

Chapter 7

Regional Analysis of GEC

7.1 Balance Analysis of GEC

The GEC scores and rankings of the countries obtained through non-dimensional processing with threshold method and weighted summing only reflect the status of environmental competitiveness of single country. To reflect the physical variance and overall status of the GEC in each country, GEC scores and its distribution as well as the physical difference and balance among the scores need in-depth study and analysis. Figure 7.1 shows the evaluation scores of GEC in 2012 and distribution of such scores.

It can be found from Fig. 7.1 that the GEC scores of the countries are not distributed in balance, with most countries scoring 45–55 points, accounting for 72.93%; countries scoring 40–45 points account for 9.77 %; countries scoring higher than 55 account for 12.78 %; and countries scoring lower than 40 are few in number, accounting for 4.51 %. Generally speaking, GEC evaluation scores are in symmetrical distribution, and the GEC scores demonstrate wide gap between the countries, as the lowest score 32.3 for Niger is only 55 % of that of the highest score for Switzerland, a gap of 26.4 points. It should be pointed out that the score difference between close rankings is generally very small, and therefore the relative ranking of the indicators is not Stable.

7.2 Regional Evaluation and Analysis of GEC

Table 7.1 lists the average GEC and sub-index scores of the 133 countries covered by this study by six contents of the world (Antarctica is excluded since there is no country on the continent).

According to the GEC scores of the six continents in 2012, Oceania obtained the highest GEC score, at 56.3 points; Europe, South America and North America scores were also high, all over 50 points; the lowest score occurred to Africa, at 46.7

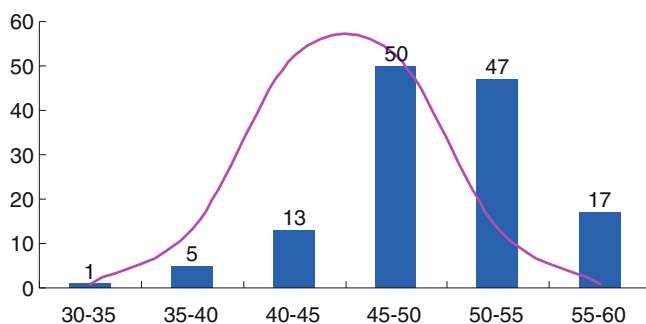


Fig. 7.1 GEC evaluation scores and distribution 2012

Table 7.1 2012 average GEC and sub-index scores of six continents

Region		Score					
		GEC	REC	EEC	ECC	EMC	EHC
Asia	East Asia	50.8	18.7	47.8	64.9	60.6	62.0
	Southeast Asia	50.6	27.3	44.3	62.7	46.7	70.7
	South Asia	48.0	22.3	35.8	66.7	48.0	67.3
	West Asia	46.1	10.6	47.3	63.0	45.8	63.9
	Central Asia	42.1	10.5	43.0	63.1	37.3	56.8
	Average score	47.5	17.9	43.6	64.1	47.7	64.1
Europe	East Europe	49.0	19.2	51.4	62.3	50.3	61.6
	South Europe	49.8	16.7	47.9	68.2	52.2	64.1
	West Europe	53.1	14.7	57.7	71.6	53.9	67.5
	North Europe	55.0	21.9	56.3	71.0	55.9	69.7
	Central Europe	54.7	17.8	62.3	70.8	55.3	67.4
	Average score	52.3	18.1	55.1	68.8	53.5	66.0
Africa	East Africa	47.0	16.4	40.1	68.8	45.5	64.2
	South Africa	47.3	14.9	48.2	66.9	49.1	57.3
	West Africa	45.0	14.8	42.0	67.7	42.9	57.6
	North Africa	45.2	11.5	43.5	67.7	36.4	67.1
	Central Africa	49.1	17.2	49.1	68.8	50.7	59.9
	Average score	46.7	15.0	44.6	68.0	44.9	61.2
Oceania		56.3	28.0	66.6	67.3	55.6	63.8
North America		53.0	22.5	50.5	68.5	53.0	70.4
South America		53.5	21.5	53.6	68.4	51.1	72.8

points. As a whole, the gap between the GEC of six continents was narrow, showing a score ratio of 1.02:1.12:1:1.20:1.13:1.14.

Within Asia, the GEC scores of East Asia and Southeast Asia were relatively higher, at 50.8 points and 50.6 points respectively; next to them is South Asia that scored 48.0 points; Central Asia scored the lowest, only at 42.1 points.

Within Europe, the highest GEC score went to North Europe, at 55.0 points and it is also the second highest score among all regions in the six continents; scores of

Central Europe and West Europe were also high, all above 50 points; the score of East Europe was the lowest, at 49.0 points.

Within Africa, scores of all regions showed no big difference, all below 50 points. Central Africa's score was the highest, at 49.1 points; next to it is East Africa, at 47.0 points; West Africa's score was the lowest.

According to the sub-index scores of the six continents in 2012, the REC, EEC and EMC scores of Oceania were all the highest, but its ECC and EHC both ranked only the 2nd from bottom; Africa's REC, EMC and EHC scores were all the lowest among six continents and its EEC ranked the 2nd from bottom.

With respect to REC, scores of all continents showed narrow difference, in which Oceania scored the highest and Asia and Africa scored lower; within Asia, only Southeast Asia and South Asia scored no less than 20 points and all other regions scored below 20, while the scores of all African regions were below 20. Among all regions, Central Asia's score was the lowest, at 10.5 points and only 37.4 % of the highest score for Oceania.

With respect to EEC, the gap between six continents was relatively wider; Oceania obtained the highest score of 66.6 points, while Asia scored the lowest, leaving wide gap between itself and other five continents. Within Asia, each region scored below 50 points and South Asia scored the lowest 35.8 points. Within Europe, regional scores showed big difference, leaving a gap of 14.4 points between the highest and the lowest scores. Africa showed small difference in scores, with a gap of 9.0 points between the highest and the lowest scores.

With respect to ECC, scores of six continents were relatively high, all above 60 points with small difference, in which West Europe scored the highest 71.6 points; next to West Europe was North Europe, scoring 71.0 points; East Europe's score was the lowest, but still as high as 62.3 points. Scores of Asian regions were the lowest in the six continents, with South Asia having the highest score and Southeast Asia having the lowest among all regions. Africa's score was on the moderate level, and scores of regions were about 68 points; East Africa and Central Africa scored the highest 68.8 points and South Africa had the lowest score, still arriving at 66.9 points.

With respect to EMC, scores of six continents showed no big difference, with Oceania having the highest score and Europe next to it; scores of Asia and Africa were lower than 50 points, especially within Africa where only Central Africa scored over 50 points and the lowest score was as low as 36.4 points. In Asia, all regions obtained low scores, except for East Asia, the other four regions all scored below 50 points; European regions' scores were all above 50 points, and Central Europe had the highest EMC score 55.9 points, which was also the second highest score among all regions of the six continents.

With respect to EHC, scores of six continents were all relatively high with big difference, in which South America had highest score 72.8 points and next to it was North America and Europe, but scores of Africa and Oceania were lower. Asian scores showed big difference, with Southeast Asia having the highest score 70.7 but Central Asia having the lowest score 56.8, also as the lowest among all regions of the six continents.

7.3 Special Evaluation & Analysis on Regional Environment Competitiveness

7.3.1 Evaluation and Analysis on Asia's GEC

7.3.1.1 General Analysis on the GEC of Asian Countries

In order to further analyze the GEC difference between Asian countries, the GEC rankings in Asia and in the world for the 39 Asian countries covered by this study are provided in Table 7.2.

As indicated by the rankings of the Asian countries in 2012, Japan, Philippines and Sri Lanka were the top 3 Asian countries in terms of environment competitiveness, China ranked the 17th place and Iraq ranked the last place.

If looking at the worldwide rankings in 2012, it can be found that only Japan entered the First Echelon (1st–10th rankings) and even neither a single country ranked top 20; there were only 1 countries in Second Echelon (11th–30th rankings), 8 in Third Echelon (31st–60th rankings), 11 in Fourth Echelon (61st–100th rankings) and as many as 18 countries in Fifth Echelon (101st–133rd rankings), accounting for 54.5 % of all countries in Fifth Echelon. Thus a conclusion may be reached that the environment competitiveness of Asian countries were at a low level and most countries had low rankings.

From the sub-index rankings, Asian countries' performance in the 5 sub-indexes were not consistent and no single country showed consistent performance in every aspects, always having one or two low rankings. For instance, Armenia, which ranked 14th worldwide in terms of GEC, had very high rankings in REC and EHC, at 1st and 5th respectively, and its ECC was above the middle level, at 33rd, but its worldwide EEC and EMC rankings were very low, which significantly pulled down its GEC rank. Saudi Arabia was faced with similar situation as Armenia, as its REC and EHC rankings were also very low. There were many more similar Asian countries that always had one or two low-ranking indicators which pulled down their overall GEC rank. Therefore, while making efforts in enhancing environment competitiveness, coordinated development of all aspects is very important and the "short slab" in certain field must be made up to improve the overall environment competitiveness; otherwise, global ranking would be seriously affected. For countries whose GEC rankings fell into Fifth Echelon, most of the countries had 3 sub-indexes ranking lower than 100th place, which made their overall rankings very low.

7.3.1.2 Present Status and Trends of Environment Competitiveness: Major Asian Countries

In order to further understand the characteristics and physical circumstances of the environment competitiveness in Asian countries, we selected China, Japan and India as typical Asian countries for analysis and listed in Table 7.3 the rankings of the indicators

Table 7.2 Comparison of Asian countries' GEC rankings 2012

Country	Rank											
	Rank in Asia						Rank worldwide					
	GEC	REC	EEC	ECC	EMC	EHC	GEC	REC	EEC	ECC	EMC	EHC
Japan	1	9	1	2	2	12	6	31	19	35	4	55
Philippines	2	5	18	12	9	5	29	11	81	72	56	20
Sri Lanka	3	10	22	16	6	3	39	32	91	80	28	10
Myanmar	4	1	32	1	28	2	41	1	121	33	106	5
Cambodia	5	6	16	7	12	18	44	15	74	54	65	68
Indonesia	6	3	28	4	10	13	46	8	110	44	60	58
Malaysia	7	4	5	32	20	15	50	9	37	123	84	64
Saudi Arabia	8	25	2	9	1	35	54	109	20	64	3	120
Nepal	9	8	14	5	19	22	56	21	71	48	81	84
Georgia	10	17	31	8	7	4	58	60	113	63	34	11
Korea, Rep.	11	14	11	14	11	21	64	51	57	76	63	83
Israel	12	34	3	21	13	14	69	127	29	92	67	61
Cyprus	13	32	4	20	8	23	72	122	34	91	54	86
Armenia	14	27	23	3	14	7	77	111	95	36	68	25
Thailand	15	13	24	26	16	11	79	48	100	109	74	53
Singapore	16	12	7	39	34	1	86	42	45	133	124	1
China	17	20	34	19	3	31	87	89	124	87	6	106
Turkey	18	23	30	10	17	6	89	106	112	66	76	24
Mongolia	19	16	19	36	4	33	91	59	83	128	8	117
Lebanon	20	22	10	28	26	16	94	105	54	115	101	65
Bangladesh	21	2	38	13	31	9	99	4	132	74	119	41
Vietnam	22	7	36	30	21	24	101	19	126	121	85	89
Azerbaijan	23	21	17	17	32	19	106	98	78	84	120	71
Oman	24	35	12	6	23	32	109	128	59	49	91	107
Iran	25	30	13	15	25	30	110	116	64	78	95	102
Pakistan	26	24	37	11	18	25	112	108	128	69	79	90
Syria	27	36	20	25	29	17	113	129	85	108	108	67
United Arab Emirates	28	26	15	38	5	29	114	110	73	132	18	100
Tajikistan	29	29	26	29	30	8	116	115	105	117	118	29
India	30	11	39	22	15	27	117	36	133	93	72	95
Qatar	31	15	8	37	22	34	118	56	50	131	89	119
Jordan	32	39	6	35	36	10	120	133	40	126	126	45
Turkmenistan	33	28	9	27	27	37	122	113	53	112	105	125
Kyrgyz Republic	34	31	27	24	38	26	123	117	107	103	128	92
Kuwait	35	18	21	34	24	39	124	70	90	125	93	129
Yemen	36	38	33	23	35	20	125	131	123	99	125	82
Uzbekistan	37	33	29	18	33	36	127	126	111	86	123	121
Kazakhstan	38	19	25	33	37	38	128	74	103	124	127	128
Iraq	39	37	35	31	39	28	131	130	125	122	130	97

Table 7.3 Distribution and comparison of GEC rankings of major Asian countries 2012

Country	Indicator	Number	1st– 10th	11th– 30th	31st– 60th	61st– 100th	101st– 133rd
China	Sub-index	5	1	0	0	2	2
	Pillar	16	2	1	4	5	4
	Individual indicator	60	3	1	13	26	17
Japan	Sub-index	5	1	1	3	0	0
	Pillar	16	4	3	4	2	3
	Individual indicator	60	9	13	8	12	17
India	Sub-index	5	0	0	1	3	1
	Pillar	16	0	1	5	6	4
	Individual indicator	60	4	4	14	22	15

of all levels in the 3 countries. Taking their efforts in enhancing their environment competitiveness into consideration, we summarized the findings as follows:

1. China's environment competitiveness remains steady and still moves forward, with obvious achievements in environmental protection.

In 2012, China's environment competitiveness ranked 87th worldwide, located in the down-middle position among the list. Among China's indicators ranking higher than 60th, 1 was sub-index, accounting for 20 % of total number of indicators and this indicator ranked top 10; 7 were pillars, accounting for 43.75 % of total indicators and 2 of them entered top 10; 17 were individual indicators, accounting for 28.33 % of total indicators and 3 of them were among top 10. However, among the indicators ranking below 60th, 80 % were sub-indexes, 56.25 % were pillars and 71.67 % were individual indicators; these directly influenced the global ranking of China's environment competitiveness.

Since the start of this new century, especially after the 16th CPC National Congress, the CPC Central Committee led by Secretary General Hu Jintao adhered to leading social and economic development with scientific outlook of development as well as the fundamental national policy of resource conservation and environment protection, thoroughly implemented the strategy of sustainable development, and initially put forward the key proposal and strategic mission of constructing ecological civilization; this has provided a solid theoretical basis, a far-reaching goal and driving force for Chinese people to realize harmonious development between human and nature, environment and economy, and human and society, pushing the socialism under Chinese context into a new space. Particularly during the "11th Five-Year" period, the entire environmental protection input reached RMB 2.1 trillion, the installed capacity of thermal power units over 300 MW as a proportion of total capacity increased from 47 % to 71 %, and the proportion of blast furnace over 1,000 m³ capacity in steel industry also increased from 21 % to 52 %. In the future, there will be more energy conservation and emission reductions projects to accelerate the structuring of clean and efficient industrial system and

promote green development; prevention and control measures against water pollution and air pollution are also key areas of work to improve people's living and production environment, so that both economic development and environmental protection can be realized as double wins.

1. REC and EEC are at the upper-middle positions, having higher competitiveness rankings. In the GEC rankings 2012, China's EMC ranked 6th, going ahead of other countries, but its REC and EEC ranked 89th and 87th respectively, located in the down-middle among the ranking list of 133 countries. China is a developing country; this three indicators can ranked relatively high, because, in addition to its resource environment advantages (e.g., its Growing stock in forest and other wooded land ranked the 5th place), the Chinese government attached high importance to and actively promoted coordinated and sustainable scientific development under humanitarian approach, with government departments and all regions carefully implementing the strategic deployment of ecological environment protection and the construction of "Two oriented society"(resource-saving and environmentally-friendly society), increasing the environmental protection (e.g., its Area of plantation and Afforestation ranked the 5th place). With these efforts, China's socioeconomic development and resource environment are in better balance, the capacity to realize sustainable development is built up and the quality of ecological environment is improved. These policies and steps will continue strengthen China's ecological environment competitiveness.
2. Ranks of various per capita indicators are lower, which constrains the climbing speed of overall competitiveness rank. It is true that the Chinese government has taken many effective steps in areas like environmental protection input, closing backward production facilities and combating climate change, but due to the large population accounting and the imbalance in town/rural, regional and socioeconomic development, there are many more difficulties so that many of the per capita indicators ranked below 80th worldwide and the global ranking of China's overall environment competitiveness is pulled down accordingly. Faced with such situation and problems, the Chinese government even paid more attention to environmental protection in recent years and have been aggressively exploring for new way of achieving sustainable environmental protection at lower cost, better benefit and lower emission. Not only is the environmental protection input increased year by year, but also strict policies are adopted, such as project environmental assessment, necessary regional restriction and closing backward production facilities; these can greatly promote green development. Execution of such measures and steps will further enhance the competitiveness of per capita type of indicators of China.
3. Ranks of various resource and energy consumption related and air quality related indicators are low, requiring strengthened environmental management and utilization. In recent years, the Chinese government put much emphasis on strengthening energy conservation and increasing energy efficiency. According to statistics, the energy consumption elasticity coefficient has dropped from 1.04 in the "10th Five-Year" period down to 0.59 in the "11th

Five-Year” period, saving 630 million tons of standard coal equivalents. It is clearly pointed out in The Twelfth Five-Year Plan for Energy Conservation and Emission Reduction released by the State Council in 2012 that “Till 2015, the energy consumption per 10,000 Yuan of GDP should drop down to 0.869 t of SCE, a decrease of 16 % compared with the 1.034 t SCE in 2010.” At present, China’s energy utilization efficiency is generally on the low side, and such indicators as power consumption, gross energy consumption and energy consumption per unit GDP all rank below 100th globally. At the same time, due to the excessive energy consumption, quite a few air quality indicators such as sulfur dioxide emission and nitrogen oxide emission also rank low; this thus requires the Chinese government to strengthen the binding force of energy conservation and emission reduction goals, further integrate climate change resilience into economic and social development plan and continue taking strict measures to strengthen and accelerate the transformation of economic development mode, so as to enhance the ability for sustainable development. Effective use of resource and great efforts to strengthen environmental management by government will be an important guarantee for China to enhance the competitiveness in environment carrying, management and coordinating.

2. Japan’s environment competitiveness takes the lead in Asia and has advantages even worldwide.

In 2012, Japan’s environment competitiveness ranked 6th worldwide, going ahead of other Asian countries and even having its advantages compared with other countries globally. Among the indicators ranking higher than 60th, 5 were sub-indexes, accounting 100 % of total indicators and 1 indicator ranked within top 10; 11 were pillars, accounting for 68.75 % of total indicators and 4 indicators entered the top 10; 30 were individual indicators, accounting for 50 % of total indicators and 9 indicators were one of the top 10. Among the indicators ranked below 60th, no sub-index, 31.25 % were pillars and 50 % were individual indicators; these directly influenced the global ranking of Japan’s environment competitiveness.

It’s beyond all doubt that since the 1970s the Japanese government has released series of environmental protection policies and legislation with high operability, advocated pollution control at the production and consumption links and tried to find the connection point of both environmental protection and economic growth, which have effectively reduced pollution and thus made Japan the world recognized advanced country in public pollution control. Entering the 21st century, Japan has initiated “open-loop economy” pattern formed from linear flow of “nature-resource-product utilization-waste treatment” and “reuse economy” emphasizing resource conservation & recycle and thus takes the lead globally in constructing circular economy.

1. EHC ranks in the front and shows obvious advantage in the world. In 2012, Japan’s EHC ranked 4th worldwide, showing advantageous status among the 133 evaluated countries. The pillars environmental governance and ecological protection under EHC ranked the 24th and 6th place, which explains that

the policies and measures about economic development and environmental governance, ecological protection taken by the Japanese government are scientific and effective. This is closely related to Japan's "reuse economic model" advocating resource saving and reuse & recycle and also guarantees that Japan remains one of the leading countries in coordinating development of economy and environment.

2. REC, EEC and EBC rank in the front of the list too. Japan's REC, EEC and EBC ranked 31st, 19th and 35th respectively, both in the obvious advantage positions among the 133 countries. This of course has something to do with the domestic resource, economic and environmental situations in Japan after WWII; particularly, after the War, Japan put economic recovery as priority that for a time ecological environment protection was overlooked and government investment was seldom used in ecological environment construction, which led to a wide gap in this field between Japan and western developed countries. With decades of efforts, it should be admitted that Japan has made great achievements in ecological environment protection, but there are still areas requiring further efforts, such as environmental protection input, ecological environmental infrastructure construction and biodiversity protection, so that REC and EEC can be effectively enhanced.
3. ECC ranks low, ranked 55th in the worldwide, located in the up-middle position, and thus requires attention and strengthened efforts.

The pillar Economy and Environment under ECC ranked the 7th, but the pillar Population and Environment ranked the 111th, which significantly pulled down ECC and the overall environment competitiveness of Japan. Such phenomenon should arouse close attention and the Japanese government needs to promote the coordinated development of population and environment.

3. India is weak in enhancing environment competitiveness and faced with great pressure from environmental protection.

In the global environment competitiveness rankings of 2012, India was the 117th country, a rather weak position along the list. Among the indicators ranking higher than 60th, 1 was sub-indexes, accounting 20 % of total indicators and no indicator ranked within top 10; 6 were pillars, accounting for 37.5 % of total indicators and no indicator entered the top 10; 22 were individual indicators, accounting for 36.67 % of total indicators and 4 indicators were one of the top 10. Among the indicators ranked below 60th, 80 % were sub-indexes, 71 % were pillars and 68 % were individual indicators; these directly influenced the global ranking of India's environment competitiveness.

Although India is the first country that put environmental protection into the Constitution and it also released series laws and policies to strengthen environmental protection, effect has been very small. At present, India is still a country dominated by service industry, but in the forthcoming few years of economic development, the industry with manufacturing as the typical will rise quickly; considering the construction of weak infrastructure facilities that requires a centralized and fast

development period, India is going to face enormous pressure from environmental protection. How to achieve the subtle balance between environment and development has to do with to what degree India can realize continued fast development.

1. Resource environment competitiveness has advantage in global market. REC of India was ranked 36th, which is an advantaged position among the 133 countries of the world. The pillars Land resources competitiveness under this indicator is ranked 13th. And the individual indicators Agricultural acreage as a percentage of national land area, Growing stock in forest and other wooded land ranked 5th and 9th. India has a variety of geographic formations and almost all types of geographic environment can be found in this country, like snow mountain, mountain range, desert and rain forest; therefore, India is a country with abundant natural resources like land resources and water resources. Of course, India needs to maintain such advantage by rational development and utilization of resources and adopt an approach of conservation and sustainable development.
2. Economic development decides strong need for energy while consumption is high, which makes development of new energy and clean energy imperative under the situation. It can be found by looking at the energy consumption type of indicators that the indicators related to energy consumption all ranked low; for instance, Energy consumption per unit of land area ranked 96th, Energy consumption per unit of GDP ranked 113th. This undoubtedly has to do with the heavy demand for energy due to reinforced development of manufacturing industry in India, but substantive energy consumption has put great pressure on environment. Sulfur dioxide emission per unit GDP in India ranked 100th and Carbon dioxide emission per unit GDP ranked 113th; economic and environmental development are extremely unbalanced. Therefore, development of new energy and clean energy as well as increasing energy utilization efficiency could be a solution. It should also be noticed that India is starting collaboration on new energy internationally, with great efforts in solar energy, nuclear energy and biological fuel, and actively engaged in the hot wave of shale gas reserve development in Asia.
3. Indicators related to air quality and climate change is very lower-ranking, presenting challenging missions in fighting climate change. The pillars Air quality ranked 133rd, in which Inhalable particles (PM10), Particulate matter (PM2.5), Index of Indoor air pollution, Nitrogen oxides emission, Sulfur dioxide emission ranked 99th, 133rd, 100th, 129th and 129th. The pillars Greenhouse Gas ranked 87th, in which CO₂ emissions per unit of land area and CO₂ emissions per unit of energy consumption ranked 102ed and 82ed. These rankings almost are all bottommost, revealing the terrible air quality and uncontrollable climate change in India. India has always been trying to build itself into a low-carbon economic power; according to statistics, during the past 20 years India has maintained about 8 % of annual average GDP growth rate, but its energy consumption only increased 4 % and energy consumption per unit GDP decreased almost by half, from 0.3 falling down to 0.16. However, as India is located in the tropic and subtropical zone, its ability to fight climate change is rather fragile compared

with other countries and regions of the world; its energy structure is dominated by coal, which accounting for 53 % of its total energy. Therefore, India needs to further optimize its structure of energy use, actively promote clean energy and coordinate the relationship between economic development and environmental protection so as to take more initiative in fighting climate change.

7.3.2 Evaluation and Analysis on Europe's GEC

7.3.2.1 General Analysis on the GEC of European Countries

In order to further analyze the GEC difference between European countries, the GEC rankings in Europe and in the world for the 36 European countries covered by this study are provided in Table 7.4.

From the 2012 environment competitiveness rankings in Europe, Switzerland, Germany and Norway were the top 3 European countries, the old-brand capitalist countries like UK, France and Netherlands were located in the upper middle of the list, and Moldova was the bottommost country.

If looking at the worldwide rankings of 2012, it can be found that 6 European countries entered First Echelon (1st–10th rankings), claiming the largest proportion among the six continents; there were 6 countries in Second Echelon (11th–30th rankings), 12 in Third Echelon (31st–60th rankings), 9 in Fourth Echelon (61st–100th rankings) and only 3 countries in Fifth Echelon (101st–133rd rankings). Thus a conclusion may be reached that the environment competitiveness of European countries were relatively high and most countries had high rankings.

From the sub-index rankings, the EEC, ECC and EMC rankings of European countries were relatively high, showing better performance. Actually, all European countries' performance in the 5 sub-indexes were balanced, except individual indicators that ranked lower but was pulled up by other indicators; particularly the pulling force from indicators with larger weight has driven the overall ranking of Europe's environment competitiveness to the front. For countries whose GEC rankings fell into Fifth Echelon, all of them had 4 sub-indexes ranking lower than 70th place, which made their overall rankings very low.

7.3.2.2 Present Status and Trends of Environment Competitiveness: Major European Countries

In order to further understand the characteristics and physical circumstances of the environment competitiveness in European countries, we selected Switzerland, Germany, Italy, Russia and UK as typical European countries for analysis and listed in Table 7.5 the rankings of the indicators of all levels in the 5 countries. Taking their efforts in enhancing their environment competitiveness into consideration, we summarized the findings as follows:

Table 7.4 Comparison of European countries' GEC rankings 2012

Country	Rank											
	Rank in European						Rank worldwide					
	GEC	REC	EEC	ECC	EMC	EHC	GEC	REC	EEC	ECC	EMC	EHC
Switzerland	1	13	2	3	4	3	1	63	2	7	12	30
Germany	2	17	1	2	3	20	2	72	1	6	11	74
Norway	3	1	13	10	11	2	3	6	25	21	23	15
Austria	4	11	4	16	9	11	8	55	5	28	21	49
United Kingdom	5	32	5	6	1	10	9	96	10	14	5	48
France	6	15	9	1	8	13	10	65	18	2	20	51
Slovak	7	25	3	4	24	12	13	85	3	10	57	50
Sweden	8	8	15	7	13	5	14	45	28	15	25	36
Belgium	9	36	7	5	14	21	25	103	16	12	26	76
Slovenia	10	2	29	9	15	19	27	17	68	20	30	72
Finland	11	7	18	21	17	24	28	43	32	46	35	85
Denmark	12	16	21	12	20	8	30	68	42	23	42	46
Albania	13	4	32	20	19	1	31	35	93	39	41	6
Italy	14	22	12	15	12	28	32	82	24	27	24	94
Greece	15	30	19	13	16	16	33	94	33	24	31	59
Latvia	16	6	22	27	10	14	36	41	46	89	22	54
Netherlands	17	24	11	11	26	17	37	84	22	22	64	62
Poland	18	28	8	29	2	27	38	88	17	100	10	93
Portugal	19	31	20	19	23	7	43	95	38	37	49	44
Czech Republic	20	27	14	23	21	26	47	87	27	62	45	91
Luxembourg	21	35	6	24	18	30	48	102	13	70	37	99
Ireland	22	29	25	18	25	9	51	90	52	34	58	47
Croatia	23	12	30	8	27	4	53	57	75	19	70	31
Lithuania	24	18	10	28	29	22	55	73	21	90	78	78
Hungary	25	23	23	22	34	6	65	83	48	51	102	38
Spain	26	33	24	14	33	18	67	97	51	26	94	63
Romania	27	20	28	17	32	23	68	79	65	29	92	79
Estonia	28	14	16	36	5	33	71	64	30	130	14	115
Russia	29	3	26	26	35	31	81	24	61	85	107	103
Belarus	30	19	17	34	31	29	83	77	31	120	87	98
Bulgaria	31	26	27	30	6	34	85	86	63	101	16	118
Macedonia	32	34	34	32	30	15	93	101	98	104	82	57
Ukraine	33	5	33	33	7	35	96	40	94	110	19	122
Bosnia and Herzegovina	34	9	36	31	28	32	103	50	115	102	71	105
Serbia	35	21	31	25	22	36	108	81	88	83	48	123
Moldova	36	10	35	35	36	25	115	53	106	127	111	87

1. Switzerland's environment competitiveness led the entire globe.

Among Switzerland's indicators ranking higher than 60th in 2012, 4 were sub-indexes, accounting for 80 % of total indicators and 2 indicators ranked top 10; 12 were pillars, accounting for 75 % of total indicators and 5 indicators entered top 10;

Table 7.5 Distribution and comparison of GEC rankings of major European countries 2012

Country	Indicator	Number	1st– 10th	11th– 30th	31st– 60th	61st– 100th	101st– 133rd
Switzerland	Sub-index	5	2	2	0	1	0
	Pillar	16	5	1	6	3	1
	Individual indicator	60	12	13	11	15	7
Germany	Sub-index	5	2	1	0	2	0
	Pillar	16	4	1	4	6	1
	Individual indicator	60	13	11	11	17	8
Italy	Sub-index	5	0	3	0	2	0
	Pillar	16	1	2	8	2	3
	Individual indicator	60	4	10	21	17	7
Russia	Sub-index	5	0	1	0	2	2
	Pillar	16	2	1	3	7	3
	Individual indicator	60	8	7	11	20	14
UK	Sub-index	5	2	1	1	1	0
	Pillar	16	2	5	4	4	1
	Individual indicator	60	10	11	14	15	10

36 were individual indicators, accounting for 60 % of total indicators and 12 indicators were among top 10. However, among the indicators ranking below 60th, only 20 % were sub-indexes, 25 % were pillars and 40 % were individual indicators; most of the indicators ranked high and these directly influenced the global ranking of Switzerland's environment competitiveness.

1. REC ranks in the medium level due to the congenital natural factors.

Switzerland has a land area of over 40,000 km², in which mountainous area accounts for 60 %. Because of such restrictions of natural factor, the land resources and forest resources rankings of Switzerland were all in the lower middle. Switzerland's REC ranked 63rd in 2012, which does not match with the situation of GEC ranked 1st. Further, land resources ranked 117th, forest resources ranked 64th and energy resources ranked 91st. Influenced by these, the per capita indicators, such as land area per capita, arable land per capita and forest area per capita, also ranked lower; for example, arable land per capita ranked 117th and forest area per capita ranked 83rd. At the same time, due to the lack of resources, net energy imports of the energy consumption also ranked low at 91st.

2. Due to the benefits of ecological environment protection and management, Switzerland's EEC, ECC and EMC rankings are all very high.

In spite of the low ranking of REC in 2012, Switzerland's EEC, ECC and EMC ranked 2nd, 7th and 12nd. This has to do with Switzerland's awareness of environmental protection and territorial harnessing as well as the methods they used. The country has accumulated extensive experience in ecological protection

(nature reserve area), safeguarding and improving air quality and environmental management. It has very strict legislation for environmental protection, such as legal sanction on any person who cuts down a single tree. Environmental measures of government are also strict and concrete, requiring green surface and vegetation cover for all land except for mountain, lake, farmland and buildings, regardless in cities and in rural areas and no single piece of bare land is allowed to be exposed to the air. In order to reduce environmental pollution, the 5,300 km of railroad line of Switzerland is electric, cities are encouraged to develop tram-car and trolley bus and in recent years environmental protection projects like battery car were initiated; hotels, restaurants, office buildings and even privately owned houses are not allowed to install air conditioner without special permit and instead natural ventilation or electric fan are recommended, and 3 individual indicators in environmental governance ranked first in the world. Participation by Swiss citizens is also active. The public may directly participate in the preparation for environmental legislation, make suggestions, and may vote by ballot the proposals and finally determine the environmental measures to be adopted.

3. A few individual indicators still rank low and require further improving the coordination of population and the environment.

In the 2012 GEC rankings, some of the individual indicators of Switzerland ranked extremely low, such as GEF benefits index for biodiversity, fertilizer consumption per unit of arable land, energy consumption per unit of land area, CO₂ emissions per unit of land area, motor vehicles per 1,000 people and energy consumption per capita, which ranked 109th, 102nd, 114th, 115th, 119th and 98th. According to the Swiss newspaper *20 Minutes*, the average quantity of energy, food, wood and other natural resources consumed by one Swiss is about twice of the average quantity per capita worldwide, the per capita consumption is 8 times higher than in poor countries such as Bangladesh. WWF also said that if human beings live like the Swiss, that we need at least 2.8 earth. Therefore, as the richest country of the world, Switzerland may consider, while improving the quality of life for Swiss people from financial and technology angles, reducing consumption of natural resources at the same time. For example, the Swiss should bear more responsibility in constructing environmental protection building, using low energy consumption car, reducing the consumption of meat and dairy foods, and realizing coordinated and sustainable development of both humans and nature.

2. Germany achieved remarkable results in environmental protection initiatives.

Among Germany's indicators ranking top 60 in 2012, 3 were sub-indexes, accounting 60 % of total indicators and 2 indicator ranked top 10; 9 were pillars, accounting for 56.25 % of total indicators and 4 indicators entered top 10; 35 were individual indicators, accounting for 58.33 % of total indicators and 13 indicators were among top 10. However, among the indicators ranking below 60th, 40 % were sub-indexes, 43.75 % were pillars and 41.67 % were individual indicators; most of

the indicators ranked high and these directly influenced the global ranking of Germany's environment competitiveness.

1. REC and EHC rank in the middle and lower levels, the coordination capability between population and environment needs to be further ascension.

In the 2012 GEC rankings, Germany's REC and EHC ranked 72nd and 70th, which in no sense matched its overall environment competitiveness ranking of 2nd worldwide. The low rankings of the 2 sub-indexes were mainly because of arable land per capita, annual precipitation, forest area per capita, net energy imports of the energy consumption, motor vehicles per 1,000 people, renewable internal freshwater resources per capita, CO₂ emissions per capita, and energy consumption per capita, ranking 76th, 72nd, 90th, 99th, 127th, 89th, 113rd and 102nd respectively. Germany's proportion of land area covered by forest was very high in the history, but due to irrational deforestation reclamation, over-exploitation of early industrialization, as well as the destruction of war, the original forest area quickly dropped, proportion of land area covered by forest decreased, causing serious ecological and timber crisis.

2. EEC ranks 1st globally and ECC, EMC rank in the top, ecological protection measures have produced excellent effects.

The top 1 ranking of Germany's EEC benefits from the series steps about ecological protection. Similar to Switzerland, the German government makes much account of public awareness on environmental protection and emphasizes environmental protection relying on public involvement. They publicize and popularize environmental protection knowledge to the public by means of free lectures and pamphlets; the German people put environmental protection as the second important domestic issue only next to employment. And, Germany issued related laws and monitoring measures to strengthen prevention and control over environment, such as Waste Management Law, "Regulation on Large Combustion Equipment" and "Technical Guide for Air Purification". The country also put the development of renewable energy on a strategic height and established series of sound laws and regulations for development of renewable energy and increasing energy efficiency for the purpose of climate change resilience. Germany launched a massive campaign to restore forests, first proposed the science business ideas of sustainable use of forest, carry out the construction of artificial afforestation, which gradually reversing the situation of the forest's continuing sharp decline. The number of forest increasing, area of plantation and afforestation in 2012 ranks 10th, ecological protection effect was apparent.

3. Some of the individual indicators still rank low and require further strengthening of environmental governance.

Among the individual indicators, low-ranking indicators include nitrogen oxides emission, sulfur dioxide emission, energy consumption per unit of land area, CO₂ emissions per unit of land area, motor vehicles per 1,000 people, CO₂ emissions per capita and Energy consumption per capita, ranking 125th, 103rd, 117th, 123rd, 127th, 113rd and 102nd respectively; these indicators by no means match with the overall environment competitiveness ranking at the 2nd place. In

the future, the country needs to strengthen governmental governance and adopt measure to build up its ability for sustainable development.

3. Italy still needs to keep increasing the harmony competitiveness of population and environment.

Among Italy's indicators ranking higher than 60th in 2012, 3 were sub-indexes, accounting for 60 % of total indicators and no indicator ranked top 10; 11 were pillars, accounting for 68.75 % of total indicators and 1 indicator ranked top 10; 25 were individual indicators, accounting for 41.67 % of total indicators and 4 indicators ranked top 10. Among the indicators ranking below 60th, only 40 % were sub-indexes, 31.25 % were pillars and 58.33 % were individual indicators; most of the indicators ranked high and these directly influenced the global ranking of Italy's environment competitiveness.

1. EEC, ECC and EMC rank high and the ability of environmental governance is strong.

In the 2012 GEC rankings, Italy's EEC, ECC and EMC ranked 24th, 27th and 24th respectively, which are rather high. Italy's environmental management competitiveness is more prominent, ranked 24th, thereinto Agricultural chemicals regulation ranked 20th and the rankings of the percentage of the rural population with access to an improved water source and the percentage of the urban population with access to an improved water source both ranked at the top. Italy through the classification of garbage collection, demolition of illegal construction and strengthen the green protection measures, to actually improve the environment and promote environmental protection.

2. The ranking of EHC was low and the main reason was due to the less harmony competitiveness of population and environment.

In the 2012 GEC rankings, Italy's EHC ranked 94th, mainly because of the rankings of the harmony competitiveness of population and environment was at 125th, which was extremely low. Thereinto the rankings of motor vehicles per 1,000 people and SO₂ emissions per capita were at 129th and 96th. At present, Italy has become the world's fifth largest car market, and the car consumption level ranked the forefront in Europe. Every thousand people have 581 passenger cars, and the average family owns 1 cars. Because car ownership is direct influence factors of the number of carbon dioxide emissions, it indirect effected the local environment, which makes the low rankings. While Italy's harmony competitiveness of economy and environment ranked 9th, and land resource utilization efficiency, sulfur dioxide emissions per unit of GDP, carbon dioxide emissions per unit of GDP, energy consumption per unit of GDP ranked 14th, 13th, 17th, and 6th respectively, the resource utilization efficiency is higher.

3. Ranks of some individual indicators are extremely low, which constrains the climbing speed of environment competitiveness rank.

In the 2012 GEC rankings, Italy's land area per capita, net energy imports of the energy consumption, threatened fish species, nitrogen oxides emission, energy consumption per unit of land area, CO₂ emissions per unit of land area

and motor vehicles per 1,000 people ranked extremely low, at 112th, 115th, 103rd, 112th, 112th, 117th and 129th respectively, which in no way match with the 32nd ranking of its global environment competitiveness and restrict the enhancement of competitiveness. The development of biofuels has influenced the development of biodiversity. Also owing to global climate change, the sea level near Italy moved up due to temperature rise, which further influenced the development of biological varieties.

4. Russia's environment competitiveness ranks in the middle and it needs to keep increasing its capacity in coordinating environment with economy and population.

Among Russia's indicators ranking higher than 60th in 2012, 1 was sub-indexes, accounting for 20 % of total indicators and no indicator ranked top 10; 6 were pillars, accounting for 37.5 % of total indicators and 2 indicators ranked top 10; 26 were individual indicators, accounting for 43.33 % of total indicators and 8 indicators ranked top 10. Among the indicators ranking below 60th, 80 % were sub-indexes, 62.5 % were pillars and 56.67 % were individual indicators; most of the indicators ranked low and these directly influenced the global ranking of Russia's environment competitiveness.

1. Russia's REC ranks in the middle and upper level, which is the benefit of its unique environment advantages.

In the 2012 GEC rankings, Russia's REC ranked 24th, under which land resources, forest resources and energy resources ranked 20th, 2nd and 38th respectively. Russia is the biggest country in the world, which is rich in natural resources and the natural resources in Russia accounts for 22 %–28 % of that in the whole world. There are deposits of coal, petroleum, natural gas, oil shale, iron, manganese, chromium, copper, lead, zinc, nickel, titanium, gold, potash, asbestos and so on. Russia's forest areas account for 1/3 of Russia's total territory, which is the world's largest subarctic coniferous forest. Although the runoff volume ranks second in the world, Russia's annual precipitation ranked 103rd, that becomes a short board to further enhance the REC. The ranking of proportion of combustible renewables and waste to total energy consumption was at 106th, which further restrict the increasing of its energy resources competitiveness.

2. EMC and EHC rank so low that Russia should pay attention to enhancing the coordination of economy and environment.

And reduction of energy consumption should be one of the focal areas for efforts. In the 2012 GEC rankings, Russia's ECC and EMC ranked 107th and 103rd, thereinto the ability of environmental governance ranked 123rd, resource utilization ranked 104th, especially the utilization rate of water resources is very low, which ranked 106th, and the harmony of economy and environment ranked 107th. Russia has become the largest crude and natural gas producer of the world and also the fourth largest energy user of the world, only next to China, USA and India. Compared with the OECD member countries, the energy utilization level

in Russia is low with severe waste. If Russia could make achievements in industrial modernization and vehicle exhaust emission reduction, the saved energy per year would satisfy the energy demand of the entire UK, equivalent to the energy of 200 million tons of crude oil. Disposal of household and industrial solid wastes in Russia is still a tough job; the equipment in some traditional industries like chemical engineering, petrification and microorganism are badly aged and frequent leakage accidents are also the cause for environmental pollution. For Russia, it must fully understand the high degree of consistency of environmental protection and scientific development, adhere to the “environment protection first” principle, correctly handle the relationship between environment and development, and establish the ecological philosophy that man and nature is harmony. And Russia should regard environmental protection as an important part in the process of production and consumption, vigorously develop the circular economy, transform the mode of economic development.

3. Some of individual indicators ranked so low, that should speed up to develop green economy.

Russia’s overall biodiversity ranked fourth, thanks to its GEF benefits index for biodiversity ranked 10th, but the threatened mammal species ranked 110th. In the air quality index, it ranked 66th, but the rankings of nitrogen oxides emission and sulfur dioxide emission were at 127th and 128th. There were 185 cities and industrial districts in Russia’s air pollution index were overproof. The exhaust emissions and automobile exhaust emissions exceed the standard from some metallurgical, chemical, petrochemical, construction, power and other enterprises are the main reason of air pollution. In addition, the waste which contain sulfur and nitrogen oxides discharged into the Russian forest, lakes and agriculture and forestry generated from other countries, such as Ukraine, Poland and Germany, also have a serious impact on Russia’s air quality. In ECC, SO₂ emissions per unit of value added of industry ranked 108th. In recent years, Russia has also taken a series of measures to improve air quality and control pollution, such as Russia has approved the state environmental protection plan from 2012 to 2020, aimed at developing “green economy”, to reduce the negative influence on environment from enterprises, legislated to implement fees and hefty fines for polluting enterprises and through the development plan of national forest economy from 2013 to 2020, called for the strengthening of forest protection, which have a positive effect on air quality improvement.

5. The effect of all the UK’s environmental policy is obvious.

Among UK’s indicators ranking higher than 60th in 2012, 4 were sub-indexes, accounting for 80 % of total indicators and 2 indicators ranked top 10; 11 were pillars, accounting for 68.75 % of total indicators and 2 indicators ranked top 10; 35 were individual indicators, accounting for 58.33 % of total indicators and 10 indicators ranked top 10. Among the indicators ranking below 60th, only 20 % were sub-indexes, 31.25 % were pillars and 41.67 % were individual indicators. These directly influenced the global ranking of UK’s environment competitiveness.

1. REC ranked low, and forest resources and energy resources more deficient.

In the 2012 GEC rankings, UK's REC ranked 96th, in the lower middle level, which do not match with its global environment competitiveness rank 9th. The main reason is that the rankings of UK's forest resources and energy resources were low at 92nd and 101st. According to the data from global forest resources assessment report published by FAO in 2010, UK's forest area is 2,881 thousand hm², accounting for 12 % of the land area, so UK is the lower forest coverage country in the developed countries (the average of European forest coverage rate is 44.3 %). According to the assessment report issued by the office of gas and electricity markets, from 2015 to the winter in 2016, the remaining proportion of UK energy will decrease from the current 14 to 4 %, which will lead to the United Kingdom is more dependent on imports of natural gas.

2. EEC, ECC and EMC rank high, which is the benefit of UK's various environmental laws and legal system.

In the 2012 GEC rankings, UK's EEC, ECC and EMC ranked 10th, 14th and 5th respectively. It is mainly benefits of various laws on managing air quality and environmental governance. UK made tremendous efforts in the governance of the haze. The first stage is to announce "environmental law in industrial development", the second stage is mainly to govern soot, through the "Clean Air Act", the local authority provided to set smokeless zone, strictly control the emissions of smokeless coal, no black smoke emission in the smokeless zone, the height like chimney, the upper limit of sulfur in the Industrial dye, the third stage is to control traffic pollution, and the fourth stage is the strategic stage. UK's government emphasis on improving energy efficiency and developing renewable energy, have established the target of developing "low carbon economy". UK has a series of projects and home users with recommendations for effective utilization of energy. Each new family in England and Welsh must comply with the standardized evaluation process designed for home energy tax, which fully embodies the efficiency of energy and the impact on the environment, and household equipment must have the energy label. All these measures make UK resource utilization in the world ranked 18th. In 2010, UK pointed out that it will build the world's biggest nature reserve in the waters around chagos islands of the Indian Ocean, to make the coral reefs exempted from the threat of global warming and protect the sea ecology and deep trenches, which are the efforts UK have made in ecological security. In 2012, UK'S ecological security competitiveness ranked 20th.

3. Ranks of some individual indicators are extremely low, which constrains the climbing speed of overall competitiveness rank.

Although UK government has attached much importance to environmental issues and put forward the concept of "Zero-energy development", which aims at maximally utilizing natural resources, reducing environment damage and pollution, realizing application of zero fossil energy, and finally realizing the residential mode of basic recycle between energy demand and waste treatment, in fact, the rankings of nitrogen oxides emission, sulfur dioxide emission,

fertilizer consumption per unit of arable land, energy consumption per unit of land area, elasticity of energy consumption, CO₂ emissions per unit of land area, motor vehicles per 1,000 people, CO₂ emissions per capita were at 116th, 106th, 110th, 116th, 103rd, 122nd, 111th and 103rd respectively. UK is the birthplace of the industrial revolution. The pollution brought by this revolution to UK is very serious, and the “Oliver twist” is called connected with the pollution by the factories at the time. According to goals established by the UK government, the renewable energy generating capacity will account for 15.4 % by 2015, and the CO₂ emissions will be reduced 60 % by 2050. There will be more funds invested into the research in development of clean technologies, increasing of energy utilization rate and so on in the next two years, so enterprises should be aware of the advantage of environmental protection industry as early as possible.

7.3.3 Evaluation and Analysis on Africa's GEC

7.3.3.1 General Analysis on the GEC of African Countries

In order to further analyze the GEC difference between African countries, the GEC rankings in Africa and in the world for the 33 African countries covered by this study are provided in Table 7.6.

In terms of national rankings within Africa in 2012, Gabon, Zambia and Botswana were top 3 environmentally competitive countries in Africa and Niger was the bottommost country.

If looking at the worldwide rankings of 2012, we can see that none of the African countries entered the First Echelon (1st–10th rankings); there was only 1 country in Second Echelon (11th–30th rankings), 5 in Third Echelon (31st–60th rankings), 15 in Fourth Echelon (61st–100th rankings) and 12 countries in Fifth Echelon (101st–133rd rankings), accounting for 36.4 % of all countries in Fifth Echelon. Lesotho and Niger were the bottommost 1st and 2nd respectively. Therefore, the environment competitiveness of African countries is generally at low level, and most countries ranked in the bottom part, falling into the fourth and fifth echelons.

From the rankings of sub-indexes, African countries' performance in REC, EEC and ECC were relatively better; Congo, Rep.'s REC ranked 2nd, Zambia's EEC ranked 7th, and Madagascar's ECC ranked 1st. Although certain sub-indexes of some countries ranked relatively in the front, the overall environment competitiveness ranking was not high, since other sub-indexes all ranked lower. For countries whose GEC rankings fell into Fifth Echelon, almost all of them had 3 sub-indexes ranking lower than 100th place, which made their overall rankings very low, particularly for Mali, Lesotho and Niger that all had 4 sub-indexes ranking lower than 100th place.

Table 7.6 Comparison of African countries' GEC rankings 2012

Country	Rank											
	Rank in Africa						Rank worldwide					
	GEC	REC	EEC	ECC	EMC	EHC	GEC	REC	EEC	ECC	EMC	EHC
Gabon	1	2	9	11	16	1	19	3	72	42	80	3
Zambia	2	6	1	21	11	25	40	29	7	79	66	114
Botswana	3	20	2	28	6	12	42	92	12	111	47	66
Mauritius	4	3	5	3	2	28	45	20	43	4	32	126
Tanzania	5	11	8	14	5	11	52	49	67	58	44	60
Congo, Rep.	6	1	18	29	28	2	57	2	92	114	121	14
Senegal	7	17	14	22	4	10	62	76	84	81	39	42
Benin	8	13	4	12	15	18	63	66	39	45	77	96
Namibia	9	22	13	25	1	21	73	104	82	97	7	109
Ghana	10	14	22	16	8	14	74	67	101	61	55	75
Cameroon	11	4	31	9	18	4	75	23	129	40	90	27
Zimbabwe	12	16	3	31	3	27	78	75	15	118	33	124
Nigeria	13	7	25	18	13	13	80	37	114	71	73	70
Tunisia	14	26	6	26	12	9	82	118	58	105	69	40
Togo	15	15	16	10	14	19	84	69	87	41	75	101
Angola	16	5	24	32	25	3	88	27	108	119	113	17
Kenya	17	23	21	15	10	17	90	107	99	59	62	88
Sudan	18	8	32	13	17	8	92	38	130	52	88	39
Morocco	19	27	23	6	20	6	95	119	102	13	97	33
South Africa	20	24	19	8	9	20	97	112	96	30	59	104
Guinea	21	12	29	2	19	23	100	62	122	3	96	112
Cote d'Ivoire	22	10	15	17	7	29	102	46	86	65	51	127
Algeria	23	30	11	23	26	5	104	123	77	82	114	28
Mozambique	24	9	12	27	21	22	105	44	80	106	99	111
Egypt	25	33	7	19	24	7	107	132	66	75	112	34
Ethiopia	26	18	20	7	27	24	111	80	97	25	115	113
Madagascar	27	19	27	1	23	31	119	91	117	1	109	131
Eritrea	28	25	28	20	29	16	121	114	120	77	122	81
Libya	29	21	10	30	33	15	126	99	76	116	133	80
Mauritania	30	31	17	5	32	30	129	124	89	8	132	130
Mali	31	29	33	4	31	26	130	121	131	5	131	116
Lesotho	32	32	26	24	22	33	132	125	116	96	103	133
Niger	33	28	30	33	30	32	133	120	127	129	129	132

7.3.3.2 Present Status and Trends of Environment Competitiveness: Major African Countries

In order to further understand the characteristics and physical circumstances of the environment competitiveness in African countries, we selected South Africa, Gabon and Kenya as typical African countries for analysis and listed in Table 7.7 the rankings of the indicators at all levels in the 3 countries. Taking their efforts in enhancing their environment competitiveness into consideration, we had the following findings:

Table 7.7 Distribution and comparison of GEC rankings of major African countries 2012

Country	Indicator	Number	1st– 10th	11th– 30th	31st– 60th	61st– 100th	101st– 133rd
South Africa	Sub-index	5	0	1	1	1	2
	Pillar	16	0	3	3	7	3
	Individual indicator	60	3	7	14	21	15
Gabon	Sub-index	5	2	0	1	2	0
	Pillar	16	2	3	6	3	2
	Individual indicator	60	10	14	13	13	9
Kenya	Sub-index	5	0	0	1	3	1
	Pillar	16	0	3	3	5	5
	Individual indicator	60	2	7	13	19	18

1. South Africa's environment competitiveness ranked relatively low in the world; its economic development has pushed the country to work on ecological recovery.

In the global environment competitiveness rankings of 2012, South Africa was the 97th country, in the down-middle among the list. Among the indicators ranking top 60, there was 2 sub-indexes, accounting for 40 % of total indicators; 6 were pillars, accounting for 37.5 % of total indicators; 24 were individual indicators, accounting for 40 % of total indicators and 3 indicators were among the top 10. However, among the indicators ranked below 100th, 60 % were sub-indexes, 18.8 % were pillars and 25 % were individual indicators, which seriously influenced the global ranking of South Africa's environment competitiveness.

Restricted by the natural conditions in South Africa, such as not so many grassland and forest resources and lack of water resources, as well as the environmental damage caused by exploitation of the rich mineral resources throughout the years, enhancing environment competitiveness in the country has been constrained. Of course, as the most developed economic country in Africa, South Africa has established solid material foundation for environmental protection and ecological recovery programs relying on fast developing economy; besides, the government paid close attention to administration of environmental protection and ecological recovery, through active investment in recovery of ecological vegetation, and set the requirement for all mining enterprises that a plan for recovery of ecological vegetation should be made ready before opening a mine. In order to protect natural ecological environment, South Africa also established various large-scale natural wildlife reserve in ecologically fragile arid and semiarid areas. In November 2011, the climate conference held in Durban of South Africa further promoted the country's awareness and efforts in enhancing environment competitiveness.

1. Lack of indicators that have high potential for pulling up rank; Quite a few indicators rank low. Among the 5 sub-indexes, 1 was in the up middle position, with

ECC ranking 30th. 2 were in the lower middle positions, with EEC and EMC ranking 96th and 59th. And the other 2 indicators were all in absolute disadvantage, REC ranking 112th and EHC ranking 109th. Due to the lack of indicator with high potential of ranking up, South Africa's environment competitiveness ranking was in the lower part. Therefore, the country should, on the basis of preventing further declining of indicator rankings, improve the short-slab indicators and thus enhance the overall environment competitiveness. For example, among the 2 pillars under EHC, Population and Environment ranked 83rd, Economy and Environment ranked 106th. So, it's obvious that the Economy and Environment was the main cause for hard climbing up of EHC. So it would be possible for ECC ranking to roll up, through adequate utilization of the material basis built up by the economic development, changing the industrial structures to promote technical innovation in environmental protection and through reduction of energy consumption and carbon emission.

2. The country emphasizes the ecological environment protection and keeps on improving EMC. During the evaluation period, South Africa's EMC is ranked 59th, in the middle position. Among the 3 pillars reflecting EMC, Resource Utilization ranked 16th, reflect that resource utilization is ideal, but using more fossil energy partly affected to further improve the position of resource utilization indicators; Ecological Protection ranked 59th, reflect that South African mine ecological environment restoration work has made progress, but the biological community protection efforts should to be further strengthened; Environmental Governance ranked 93rd, reflect that South Africa need to further improve the efficiency of environmental governance, to strengthen the environmental protection policies. to track supervision and enhance the governance effect, which is the effective way to further improve the country's EMC.
3. REC and EHC related indicators apparently rank low and thus require emphasized efforts for improvement and optimization. During the evaluation period, South Africa's REC and EHC were ranked 112th and 104th. Among the 4 pillars that reflect the REC, Water Resources and Forest Resources ranked after 100 places, reflect that South African should further focus on the protection and utilization of water resources and the forest resources. Among the individual indicators that reflect the EHC, Sulfur dioxide emissions per unit of GDP and Carbon dioxide emissions per unit of GDP ranked after 110 places, reflect that in economic developing, South Africa environmental pollution is relatively serious, low carbon industry development relative lag. In the future, South Africa should actively adjust the structure of economic development by encouraging technology and capital intensive industries promote technical innovation and reduce the carbon emission by mining and industrial sectors; efficient, rational and sustainable utilization of resources and improvement of utilization efficiency would also increase the EMC and EHC of South Africa.

2. Gabon's environment competitiveness takes the lead in Africa and ranks in the front even worldwide.

In 2012, Gabon's environment competitiveness ranked 19th worldwide, going ahead of other African countries and even having its advantages compared with other countries globally. Among the 5 sub-indexes, 2 ranked top 10, accounting for 40 %; no indicator EMC ranked below the 100th. Among the 16 pillars, 11 were in the top 60, accounting for 68.8 %; 2 ranked below 100th, accounting for 12.5 %. Among the 60 individual indicators, 37 were in the top 60, accounting for 61.7 %; and only 9 indicators ranked below the 100th, accounting for 15 %. As a whole, the indicator rankings were in the front, which determines the advantage of Gabon's environment competitiveness.

Republic of Gabon, which has been known as "forest republic" and "country of green gold", has 22 million hectares of forest, about 85 % of national land. But, Gabon didn't start large-scale exploitation of forest; instead, it took the protection of ecological environment and wildlife resources as a fundamental policy and established long-term mechanism for sustainable development to keep a balance between economic development and protection of ecological environment. In 2002, President Bongo announced that the country would build 13 national parks covering an area of nearly 2.6 million hectares of land in order to protect the important habitat of wildlife. The central government of the Republic of Gabon also strengthened the protection of ecological environment and wildlife through legislation and organization structuring, specifically establishing two ministries, i.e. the Ministry of Environment, Nature Conservation and Sustainable Development and the Ministry of Tourism and National Parks. The government believes that the national park program is of global significance as certain medium-/short-term sacrifice may preserve this natural wealth for human descendants. The series of environmental protection measures made Gabon a model country in the field of protecting ecological environment and wildlife.

1. EHC and REC rank in the front in Africa and shows advantages even worldwide. During the evaluation period, Gabon's REC ranked 3rd, and the Forest Resources pillar is ranked 1st, which was the most direct result and most effective reflection of the strong awareness of forest conservation and protection measures. EHC ranked 3rd, and the Renewable internal freshwater resources per capita pillar is ranked 2nd, which are closed to the natural resources and the country's ecological environment protection consciousness and effective measures. The superiority of natural endowment of resources and effective protection of the natural resources of the country related index ranking in front, so it enhance the environmental competitiveness of Gabon.
2. ECC ranks in the middle and has large space for improvement. During the evaluation period, Gabon's ECC ranked 42nd, an up-middle position among the 133 countries of evaluation objects. Pillars Industrial Carrying and Greenhouse Gas in ECC, were ranked 11th and 16th. The Individual indicator of Electric power consumption per unit of value added of industry is ranked 5th, which vigorously raise the pillar of Industrial Carrying ranking. It reflects that country's industrial

production less power consumption. The Individual indicator of Growth rate of Methane emissions is ranked 1st, which caused the pillar of Greenhouse Gas ranking front. It reflects that the country has made positive efforts in the control of greenhouse gas emissions. However, the 2 pillars of Agricultural Carrying and Energy Consumption were ranked 71st and 67th, reflect that the country's agricultural production level is lag behind, and this can be reflect by the Individual indicator of Cereal yield per unit of arable land, which ranked 94th. The main cause of Energy Consumption ranking low is that the proportion of clean energy is low in the energy consumption, and the Elasticity of energy consumption is low. Then, rapidly improving the Gabon's industrial and agricultural production capacity and increasing the proportion of clean energy, making up for the "short slab", can further improve the Gabon's environmental competitiveness.

3. EEC and EMC apparently ranks in the lower part and thus needs more attention and improvement. Gabon's EEC ranked 72nd during the evaluation period, and pillar of Biodiversity ranked 122nd caused the sub-indexes ranked low. So, the country should increase the protection of endangered species to improve Gabon's biological diversity. During the evaluation period, Gabon's EMC is ranked 80th, in which the pillar of Environmental Governance is ranked 108th. It reflects that Gabon still need to further efforts in environmental governance, especially to improve the infrastructure and the percentage of the rural population with access to an improved water source, to further enhance Gabon's EMC.

3. Kenya' environment competitiveness ranks in the lower part but with large space for improvement.

In 2012, Kenya's GEC ranked 90th worldwide, a down-middle position among the 133 evaluated countries. Among the indicators ranking top 60, 1 were sub-indexes, accounting for 20 % of total indicators and 0 indicator ranked top 10; 6 were pillars, accounting for 37.5 % of total indicators and 0 indicator entered top 10; 22 were individual indicators, accounting for 36.7 % of total indicators and only 2 indicators Carbon dioxide emissions per unit of GDP and Percentage of fossil fuel energy consumption to total energy consumption were among top 10. Among the indicators ranking below 60th, 80 % were sub-indexes, 62.5 % were pillars and 61.7 % were individual indicators; most indicators' rankings were in the lower part and these directly influenced the global rank of Kenya's environment competitiveness.

Kenya is located in the middle east of Africa; the country has natural environment in moderate climate and various species. Ecological construction and environmental protection is an important aspect work. Mining activities are strictly controlled, because the government thinks that such activities would seriously damage environment. So, in spite of the rich mineral resources, most of them remain untouched. However, deserts and half-deserts that account for 56 % of total national land impaired the REC of Kenya, and the fast growing population, lack of ecological protection system, caused the environmental policy difficult to play, and not timely adjustment economic structure and poor infrastructure, seriously restricted the Kenya environmental competitiveness improving.

1. Strengthening the ecological environment protection, enhance the EMC is still larger room. During the evaluation period, Kenya ranked 62nd by EMC, located in the up-middle among the ranking list of 133 countries. It reflects that the country's attention to ecological environment protection policy has achieved some effects. In 1977, the Kenyan government gave an order of complete prohibition of hunting, established strict policy for wildlife protection, and established 59 places of national park, natural conservation area or nature reserve that covering 12 % of Kenyan land area, a proportion ranking top in the world. The policy bring the country's pillar Ecological Protection ranked 49th, then improved the country's rank of EMC. But the pillar Environmental Governance ranked lower just 112th, which reflect that the country should to increase investment in environmental governance, improve the effect of environmental governance, thereby to improve the Kenya's EMC quickly.
2. The productivity of industry and agriculture should be improved to break the situation of moderate-ranking ECC. During the evaluation period, Kenya's ECC ranked 59th, located in the up-middle position. The pillar Greenhouse Gas ranked 27th, which reflect that Kenya's low carbon industry developed rapidly. In which the individual indicator CO₂ emissions per unit of energy consumption ranked 8th, it reflects that the country develop the low-carbon energy sources positively, geothermal power **generation** is one of the effective measures to reduce carbon emissions in recent years. The pillar Industrial Carrying ranked 55th, located in the up-middle position, which reflect that the industrial production is high efficiency. But the pillar Agricultural Carrying ranked 87th, in which the individual indicator Cereal yield per unit of arable land ranked 102nd, it reflects that the agricultural production is relatively backward, then Kenya should take full advantage of the country's industrial production capability to increase agricultural production level and quickly repair the "short slab", so that the rank of the indicator can be soon increased.
3. REC and EEC rank low and thus require close attention and improve. During the evaluation period, Kenya's REC ranked 107th, the pillars except Energy Resources ranked 24th, the other three pillars ranked below 100th. Therefore, how to effectively improve the country's land resources and water resources, forest resources, is the key to enhance the Kenya's REC. Kenya ranked 99th by EEC, located in the down-middle among the ranking list of 133 countries. This doesn't quite fit that Kenya attach great importance to ecological environment protection policy. The reason is although the country attaches great importance to ecological protection, but the implementation of environmental policies has not obtained the due effect. In which the pillar Biodiversity ranked 120th, it reflects that Kenya should strengthen the effort to protect the endangered species. And the Kenya government attaches great importance to ecological protection zone, while ignoring the protection out of them. Natural ecological protection within the conservation areas is strict and complete, but beyond the conservation areas, damage is severe, such desertification caused by over grazing in certain areas. Such non-systematic ecological environment concept and protection failed to correspondingly enhance the EEC of Kenya.

Table 7.8 Comparison of Oceanian countries' GEC rankings 2012

Country	Rank											
	Rank in Oceania						Rank worldwide					
	GEC	REC	EEC	ECC	EMC	EHC	GEC	REC	EEC	ECC	EMC	EHC
New Zealand	1	1	1	1	1	1	4	12	6	55	29	56
Australia	2	2	2	2	2	2	21	16	8	73	36	108

Table 7.9 Distribution and comparison of GEC rankings of major Oceanian countries 2012

Country	Indicator	Number	1st–10th	11th–30th	31st–60th	61st–100th	101st–133rd
Australia	Sub-index	5	1	1	1	1	1
	Pillar	16	5	1	4	4	2
	Individual indicator	60	13	6	11	18	10
New Zealand	Sub-index	5	1	2	2	0	0
	Pillar	16	4	4	3	3	2
	Individual indicator	60	12	14	11	13	6

7.3.4 Evaluation and Analysis on Oceania's GEC

7.3.4.1 General Analysis on Environment Competitiveness of Oceanian Countries

In order to further analyze the GEC difference between Oceanian countries, the GEC rankings in Oceania and in the world for the 2 Oceanian countries covered by this study are provided in Table 7.8.

The rankings of the two countries within Oceania in 2012 showed that New Zealand ranked 1st and Australia ranked 2nd.

From the two countries' global rankings of 2012, New Zealand ranked 4th in First Echelon (1st–10th rankings), while Australia ranked 21st in Second Echelon. Generally speaking, Oceania's environment competitiveness is at a high level.

In terms of sub-indexes, all the 5 sub-indexes for New Zealand ranked higher than those for Australia. New Zealand's REC, EEC and EMC were in the front along worldwide rankings; Australia's REC and EEC were in the front along worldwide rankings, but its EHC ranked very low.

7.3.4.2 Present Status and Trends of Environment Competitiveness: Major Oceanian Countries

In order to further understand the characteristics and physical circumstances of the environment competitiveness in Oceanian countries, we listed in Table 7.9 the rankings of the indicators of all levels in Australia and New Zealand. Taking the two

countries' efforts in enhancing their environment competitiveness into consideration, the study has the following findings:

1. Australia's environment competitiveness remains steady and still moves forward, with orderly and effective environmental protection measures.

Among Australia's indicators ranking top 60 in 2012, 3 were sub-index, accounting 60 % of total indicators and 1 indicator ranked top 10; 10 were pillars, accounting for 62.5 % of total indicators and 5 indicators entered top 10; 30 were individual indicators, accounting for 50 % of total indicators and 13 indicators were among top 10. As all levels of indicators were evenly distributed in different stage of rankings, Australia's environment competitiveness was slightly up from middle in the world.

Most Australian regions are in semiarid or desert belts, but with very rich ecological environment resources; the vast land has very high capacity of self purification. Both the Australian government and the public show high concern about environmental protection and environmental legislation and management have been continuously strengthened; and new public administration concepts were applied to make innovations and improvements in areas like environmental policy, decision-making mechanism and administrative mechanism. These have made the Australian government a very important role in the protection and construction of ecological environment and made great success.

1. REC shows obvious advantage and becomes an important guarantee of the advantageous overall environment competitiveness. In 2012, Australia's REC ranked 5th worldwide, a leading position among the 133 evaluated countries. Australia has large area of land, with very rich land, forest and mineral resources and has been well known as a country sitting on miner's truck. The proved economic reserves of bauxite, lead, nickel, silver, uranium, zinc and tantalum all rank world's first; and the country is also rich in iron, crude oil and natural gas resources.
2. EEC ranked in the front, EEC ranked 8th, In a leading position among the evaluated countries. As Australia has a small population and the entire country put the protection of ecological environment on an important position, with high intensity of protection on biodiversity, and the emphasized technological innovation and strictly followed environmental protection laws promoted coordinated development of resource, ecology and economic society.
3. Various energy consumption indicators rank rather low and industrial structure needs further readjustment. Australia also put great efforts in energy conservation and development of clean energy. At present, Australia is one of the countries that most widely utilized the most advanced solar energy. technology has been widely applied in industries, agriculture and civil facilities, and the taxation policy of Australia provided great support mainly for such green energy sources as clean energy and renewable energy. As the transportation sector of Australia is rather advanced, including aviation and highway sectors, the number of car per capita is very high, and the same is true with both total and per capital electric power and energy consumption as well as greenhouse gas and exhaust emissions. The total carbon emission increased by 40 % compared the level in 1990, and

carbon emission per capita exceeded 17 t, more than in most countries, which made the rankings of power and energy consumption related indicators much lower and influenced the incensement of environment competitiveness. Therefore, the Australian government should keep optimizing industrial structure, intensify the binding force of the energy conservation and emission reduction goals, strengthen the implementation and supervision on the measures fighting climate change and undertake more carbon emission reduction responsibility.

2. New Zealand's environment competitiveness steadily sits in the front and its environmental protection system is complete and highly efficient.

Among New Zealand's indicators ranking top 60 in 2012, 5 were sub-index, accounting 100 % of total indicators; 11 were pillars, accounting for 68.8 % of total indicators and 4 indicators entered top 10; 37 were individual indicators, accounting for 61.7 % of total indicators and 12 indicators were among top 10. As there were many indicators at different levels ranking in the front, New Zealand's environment competitiveness rankings among the top countries in the world.

New Zealand is an island country, but with very high environmental capacity and powerful environmental self purification ability; the country has comfortable climate, fresh environment, beautiful landscape and rich forest resources. And, the awareness in environmental protection has been very high among the Zelanian government, enterprises and the public. The government advocates protection and construction of ecological environment and stresses sustainable utilization and development of resources, thus legislatively establishing logical relationship between environment and economic development; its management system functions in order and with high performance, and the clean and green image from environmental protection also promotes rapid development of tourism industry, agriculture, forestry and stock farming. The perfect integration of environmental protection and economic development has made the country's environment quality among the best in the world.

1. REC, EEC and EMC all show distinct advantages and thus constitute the important basis of the top rank of New Zealand's environment competitiveness. EEC ranked 6th, and REC and EMC ranked 12nd and 29th respectively, all in advantaged positions. Because the population of New Zealand is very small and much importance has been attached to the protection of ecological environment, the government has established 1/3 of its national land into virgin forest conservation areas, national parks, coastal nature conservation areas and island and oceanic life conservation areas through legislation. The environmental protection institution of government and legislation are complete, ensuring multiple layers of guarantee for effective measures of legislation and management.
2. Various energy consumption indicators rank in the front and performance indicators are outstanding. New Zealand kept introducing and sharing with the public the concepts about environmental protection, functioning as an environmental

protection organization, promoted international exchange and collaboration and signed multiple international covenants including Convention on Biological Diversity (CBD) and Framework Convention on Climate Change that have been implemented in the country through domestic laws. In the fields of energy conservation and emission reduction as well as resource utilization efficiency, the country also achieved uncommon results, with both total energy consumption and exhaust emission indicators ranking in the front; the indicators under economy and environment also rank among the top countries. However, as the country has a small population, some per capita indicators rank in the lower part, such as carbon emission per capita at 7.23 t, which exceeded most countries and affected the improvement of overall environment competitiveness.

3. ECC and EHC rank in the middle part, the ECC, which ranked 55th, worse than most countries. As an island country, its geographic conditions have determined that the country lacks mineral resources and its ecological environment is rather fragile, with weak capacity of bearing large-scale industrial development and this, to some degree, influenced the diversity of industrial system, leading to constrained industrial structure.

7.3.5 Evaluation and Analysis on North America's GEC

7.3.5.1 General Analysis on Environment Competitiveness of North American Countries

In order to further analyze the GEC difference between the countries in North America, the GEC rankings in North America and in the world for the 13 North American countries covered by this study is provided in Table 7.10.

In terms of national rankings within North America in 2012, Costa Rica, Honduras and Guatemala were the top 3 environmentally competitive countries in North America; USA ranked 7th and Haiti was the bottommost country in the continent.

From worldwide rankings of 2012, only 1 country from North America, i.e. Costa Rica, entered First Echelon. Six countries were in Second Echelon, 4 countries in Third Echelon, 2 countries in Fourth Echelon and no country in Fifth Echelon. In general, North American countries were at relatively high level of environmental competitiveness and most countries rank in the front.

From the sub-index rankings, the REC, ECC and EHC rankings of North American countries were relatively higher, showing better performance. Actually, all the countries' performance in the 5 sub-index were balanced, except individual indicators that ranked lower but was pulled up by other indicators; particularly the pulling force from indicators with larger weight has driven the overall rank of environment competitiveness to the front, such as Costa Rica, Honduras, Guatemala and Canada. For the only country which will fall into Fifth Echelon, Haiti only had

Table 7.10 Comparison of North American countries' GEC rankings 2012

Country	Rank											
	Rank in North America						Rank worldwide					
	GEC	REC	EEC	ECC	EMC	EHC	GEC	REC	EEC	ECC	EMC	EHC
Costa Rica	1	2	5	13	2	1	7	7	47	107	9	2
Honduras	2	5	11	12	1	7	16	22	70	98	1	32
Guatemala	3	7	6	6	3	4	17	34	49	38	13	19
Canada	4	4	3	5	7	11	18	13	35	32	46	69
Nicaragua	5	1	1	9	11	8	22	5	11	68	104	37
Panama	6	3	8	11	6	3	23	10	60	95	38	13
United States	7	8	2	1	5	13	26	39	23	11	17	110
Jamaica	8	6	7	10	4	10	35	33	56	88	15	52
Cuba	9	12	9	8	9	5	49	71	62	67	53	22
El Salvador	10	11	12	2	10	2	59	61	109	16	83	9
Dominican Republic	11	10	4	4	13	6	60	54	44	31	117	23
Mexico	12	13	10	7	8	9	61	93	69	50	50	43
Haiti	13	9	13	3	12	12	98	52	119	17	116	73

2 sub-index EEC ranking lower than 100th, and its REC and EHC also ranked in the lower middle. Affected by these, the overall rank of Haiti was rather low.

7.3.5.2 Present Status and Trends of Environment Competitiveness: Major North American Countries

In order to further understand the characteristics and physical circumstances of the environment competitiveness in North American countries, we selected USA, Canada and Mexico as typical countries for analysis and listed in Table 7.11 the rankings of the indicators at all levels in the 3 countries. Taking their efforts in enhancing their environment competitiveness into consideration, we had the following findings:

1. USA ranks higher-middle in the world and new energy industry and green economy are the important penetration points of recovery and transformation.

Among the indicators ranking top 60 for USA in 2012, 4 were sub-index, accounting for 80 % of total indicators and no one entered top 10; 12 were pillars, accounting for 75 % of total indicators and 2 indicators entered top 10; 31 were individual indicators, accounting for 51.67 % of total indicators and 9 indicators were among top 10. These indicators directly influenced the global rank of USA's environment competitiveness, which rank 26th during 133 countries.

With the advent of the twenty-first century, new energy industry and green economy have become the focus of USA's development. Particularly after inauguration of the Obama administration, government released the economic revitalization

Table 7.11 Distribution and comparison of GEC rankings of Major North American countries 2012

Country	Indicator	Number	1st– 10th	11th– 30th	31st– 60th	61st– 100th	101st– 133rd
USA	Sub-index	5	0	3	1	0	1
	Pillar	16	2	2	8	3	1
	Individual indicator	60	9	8	14	17	12
Canada	Sub-index	5	0	1	3	1	0
	Pillar	16	3	3	5	5	0
	Individual indicator	60	12	9	16	13	10
Mexico	Sub-index	5	0	0	3	2	0
	Pillar	16	0	1	6	9	0
	Individual indicator	60	1	4	21	28	5

plan integrating energy conservation & emission reduction as well as green energy environment climate that can reduce pollution. In the American Recovery and Reinvestment Act totaling USD 787 billion, a great part of the contents are about new energy development, energy conservation & synergy and climate change resilience. The USA has been actively pursuing a way for developing diversified new energy industry, including development of clean energy sources like solar energy, wind energy, biological fuel and nuclear power, and new energy sources through technical reform on traditional energy like new type automobile fuel, smart power grid, high-efficiency battery, carbon storage and carbon capture. Through development of new energy industry and green economy to push economic recovery and promote economic transformation, USA has tried not only to take control on issues about global warming, but also to be the leader of world economy.

1. ECC and EMC show obvious advantage, REC and EEC give excellent performance in the world. In the evaluation year, USA's ECC and EMC ranked 11th and 17th in the world and showed apparent advantages; both Cereal yield per unit of arable land and Net exports of goods as a percentage of GDP ranked 7th, Percentage of the urban population with access to an improved water source ranked first, Area of plantation and afforestation ranked second, all in the upper middle of the ranking list. USA has very rich natural resources and the area of plain accounts for half of national land; it is the country that has the largest area of arable land in the world. In particular, the vast plain in the east provides sufficient conditions for agriculture, forestry and animal husbandry. It also has abundant mineral resources; the aggregate mineral reserve of the country rankings among world's top. In order to further improve air quality, USA actively implemented greenhouse gas emission reduction through legislation and distinct regulation of reduced use of fossil energy and development of clean energy; and starting from 2012, USA would carry out total greenhouse gas control and emis-

sion permit trading system. These measures will further consolidate USA's advantage in REC.

2. EHC turns to be weak and become the "Achilles' heel" of environment competitiveness. Among the 133 countries for GEC evaluation in 2012, USA was ranked 110th according to EHC. Like other industrialized countries, USA also adopted the strategy of "pollution first governance next" for industrialization and thus accumulated severe environmental problems; environment carrying capacity is faced with challengeable test. Production and living resources and energy consumption has been very large. According to statistics, USA has consumed 35 % of world's resources with 6 % of global population. Take petroleum for example, USA is the largest petroleum importer and consumer of the world, its import volume accounts for over half of its total demand and consumption accounts for 21 % of global oil consumption. The environmental management ability of USA is also yet to be further improved. Resource and energy utilization efficiency needs to be increased and environmental safety supervision needs to be strengthened, so as to provide larger space for environmental improvement and optimization.
3. Resources and energy consumption and exhaust emission indicators are giving poor performance; there will be a very long way to go in emission reduction and climate change resilience. In terms of either total amount indicators or per capita indicators, USA's air quality indicators all ranked very low; such as nitrogen oxide emissions ranked 131st, sulfur dioxide emissions ranked 130th, CO₂ emissions per unit of land area ranked 105th, SO₂ emissions per capita ranked 112th, CO₂ emissions per capita ranked 128th, Energy consumption per capita ranked 120th. USA should take its responsibility of a great power of the world by decreasing the use of fossil energy and encouraging use of clean energy and reducing exhaust emissions. Of course, we can see that USA has already taken some measures in this regard, including establishing new fuel economy standards, setting upper limit on discharge of mercury from power plant and other toxic air pollutant applicable nationwide, large investment in development of clean energy, etc.; these measures will be a forceful guarantee for improvement of the air quality in USA.

2. Canada is the environment competitiveness leader in North America and also an eye-catcher in the world.

In the 2012 global rankings of environment competitiveness, Canada was the 18th country, showing advantage status in the GEC. Among the indicators ranking higher than 60th, 4 were sub-index, accounting for 80 % of total indicators with none indicator ranked within top 10; 11 were pillars, accounting for 68.75 % of total indicators and 3 indicators entered the top 10; 37 were individual indicators, accounting for 61.67 % of total indicators and 12 indicators were in the top 10. However, among the indicators ranking below 60th, 20 % were sub-index, 31.25 % were pillars and 38.33 % were individual indicators; these indicators constrained enhancement of the environment competitiveness of Canada and directly influenced its overall rank.

Environmental protection of Canada takes the lead in the world and adopts federal, provincial and municipal three-level management model. According to statistics, Canada has over 7,000 companies involved in environmental protection business and the yearly output value amounts to USD 15 billion, accounting for 2.2 % of GDP; the export value of Canada's environmental protection industry has exceeded USD 1 billion. The environmental protection technologies about soil, air and water has obtained world recognition, especially the water and wastewater treatment technology that ranks top in global market. At present, the Canadian government is preparing a new clean energy innovation program targeting at 97 million Canadian dollars for research, development and demonstration projects.

1. Rich natural resources guarantees the top rank of REC. Canada is the second largest country of the world in terms of territory area and natural resources are abundant. In the evaluation year, Canada's forest resources and land resources competitiveness ranked 3rd and 4th respectively, all at outstandingly advantaged positions. The vast plain provides sufficient conditions for agriculture, forestry and animal husbandry; mineral reserve occupies 3.8 % of world's total. The minable oil sand resource in west Canada is abundant, which makes Canada a country with large oil resource reserve only next to Saudi Arabia. Canada also owns numerous national parks, provincial-level parks and nature conservation nature reserves; the total land area of these parks and reserves exceeds one million square kilometers. Besides, Canada put north Canada a specially protected region. The federal government developed a North Pole environment protection plan under which the countries neighboring with the Arctic collaborate to protect the region. Rich resources together with governmental concern for development of such resources constitute an important guarantee for Canada's REC position.
2. EHC is at downstream positions, forming a biggest constraint of Canada to enhance environment competitiveness. Among the 133 countries for GEC evaluation in 2012, Canada was ranked only 69th according to EHC. In recent years, irrational tapping of resources has seriously damaged the biodiversity in Canada; problems like environmental pollution, large energy consumption and climate change caused by industrial production are still severe. How to repair the environmental damage caused by industrial production and how to actively fight climate change and to increase biodiversity are the penetration points for improving ecological environment and enhancing environment carrying capacity. It should also be noticed that Canada has already take steps in this regard and put the two largest carbon emission sectors, transportation and electric power, as the key emphasis of work; collaboration with USA and Mexico is also an emphasized aspect. Investment in clean energy technology is increased. In achieving the carbon emission reduction goals, Canada has provided 4 % of total funding, though it is only responsible for 2 % of global emissions.
3. Large amount of resource and energy consumption makes exhaust emission indicators a big concern and also reflects the relatively low efficiency of resource and energy resource utilization. In the evaluation year, Canada's resource and energy consumption indicators and air quality indicators all ranked beyond 100th place;

for example, Nitrogen oxide emissions ranked 120th, Sulfur dioxide emissions ranked 121st, SO₂ emissions per capita ranked 120th, CO₂ emissions per capita ranked 125th and Energy consumption per capita ranked 122nd. These indicators reflect that although Canada has abundant resources and energy reserves, the efficiency of utilization is rather low. A priority for industrial production is to replace and save traditional fossil energy through technological improvement and new energy development. Strengthening supervision on exhaust emission, opening and promoting use of clean energy and taking the responsibilities in air quality improvement and climate change resilience are also aspects requiring efforts.

3. Mexico's environment competitiveness is quite satisfactory, but it lacks core indicators that may lead to enhancement of its GEC.

In the global environment competitiveness rankings of 2012, Mexico was the 61st country, a moderate position along the list. Among the indicators ranking higher than 60th, 3 were sub-index, accounting for 60 % of total indicators and no indicator entered top 10; 7 were pillars, accounting for 43.75 % of total indicators and no indicator entered top 10; 26 were individual indicators, accounting for 43.33 % of total indicators and only 1 of them was within top 10. However, among the indicators ranking below 60th, 40 % were sub-index, 56.25 % were pillars and 56.67 % were individual indicators; these indicators constrained enhancement of the environment competitiveness of Mexico and directly influenced its overall rank.

Although Mexico's performance in the rankings shows nothing outstanding, the country takes an active part in global environment governance by releasing climate change law to reduce emission of greenhouse gases and setting objective of increasing the use of renewable energy; the law made Mexico the first developing country that established compete law against climate change. In addition to the objective for greenhouse gases emission, the law also specified that about 35 % of the energy source in Mexico will be renewable energy by 2024 and government agencies must use renewable energy. Mexico also invested active efforts in the development of clean energy, nuclear energy and wind energy with an eye to promote diversification of energy source, so as to improve environment quality and fight climate change.

1. Multiple indicators are in medium level without indicators having strong pulling force. In the evaluation year, 4 of the 5 sub-index of Mexico were all in medium level, in which EEC ranked 69th, ECC and EMC ranked 50th, EHC ranked 43rd, there was not any indicator showing outstanding performance. Due to lack of indicators with strong pulling force, Mexico's environment competitiveness was rather ordinary in worldwide scale. The country should select indicators with growth potential as key areas of efforts to form core competitiveness and at the same time shall prevent current indicator rankings from declining. For instance, Mexico has made full use of its geographic location between the Pacific Ocean and the California Gulf; it increased investment in clean energy, particularly wind energy, putting over 80 % of its energy into wind energy industry, and adopted wind power generation allowance policy, endeavoring to take the lead in the development of new energy.

2. REC performance is barely satisfactory and needs special attention. Taking a wide view on the sub-index rankings of Mexico, it is clear that ECC is obviously the “short slab”. In the 2012 rankings, it ranked 93rd among the 133 countries and among the 4 pillars under it, land resources ranked 77th, water resources ranked 75th, forest resources and energy resources ranked 46th and 66th respectively. Due to the development and expansion of city need to constantly forestland, the city also needs a lot of land for industrial and expanding livestock raising, which directly led to the decrease of Mexico forest and forest degradation. Mexico has become one of the most serious national forest degradation in the world. In addition, part of Mexico’s industrial development has seriously polluted the main rivers, causing the destruction of water resources is quite serious. The country needs to further take active steps in fighting climate change, enhance environment carrying capacity and finally promote the sustained growth of economy.
3. Internal structure of GEC indicators should be improved to push smooth and coordinated growth of environment competitiveness. The internal structure of the indicators of different levels in Mexico is not balanced; for instance, within EEC, ecological diversity indicator is very competitive, ranking 17th, Air quality indicator is much less competitive, ranking 83rd, reflecting the unbalance of the resource structure of Mexico. Another example is the 2 pillars under EEC. Its ecological protection ranked 62nd, while biodiversity ranked 110th, leaving wide gap within EEC. Therefore, the moderate performance of several indicators is actually the result of neutralization between high-ranking and low-ranking indicators; such imbalance in structure will certainly affect the stability of competitiveness. So, Mexico should actively improve such internal structure by improving the low-ranking indicators while at the same time maintaining the high-ranking indicators so as to narrow the gap and realize steady and coordinated enhancement of its environment competitiveness.

7.3.6 Evaluation and Analysis on South America’s GEC

7.3.6.1 General Analysis on Environment Competitiveness of South American Countries

In order to further analyze the GEC difference between the countries in South America, the GEC rankings in South America and in the world for the 10 South American countries covered by this study are provided in Table 7.12.

In terms of national rankings within South America in 2012, Brazil, Ecuador and Venezuela were top 3 environmentally competitive countries in South America and Uruguay was the bottommost country.

From worldwide rankings of 2012, 1 country from South America entered First Echelon. Five countries were in Second Echelon, 1 country was in Third Echelon, 3 countries were in Fourth Echelon and no country was in Fifth Echelon. In summary,

Table 7.12 Comparison of South American countries' GEC rankings 2012

Country	Rank											
	Rank in South America						Rank worldwide					
	GEC	REC	EEC	ECC	EMC	EHC	GEC	REC	EEC	ECC	EMC	EHC
Brazil	1	1	3	3	4	3	5	14	14	43	43	8
Ecuador	2	6	2	10	3	2	11	30	9	113	40	7
Venezuela	3	3	1	5	7	8	12	25	4	53	86	26
Bolivia	4	5	6	9	1	10	16	28	41	94	2	77
Colombia	5	4	5	6	2	7	20	26	36	56	27	21
Chile	6	7	4	7	5	5	24	47	26	57	52	16
Peru	7	2	8	8	6	4	34	18	79	60	61	12
Argentina	8	10	7	2	9	9	66	100	55	18	100	35
Uruguay	9	9	10	1	10	1	70	78	118	9	110	4
Paraguay	10	8	9	4	8	6	76	58	104	47	98	18

the environment competitiveness of South American countries was generally high and most countries ranked high.

From the sub-index rankings, the REC, EEC and EHC rankings of South American countries were relatively higher, showing better performance. Actually, all the countries' performance in the 5 sub-index were balanced, except individual indicators that ranked lower but was pulled up by other indicators; particularly the pulling force from indicators with larger weight has driven the overall rank of environment competitiveness to the front, such as Brazil and Ecuador. As for Uruguay that ranked 98th, its ECC and EHC both ranked very high, but as REC and EEC both ranked lower than 100th, the overall environment competitiveness was rather low.

7.3.6.2 Present Status and Trends of Environment Competitiveness: Major South American Countries

In order to further understand the characteristics and physical circumstances of the environment competitiveness in South American countries, we selected Brazil, Colombia and Ecuador as typical countries for analysis and listed in Table 7.13 the rankings of the indicators at all levels in the 3 countries. Taking their efforts in enhancing their environment competitiveness into consideration, we had the following findings:

1. Brazil shows excellent performance in environment competitiveness with outstanding achievements in environmental protection.

Among Brazil's indicators ranking top 60 in 2012, 5 were sub-index, accounting for 100 % of total indicators and 1 of them was within top 10; 12 were pillars, accounting for 75 % of total indicators and 3 of them entered top 10; 39 were quaternary indicators, accounting for 65 % of total indicators and 6 of them were among top 10. These indicator rankings directly lead to the advantaged situation for Brazil

Table 7.13 Distribution and comparison of GEC rankings of Major South American countries 2012

Country	Indicator	Number	1st– 10th	11th– 30th	31st– 60th	61st– 100th	101st– 133rd
Brazil	Sub-index	5	1	2	2	0	0
	Pillar	16	3	4	5	3	1
	Individual indicator	60	6	15	18	14	7
Colombia	Sub-index	5	0	3	2	0	0
	Pillar	16	1	6	4	3	2
	Individual indicator	60	5	18	17	12	8
Ecuador	Sub-index	5	2	1	1	0	1
	Pillar	16	2	3	2	3	6
	Individual indicator	60	6	7	20	18	8

in the comparison of GEC and move Brazil to the 5th place among the 133 countries.

The reasons for Brazil's outstanding environment competitiveness are the strong public awareness of environmental protection and government policies. As shown by the national survey conducted by the National Confederation of Industry (CNI) of Brazil through polling company Ibope, Brazilian people is showing increasing concern about global warming and environmental issues. According to the survey, the percentage of Brazilian people who were concerned for environmental issue has increased from 80 to 94 % during the period of from 2010 to 2011. Furthermore, the percentage of respondents who regard environmental protection as more important than economic growth also increased from 30 to 44 %; another 40 % of respondents think that a balance can be achieve between the two; only 8 % of respondents give priority to economic growth. Brazil has accumulated extensive experience in environmental protection policy and formed complete environmental management system and environmental protection law system. For instance, in order to prevent damage to natural environment, the Brazilian government sets up a special capital felony that is rarely seen in the world, i.e. crime of damaging the nature, which is equivalent to "crime of racial discrimination". Brazil is the only country of the world that never uses pure gasoline for motor fuel and also the earliest in the world to force the use of ethanol gasoline through legislation. The Brazilian Constitution also stipulates that government has the responsibility to protect environment, which provides the legal guarantee for environmental protection from foundation level.

1. REC, EEC and EHC rank high and show apparent advantage. In the GEC rankings 2012, Brazil's REC, EEC and EHC ranked 14th and 8th respectively, all at leading places among the 133 countries. On the one hand, Brazil is a developing country in South America, with very rich natural resources, and naturally has the competitive advantage in ecological environment (e.g. GEF benefits

index for biodiversity ranked first, Growing stock in forest and other wooded land ranked 4th, Proportion of land area covered by forest ranked 10th). On the other hand, the Brazilian government attached high importance to environmental protection and established a complete environmental management system that takes improving and restoring environment quality and ensuring socioeconomic development, national security and public happiness as objectives, which perfectly coordinated the sustainable development of population, resource and environment.

2. ECC and EMC rank in the above-middle place and there is still room for further improvement. In 2012, Brazil's ECC and EMC ranked 43rd worldwide, a higher middle place among the 133 evaluated countries. Among the indicators, Elasticity of energy consumption ranked 79th, Elasticity of electric power consumption ranked 72nd, Growth rate of CO₂ emissions ranked 125th, Growth rate of Methane emissions ranked 95th, these indicators still have higher improvement place. For the past few years, continued fast economic growth has led to heavy demand for energy and power supply, and consequently, consumption of oil, electric power and natural gas in Brazil increased sharply. For instance, the energy consumption in 2010 reached 265 million tons of standard oil equivalent, an increase of 9.96 % compared with the 241 million tons in 2009. In the future 5–10 years, Brazil will possibly witness fast development in such energy intensive industries as steel, which will further drive increase of energy consumption. This would be a constraint for improvement of environment competitiveness. Therefore, Brazil should focus on increasing efficiency of energy utilization and encouraging R&D on technologies for sustainable utilization and protection of resource environment realize; this way, transformation of economic development mode can be successfully achieve.
3. Due to over consumption of energy, air quality indicators as well as per capita consumption and emission indicators all rank very low and environmental governance needs to be intensified. It is expected that by 2020, the greenhouse gas emission in Brazil will be reduced by 36.1–38.9 %, in which 24.7 % will have to rely on reduction of felling and/or burning of the forest in Amazon rainforest and savanna, 6.1 % will rely on transformation of production mode in agriculture and animal husbandry as well as restoration of vegetation of pasture, and 7.7 % will rely on increasing hydropower capacity and emission reduction measures of metallurgy companies.
2. **Colombia demonstrates obvious advantage in environment competitiveness with balanced development in general.**

Among the indicators ranking higher than 60th in 2012, 5 were sub-index, accounting for 100 % of total indicators with no indicator ranked top 10; 11 were pillars, accounting for 68.8 % of total indicators and 1 of them entered top 10; 40 were individual indicators, accounting for 66.7 % of total indicators and 5 of them were among top 10. These indicator rankings directly lead to the advantaged situation for Colombia in the comparison of GEC and move Colombia to the 20th place among the 133 countries.

Colombia is a country that respects harmonious coexistence of man and nature, emphasizing economic development and environmental protection as well. Article 21 of the Constitution of Colombia includes environmental issues, requiring adequate consideration of environmental problems while achieving economic and social development; in national development plans, environmental objectives are put on the same level as economic and social objectives. In the Global Environment Outlook 5 (GEO-5) released in 2012, the integrated land use plan and the magnetic suspension city bus initiated by Bogota of Colombia are selected as the successful case for environmental policy and acts by local government. Because the Columbia has energy strategy, provide for oneself oil reserves and powerful hydroelectric power industry combined with the environmental protection, it was named “global energy competition” national ranking fifth in the world.

1. The environment competitiveness of Colombia is in balanced distribution and 5 sub-index are all in the upper middle places. EHC, REC and EMC all ranked in the front, at 21st, 26th and 27th places respectively. Colombia is also a South American country with large territory; its southeastern region is covered by the robust Amazon rainforest, which is regarded the most valuable natural resource of the world and has 10 % of world's biological species (only next to Brazil, ranking second). However, only 5 % of Colombian population lives in the Amazon area, which is to some degree a form of protection for the ecological environment. In order to promote the coordinated development of population, resource and environment and to enhance environment carrying capacity, Colombia has taken series steps. For instance, in recent years, the Colombian government spent great efforts in promoting application of biological fuel like ethanol, because the greenhouse gas emission out from biological fuel use is 70–80 % less than that from fossil fuel use. This is of course good for improving environment quality and fighting climate change. By 2014, the Colombian government will try to achieve the goal of yearly output of 340 million liters of ethanol.
2. EEC and ECC ranked 36th and 56th respectively, with overall good performance, there is room for improvement. Columbia also is known as the “Noah's Ark of humanity” by the genetics community. It has rich resources and unique natural landscape, so the ecological diversity, ecological security and other three indicators ranked front, with strong competitiveness. But relatively speaking, the air quality, agricultural bearing, energy consumption still have room for further improvement.
3. Some resource consumption indicators and greenhouse gas emission indicators rank low and need improvement. For instance, Elasticity of energy consumption ranked 68th, Fertilizer consumption per unit of arable land ranked 123rd, Growth rate of Methane emissions and Nitrogen oxides emission ranked 101st and 100th respectively, these indicators all need further improvement. Moreover, although Colombia advocates development of industries and product on the basis of continued use of biodiversity resource, illegal felling still widely exists and causes damage to ecological diversity, which makes intensified governance necessary. Due to overfishing, habitat degradation caused by

the natural fishery resources supply drop, Columbia is constantly in aquaculture instead of fishing products.

3. Ecuador is an eye-catcher in environment competitiveness with better improved ecological environment.

Among Ecuador's indicators ranking top 60 in 2012, 4 were sub-index, accounting 80 % of total indicators and 2 of them ranked top 10; 7 were pillars, accounting for 43.8 % of total indicators and 2 of them entered top 10; 33 were individual indicators, accounting for 55 % of total indicators and 6 indicators were among top 10. These indicator rankings directly lead to the advantaged situation for Ecuador in the comparison of GEC and move Ecuador to the 11th place among the 133 countries.

Ecuador government holds high the protection and construction of environment and emphasizes the coordination and balance between economy, society and environment. In 2011, the more than 100 cities of Ecuador committed to promoting and handling climate change and showed concern for related public policies, which was included in its national development and deployment plan. At the same time, environmental action plan about emission reduction was listed in its national climate change local action system, requiring establishment of environmental protection organization to take charge of local environmental policy and planning.

1. EEC and EHC are at the advantage positions, having higher competitiveness rankings. The two indicators ranked 9th and 7th in the global environment competitiveness rankings of 2012. In spite of limited territory area, Ecuador is the country having the largest number of biological species per 1,000 km² in the world. These animals and plants are distributed in very much differentiated environment, including tropical rainforest and dry forest in the south, and the country is regarded as one of the 17 most ecologically diversified countries of the world. Ecuador has large number of natural reserves, and about 20 % of the land is conservation area; and it has more than 20 national parks showing the diversified ecosystem. These are the major reasons for the high rankings of Ecuador's biodiversity and ecological protection indicators.
2. ECC ranks 113th position, which is at lower-middle positions in the 133 evaluation countries. Among these, annual freshwater withdrawals for agriculture per unit of arable land, Electric power consumption per unit of value added of industry and SO₂ emissions per unit of value added of industry are ranked 120th, 109th and 129th respectively. The agricultural acreage of Ecuador takes only 5 % of its national land, and marine fishing resources are rich, but the resources are faced with overfishing, which definitely influences the sustainable development of fishing resources. Although Ecuador has rich oil resources, with low production capacity, weak industrial base, the industrial pollution is serious.
3. Ranks of various per capita indicators and resource consumption indicators are mostly at upper-middle positions. Ecuador is an underdeveloped region. In 2010, the agricultural population accounted for about 47 % of its total population and the population in poverty accounted for about 32.8 % of total population. As the economic development is rather lagged, Ecuador is mainly an energy exporter as

Table 7.14 Comparison of G20 nations' GEC rankings 2012

Country	Rank											
	Rank in G20						Rank worldwide					
	GEC	REC	EEC	ECC	EMC	EHC	GEC	REC	EEC	ECC	EMC	EHC
Germany	1	11	1	2	5	10	2	72	1	6	11	74
Brazil	2	3	4	10	10	1	5	14	14	43	43	8
Japan	3	6	6	9	2	7	6	31	19	35	4	55
United Kingdom	4	15	3	4	3	5	9	96	10	14	5	48
France	5	10	5	1	7	6	10	65	18	2	20	51
Canada	6	2	10	8	11	9	18	13	35	32	46	69
Australia	7	4	2	15	9	17	21	16	8	73	36	108
United States	8	8	8	3	6	18	26	39	23	11	17	110
Italy	9	12	9	6	8	12	32	82	24	27	24	94
Indonesia	10	1	16	11	14	8	46	8	110	44	60	58
Saudi Arabia	11	18	7	13	1	19	54	109	20	64	3	120
Mexico	12	14	14	12	12	4	61	93	69	50	50	43
Korea, Rep.	13	9	12	16	15	11	64	51	57	76	63	83
Argentina	14	16	11	5	18	3	66	100	55	18	100	35
Russia	15	5	13	17	19	14	81	24	61	85	107	103
China	16	13	18	18	4	16	87	89	124	87	6	106
Turkey	17	17	17	14	17	2	89	106	112	66	76	24
South Africa	18	19	15	7	13	15	97	112	96	30	59	104
India	19	7	19	19	16	13	117	36	133	93	72	95

one of the largest crude exporter in South America. In 2010, the net crude oil export was about 285,000 barrels per day, while its domestic consumption of energy was very limited. Therefore, emission of greenhouse gases like carbon dioxide took only tiny part of world's total and the carbon dioxide emission data showed downtrend in recent years. In order to realize coordinated development of population, economy, society, resource and environment, Ecuador should also expedite economic development, promote social progress and keep emphasizing environmental protection during the process.

7.3.7 Evaluation and Analysis on G20 Nations' GEC

For the purpose of analyzing the GEC difference between the countries of the Group of Twenty (G20), the environment competitiveness rankings of the 19 countries of G20 within the group and worldwide in 2012 are given in Table 7.14. As EU is not taken as a single entity for ranking and evaluation in worldwide scale, it is excluded from the analysis in this part.

In terms of national rankings within G20 in 2012, Germany, Brazil and Japan were the top 3 countries among G20 nations; China ranked 16th and India was at the last place. Among the top 10 countries, only Brazil and Indonesia are developing

Table 7.15 Comparison of BRICS countries' GEC rankings 2012

Country	Rank											
	Rank in BRICS						Rank worldwide					
	GEC	REC	EEC	ECC	EMC	EHC	GEC	REC	EEC	ECC	EMC	EHC
Brazil	1	1	1	2	2	1	5	14	14	43	43	8
Russia	2	2	2	3	5	3	81	24	61	85	107	103
China	3	4	4	4	1	5	87	89	124	87	6	106
South Africa	4	5	3	1	3	4	97	112	96	30	59	104
India	5	3	5	5	4	2	117	36	133	93	72	95

countries, and the others are all developed countries, but among the 11th–19th places, only 1 country is developed country and the other 8 are all developing countries.

With respect to worldwide rankings in 2012, Germany and Brazil were the top 5 countries; Japan, United Kingdom and French were also in the front, at the top 10th place. South Africa and India ranked very low, all beyond 100th places.

In terms of rank distribution in echelons in 2012, there were 5 countries in the First Echelon, 3 in the Second Echelon, 3 in the Third Echelon, 7 in the Fourth Echelon; and 1 in the Fifth Echelon. As a whole, the environment competitiveness of G20 nations are relatively high and echelon distribution is even with the First Echelon and the Fourth Echelon including more countries.

From the sub-index rankings, the EEC, ECC and EMC rankings of G20 nations were relatively higher, showing better performance. Actually, all the countries' performance in the 5 sub-indexes were balanced, except individual indicators that ranked lower but were pulled up by other indicators; driven by combined forces, overall rank of environment competitiveness was still in the front, such as Germany, Brazil, United Kingdom and Australia. For countries whose GEC rankings falling into the Fifth Echelon, all of them had 2 sub-indexes ranking lower than 100th place, such as South Africa, Turkey and China. Although India had only 1 sub-index beyond 100th place, its overall rank of environment competitiveness was very low, due to EEC ranking 133rd place, ECC ranking 93rd place and EHC ranking 95th.

7.3.8 Evaluation and Analysis on the GEC of BRICS

In order to further analyze the GEC difference between BRICS countries, the GEC rankings within the countries and in the world for the 5 countries covered by this study are provided in Table 7.15.

In terms of national rankings within the countries in 2012, Brazil and Russia were the top 2 countries and India was the last.

From worldwide rankings in 2012, Brazil's rank was very high, at 5th; Russia and China ranked in the lower middle level; and the other 2 countries ranked rather low. As a whole, the BRICS countries are in a relatively lower level of environment competitiveness.

From the sub-index rankings, the REC and EMC rankings of BRICS countries were relatively higher and the other 3 sub-indexes ranked relatively lower, which makes the overall rank rather low.

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