EVALUATION AND COMPARATIVE ANALYSIS OF GLOBAL ENVIRONMENTAL COMPETITIVENESS

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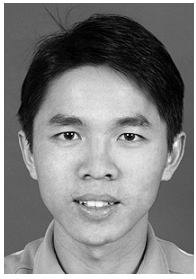

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Abstract: This article firstly puts forward a definition of global environmental competitiveness (GEC) and explains its connotations and component elements in detail. GEC has five parts, that is, ecological environmental competitiveness (EEC), resource environmental competitiveness (REC), environmental bearing competitiveness (EBC), environmental management competitiveness (EMC), and environmental coordination competitiveness (ECC). Based on the GEC Evaluation Indicator System and mathematical model, we carried out overall evaluation and regional analysis on the 2012 GEC of 133 countries. The environmental competitiveness of these countries displayed four characteristics and four rules. Finally, we propose some basic approaches and policy suggestions to enhance GEC.

Key words: global environmental competitiveness; overall evaluation; comparative analysis

1. Connotations and Component Elements of Global Environmental Competitiveness (GEC)

1.1. Connotations of GEC

Since the 1990s, the concept of environmental competitiveness has been frequently used and has become a high priority. However, but as discussion of the concept was done from different angles, there has been no unified definition of the term (Li et al. 2011a; Li et al. 2012).

GEC is a whole new way of evaluating competitiveness in the context of increasing contradictions between economic development and environmental protection. It centers on competitiveness supported by the natural environment and takes technology innovation as the main instrument; market mechanisms and government regulation as the means; bearing capacity/coordinating capacity/executive capacity/influencing capacity/contributing capacity as the evaluation basis; capacity/response/feedback/adjustment/optimization as the main line; intensifying environmental development and utilization, reducing environmental damage, maintaining global ecological equilibrium and realizing global sustainable development as objectives; and has the ecological environment, resource environment, environmental bearing capacity, environmental management, and environmental coordination as its contents. It reflects the environmental competitive capacity of different countries of the world in a comprehensive and systematic way. Compared with traditional competitiveness concepts, GEC places more emphasis on the environment as the basic element of human production and living; it places stress on the coordinated development of both human beings and the environment and focuses on the existing and potential impact of the environment (Li et al. 2013).

The GEC is a huge comprehensive system involving the economy, society, and the environment. It can be divided into five aspects, as shown in Figure 1.

(1) Bearing capacity. This reflects the capacity of a nation or region's ecological and resource environment to bear sustainable regional development. Environments with different sizes, structures, and functions will show varying bearing capacities, but environmental bearing capacity is never unalterable.

(2) Coordinating capacity. This reflects the capacity of a nation or region's ecological and resource environment to coordinate with regional production and living activities. It can be adjusted and optimized by means of lifestyle transformation, readjustment of industrial structure, and emission controls.

(3) Executive capacity. This reflects the executive capacity of all levels of government of a nation or region to manage the ecological and resource environment so as to realize environmental optimization. It focuses on innovation in technology, systems, and mechanisms and on combining price and non-price instruments.

(4) Influencing capacity. This reflects the capacity of a nation or region's ecological and resource environment to influence neighboring regions and the capacity of human activity, especially major construction projects, to influence the internal regional environment. Such capacity varies with the improvement of environmental management and management patterns and with the influencing capacity of surrounding areas.

(5) Contributing capacity. This reflects the capacity of a nation or region's existing, improved and degraded environment to make a contribution to sustainable regional development. The quality of the environment, efficiency of environmental management, and implementation of major projects will directly influence the contributing capacity of the environment. Conversely, contributing capacity influences the bearing capacity of regional ecological and resource environments and the coordinating capacity of humans and the environment.

In summary, GEC has the following characteristics: (1) It considers both existing environmental competitiveness and the potential impact of environmental changes; (2) it mainly investigates the natural environment, but its contents have areas that overlap with the ecological environment and the hard environment; (3) it also investigates the impact on all nations in and outside the region of environmental quality improvement carried out under the aegis of environmental protection; and (4) it considers the multi-layer superimposed effects of the implementation of environmental protection in the current state of the global environment.

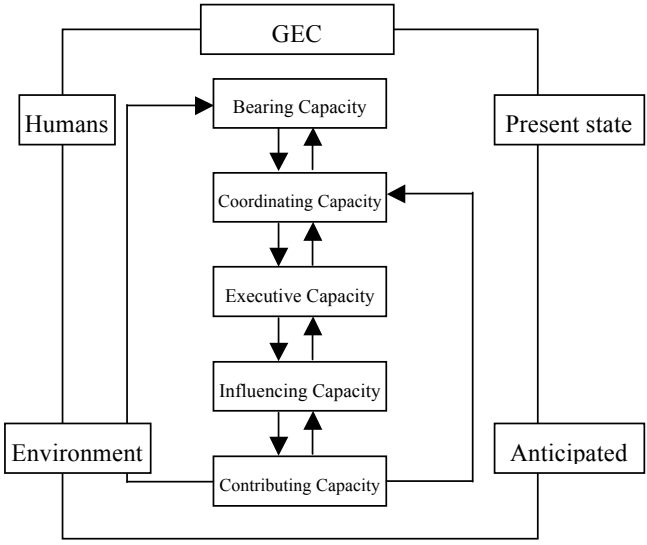

Figure 1 Connotations of GEC

1.2. Component Elements of GEC

The five components of GEC are: ecological environmental competitiveness (EEC), resource environmental competitiveness (REC), environmental bearing competitiveness (EBC), environmental management competitiveness (EMC), and environmental coordination competitiveness (ECC).

EEC is the basic element of GEC. Ecological environment is the main component that attracts inhabitants and capital input and also an important factor that influences environmental competitiveness in the long term. ECC should reflect not only the contributing capacity of ecological environment for human activity but also the utilization intensity and level of ecological environment by humans; it also reflects the degree of emphasis put by humans on ecological environment; it is the assessment basis of GEC.

REC is the fundamental condition of GEC. Resource environment includes water environment, land environment, atmosphere environment, forest environment, mineral product environment, and energy environment; it is the existing element of GEC and provides necessary support for human production and living. REC is an internal element of GEC and the necessary guarantee to form GEC; it comprehensively reflects environmental capacity to bear human production.

EBC is an important element in assessing the strength of GEC. Environmental bearing capacity involves industrial and agricultural production, energy consumption, and climate change; it reflects the capacity of a nation or region's ecological and resource environment to bear sustainable regional development and also the influence of human activity on the natural environment, or the environment's response and restorative capacity with regard to the outcomes of human activity; it is an important indicator for assessing the strength of environmental competitiveness.

EMC is a powerful support to GEC. Government and the public are the key players in environmental management, which coordinates the supervisory relationship between socioeconomic development and environmental protection through various administrative instruments and economic and legal means. EMC covers the two aspects of resource utilization and environmental safety, used to show the governance outcomes of utilization efficiency and environmental pollution, respectively. EMC comprehensively reflects executive capacity for environmental governance; it is an important step in enhancing GEC.

ECC is an important reference for the assessment of GEC. Population, the economy, society, and coordinated environmental development are the important criteria for judging the superiority or inferiority of environmental competitiveness and also an important way of realizing the objective of sustainable development. It is an external factor that influences GEC and is also an important safeguard for the formation of GEC.

The formation of GEC is a complex dynamic process. EEC and REC reflect environmental bearing capacity and contributing capacity through capacity/response; they are the foundation and guarantee of the management, bearing and coordinating competitiveness of the environment. Without the ecological and resource environment, human production and survival would have no support,

and utilization and protection of the environment would not exist. Various administrative and economic policies, systems, and mechanisms protect and govern the ecological and resource environments. Their processes and outcomes receive feedback from EMC and EBC and keep continuous readjustment and improvement on the basis of their performance. The ultimate objective of improving environmental quality is promotion of the harmonious unity of humankind and the environment, and realization of the sustainable development of both; this is the essential contents reflected in ECC and the key locus of environmental optimization (see Figure 2). Therefore, EEC, REC, EBC, EMC and ECC are never mutually independent units; instead, they are an interactive unity focused on the main thread of capacity/response/feedback/adjustment/optimization. An appropriate degree of enhancement and collaboration of these five elements can drive the overall enhancement of GEC.

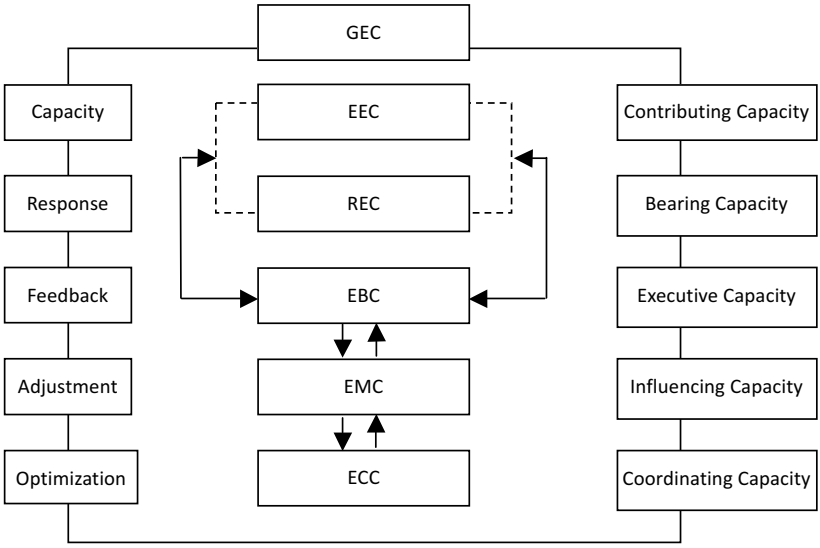

Figure 2 GEC Elements and Their Internal Relationships

2. Overall Evaluation of GEC

2.1. GEC Evaluation Results

This article completes the evaluation and analysis of the 2012 GEC of 133 countries based on the GEC Evaluation Indicator System and mathematical model. Due to limited space, the 2012 country environmental competitiveness rankings and scores are shown in Figure 3. Figure 3 shows the environmental competitiveness scores of the six continents and the top three countries in each continent.

Figure 3 Environmental Competitiveness Scores of the Six Continents and the Top Three Countries in Each Continent

Listed in order, the countries whose GEC ranked 1st–10th in 2012 were Switzerland, Germany, Norway, New Zealand, Brazil, Japan, Costa Rica, Austria, United Kingdom, and France; those ranked 11th–20th were Ecuador, Venezuela, Slovakia, Sweden, Bolivia, Honduras, Guatemala, Canada, Gabon, and Colombia; those ranked 21st–30th were Australia, Nicaragua, Panama, Chile, Belgium, the United States, Slovenia, Finland, the Philippines, and Denmark; and the bottom 10 countries were Kuwait, Yemen, Rep., Libya, Uzbekistan, Kazakhstan, Mauritania, Mali, Iraq, Lesotho, and Niger.

The highest GEC score was 58.7 points, the lowest was 32.3 points, and the average score was 49.6 points; this indicates that overall environmental competitiveness in countries worldwide is yet to be improved, as there is not a single country that scored above 60 points. In addition, 67 countries scored higher than the average score, accounting for 50.38% of total countries.

The distribution of country GEC scores shows a ladder pattern. Here, 18 countries scored above 55 points; 47 countries scored 50–55 points; 49 countries scored 45–50 points; 13 countries scored 40–45 points; 5 countries scored 35–40 points; 1 country scored 30–35 points; and no country scored below 30 points. It is clear that most countries scored above 45 points and only a few obtained scores lower than 45 points. Furthermore, the standard deviation of the GEC scores was as low as 4.8, which means the difference in different countries' environmental

competitiveness was not large. In particular, the difference between countries with close rankings was very slight.

The countries with higher scores were mainly developed countries; 17 developed countries were among the top 30 rankings, accounting for 56.7%, and 8 developed countries were among the top 10 rankings, accounting for 80.0%. The countries with lower scores were mostly developing countries, mainly because of the long-standing gap in socioeconomic development foundation, environmental protection inputs, environmental management, and environmental technology between developed and developing countries.

As a whole, the difference among all the countries was not large, but the scores of the bottom 10 countries lagged far behind those of the others. This was especially so for Niger, which ranked last with a score of 32.3, 26.4 points below the highest score and even 17.3 points below the average score. Among developed countries, the highest score, of 58.7, went to Switzerland, in 1st place; the lowest score, of 44.3, went to Qatar, ranking 118th. Among developing countries, the highest score, of 57.5, went to Brazil, ranking 5th, and the lowest score, of 32.3, went to Niger, ranking 133rd.

The standard deviation of EEC was 9.3; this indicator shows the largest difference between countries and is the key factor leading to the differences in their environmental competitiveness. In addition, the standard deviation values of EMC and ECC reached 9.1 and 8.9, respectively; they are also important causes of differences in competitiveness. The standard deviation values of REC and EBC are relatively low. The EBC standard deviation is the lowest, at 5.3, which means that EBC has the least influence on the differences in environmental competitiveness among countries. Basically, there is not a great difference in countries' overall environmental competitiveness; the major cause of differences in competitiveness is seen in EEC, EMC, and ECC. Of course, REC and EBC also exert a certain influence, but to a lesser degree. Therefore, countries with weak environmental competitiveness need to especially strengthen the efforts in EEC, EMC, and ECC, so as to narrow the gap between them and other countries and to significantly enhance their environmental competitiveness.

2.2. GEC Echelon Scores

Table 1 lists the average scores of the five echelons (first echelon: countries ranking 1st–10th; second echelon: countries ranking 11th–30th; third echelon: countries ranking 31st–60th; fourth echelon: countries ranking 61st–100th; fifth echelon: countries ranking 101st–133rd) of GEC in 2012.

As shown in Table 1, the average environmental competitiveness scores of the first, second, and third echelons are close with little difference, presenting a ratio of 1.11:1.05:1. The difference between the fourth and fifth echelons and the

previous three echelons is larger: the score of the first echelon is 1.33 times that of the fifth echelon, a difference of 14.1 points.

The average REC score of each echelon shows a great difference, with a ratio of 1.83:1.91:1.67:1.34:1.

The average EEC score of each echelon also shows a great difference, with a ratio of 1.50:1.33:1.22:1.08:1.

The difference in average EBC scores between the echelons is slight, with a ratio of 1.11:1.07:1.06:1.03:1.

The average EMC score of each echelon shows a great difference, with a ratio of 1.48:1.38:1.30:1.22:1.

The difference in average ECC scores between the echelons is slight, with a ratio of 1.23:1.21:1.18:1.14:1.

Moreover, except for REC, the scores for environmental competitiveness and the other four sub-indexes diminish from the first to the fifth echelon. The REC score of each echelon is the lowest, with the highest score being only 23.4 points. The difference in the EEC score of the first and fifth echelons is the most marked, while the EBC scores of all echelons show the least difference.

Table 1 Average Environmental Competitiveness Score of Each Echelon

Average Score	*Indicator*					
	Environmental Competitiveness	*REC*	*EEC*	*EBC*	*EMC*	*ECC*
First echelon	57.4	22.5	63.4	71.4	59.3	70.6
Second echelon	54.6	23.4	56.4	68.8	55.0	69.5
Third echelon	51.9	20.5	51.5	68.0	52.1	67.7
Fourth echelon	48.7	16.4	45.7	66.4	48.8	65.8
Fifth echelon	43.3	12.2	42.3	64.3	40.0	57.6

3. Regional Evaluation and Analysis of GEC

Table 2 lists the average GEC and sub-index scores of the 133 countries covered by this study by continent (excluding Antarctica, which has no countries).

The 2012 GEC scores of the six continents show that Oceania obtained the highest GEC score, at 56.3 points; the scores of Europe, South America, and North America were also high, all above 50 points; and the lowest scorer was Africa, at 46.7 points. As a whole, the gap between the GEC of the six continents was narrow, with scores in a 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 high, at 50.8 points and 50.6 points, respectively; next was South Asia, with 48.0 points; and Central Asia scored the lowest, with only 42.1 points.

Table 2 Average GEC and Sub-Index Scores of Six Continents

Region	*Score*					
	GEC	*REC*	*EEC*	*EBC*	*EMC*	*ECC*
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						
Eastern Europe	49.0	19.2	51.4	62.3	50.3	61.6
Southern Europe	49.8	16.7	47.9	68.2	52.2	64.1
Western Europe	53.1	14.7	57.7	71.6	53.9	67.5
Northern 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**

Within Europe, the highest GEC score went to Northern Europe, at 55.0 points, which was also the second highest score of all regions in the six continents; the scores of Central Europe and Western Europe were also high, above 50 points; and the score of Eastern Europe was the lowest, at 49.0 points.

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

The sub-index scores of the six continents for 2012 show that Oceania had the highest REC, EEC, and EMC scores, but its EBC and ECC scores both ranked only second from the bottom. Africa's REC, EMC, and ECC scores were all the lowest among the six continents, and its EEC score ranked second from the bottom.

With respect to REC, the scores of all the continents showed narrow relatively slight differences, with Oceania scoring the highest and Asia and Africa scoring lower. Within Asia, only Southeast Asia and South Asia scored more than 20 points,

with all other regions scoring below 20. The scores of all the African regions were below 20. Among all regions, Central Asia's score was the lowest, at 10.5 points; this was only 37.4% of the highest score, Oceania's.

With respect to EEC, the gap between the six continents was wider; Oceania obtained the highest score of 66.6 points, while Asia scored the lowest, leaving a wide gap between Asia and the other five continents. Within Asia, each region scored below 50 points, with South Asia scoring the lowest, at 35.8 points. Within Europe, regional scores showed a big difference, with a gap of 14.4 points between the highest and the lowest. Scores for Africa did not show much difference, with a gap of 9.0 points between the highest and the lowest scores.

With respect to EBC, all six continents scored relatively high; all were above 60 points, with little difference. Western Europe scored the highest, at 71.6 points, followed by Northern Europe, scoring 71.0 points. Eastern Europe's score was the lowest, but still reached 62.3 points. The scores of the Asian regions were the lowest among the six continents, with South Asia having the highest score and Southeast Asia the lowest within Asia. Africa's score was moderate, with the average score of the different regions being about 68 points; East Africa and Central Africa scored the highest, at 68.8 points, and South Africa, with the lowest score, still reached 66.9 points.

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

With respect to ECC, the scores of the six continents were all relatively high with substantial differences. South America had highest score, of 72.8 points, followed by North America and Europe, but the scores of Africa and Oceania were lower. The Asian scores showed big differences, with Southeast Asia having the highest score, at 70.7, and Central Asia having the lowest score, at 56.8. The latter score was also the lowest of all the regions of the six continents.

4. Present Status and Trends in China's Environmental Competitiveness

In order to further understand the characteristics and physical circumstances of environmental competitiveness in Asian countries, we selected China, Japan, and India as representative Asian countries for analysis. Table 3 lists the rankings

of the indicators of different levels in the three countries. Taking into account their efforts to enhance their environmental competitiveness, we summarize the findings as follows: China's environmental competitiveness remains steady and continues to progress, with marked achievements in environmental protection and effective improvement in ecological environmental quality.

Table 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-indicator	5	1	0	0	2	2
	Pillar	16	2	1	4	5	4
	Individual indicator	60	3	1	13	26	17
Japan	Sub-indicator	5	1	1	3	0	0
	Pillar	16	4	3	4	2	3
	Individual indicator	60	9	13	8	12	17
India	Sub-indicator	5	0	0	1	3	1
	Pillar	16	0	1	5	6	4
	Individual indicator	60	4	4	14	22	15

In 2012, China's environmental competitiveness ranked 87th in the world, falling into the lower-middle part of the list. Of the indicators ranking higher than 60th, 1 was a sub-index, accounting for 20% of the total number of indicators; this indicator ranked in the top 10. Seven were pillars, accounting for 43.75% of the total number of indicators, of which 2 were in the top 10; and 17 were individual indicators, accounting for 28.33% of the total number of indicators, of which 3 were among the top 10. Among the indicators ranking below 60th, 80% were sub-indicators, 56.25% were pillars, and 71.67% were individual indicators; these directly influenced the global ranking of China's environmental competitiveness (Li 2012).

With the start of the new century, especially after the 16th National Congress of the Communist Party of China (CPC), the CPC Central Committee led by Secretary General Hu Jintao adhered to guiding social and economic development with the scientific outlook on development and the fundamental national policy of resource conservation and environmental protection, thoroughly implemented the strategy of sustainable development, and put forward the initial key proposal and strategic mission of constructing ecological civilization. This has provided a solid theoretical basis, far-reaching goal, and driving force for the Chinese to realize the harmonious development of humanity and nature, the environment and the economy, and humanity and society, advancing socialism in the Chinese

context into a new space. Particularly during the 11th Five-Year Plan period, total 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 furnaces over 1,000 m^3 capacity in the steel industry increased from 21% to 52%. In the future, there will be more energy conservation and emission reduction projects to accelerate the restructuring of a clean and efficient industrial system and promote green development. Prevention and control measures for water and air pollution are also key areas of work for improving people's living and production environments, enabling both economic development and environmental protection to achieve a win-win result.

(1) REC and EEC occupy an upper-middle position, with higher competitiveness rankings. In the 2012 GEC rankings, China's EMC ranked sixth, ahead of many other countries, but its REC and EEC ranked 89th and 87th, respectively, and were in the lower-middle part of the list. China is a developing country; it ranks relatively high on these three indicators because, in addition to its resource environment advantages (e.g., its growing stock in forest and other wooded land, which ranked the 5th place), the Chinese government attaches great importance to and actively promotes coordinated and sustainable scientific development under a human-centered approach, with government departments and all regions carefully implementing the strategic deployment of ecological environment protection and the construction of a "two oriented society" (i.e., a resource-saving and environmentally friendly society) and increasing the environmental protection (e.g., China ranked 5th in area of plantation and afforestation). These efforts have provided a better balance for China's socioeconomic development and resource environment, built up the capacity to realize sustainable development, and improved the quality of the ecological environment. These policies and measures will continue to strengthen China's EEC.

(2) China's ranking for various per capita indicators is lower, which constrains the acceleration of its 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 population accounting and the urban/rural imbalance and imbalance in regional and socioeconomic development present many more difficulties. Thus, many of China's per capita indicators ranked below 80th in the world, lowering the global ranking of the country's overall environmental competitiveness. Faced with this situation and these problems, the Chinese government has paid even greater attention to environmental protection in recent years and has been aggressively exploring new ways of achieving sustainable environmental protection with lower costs, higher benefits, and lower emissions. Not only does environmental protection input increase year by year, but strict policies have also been adopted, such as

project environmental assessments, imposing necessary regional restrictions and closing backward production facilities. These measures can substantially promote green development. Execution of such measures will further enhance the competitiveness of China's per capita-type indicators.

(3) The ranking of various indicators related to resource and energy consumption and air quality are low, requiring strengthened environmental management and utilization. In recent years, the Chinese government has placed much emphasis on strengthening energy conservation and increasing energy efficiency. According to the statistics, China's energy consumption elasticity coefficient dropped from 1.04 in the 10th Five-Year Plan period down to 0.59 in the 11th Five-Year Plan period, saving 630 million tons of standard coal equivalents (Han 2014). The 12th Five-Year Plan for Energy Conservation and Emission Reduction released by the State Council in 2012 clearly points out that "By 2015, energy consumption per 10,000 RMB of GDP should drop to 0.869 ton of SCE, a decrease of 16% compared with the 1.034 ton of SCE of 2010" (Central People's Government of the People's Republic of China 2012). At present, China's energy utilization efficiency is generally on the low side, and indicators such as power consumption, gross energy consumption, and energy consumption per unit GDP all rank below 100th globally. At the same time, due to excessive energy consumption, quite a few air quality indicators, such as sulfur dioxide and nitrogen oxide emissions, also rank low; this requires that the Chinese government strengthens the binding force of energy conservation and emission reduction goals, further integrates climate change resilience into its economic and social development plans, and continues to take strict measures to strengthen and accelerate the transformation of economic development mode, so as to enhance China's capacity for sustainable development. Effective use of resources and great efforts to strengthen environmental management on the part of government will be an important guarantee for China's enhancement of competitiveness in environment load-bearing, management, and coordination.

5. Main Features of GEC

The results of the evaluation of GEC comprehensively represent the developmental level and competitive strength of the countries concerned on the five dimensions of the resource environment, ecological environment, environmental load-bearing, and environmental management and coordination. Of course, all countries' environmental competitiveness shows certain characteristics and rules: both the general rules universally existing in each country and the special rules determined by different national conditions.

(1) Environmental competitiveness is the overall reflection and combined result of the economic, social, and natural environment, reflecting countries' capacity for and level of sustainable development.

As the overall representation and combined result of economic, social, and natural environment, GEC reflects countries' capacity for and level of sustainable development in an all-around way. This feature is evident in the setting up of the indicator system and also in the variations in the results of the evaluation of environmental competitiveness.

From the evaluation and comparative analysis of all countries' environmental competitiveness, we can observe that the developed countries perform well on environmental competitiveness overall while the majority of developing countries perform poorly; there is a large difference between the developed and the developing world. Their performance on the sub-indexes shows that the majority of the countries that score higher on the sub-indicators (other than EEC) are developing countries; the developed countries are only at the intermediate level. Compared with the developed countries, many developing countries are "handicapped." Their performance on the sub-indexes is mostly not balanced, so that the developed countries still rank higher than the developing countries on overall environmental competitiveness. For example, as shown in Table 4, Morocco ranks 95th on environmental competitiveness: in both EBC and ECC, it ranks ahead, at 13th and 33rd, respectively, but it ranks behind in REC, EEC, and EMC, at 119th, 102nd and 97th, respectively, which drags down its overall ranking on environmental competitiveness. As a further example, Bangladesh ranks 99th on environmental competitiveness: on REC, EBC, and ECC, it ranks ahead, at 4th, 74th, and 41st, respectively, but its EEC and EMC rank low, at 132nd and 119th, respectively, dragging down its overall environmental competitiveness. Other developing countries, such as Guinea, Oman, and so forth, are similar: they have one or two sub-indexes that rank very low and drag down their overall environmental competitiveness. Conversely, the developed countries have balanced sub-indexes. For instance, Norway ranks 3rd on environmental competitiveness: except for REC, its sub-indexes do not rank particularly high, coming about 20th, but it has no serious lagging indicator, and so it enjoys very high environmental competitiveness overall. As a further example, Finland, ranking 28th on environmental competitiveness, also does not have any sub-index ranking particularly high or low, with EEC (32nd) the highest and ECC (85th) the lowest. All its sub-indexes are balanced, so Finland ranks relatively high on environmental competitiveness (as shown in Table 3).

During their subsequent development process, countries should focus on all the aspects of environmental competitiveness, advancing in a comprehensive and coordinated way. In particular, priority should be given to effective measures for

improving and enhancing lagging indicators, to ensure an advantageous position in environmental competitiveness.

Table 4 Rankings of Representative Developing Countries and Developed Countries on Environmental Competitiveness and Sub-Indexes

Country	*Rank*					
	Environmental Competitiveness	*REC*	*EEC*	*EBC*	*EMC*	*ECC*
Morocco	95	119	102	13	97	33
Bangladesh	99	4	132	74	119	41
Guinea	100	62	122	3	96	112
Oman	109	128	59	49	91	107
Norway	3	6	25	21	23	15
Finland	28	43	32	46	35	85

(2) EBC contributes the most to the overall score of environmental competitiveness. Countries differ slightly in their scores on REC and EBC but differ greatly in their scores on EEC, ECC, and EMC.

Figure 4 depicts the contribution rates of the GEC sub-indexes to the primary indicator (i.e., environmental competitiveness). According to this figure, EBC contributes the most to environmental competitiveness, at the rate of 27.0%; ECC also contributes a lot, reaching 26.2%; EEC and EMC both contribute 19.8%; and REC contributes the least, at only 7.2%. Therefore, in the course of enhancing environmental competitiveness, countries should focus specially on EBC and ECC, while not ignoring REC, EEC, and EMC.

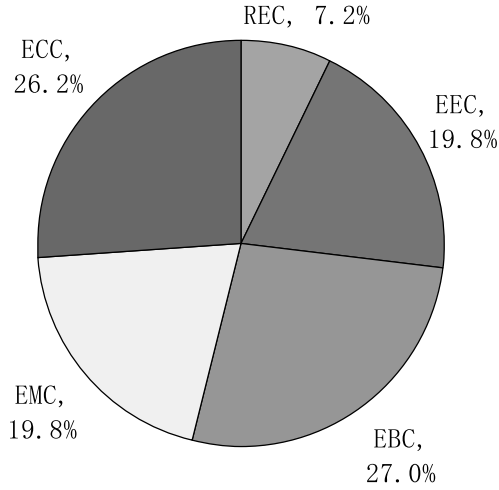

Figure 4 Contribution Rates of Sub-Index Scores of GEC

From the analysis above, we can observe that EEC, ECC, and EMC have standard deviations of 9.3, 9.1, and 8.9, respectively. They are the main factors causing the differences in environmental competitiveness among countries. REC and EBC have a relatively low standard deviation, 6.8 and 5.3, respectively. Of the two, EBC has the lowest standard deviation and exerts the least influence on the differences in environmental competitiveness among countries. It also means these differences are mainly represented in EEC, ECC, and EMC, with little difference in EBC.

Furthermore, this can also explain why the REC scores of developed countries are lower than those of most developing countries but their overall environmental competitiveness scores remain higher. This is because although many developed countries' REC scores rank lower by a wide margin than those of developing countries, the contribution rate of REC to environmental competitiveness is not very high because differences among countries' REC scores are slight and there is not a very marked gap between them, so that the overall environmental competitiveness of developed countries is influenced only very slightly by REC. Besides, the developed countries score higher on the other four sub-indexes, better than most developing countries, so the environmental competitiveness of developed countries ends up higher than that of most developing countries.

(3) Developing and developed countries differ greatly. Emerging market countries have much room for improvement.

Table 5 compares the average scores and contribution rates of developed countries, developing countries, and emerging market countries on environmental competitiveness and the sub-indexes. It should be noted that United Nations Development Program (UNDP) modified the groups of countries in its "Human Development Report 2010," issued on November 4, 2010, taking the number of developed countries or regions up to 44 (UNDP 2010). On this basis, of the 133 countries covered in this article, 34 are developed countries and 99 are developing countries. Furthermore, the 10 non-developed countries of the G20 are recognized as emerging market countries. They comprise Brazil, Indonesia, Mexico, Russia, Saudi Arabia, Argentina, Turkey, China, India, and South Africa.

It can be observed from Table 4 that developing and developed countries differ greatly: the developed countries score 53.0 points on environmental competitiveness, 4.5 points higher than the developing countries and 3.3 points higher than the emerging market countries. The developing countries score lower than the developed countries on all sub-indexes, and there are very large differences on EEC and EMC, respectively, 12.2 points and 7.1 points. Emerging market countries score slightly higher than developing countries on overall environmental competitiveness, with a difference of 1.2 points, but there is a big gap between them and the developed countries, with the difference of 3.3 points. Emerging

market countries score very low on EEC, even lower than developing countries, and 12.9 points lower than developed countries. This drags down their overall environmental competitiveness score.

Table 5 Average Scores and Contribution Rates of Different Categories of Country on Environmental Competitiveness and their Sub-Indexes

Country	Item											
	Environmental Competitiveness		REC		EEC		EBC		EMC		ECC	
	Score	Contribution Rate	Score	Contribution Rate	Score	Contribution Rate	Score	Contribution Rate	Score	Contribution Rate	Score	Contribution Rate
Developed countries	53.0	100.00%	17.9	6.74%	58.1	21.95%	68.0	25.66%	54.4	20.52%	66.5	25.13%
Developing countries	48.5	100.00%	17.8	7.35%	46.0	18.97%	66.6	27.51%	47.3	19.51%	64.6	26.67%
Emerging market countries	49.7	100.00%	18.0	7.23%	45.2	18.19%	68.0	27.36%	52.3	21.03%	65.1	26.19%

According to the contribution rates of sub-indexes to environmental competitiveness, in developed countries, REC has the lowest contribution rate to environmental competitiveness, at just 6.74%. The contribution rates of the other sub-indexes are higher than 20%. Therefore, even though the contribution rate of REC is close to that of the developing countries and slightly lower than that of emerging market countries, it has no great influence on environmental competitiveness. Shortfalls in REC can be easily made up by superiority in the other four sub-indexes; thus, developed countries' overall environmental competitiveness score is still higher than that of the developing countries and emerging market countries.

Furthermore, according to the country distribution of each echelon in environmental competitiveness (shown in Table 6), among the 34 developed countries, 8 fall into the first echelon, accounting for 80%, but among the 99 developing countries, only 2 fall into the first echelon, a great difference. The number of developed countries in the second echelon is lower by two countries than the number of developing countries. Quite a number of developing countries fall into the third to fifth echelons, 86 in all, accounting for 86.87 of the total; while among the 34 developed countries, only 17 are placed in the third to fifth echelons, accounting for only 50.0% of the total. In the fifth echelon, only 2 are developed countries, while up to 31 are developing countries; the latter account for 93.94% of the total in the fifth echelon. The emerging market countries do not perform as well in environmental competitiveness as they do economically. Only 1 of them

is placed in the first echelon and the rest are all in the third to fifth echelons. Of these, 6 countries are placed in the fourth echelon, accounting for 60% of the total.

All of the above points indicate that the developed countries perform well in environmental competitiveness, scoring high and ranking toward the top. Most developing countries score low and rank toward the bottom in environmental competitiveness. Emerging market countries also need to further enhance their environmental competitiveness.

Table 6 Number and Ratio of Countries in Each Echelon of Environmental Competitiveness

Country	*Item*									
	First Echelon		*Second Echelon*		*Third Echelon*		*Fourth Echelon*		*Fifth Echelon*	
	Number	*Ratio*	*Number*	*Ratio*	*Number*	*Ratio*	*Number*	*Ratio*	*Number*	*Ratio*
Developed countries	8	23.53%	9	26.47%	8	23.53%	7	20.59%	2	5.88%
Developing countries	2	2.02%	11	11.11%	22	22.22%	33	33.33%	31	31.31%
Emerging market countries	1	10.00%	0	0.00%	2	20.00%	6	60.00%	1	10.00%

(4) Scores on environmental competitiveness differ slightly among the regions but rankings differ greatly: the countries of Oceania, Europe, South America, and North America rank ahead, while Asian and African countries rank behind.

Table 7 lists the average GEC scores of the 133 countries covered in this article by continent as well as the numbers and ratios of the countries in the first and second echelons in 2012. In 2012, Oceania scored the highest in environmental competitiveness, reaching 56.3 points; South America, North America, and Europe also score rather high, reaching 53.5, 53.0, and 52.3, respectively; and Asia and Africa score the lowest, at 47.5 and 46.7 points, respectively. The score ratio of the 6 continents is 1.02:1.12:1:1.20:1.13:1.14, with little difference.

The differences in the scores among the continents are slight, but the ranking differences are rather great. In terms of number, Europe has the most countries in the first echelon, six in all; other continents have one country each in the first echelon, except for Africa.

Europe still has the most countries in the first and the second echelons, 12 in all, far higher than the other continents; North America and South America come next, with 7 and 6 countries, respectively; both Asia and Oceania have 2 countries; and Africa has only 1. In percentage terms, Oceania has the highest percentage of the countries in the first echelon as a proportion of total countries, at 50%, followed by Europe, South America, North America, and Asia. Africa has none. Further analysis shows that Oceania reaches 100% in terms of the countries in the first and

second echelons as a percentage of total countries, followed by South America, North America, and Europe. Asia and Africa both have low ratios, of 5.13% and 3.03%, respectively.

Therefore, in terms of both number and ratio, Oceania, South America, North America, and Europe are strong on GEC, holding the front places in the rankings with a wide gap separating them from the other continents. In view of the special nature of Oceania (containing only the 2 countries of New Zealand and Australia), it is normal that it should score high and rank at the top. South America and North America are also very strong on environmental competitiveness, with more than half of the countries in each placed in the first and second echelons. Among the 36 countries of Europe covered in the evaluation, 30% place in the first and second echelons, indicating Europe's strong environmental competitiveness. Asia and Africa are weak in environmental competitiveness; although 39 and 33 countries, respectively, are covered in the evaluation, Asia has only 1 country falling into the first echelon and Africa has not even one. In the second echelon, both have only 1 country, with ratios of 5.13% and 3.03%, respectively. Therefore, Asian and African countries need to further enhance their environmental competitiveness.

Table 7 Average Scores of the Six Continents in Environmental Competitiveness and Numbers and Ratios of the Countries Placed in the First, Second, and Third Echelons

Region	*Item*						
	Environmental Competitiveness	*First Echelon*		*Second Echelon*		*Third Echelon*	
	Average Score	*Number*	*%*	*Number*	*%*	*Number*	*%*
Asia (39 countries)	47.5	1	2.56%	1	2.56%	2	5.13%
Europe (36 countries)	52.3	6	16.67%	6	16.67%	12	33.33%
Africa (33 countries)	46.7	0	0.00%	1	3.03%	1	3.03%
Oceania (2 countries)	56.3	1	50.00%	1	50.00%	2	100.00%
North America (13 countries)	53.0	1	7.69%	6	46.15%	7	53.85%
South America (10 countries)	53.5	1	10.00%	5	50.00%	6	60.00%

6. Basic Approaches and Policy Proposals for Enhancing GEC

6.1. Basic Approaches to Enhancing GEC

Combining our dynamic evaluation results and the pressures confronting the global environment at present, we put forward a basic framework of approaches to enhancing GEC. We highlight "one basis, three great motive forces, five systems,

and six paths," forming the four levels of the basis, the motive force, the system, and the path (see Figure 5). This framework aims to achieve the enhancement of GEC through the coordination and cooperation of all levels, thus driving the worldwide elimination of resource energy constraints, the sharing of the fruits of new energy and environmental protection, and achievement of the overall progress of human society.

6.1.1. Global Environmental Cooperation Is the Basis of Enhancement of GEC

The influence of the environment is not limited by regional and national boundaries; it is a classic example of externalities. Due to the spread of and inability to control environmental destruction and pollution, environmental pollution or environmental safety events occurring in one country or region tend to endanger the countries and regions around and even cause worldwide environmental disaster (Zhao and Pan 2012). Therefore, to enhance GEC, we need to strengthen global cooperation, organize and establish global environmental cooperation and coordination agencies, and build relevant coordination mechanisms focused on coordinating global environmental interests (Wu and Ma 2011; Wu and Wang 2011). The developed countries should moderate their strong stance and compromise by accepting responsibility for their industrialization; at the same time, they should keep their promises of funding and technology and strengthen their environmental assistance to developing countries. The regions (continents) should gather round common environmental objectives to eliminate their differences and develop bilateral and multilateral cooperation. Based on common global interests, global dialogue and negotiation should be strengthened and translated into concerted action as soon as possible, in order to cope with and address global environmental problems jointly and promote the coordinated improvement of GEC (Huang 2013).

6.1.2. Transformation, Innovation, and the Green Revolution Are the Motive Forces Driving the Improvement of GEC

Transformation involves transforming the economic development pattern, breaking through the constraints of traditional development modes, readjusting industry and consumption structures, and exploring the engines for a new round of economic growth. Thus, developing strategic emerging industries such as new energy and building new industrial and consumption models are the main direction for global economic transformation and an important guarantee for countries' improvement of their international position. Innovation includes technological innovation and system innovation. The former can provide technological support to develop new energy and clean energy and cope with climate change, can ensure the reindustrialization of developed countries and the reconstruction of the real economy, and can ensure that the successful progress of new industrializa-

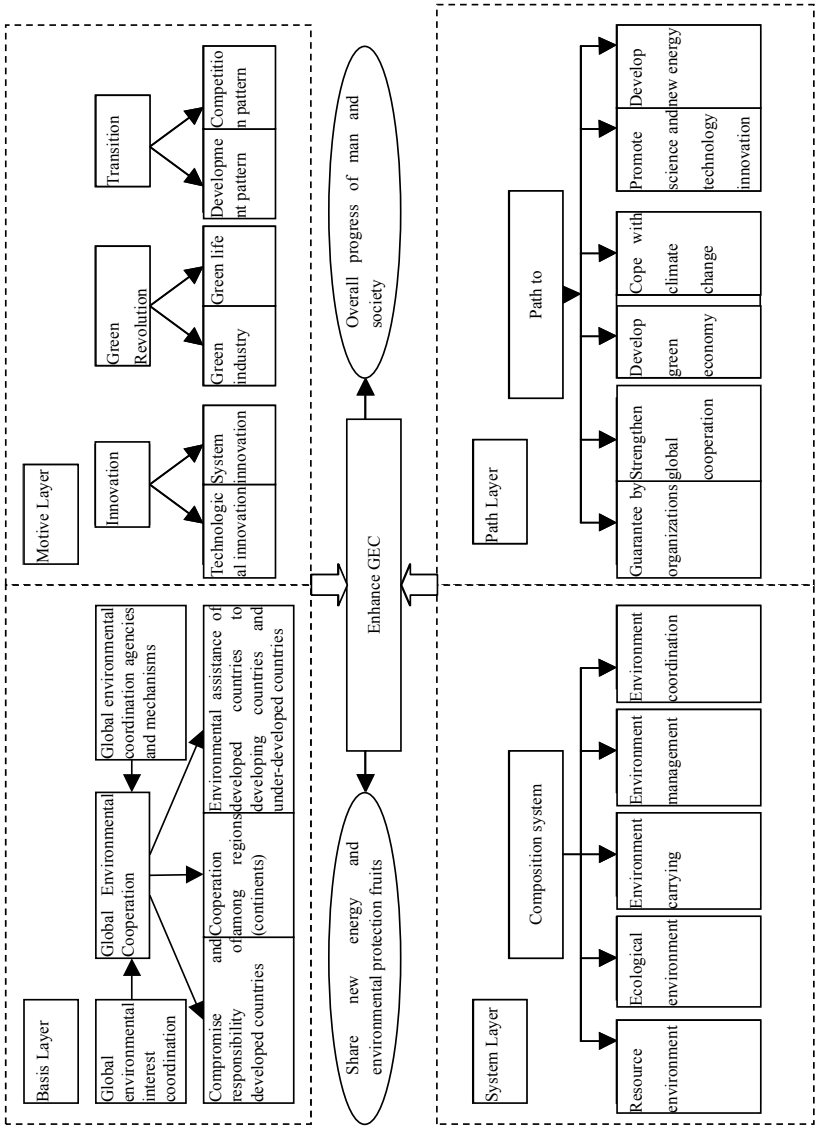

Figure 5 Basic Framework of Approaches to Enhancing GEC

tion in developing countries is not at the expense of the environment. System innovation means constructing mutual constraints among countries and regions by establishing global environmental protection systems and mechanisms to ensure countries' unified action. The development of the green revolution around the green economy has become a new trend in the green transformation of the global economy. The green revolution in production requires the development of green agriculture, green manufacturing industry, and green service industries and the construction of a green industrial system. In consumption, the green revolution stands for green consumption patterns and equitable green employment to give new impetus to GEC through the dynamics of transformation, innovation, and green revolution (Huang 2013).

6.1.3. The Key Strategy for Enhancing GEC Is to Enhance the Five Sub-Indexes Jointly

The GEC indicator system constructed in this article decomposes GEC into five aspects: REC, EEC, EBC, EMC, and ECC. The five systems are not isolated, but influence and constrain one another. They have to be integrated into an overall system to enhance environmental competitiveness premised on a concerted general objective, undertaking overall planning while giving due attention to concrete implementation processes. Of course, due to regionally and environmentally based differences, countries and regions are not uniform in terms of the composition of their environmental systems. They need to give full play to the driving force of their superior indicators to overcome the adverse influence of weak indicators and at the same time conduct in-depth analysis of the indicator system level by level to find the key link that impedes the improvement of their environmental competitiveness and make joint efforts to enhance GEC.

6.1.4. A Global Horizon and Dynamic Vision Are the Means of Seeking a Path to Enhance GEC

Environmental problems are global problems. To solve them, we need to aim at common global interests and develop concerted actions worldwide. What's more, the environmental problem is not only a present day problem but also an intergenerational one. We need to focus on long-term sustainable development as well as on the resolution of current problems to do better in achieving inter-generational equity. The growth of environmental problems is a process of long-term accumulation; their resolution and the improvement of environmental competitiveness also require a long-term process. Furthermore, as new environmental problems keep emerging, these problems become much more complex; we need to keep shifting our thinking and changing our innovation modes (Li et al. 2012). Thus, we need to seek pathways to enhance GEC through a dynamic vision in

combination with the present important and urgent task of global environmental protection revolving around the ultimate goal of global sharing and the overall progress of man and society. Pathways to enhancing GEC include strengthening organizational guarantees, strengthening global cooperation, developing the green economy, responding to climate change, promoting science and technology innovation, developing new energy and clean energy, and so on.

6.2. Policy Proposals to Enhance GEC

6.2.1. Vigorously Develop the Green Economy and Advance New Approaches to Sustainable Development

To develop the green economy, the idea of developing the green economy needs to run through all areas of economic and social development and all links in the chain of industrial development. In terms of resource utilization and environmental protection, this requires replacing material resources with intelligence resources to a greater extent and on a larger scale, enhancing the efficiency of resource utilization, reducing pollutant emissions, and holding resource consumption below the threshold of resource renewal and pollution emissions below the threshold of natural purification. To solve environmental pollution, we need to change from "end point management" to the safe production level of "total clean processing" (Miao et al. 2006). We need to try to separate economic growth from resource consumption, environmental pollution, and ecological damage and to realize the coordination of economic development with resource utilization and environmental protection. All countries need to actively advance the global new energy revolution; vigorously develop renewable energy sources; promote the application of new energies such as nuclear power, solar power, wind power, tidal power, biological power, oceanic power, and geothermal power; reduce the consumption of fossil energy; accelerate economic restructuring and industry structure optimization; develop "lighter" industries and green industries with a high knowledge content, less environmental pollution, less resource consumption, and strong agglomeration and radiation capacity; direct resource integration and allocation toward green industry and construct a modern green economic and industrial system; increase green investment, improve the investment and financing channels of green finance, and strengthen credit aid to new energy enterprises; give full play to the driving force of government investment; develop the green economy by attracting venture capital investment, angel investment, stock equity funds, and so forth, with a green credit policy and provide funding guarantees for the development of the green economy; promote the idea of green consumption; encourage green consumption through measures including government procurement and green product subsidies; guide consumers to purchase energy-saving and green products;

facilitate the formation of sustainable green consumption modes worldwide; and realize the virtuous interaction of green production and green consumption. All countries also need to accelerate the formulation of strategic plans for green economic development; clarify the objectives, task, and key areas of green economic development; comprehensively coordinate the relevant national policies and the actions of interest entities; accelerate the establishment of a green system of national accounts reflecting the values of ecological capital and environmental capital; give full play to the function of market mechanisms, laws and regulations, science and technology innovation and system innovation in guaranteeing and promoting green economic development; and lay the foundation for facilitating global sustainable development and realizing the "green transformation" of the traditional "brown economy."

6.2.2. Take the Initiative in Dealing with Global Climate Change and Promote the Healthy Development of the Low-Carbon Economy

Climate change has become a global focus point, and there is a worldwide consensus on responding to climate change and implementing low-carbon development (Huang 2010). All countries and regions need to further improve their policies on industry, public finance and taxation, finance, technology, and consumption to deal with climate change; emphasize controlling greenhouse gas emissions and mitigating climate change using the policy tools of regulations and standards, taxation, convertible permits, voluntary agreements, subsidies, and incentives, and so forth; establish a greenhouse gas emissions trading system and guide voluntary trading activities involving emission reduction; establish complete low-carbon product standards, labels, and certification systems and build a database of low-carbon certification; improve government agencies' procurement of low-carbon products and promote coordination and interaction between low-carbon production and consumption systems. In basic research and technological research responding to climate change, we need to emphasize basic theoretical research such as global environment monitoring, climate change assessment, and the forecasting of future global climate change trends; intensify the organization and coordination of scientific and technological work responding to climate change; strengthen the construction of science and technology support systems for responding to climate change and establish research subjects and R&D funding dedicated to climate change; advance R&D in key low-carbon technologies; build and improve statistical and auditing systems and an evaluation and examination system for greenhouse gas emissions; strengthen statistical and survey work on energy activities, industrial production, agriculture, and forestry related to greenhouse gas emissions; provide accurate and timely information on

greenhouse gas emission monitoring, statistics, and auditing; establish a target responsibility system and an assessment and examination system for controlling greenhouse gas emissions; and enhance consciousness and proactive initiatives for responding to climate change.

6.2.3. Enhance Capacity for Science and Technology Innovation and Support Coordinated Development Servicing the Environment and the Economy

To enhance capacity for science and technology innovation, official/industry/academic/research cooperation among governments, universities, research institutions, and enterprises needs to be strengthened further to improve the construction of a science and technology innovation system (Li et al. 2011b). Countries must accelerate the building and strengthening of innovative alliances; strengthen connections among the innovation systems of different countries and regions; promote the free flow, sharing, and complementarity of innovation resources; concentrate superior resources to deal with major problems and key areas related to climate change, energy conservation and emission reduction, energy security, resource utilization efficiency, and pollution control; develop technologies for energy conservation and emission reduction, low-carbon technologies, resource recycling technology, and clean, high efficiency technology; reduce the proportion of non-renewable resources like coal in the energy structure; develop new energies, renewable energies, and new alternative energies and enhance the utilization efficiency of resources and energy in practical ways; strengthen R&D and industrial advances in environmentally friendly technologies; reduce the utilization of natural resources and waste discharge; develop various green production technologies and waste-to-resource technologies to provide sound technological support for the development of the green economy and the realization of sustainable development; develop scientific and technology innovation; optimize and upgrade industry structures; substitute knowledge resources and innovation resources for environmental and material resources and realize the knowledge transformation and ecological transformation of economic activities; and realize the transition of resource-intensive enterprises to technology-intensive and environmental protection enterprises to promote the sustainable development of the global economy (Xiao 2012).

6.2.4. Strengthen International Cooperation and Form a Robust Joint Force for Global Environmental Improvement

Protecting the environment is a universal, shared responsibility and task. Both developed and developing countries need to strengthen environmental cooperation on the basis of their own national conditions while adhering to the principle of

"common but differentiated responsibilities" (Yu 2012). The developed countries must undertake greater responsibilities and obligations to compensate for the climate "debt" they incurred due to their over-consumption of natural resources and massive emissions of greenhouse gases during the process of industrialization. They also need to provide funding and technical aid to the developing countries to help them develop a green, low-carbon economy and to enhance their ability and enthusiasm for dealing with environmental problems and help them participate better in international environmental cooperation. On the issue of the environment's relationship to trade, intellectual property rights protection, and environmental technology transfer, the developed countries need to respect the developmental demands and rights of developing countries; they should not erect barriers to the economic development and trade of developing countries or use "green economy" and "green standards" to disguise their trade protectionism as environmental protection. They should also refrain from placing obstacles in the way of technology transfer to developing countries under the banner of protecting intellectual property rights. As for the developing countries, at the primary stage of their transformation into a green economy, they need to accelerate the formation and implementation of a sustainable development strategy applicable to their basic conditions to obtain adequate support from developed countries and lay the foundation for further global environmental cooperation.

6.2.5. Reinforce Organizational Safeguards and Establish an Effective Framework for Global Environmental Improvement

The key to global environmental improvement lies in constructing an effective global improvement framework to direct and coordinate the practical activities of different countries and regions in enhancing environmental protection and promoting sustainable development. So far international mechanisms have not solved the problem of the worldwide deterioration of the environment; therefore, international organizations and mechanisms for international environmental protection need to be further developed.

First, we need to give full play to the core leadership and organizational and coordination function of the United Nations (UN) and lead the relevant agencies and multilateral and treaty mechanisms of the international community to take concerted action for sustainable development, and to the positive role of the relevant UN agencies in the resolution of various environmental problems and in the field of sustainable development, such as the United Nations Economic and Social Council (ECOSOC), the United Nations Commission on Sustainable Development (CSD), the United Nations Conference on Trade and Development (UNCTAD), the United Nations Educational, Scientific and Cultural Organization

(UNESCO), the World Health Organization (WHO) and the World Meteorological Organization (WMO), in promoting and implementing related international documents such as Agenda 21 and the Plan of Implementation of the World Summit on Sustainable Development.

Second, we need to further strengthen the function of the United Nations Environment Program (UNEP) and give full play to its important role in global environment improvement. The UNEP should be defined as a dedicated global environment improvement institution and should be granted new functions and tasks, with stronger funding guarantees, a wider membership base, and greater power to support environmental science research and coordinate a global environmental strategy. This would raise the status and importance of sustainable development mechanisms in the UN system.

Third, we need to facilitate the reform of CSD and further promote international environmental cooperation. According to the proposal raised at CSD Rio+20, a high-level political forum is planned to replace CSD and oversee the execution of environmental protection in different countries and regions. Furthermore, international financial institutions, the World Trade Organization, and multilateral development banks need to incorporate sustainable development in their planning and projects and coordinate with the relevant UN agencies to combine environmental protection and economic development in a more organic fashion.

Finally, we should leverage the role of non-governmental organizations in global environment improvement. We should give full play to the powerful role of non-governmental organizations such as the International Union for Conservation of Nature (IUCN), the World Wildlife Fund (WWF), and Greenpeace in environmental management and oversight and in participating in environmental protection and improvement, popularizing environmental protection education and enhancing awareness of environmental protection, and promoting public expression and communication between the public and government, so that they can make a positive contribution to environmental protection and sustainable development.

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