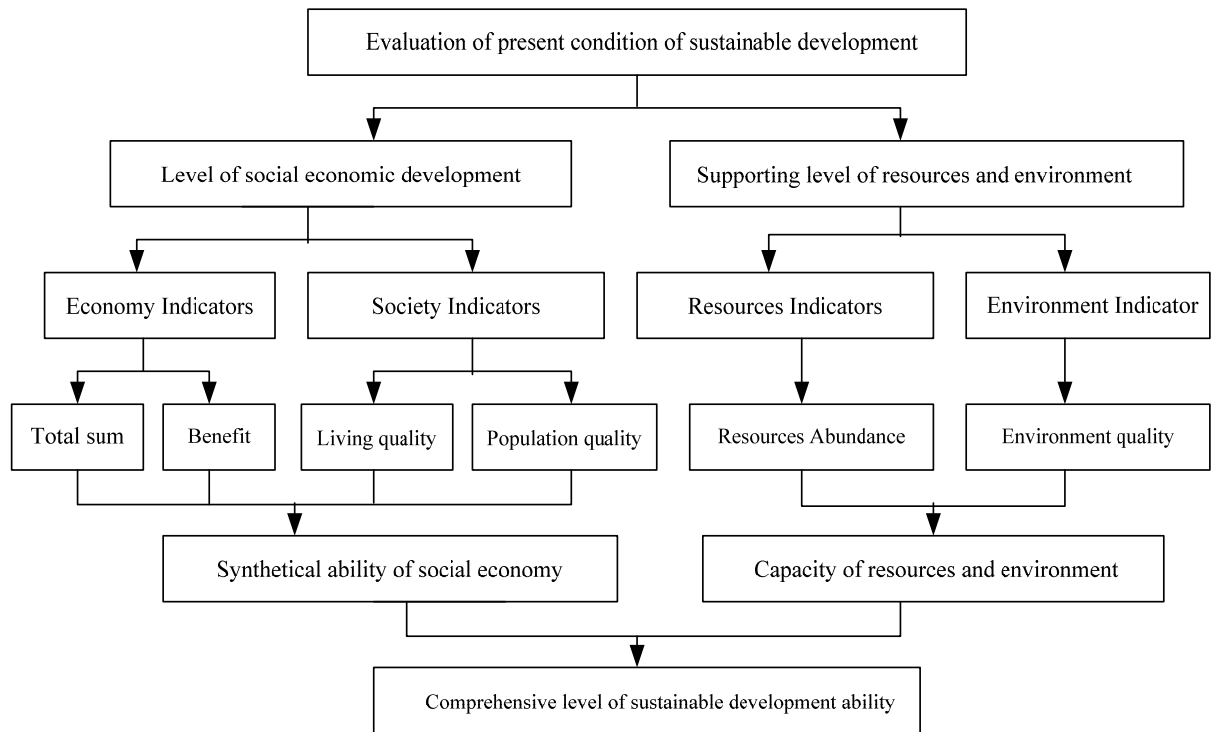
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┌─────────────────────────────────────────────────────────────┐
│      Evaluation of present condition of sustainable development│
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| Level of social economic development | Supporting level of resources and environment |

| Economy Indicators | Society Indicators | Resources Indicators | Environment Indicator |

| Total sum | Benefit | Living quality | Population quality | Resources Abundance | Environment quality |

| Synthetical ability of social economy | Capacity of resources and environment |

| Comprehensive level of sustainable development ability |

Figure 1 Indicators system of sustainable development ability

Percentage of staff

Social development indicators
- The number of technologists per ten thousand persons
- Percentage of primary and middle school students

Economical development indicators
- Five fees per capita
- Road density of the forest region
- Wage level of staff

Comprehensive ability of sustainable development

Resources indicators
- Forest covering rate
- Volume per hectare
- Percentage of nearly mature forest
- Percentage of mature forest

Environment indicators
- Annual precipitation
- Frost-free period
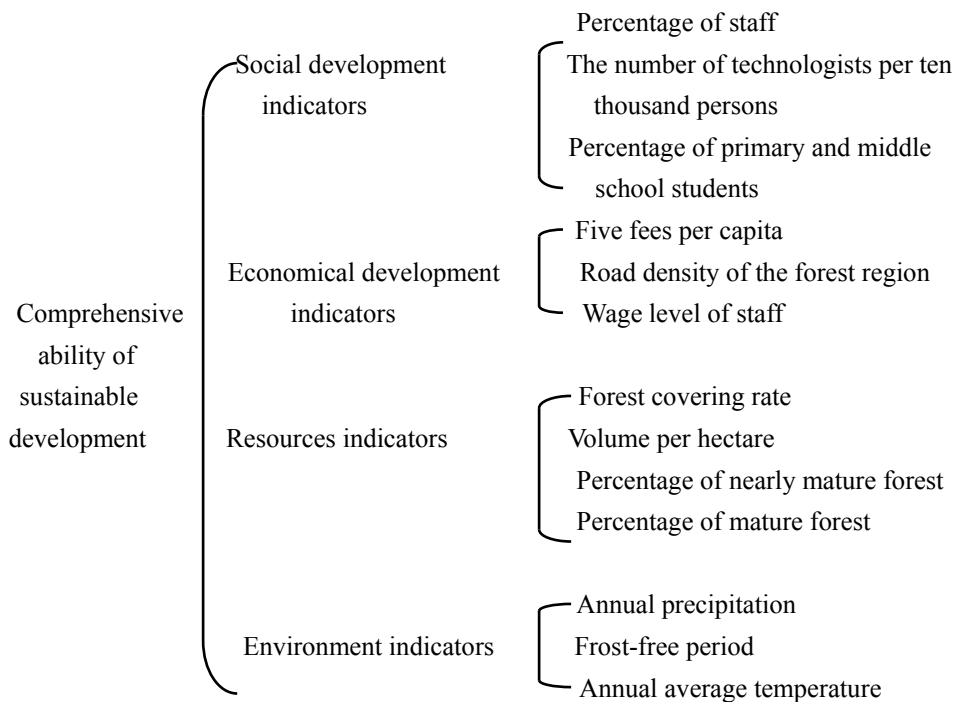- Annual average temperature

Figure 2 Evaluation indicators system of sustainable development

Table 1   Percentage of staff

Forestry Bureau	Shuang-feng	Tieli	Taoshan	Langxiang	Nancha	Jinshantun	Wumahe	Cuiluan	Youhao
	1.00	1.0	0.67	0.85	0.87	0.70	0.98	0.92	1.0
Forestry Bureau	Shang-ganling	Wuying	Hongxing	Wuyiling	Dahailin	Chaihe	Dong-jingcheng	Muling	Suiyang
	1.0	0.52	0.91	0.98	1.00	0.94	1.00	1.00	0.98
Forestry Bureau	Hailin	Linkou	Bamian-tong	Dong-fanghong	Yingchun	Shanhetun	Weihe	Yabuli	Xinglong
	1.0	0.79	0.94	1.0	1.00	0.97	0.90	0.74	0.71
Forestry Bureau	Fang-zheng	Qinghe	Suiling	Tongbei	Zhanhe	Hebei	Hua'nan	Shuang-yashan	Dailing
	0.58	0.73	0.77	0.69	0.99	1.00	1.0	1.0	1.0

2.4.2 The number of technologist per ten thousand persons

The number of technologist per ten thousand persons is one of important factors reflecting science and technique development level. Reference value is 300/ ten thousand persons. The result is showed in table 2.

Table 2   the number of technologist per ten thousand persons

Forestry Bureau	Shuang-feng	Tieli	Taoshan	Langxiang	Nancha	Jinshantun	Wumahe	Cuiluan	Youhao
	0.33	0.68	0.90	0.96	1.00	0.71	1.00	0.97	0.23
Forestry Bureau	Shang-ganling	Wuying	Hongxing	Wuyiling	Dahailin	Chaihe	Dong-jingcheng	Muling	Suiyang
	1.00	1.00	0.35	1.00	0.65	0.09	1.00	0.49	1.00
Forestry Bureau	Hailin	Linkou	Bamian-tong	Dong-fanghong	Yingchun	Shanhetun	Weihe	Yabuli	Xinglong
	1.00	1.00	1.00	0.28	1.00	0.38	0.65	1.00	0.40
Forestry Bureau	Fang-zheng	Qinghe	Suiling	Tongbei	Zhanhe	Hebei	Hua'nan	Shuang-yashan	Dailing
	0.23	0.33	0.19	0.09	1.00	1.00	0.92	1.00	1.00

2.4.3 Percentage of primary and middle school students

Percentage of primary and middle school students is an important indicator reflecting population character in forest region. Reference value is 11.58. The result is showed in table 3.

Table 3   Percentage of primary and middle school students

Forestry Bureau	Shuang-feng	Tieli	Taoshan	Lang-xiang	Nancha	Jinshan-tun	Wumahe	Cuiluan	Youhao
	0.76	1.00	0.90	1.00	1.00	0.91	0.86	0.95	0.93
Forestry Bureau	Shang-ganling	Wuying	Hongxing	Wuyiling	Dahailin	Chaihe	Dong-jingcheng	Muling	Suiyang
	0.98	0.89	0.92	0.86	1.00	1.00	1.00	1.00	1.00
Forestry Bureau	Hailin	Linkou	Bamian-tong	Dong-fanghong	Yingchun	Shanhe tun	Weihe	Yabuli	Xinglong
	1.00	0.72	0.34	0.94	0.66	0.22	1.00	1.00	0. 90
Forestry Bureau	Fang-zheng	Qinghe	Suiling	Tongbei	Zhanhe	Hebei	Hua'nan	Shuang-yashan	Dailing
	0.95	1.00	0.97	0.73	1.00	1.00	0.97	0.30	1.00

2.4. 4 Five fees per capita

Five fees per capita include silviculture output value, timber output value, multi-management value and other output values. It reflects economy development potentiality. Reference value is 8122 RMB￥/person. The result is showed in table 4.

Table 4   Five fees per capita

Forestry Bureau	Shuang-feng	Tieli	Taoshan	Langxiang	Nancha	Jinshantun	Wumahe	Cuiluan	Youhao
	1.00	0.42	0.62	1.00	0.75	1.00	1.00	0.77	0.89
Forestry Bureau	Shang-ganling	Wuying	Hongxing	Wuyiling	Dahailin	Chaihe	Dong-jingcheng	Muling	Suiyang
	1.00	1.00	1.00	1.00	0.90	0.68	1.00	0.77	1.00
Forestry Bureau	Hailin	Linkou	Bamian-tong	Dong-fanghong	Yingchun	Shanhetun	Weihe	Yabuli	Xinglong
	1.00	0.90	0.97	0.92	1.00	0.77	0.96	1.00	0.93
Forestry Bureau	Fang-zheng	Qinghe	Suiling	Tongbei	Zhanhe	Hebei	Hua'nan	Shuang-yashan	Dailing
	1.00	1.00	0.70	0.78	1.00	1.00	1.00	1.00	1.00

2.4. 5 Wage level of staff

Wage level of staff directly reflects economy development level of forest region. It influences people's life level. Reference value is 3265 RMB ￥/person. The result is showed in table 5.

Table 5   Wage level of staff

Forestry Bureau	Shuang-feng	Tieli	Taoshan	Langxiang	Nancha	Jinshantun	Wumahe	Cuiluan	Youhao
	0.92	1.00	0.52	0.76	0.90	0.88	1.00	1.00	1.00
Forestry Bureau	Shang-ganling	Wuying	Hongxing	Wuyiling	Dahailin	Chaihe	Dong-jingcheng	Muling	Suiyang
	0.89	0.67	1.00	1.00	0.92	1.00	1.00	1.00	0.94
Forestry Bureau	Hailin	Linkou	Bamian-tong	Dong-fanghong	Yingchun	Shanhetun	Weihe	Yabuli	Xinglong
	1.00	0.86	0.89	1.00	1.00	1.00	1.00	1.00	1.00
Forestry Bureau	Fang-zheng	Qinghe	Suiling	Tongbei	Zhanhe	Hebei	Hua'nan	Shuang-yashan	Dailing
	1.00	1.00	0.80	1.00	0.86	0.80	1.00	0.89	1.00

2.4. 6 Road density of the forest region

Road density of the forest region is an important indictor reflecting basic construction. It also influences silviculture and fire prevention.. Reference value is 2.78 m/km2. The result is showed in table 6.

Table 6   Road density of the forest region

Forestry Bureau	Shuang-feng	Tieli	Taoshan	Langxiang	Nancha	Jinshantun	Wumahe	Cuiluan	Youhao
	1.00	0.92	1.00	1.00	1.00	1.00	1.00	1.00	0.53
Forestry Bureau	Shang-ganling	Wuying	Hongxing	Wuyiling	Dahailin	Chaihe	Dong-jingcheng	Muling	Suiyang
	0.95	0.91	0.72	0.96	1.00	0.93	0.99	0.82	1.00
Forestry Bureau	Hailin	Linkou	Bamian-tong	Dong-fanghong	Yingchun	Shanhetun	Weihe	Yabuli	Xinglong
	1.00	0.79	1.00	0.95	1.00	0.71	0.79	0.65	1.00
Forestry Bureau	Fang-zheng	Qinghe	Suiling	Tongbei	Zhanhe	Hebei	Hua'nan	Shuang-yashan	Dailing
	1.00	0.96	0.94	0.09	0.34	0.95	1.00	1.00	1.00

2.4.7 Forest covering rate

Besides of timber economic value, forest has a lot of ecological benefits. They include water-reserving benefit, soil and water conservation benefit, wind and sand suppression benefit, microclimate improvement benefit, carbon dioxide assimilation benefit, atmosphere purification benefit, flood and drought mitigation benefit, tourism resource benefit and wild creature protection benefit. And so on. So forest covering rate is a very important indicator. Reference value is 81.11%. The result is showed in table 7.

Table 7　　Forest covering rate

Forestry Bureau	Shuang-feng	Tieli	Taoshan	Langxiang	Nancha	Jinshantun	Wumahe	Cuiluan	Youhao
	0.96	1.00	0.98	1.00	0.93	1.00	1.00	1.00	1.00
Forestry Bureau	Shang-ganling	Wuying	Hongxing	Wuyiling	Dahailin	Chaihe	Dong-jingcheng	Muling	Suiyang
	0.86	1.00	0.83	1.00	0.99	0.97	1.00	0.98	1.00
Forestry Bureau	Hailin	Linkou	Bamian-tong	Dong-fanghong	Yingchun	Shanhetun	Weihe	Yabuli	Xinglong
	1.00	0.94	1.00	0.96	0.82	1.00	1.00	1.00	1.00
Forestry Bureau	Fang-zheng	Qinghe	Suiling	Tongbei	Zhanhe	Hebei	Hua'nan	Shuang-yashan	Dailing
	1.00	1.00	0.99	0.81	0.94	1.00	0.73	0.94	1.00

2.4.8 Volume per hectare

Volume per hectare is an important indicator reflecting productivity of forest land. Reference value is 68.74m3/hm2. The result is showed in table 8.

Table 8　　Volume per hectare

Forestry Bureau	Shuang-feng	Tieli	Taoshan	Langxiang	Nancha	Jinshantun	Wumahe	Cuiluan	Youhao
	0.85	0.81	0.63	1.00	0.67	0.81	0.77	0.67	1.00
Forestry Bureau	Shang-ganling	Wuying	Hongxing	Wuyiling	Dahailin	Chaihe	Dong-jingcheng	Muling	Suiyang
	0.75	0.82	1.00	0.85	1.00	1.00	1.00	1.00	0.88
Forestry Bureau	Hailin	Linkou	Bamian-tong	Dong-fanghong	Yingchun	Shanhetun	Weihe	Yabuli	Xinglong
	1.00	0.61	0.67	1.00	0.83	1.00	0.98	0.91	1.00
Forestry Bureau	Fang-zheng	Qinghe	Suiling	Tongbei	Zhanhe	Hebei	Hua'nan	Shuang-yashan	Dailing
	0.96	1.00	1.00	0.72	1.00	1.00	0.83	0.85	1.00

2.4.9 Percentage of nearly mature forest

Percentage of nearly mature forest is an important factor reflecting reserved cutting forest volume. Reference value is 9.10%. The result is showed in table 9.

Table 9   Percentage of nearly mature forest

Forestry Bureau	Shuang-feng	Tieli	Taoshan	Langxiang	Nancha	Jinshantun	Wumahe	Cuiluan	Youhao
	0.89	0.74	0.23	1.00	0.71	0.97	0.32	0.46	0.80
Forestry Bureau	Shang-ganling	Wuying	Hongxing	Wuyiling	Dahailin	Chaihe	Dong-jingcheng	Muling	Suiyang
	0.75	0.58	1.00	0.67	1.00	1.00	1.00	1.00	0.47
Forestry Bureau	Hailin	Linkou	Bamian-tong	Dong-fanghong	Yingchun	Shanhetun	Weihe	Yabuli	Xinglong
	1.00	0.34	0.42	1.00	1.00	1.00	1.00	1.00	1.00
Forestry Bureau	Fang-zheng	Qinghe	Suiling	Tongbei	Zhanhe	Hebei	Hua'nan	Shuang-yashan	Dailing
	1.00	1.00	0.77	0.47	1.00	1.00	0.88	0.07	1.00

2.4.10 Percentage of mature forest

Percentage of mature forest is an important indicator reflecting forest quality. Reference value is 0.03. The result is showed in table 10.

Table 10   Percentage of mature forest

Forestry Bureau	Shuang-feng	Tieli	Taoshan	Langxiang	Nancha	Jinshantun	Wumahe	Cuiluan	Youhao
	0.53	0.86	0.07	1.00	0.21	1.00	0.20	0.03	0.80
Forestry Bureau	Shang-ganling	Wuying	Hongxing	Wuyiling	Dahailin	Chaihe	Dong-jingcheng	Muling	Suiyang
	1.00	0.23	1.00	0.31	0.74	1.00	0.90	1.00	0.10
Forestry Bureau	Hailin	Linkou	Bamian-tong	Dong-fanghong	Yingchun	Shanhetun	Weihe	Yabuli	Xinglong
	1.00	0.26	0.03	1.00	1.00	1.00	0.85	1.00	1.00
Forestry Bureau	Fang-zheng	Qinghe	Suiling	Tongbei	Zhanhe	Hebei	Hua'nan	Shuang-yashan	Dailing
	1.00	1.00	0.73	0.28	0.89	1.00	0.45	0.07	1.00

2.4.11 Annual precipitation

Annual precipitation is an important factor reflecting natural environment. According to others' studies (Zhang et al, 2001; Zhu et al, 2001), reference value is 800mm. The result is showed in table 11.

Table 11   Annual precipitation

Forestry Bureau	Shuang-feng	Tieli	Taoshan	Langxiang	Nancha	Jinshantun	Wumahe	Cuiluan	Youhao
	0.81	0.75	0.83	0.79	0.75	0.76	0.75	0.75	0.79
Forestry Bureau	Shang-ganling	Wuying	Hongxing	Wuyiling	Dahailin	Chaihe	Dong-jingcheng	Muling	Suiyang
	0.91	0.74	0.69	0.63	0.94	0.67	0.72	0.69	0.64
Forestry Bureau	Hailin	Linkou	Bamian-tong	Dong-fanghong	Yingchun	Shanhetun	Weihe	Yabuli	Xinglong
	0.73	0.73	0.67	0.72	0.69	1.00	0.88	0.81	0.89
Forestry Bureau	Fang-zheng	Qinghe	Suiling	Tongbei	Zhanhe	Hebei	Hua'nan	Shuang-yashan	Dailing
	0.77	0.88	0.75	0.81	0.75	0.84	0.69	0.64	0.91

2.4. 12 Frost - free period

Frost-free period is an important factor reflecting plant's growth potentiality. Its influencing on growth of crops and herbaceous is obvious. Reference value is 120 days. The result is showed in table 12.

Table 12   Frost-free period

Forestry Bureau	Shuang-feng	Tieli	Taoshan	Langxiang	Nancha	Jinshantun	Wumahe	Cuiluan	Youhao
	0.87	0.81	0.87	0.77	0.93	1.00	0.77	0.89	0.93
Forestry Bureau	Shang-ganling	Wuying	Hongxing	Wuyiling	Dahailin	Chaihe	Dong-jingcheng	Muling	Suiyang
	0.78	0.83	0.73	0.69	0.81	0.99	0.81	0.96	0.94
Forestry Bureau	Hailin	Linkou	Bamian-tong	Dong-fanghong	Yingchun	Shanhetun	Weihe	Yabuli	Xinglong
	0.93	0.96	0.98	0.95	0.99	1.00	0.89	0.93	0.89
Forestry Bureau	Fang-zheng	Qinghe	Suiling	Tongbei	Zhanhe	Hebei	Hua'nan	Shuang-yashan	Dailing
	1.00	0.85	0.82	0.75	0.77	0.89	0.94	0.96	1.00

2.4.13 Annual average temperature

Annual average temperature is an important factor directly influencing forest's growth. It is also an important indicator reflecting naturai environment. Reference value is 1.7 . The result is showed in table 13.

Table 13   Annual average temperature

Forestry Bureau	Shuang-feng	Tieli	Taoshan	Langxiang	Nancha	Jinshantun	Wumahe	Cuiluan	Youhao
	0.95	0.29	0.65	0.21	0.10	1.00	1.00	0.29	0.29
Forestry Bureau	Shang-ganling	Wuying	Hongxing	Wuyiling	Dahailin	Chaihe	Dong-jingcheng	Muling	Suiyang
	0.65	0.41	0.10	0.10	1.00	1.00	1.00	1.00	1.00
Forestry Bureau	Hailin	Linkou	Bamian-tong	Dong-fanghong	Yingchun	Shanhetun	Weihe	Yabuli	Xinglong
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.71
Forestry Bureau	Fang-zheng	Qinghe	Suiling	Tongbei	Zhanhe	Hebei	Hua'nan	Shuang-yashan	Dailing
	1.00	1.00	0.82	0.29	0.10	1.00	1.00	1.00	1.00

2.5 About the weight

In different areas, as a result of the difference of their social & economic background and the foundation of resources environment, each indicator factor should manifest the different importance in the appraisal indicators system (Zhu et al, 2001). Therefore, to correctly determine the weight becomes the essential issue. In the indicators system, each kind of indicator's weight reflects the attention paid by the evaluator to the evaluation of all kinds of indicators in the regional sustainable development. In order to avoid the one-sidedness of weight determination, in the process of each kind of target weight determination, it should listen widely to various opinions, and by applying the effective method, deal with different evaluating results, so as to obtain one reasonable synthetic result. The system index weight uses the Analytical Hierarchy Process method (Niu et al, 1998;Zhang et al, 2001)), with reference value, weight and system index, and the results is showed in table 14.

3. Results

System indicators and comprehensive indicators calculating results of each forestry bureau are showed in table 15.

The method of squaring weight is suitable to reflect the social economic development and supporting strength and capacity of the resources environment, namely:

$$CEI=Is^{Ws}\cdot Ie^{We}\cdot Ir^{Wr}\cdot Ien^{Wen}$$

Where CEI is comprehensive evaluation indicator; Is is society indicator; Ws is weight of society; Ie is economy indicator; We is weight of economy; Ir is resource indicator; Wr is weight of resource; Ien is environment indicator; Wen is weight of environment.

This CEI can quite objectively manifest the system indicators. In these four indicators, no matter how big one of the items is, as long as another item is small, the synthetic indicator can indicate sensitively. It requests the development established on the basis of the coordination of society, economy, resources, and environment. In development process of society and economy, not only the existing resources environment should be protected, but also social investment should be purposefully increased. Then resources and environment reproduction might be organically combined with population and economy reproduction to unceasingly strengthen the resources supporting capacity and the environment expansion capacity.

Calculating resultss of comprehensive indicators of   sustainable development ability are showed in table 15.

Table 14   System index weight

Factor System index	Indicators	Reference value	Weight
Society indicator 0.216	percentage of staff	27.32%	0.40
	the number of technologist per ten thousand persons	300 technologist per ten thousand people	0.30
	percentage of primary and middle school students	11.58%	0.30
Economy indicator 0.230	five fees per capita	8122 yuan per capita	0.50
	road density of the forest region	2.78m/km^2	0.30
	wage level of staff	3265 yuan per capita	0.20
Resources indicator 0.360	forest covering rate	81.11%	0.20
	volume per hectare	68.74m^3/hm^2	0.40
	percentage of nearly mature forest	9.10%	0.20
	percentage of mature forest	3%	0.20
Environment indicator 0.194	annual precipitation	800 mm	0.30
	frost-free period	120 days	0.30
	annual average temperature	1.7℃	0.40

Table 15 System Indicators and Comprehensive Indicators Calculating Figures of Each Forestry Bureau

Forestry Bureau	Society indicators	Environment indicators	Economy indicators	Resource indicators	Comprehensive indicators
Shuangfeng	0.73	0.74	0.98	0.81	0.81
Tieli	0.90	0.59	0.70	0.84	0.76
Taoshan	0.81	0.77	0.66	0.51	0.65
Langxiang	0.93	0.55	0.93	1.00	0.86
Nancha	0.95	0.50	0.85	0.64	0.71
Jinshantun	0.77	0.93	0.96	0.92	0.89
Wumahe	0.95	0.86	1.00	0.61	0.80
Cuiluan	0.94	0.61	0.89	0.57	0.71
Youhao	0.75	0.63	0.85	0.92	0.80
Shangganling	0.99	0.76	0.96	0.82	0.87
Wuying	0.77	0.63	0.88	0.69	0.74
Hongxing	0.75	0.47	0.94	0.97	0.79
Wuyiling	0.95	0.44	0.99	0.73	0.75
Dahailin	0.90	0.92	0.93	0.95	0.93
Chaihe	0.70	0.90	0.82	0.99	0.87

Dongjingcheng	1.00	0.86	1.00	0.98	0.96
Muling	0.85	0.90	0.85	1.00	0.91
Suiyang	0.99	0.87	0.98	0.67	0.84
Hailin	1.00	0.90	1.00	1.00	0.98
Linkou	0.83	0.91	0.87	0.55	0.74
Bamiantong	0.78	0.89	0.95	0.56	0.74
Dongfanghong	0.77	0.90	0.95	0.99	0.91
Yingchun	0.90	0.90	1.00	0.90	0.92
Shanhetun	0.57	1.00	0.83	1.00	0.85
Weihe	0.85	0.93	0.94	0.96	0.93
Yabuli	0.90	0.92	0.93	0.96	0.93
Xinglong	0.68	0.81	0.96	1.00	0.88
Fangzheng	0.59	0.93	1.00	0.98	0.87
Qinghe	0.69	0.92	0.99	1.00	0.91
Suiling	0.66	0.80	0.78	0.90	0.79
Tongbei	0.52	0.59	0.71	0.60	0.60
Zhanhe	0.99	0.50	0.83	0.97	0.82
Hebei	1.00	0.92	0.71	1.00	0.91
Hua'nan	0.91	0.89	1.00	0.74	0.86
Shuangyashan	0.79	0.88	0.97	0.55	0.74
Dailing	1.00	0.97	1.00	1.00	0.99

4. Summary and discussion

It is important that how to make evaluation criteria of the indicators system of sustainable development will directly affect evaluated result of the regional development. The essence of sustainable development is to unceasingly satisfy human survival and the developing demand. As the development of society and economy, resources should be used and exploited reasonably. Especially through resources and environment reproduction, the resources and environment capacity should be raised and it can ensure the sustainable development of social economy. Because of the existence of regional difference, the variance of starting point and the guide and restriction factors, the evaluation criteria must be objectively, scientifically and correctly guide the region developing process. The gradualness of the process of the sustainable development objectively requests gradualness evaluation criteria. This needs us to take the gradual goal of social economic development and the resources environment reproduction as the standard of the regional development and evolvement in the certain time and to realize the organic unification of the standard and goal. Meanwhile, on the base of refraining the worse ecological environment, living environment and degenerated ecological environment should be improved, finally expand the environment capacity and coordinate the social economy development and resources environment capacity.

Only when each indicator has achieved or surpassed the reference value, the regional whole composite indicator is equal to or approaches 1，that is it must meet the need of people's basic living and development demand. The development is sustainable, if four subsystems are coordinated and regional development accords with the sustainable development

requirements. According to the above, judging basis is as follows: If CEI<0.80, it belongs to non-sustainable; if 0.80≤CEI<0.9,it belongs to basic-sustainable, if 0.90≤CEI≤1, it belongs to sustainable.

To summarize, conclusions are as follows:

(1) It is feasible to divide the sustainable development indicators system and comprehensive evaluation system of state-owned forest region in Heilongjiang Province into three levels, four systems, and thirteen elements in our study.

(2) According to the above evaluation criteria Dailing, Hailin, Hebei, Weihe, Yabuli, Dahailin, Dongjingcheng, Muling, Dongfanghong, and Yingchun forestry bureaus belong to sustainable; Taoshan, Tieli, Linkou, Cuiluan, Bamiantong, Wuying, Hongxing, Wuyiling, Shuangyashan, forestry bureaus belong to non-sustainable; These forestry bureaus should be combined into their linked forestry bureaus. Shuangfeng, Langxiang, Nancha, Jinshantun, Wumahe, Youhao, Shangganling, Suiyang, Chaihe, Shanhetun, Xinglong, Fangzheng, Qinghe, Suiling, Tongbei, Zhanhe, Hua'nan forestry bureaus belong to basic-sustainable.

(3) Those forestry bureaus, which are middle-sustainable for their society indicators, economy indicators, or resources indicators, will become the sustainable through their hardworking and readjustment.

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References
[1] Cai Liyan. The development direction of sustainable forestry construction [J]. *World Forestry Research*(In Chinese). 2005, 18(1):68-72
[2] Cao Lijun. Evaluation theory and method [M] (In Chinese). Science Press. 1999
[3] Gao Ruixin, Wang Fengyou. Research summary of forestry sustainable development indicator and evaluation (J) (In Chinese). Protection Forest Science and Technology. 2005, 23(4):68-72
[4] John P. Holdren，Gretchen C. Daily，The Meaning of Sustainability ： Biogeophysical Aspects ， Defining And Measuring Sustainability. The Biogeophysical Foundations. 1996
[5] Niu Wenyuan and Mao Zhifeng. Systematic analysis of theory on sustainable development [M] Wuhan: Science and Technology Press of Hubei (In Chinese). 1998.
[6] Qian Yi & Tang Xiaoyan. Environmental protection and sustainable development [M]. Beijing: Higher Education Press (In Chinese). 2000
[7] Zhang Shougong, Zhu Chunquan and Xiao Wenfa et al. An introduction to forest sustainable management [M]. Beijing: Chinese Forestry Press (In Chinese). 2001
[8] Zhu Lieke & Zhi Xin. Forest sustainable management [M]. Beijing: Chinese Forestry Press (In Chinese). 2001

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