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GREEN DEVELOPMENT MODES OF THE BELT AND ROAD

ABSTRACT. A number of countries are concerned, to a certain degree, about the prospects for the implementation of the Chinese strategic initiative for the joint creation of the "Silk Road Economic Belt" (SREB). These concerns relate to fears of the transfer from China to the "belt" countries of excessive capacities of the polluting primaries industries, possible environmental degradation, and the destruction of the traditional way of life as a result of the implementation of mega-projects, and the fragility and vulnerability of many ecosystems along the routes of the prospective throughways between the eastern provinces of China and Europe [Bezrukov, 2016]. Environmental problems are clearly of key importance for the prospects of China's initiative. The initiative's program documents have stressed the need to take into account the interests of all parties and act solely on the basis of mutual benefit. The authors briefly consider the variety of natural and socio-economic conditions in the SREB zone and the sharp differences in the degree of economic development of the territory, which require close attention and scientific justification for political and economic decisions. Particular differences include temperature regime, precipitation, modern atmospheric circulation, transport of particulate matter and contaminants, soils, vegetation, land use, and risks of desertification in the SREB zone. The potential of complementarity of the natural resources of China and a number of neighboring countries may be realized. The paper also discusses China's present policy in the transition to sustainable development and its underlying concepts and achievements, especially at the level of regions and cities, including the concept of "ecological civilization" and the six stages of greening of cities. The authors believe that tourism related activities should be coordinated specifically at the city level as part of "green development." It is necessary to create free economic zones in the "economic corridors" along the planned transcontinental lines and utilize the existing national special zones. Such zones are particularly effective in border regions and cities. In conclusion, it is recommended to develop international research networks in the SREB zone, to establish an International Data Center, and to collect, organize, exchange, and publish jointly scientific information on the problems of transition to sustainable development.

KEY WORDS: green development modes, the Belt and Road initiative, ecological civilization, Chinese experience.

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INTRODUCTION

The "Silk Road Economic Belt" (SREB) zone (the "Belt and Road" initiative) encompasses many countries, practically all of Eurasia and Africa. The implementation of this initiative involves solving complex environmental problems. Many areas in this zone are rich in resources, but their environment is fragile and vulnerable. These areas are often arid and have high risks of adverse and dangerous natural phenomena (earthquakes, sandstorms, and severe water and wind erosion). There are sharp interstate and interregional economic differences that could potentially contribute to the transfer of polluting industries to poor countries and the degradation of their natural environment.

The initiative is systemic in nature and is based on the principles of integrated development adopted by the international community, i.e., the United Nations; it meets the long-term interests of all countries. The five main priorities of the initiative include coordination of economic policies, strengthening of transport connectivity, elimination of trade barriers, financial integration, and strengthening of contacts between people [Li Zehong, et al., 2015]. Territorial structures and local environmental conditions had a significant impact on the configuration of communications and the functioning of the Silk Road in the past. They are also very important for the practical implementation of the SREB project at the present time. Thus, a careful analysis of such factors as relief, temperature regime, precipitation, modern atmospheric circulation, transport of solid particles and pollutants, soils, vegetation cover, land use, physical-geographical zoning, etc., is necessary.

The paper discusses the diversity of natural and socio-economic conditions in the SREB zone and the sharp differences in the degree of economic development of the territory that require scientific substantiation for political and economic decisions, and considers some of the concepts underlying the modern Chinese policy of transition to "ecological civilization".

DIVERSITY OF NATURAL AND SOCIO-ECONOMIC CONDITIONS IN THE SREB ZONE

The SREB zone is characterized by high temperatures and low precipitation, which predetermine the high probability of desertification processes. It is experiencing a significant impact of climate change. According to 2011–2014 research, the spring wind regime is determined by western transport in the middle and upper troposphere, which causes the transfer of dust and pollutants from North Africa, Europe, the Middle East, and Central Asia to East Asia (Fig. 1). The study of the optical density of aerosols, including sulfates, (Aerosol Optical Depth) showed that frequent spring dust storms contribute to the transfer of pollutants mainly from East and South Asia and Europe. The sources of sulfate, organic carbon, and black carbon are associated with East and South Asia, Europe, and North Africa (particularly). The most significant source and recipient of sulfur-nitrogen and phosphorus emissions is East Asia-Western Europe and North Africa-Middle East, respectively (Figs. 2–4).

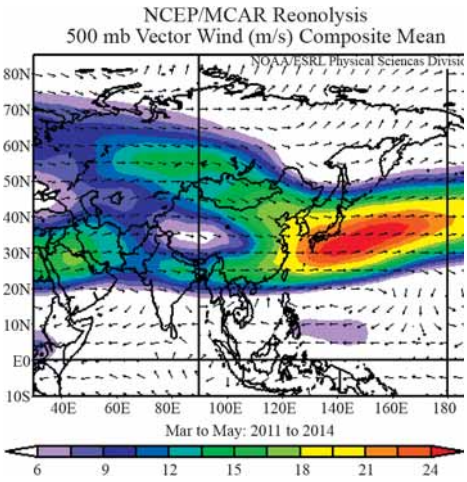

Fig. 1. Spring wind field in the SREB zone

The most common group of soils in the SREB zone is Leptosol-LP (very shallow soils over hard rock or in unconsolidated very gravelly material) (Fig. 5). Land cover in the

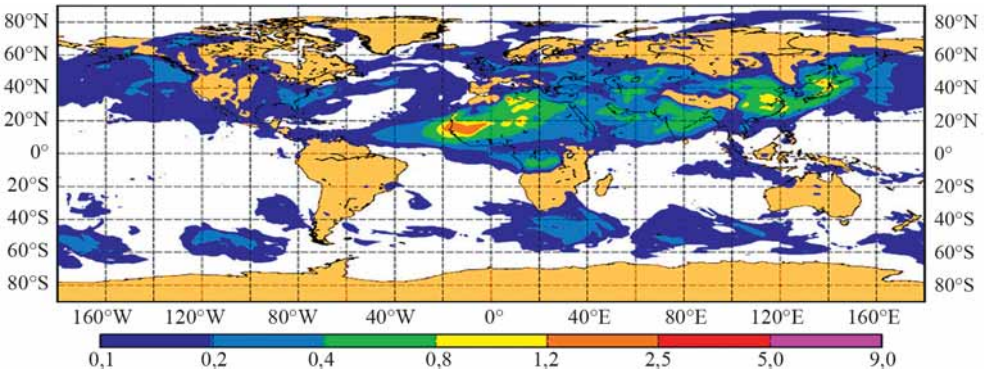

Fig. 2. Total Aerosol Optical Depth (May 24–29, 2014)

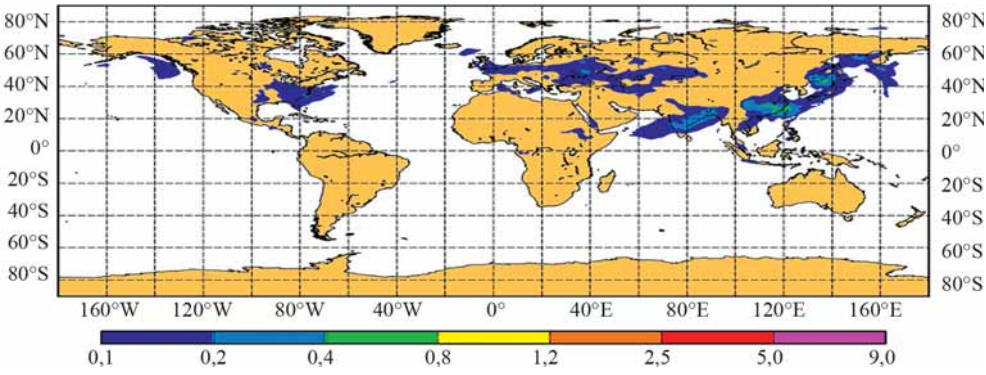

Fig. 3. Sulfate Aerosol Optical Depth (May 24–29, 2014)

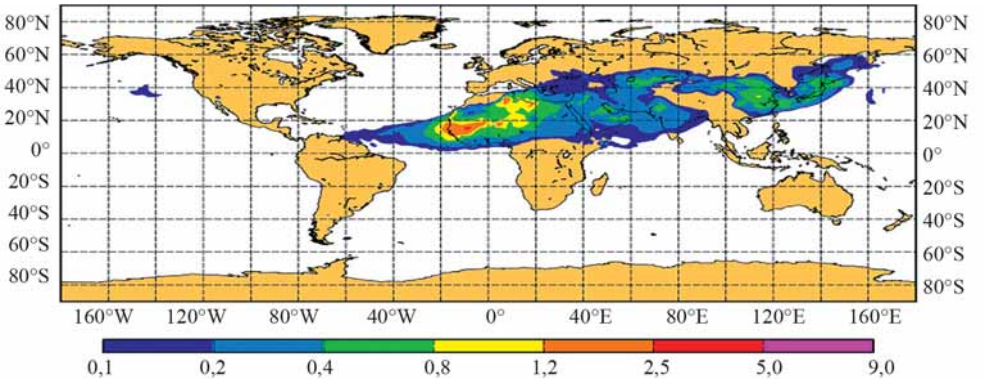

Fig. 4. Dust Aerosol Optical Depth (May 24–29, 2014)

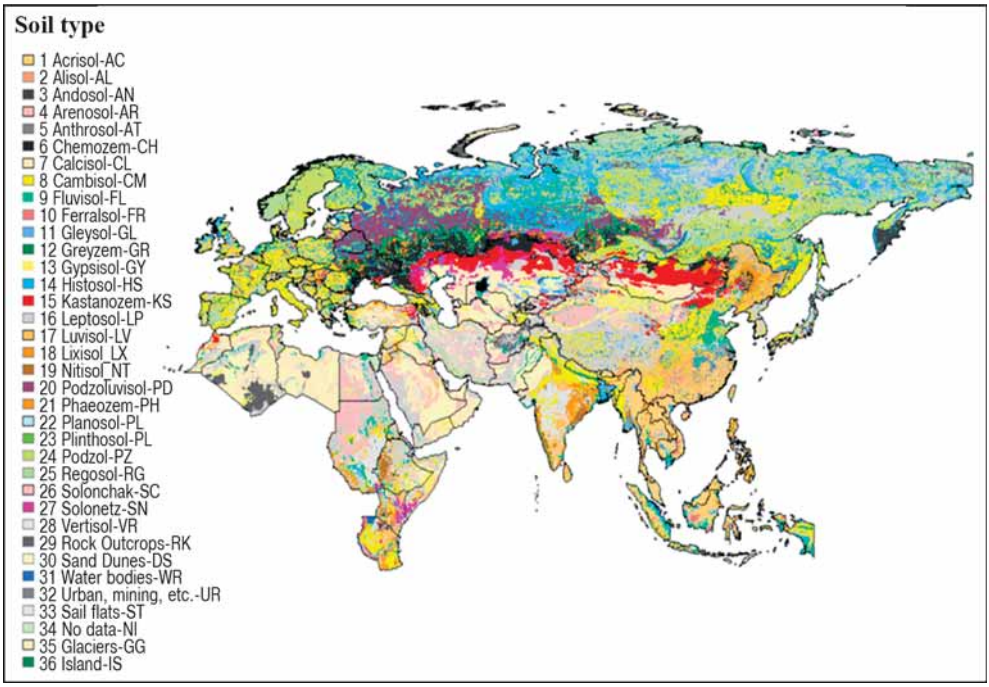

Fig. 5. Soil types in the Silk Road Economic Belt zone

western and eastern parts of the SREB zone with a relatively high level of socio-economic development is represented by pastures and forests, while the less developed central part is occupied by barrens and shrublands.

China, the countries of Central Asia, Russia, and Mongolia are rich in mineral resources, including non-ferrous metal ores. Their use in China is extremely high, especially of tungsten, lead, molybdenum, and antimony. China is the world's largest producer and consumer of steel (76.9 % and 80.7 % of all SREB countries, respectively). The areas of production and consumption of copper and aluminum in the SREB zone do not coincide, which determines a certain complementarity of the natural resources of its countries [Guo Peng et al., 2014; Yu Huilu et al., 2014].

China is the world's largest consumer of ferrous and non-ferrous metal ores, especially iron and copper ore and raw materials for aluminum production [Wang Zhe, 2015]. However, at the current level of consumption of raw materials for the production of ferrous metals, copper, and aluminum, the stocks available in the country will last no more than 30 years. At the same time, in other SREB countries such as Russia and Kazakhstan, the rich reserves and mining of ore resources exceed the relatively limited consumption of ferrous and non-ferrous metals. Thus, emerging market economies, especially China and India, constitute a vast market for other SREB countries, for metals and raw materials for their production.

According to the level of economic development, the SREB countries can be divided into three groups corresponding to gradients between the east, center, and west of the zone [Dong Suocheng et al., 2015]. In its eastern part, there are growing large economies of China, Russia, and India, which are increasingly involved in the international division of labor and are undergoing institutional reforms. The central part is divided into two subtypes: countries that have rich mineral resources,

due to which they have high revenues, such as oil exporters in the Persian Gulf, and less developed countries, generously endowed with natural resources, but located at the initial stage of industrialization (for example, the countries of Middle Asia with relatively low rates of economic growth). The states of the western part of the SREB zone have reached the post-industrial stage of development; their economic development is based on technological innovation, but due to the international financial crisis, growth rates are low (Table 1).

The economic specialization of the three parts of the SREB zone predetermines the potentially high degree of complementarity [Dong Suocheng et al., 2014]. The industrial system of the eastern (Chinese) part (i.e., the "world factory") is considerably complete and has large-scale financial, human, and technological resources; it contains the main exporting regions of manufacturing products, with the majority of manufactured goods being in the peak part of the life cycle. However, China faces the problem of excess capacity and urgently needs to expand the market.

The countries of the western part of the SREB zone, which are part of the EU, have advanced technologies and a developed industrial base, and their export goods enjoy stable demand in the world market. These countries are leading in scientific research, they have well-known brands and important intellectual property, but they have to import the main natural resources and need additional development resources. The countries in the central part of the zone, located in the Middle East, Central Asia, and North Africa, are generously endowed with natural resources, but their economic development is highly dependent on oil exports, which determines their high vulnerability to fluctuations in prices and external environment. These countries need to increase the competitiveness of their economies by making fuller use of their natural resources.

The most developed and industrialized regions in the east of the "belt" gravitate towards the coast of the Pacific and Indian oceans. It is also possible to distinguish eight highly urbanized bands along major rivers, as well as linear structures of urban settlement along transcontinental lines. In general, the urbanization is reduced from the northwest to the southeast of the SREB zone. The main gradient of population density is directed from the southeast to the northwest.

Vast differences in natural conditions in the SREB zone, the level of socio-economic development, GDP per capita, the combination of low-comfort, for humans, and scarcely populated areas with particularly vulnerable ecosystems and highly urbanized areas with a huge load on the environment dictates the need to focus primary attention on environmental factors. The implementation of large-scale projects, including the construction of high-capacity throughways thousands of kilometers long,

Table 1. Economic development differences across the three zones

	Income level	GDP per capita (US $)	GDP proportion (%)	Non-agriculture proportion (%)	Growth rate (%)
West zone	High	37419	48.9	98	0.34
East zone	Upper high	7210	31.6	90	5.32
Middle zone	–	–	–	–	–
Petroleum exporting countries in Middle East	High	43939	4.2	99	4.99
Other developing countries	Low	4955	15.3	86	3.55

the commissioning of new mineral deposits, and inadequate construction of cities and other settlements is fraught with significant negative environmental consequences. Large-scale construction and the emergence of new industries are usually associated with a massive migration of labor from other areas and countries, which can undermine the traditional way of life and threaten the identity of local residents [Li Yu et al., 2016]. In turn, this can lead to aggravation of social conflicts and emergence of new discrepancies [Yu Huilu et al., 2015; Zhao Minyan et al., 2016], especially in the case of unequal partners and an unjust and unequal distribution of costs and benefits. Such a situation can take place, for example, in the implementation of large-scale projects in the agrarian sector, which are poorly compatible with the traditional way of life and agriculture (e.g., creation of modern milk or pork enterprises, designed for thousands of livestock heads and requiring an extensive feed base). Another possible situation is the export of obsolete, "dirty" technologies and management schemes [Glazyrina, Zabelina, 2016; Laruelle, 2015; Diener, 2015; Tracy et al., 2017].

China is well aware of such risks. The program document "Vision and action aimed at promoting joint construction of the 'Silk Road Economic Belt' and the '21st Century Maritime Silk Road' " has emphasized that China's initiative is based on strict observance of the "principles of mutual benefit and win-win strategy." The document notes the need to "take into account the interests and concerns of all parties, seek common ground and common denominator for cooperation, demonstrate the wisdom and creativity of each side" [Vision and Action..., 2015].

CHINA'S EXPERIENCE ON PROGRESS TOWARDS SUSTAINABLE DEVELOPMENT AND ITS IMPORTANCE FOR INTERNATIONAL COOPERATION IN THE SREB ZONE

Although the pockets of considerable ecological tension remain in China, first of all, in large agglomerations, increasing attention is paid to environmental rehabilitation. Market instruments of environmental regulation are used. Moreover, many Chinese companies under the influence of the market have gone beyond the officially established standards in their environmental policy. In 2015, environmental legislation has been supplemented by rules aimed at strengthening public control over its compliance and the availability of information on the state of the environment. China is increasingly participating in international environmental activities on the basis of bilateral and multilateral cooperation. The Chinese government has undertaken a commitment to reduce greenhouse gas emissions. The country has become the world's leading manufacturer of wind turbines and photovoltaic panels. The National City Programs have been adopted to reduce energy consumption and pollutant and carbon dioxide emissions [Tracy et al., 2017].

China has proclaimed the "Eco-Civilization Building Strategy" which should be implemented in four stages: (1) strengthening of property rights in the use of natural resources; (2) establishment of threshold parameters, whose exceedance dictates the need to protect different types of landscapes and land use; (3) creation of a system of compensation for environmental impact; and (4) reform of environmental management [Wang and Fan, 2016].

Based on the experience of the previous five-year program (2011–2015), the new policy aims to improve eight environmental indicators, such as the share of non-fossil fuel in primary energy consumption affecting the compliance of carbon dioxide emissions in relation to GDP [Hu 2015]. This policy also provides for more efficient use of energy, a program for the restoration of ecosystems, and the removal of the most "dirty" industrial complexes from the territory of China [Xinhua news 2015b]. The latter task involves the transition to a post-industrial economy, i.e., the restructuring of the country's economy, aimed at expanding the less polluting industries

and services with the possible transfer of harmful industries abroad. Thus, considerable experience has been accumulated in solving environmental problems at different levels.

One of the declared goals of the initiative is to contribute to the improvement of the environmental sustainability of the SREB countries. Thus, it is important to identify the mechanisms that can address this goal; the mechanisms should correspond to regional, natural, and socio-economic conditions, geopolitical situation, and resources. The main principles for the development and application of these mechanisms should be the strengthening of solidarity and mutual trust of neighboring countries, including the development of socio-economic and territorial plans, achieving the profitability of their implementation for all parties involved, "green growth" (i.e., economic development without increasing the load on the environment or with its reduction), and scientific validity.

The agrarian and industrial civilizations have been associated with conflicts between nature and society. The time has come for a transition to an "ecological civilization" based on the harmonization of nature-society relations and the ideas of sustainable development [Li Zehong et al., 2014]. "Ecological civilization" presupposes a harmonious relationship between society and nature. Its ideology is based on respect for nature, adherence to its principles, and its protection [Wang, 2014, Wang and Fan, 2016]. Such a civilization is impossible without the greening of the economy and advanced ecological culture. The SREB "ecological civilization" is based on the "six in one" system, the essence of which is presented in Fig. 6.

For the SREB countries, including China, it is vitally important to develop four types of economic and environmental cycles: within enterprises (companies), industry, regions, and social sphere. These cycles must provide for environmentally sustainable development throughout the production and exchange

Fig. 6. Ecological Civilization Mode

and consumption process and be consistent with the principles of green and low-carbon economy and reduction, reuse, and recycling of natural resources (Fig. 7).

From 2005 to 2015, more than 300 projects have been implemented or are currently being implemented in China; they target the greening of enterprises, primarily the production of structural materials – the metallurgical and chemical industries. These projects include three main elements: (1) mandatory environmental audits of enterprises whose pollutant emissions exceed norms; (2) the introduction of submerged arc furnaces in the production of ferroalloys and calcium carbide, allowing recycling of carbon monoxide and thermal energy; and (3) a complete transition to dry coke quenching and the use of coke oven gas for electricity production.

After 2005, the government adopted several projects that target more complete use of resources, energy conservation, and industrial ecology in cities specializing in the production of calcium carbide, polyvinyl chloride, and other products of organic chemistry based on coal. Such projects are aimed at recycling and use of waste, including water, industrial gas, and coke tar. Another group of projects relate

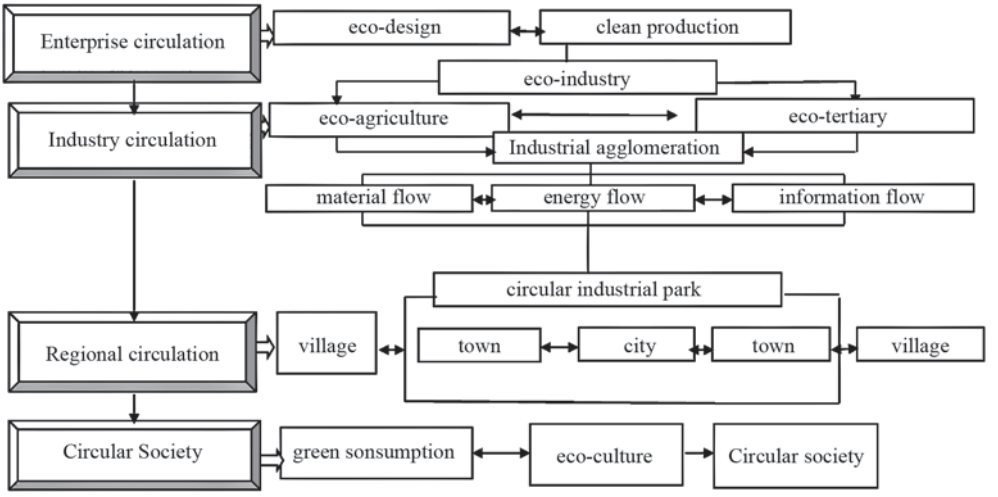

Fig. 7. Diagram of the four circular economy practices

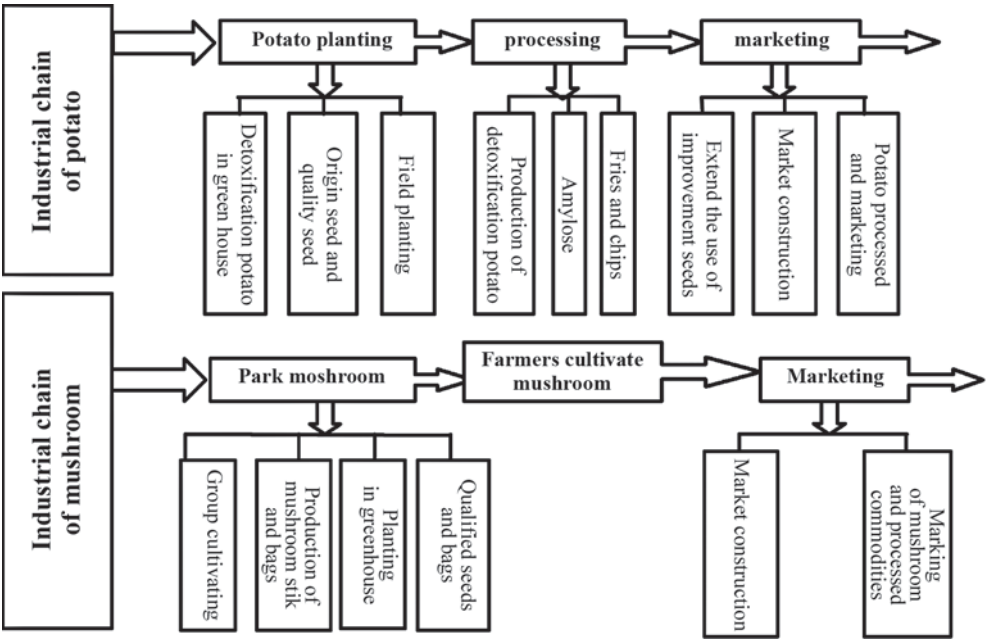

Fig. 8. Technological chains in the agro-industrial complex of Dingxi

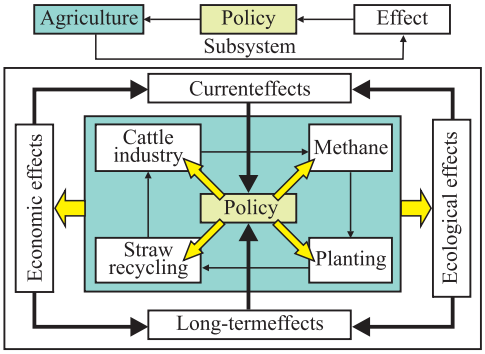

Fig. 9. Logical framework of AEP-SD model

to the deepening of processing of agricultural products (Fig. 8).

For the integrated prospective assessment of the implementation of the Strategy of Ecological Civilization in Agriculture in the period from 2009 to 2050, a model "AEP-SD" was created (Fig. 9). Given the current conditions and trends, the calculations show a rapid improvement of the situation until 2027, following which it will gradually degrade. The model allows identification of certain defects of the modern agrarian system, such as excessive increase in slaughtering, instability of methane production and unsatisfactory structure of energy balance, slow development of organic farming, etc. [Li Fujia et al., 2016].

The model allows developing some recommendations and avoiding potential risks. It is expected that methane production in the agro-industrial complex will constantly grow, and by 2030 the potential for generating methane-based electricity may exceed 500,000 tons in oil equivalent. "Clean" energy will quickly displace coal. By 2022, coal as a source of primary energy, theoretically, will be completely replaced by other types. As a result, carbon dioxide emissions will decrease from 320 thousand tons to 125.7 thousand, and the average annual reduction of carbon dioxide emissions will be 17 times greater than without these measures.

China is rich in wind energy resources, estimated at 3.2 billion kW. The installed capacity of wind power generation can reach 253 million kW, which will make the country the largest wind-energy producer in the world and will ensure the implementation of large-scale economic projects, in particular, in Western China. However, the currently installed wind power capacity is only 0.11 % of all power generation capacity (Table 2).

One example of the successful implementation of local projects for the transition to sustainable development is the city of Shizuishan. Its authorities have focused their efforts on the implementation of three tasks: (1) the recycling of waste and the formation of technological chains for the regeneration of resources in four major industrial parks; (2) the gradual establishment of an ecological system that integrates regional management of production, consumption, and utilization of waste; and (3) the creation of an "ecological community" in the districts of Dawukou, Huinong, and Pingluo.

Projects at the city level play a special role in the transition to sustainable development. There are six stages, each corresponding to specific tasks. The pinnacle on the path to "ecological civilization" is the achievement of the "harmony city" stage (Fig. 10). This is preceded by the "innovation city" stage founded on socio-economic structures based on scientific developments, pioneering technologies, and the accumulation of human capital and its rational use. An "innovation city" is characterized by favorable conditions for life and business. Its preceding stage, in turn, is a "green city" as the core of ecologically sustainable landscape. It is based on closed industrial technological chains, modern ecological agro-landscapes, and ecological services as an auxiliary system of a "closed" economy (a "circular city"). A "convenient city" is a city, whose transportation services mainly consist of public transport organized in three-dimensional space. The initial stage on the path to the "harmony city" is a "safe city" where public order is established,

Table 2. State Eco-Industry Pilot Parks (SEPP)

No.	Names	Time	Province	Types
1. State eco-industrial pilot parks of governmental authentication				
1	Suzhou industrial zone-SEPP	2008	Jiangsu	Comprehensive park-National economic and technology development zone (NETD)
2	Suzhou Hi-tech industrial development zone-SEPP	2008	Jiangsu	Comprehensive park-National Hi-tech industrial development zone(NHID)
3	Tianjin economic and technology development zone-SEPP	2008	Tianjin	Comprehensive park-NETD
2. State eco-industrial pilot parks with construction agreement				
1	Guigang (sugar industry)-SEPP	2001	Guangxi	Industrial park (sugar industry)
2	Nanhai-SEPP	2001	Guangdong	Comprehensive park (environmental protection industry)
3	Baotou (aluminum)-SEPP	2003	Inner Mongolia	Industrial park (electrolytic aluminum)
4	Huangxing,Changsha-SEPP	2003	Hunan	Comprehensive park (provincial industrial zone-PIZ)
5	Lubei chemical groups-SEPP	2003	Shandong	Industrial park (salt chemical industry)
6	Fushun mining groups-SEPP	2004	Liaoning	Industrial park(mining)
7	Dalian economic and technology development zone-SEPP	2004	Liaoning	Comprehensive park-NETD
8	Kaiyang national eco-industries pilot zone of phosphorous coal	2004	Guizhou	Industrial park (phosphorous coal engineer)
9	Yantai economic and technology development zone-SEPP	2004	Shandong	Comprehensive park-NETD
10	Weifang oceanic chemical HID-SEPP	2005	Shandong	Industrial park (oceanic chemical engineer)
11	Shangjie district, Zhengzhou-SEPP	2005	Henan	Industrial park (aluminum oxide)
12	Baotou steel-SEPP	2005	Inner Mongolia	Industrial park (steel)
13	Antai,Shanxi-SEPP	2006	Shanxi	Industrial park (coking plant)
14	Qingdao new world vein industry zone	2006	Shandong	Industrial park (vein industry)
15	Zhangjiagang free trade zone-SEPP	2006	Jiangsu	Comprehensive park-National free trade zone
16	Kunshan economic development zone-SEPP	2006	Jiangsu	Comprehensive park-NETD
17	Mawei, Fuzhou-SEPP	2006	Fujian	Comprehensive park-NETD
18	Wuxi new district-SEPP	2006	Jiangsu	Comprehensive park-NHID
19	Paojiang economic zone, Shaoxing-SEPP	2006	Zhejiang	Comprehensive park (PIZ)
20	Rizhao economic zone-SEPP	2006	Shandong	Comprehensive park (PIZ)
21	Shenzhuang industrial zone, Shanhai-SEPP	2007	Shanghai	Comprehensive park (PIZ)
22	Shibei new industries zone, Qingdao Hi-tech zone -SEPP	2007	Shandong	Comprehensive park (PIZ)
23	Yangzhou economic development zone-SEPP	2007	Jiangsu	Comprehensive park (PIZ)
24	Shanghai Jinqiao export processing zone	2008	Shanghai	Comprehensive park-NETD
25	Nanjing economic and technology development zone	2008	Jiangsu	Comprehensive park-NETD
26	Huayuan zone, Tianjin NHID-SEPP	2008	Tianjin	Comprehensive park-NHID
27	Kunming NHID	2008	Yunnan	Comprehensive park-NHID

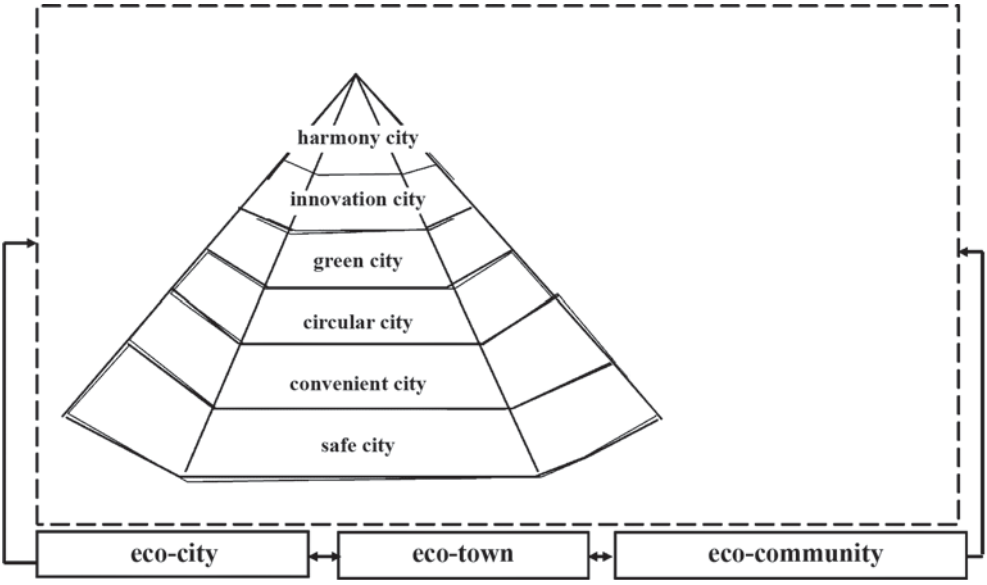

Fig. 10. The six steps of ecological sustainability of the city

the infrastructure is in excellent condition, and a reliable system for preventing natural disasters and man-made accidents is created.

Coordination of tourism related activities as part of "green development" should be conducted precisely at the city level. The SREB regions have a rich potential for tourism and rapid development of tourism related industry [Dong Suocheng, Zhao Minyan et al., 2016]. A barrier-free tourism space and special tourism economic zones should be created as instruments of regional economic integration within SREB.

The construction of high-speed railroads, in particular, between Russia, Mongolia, and China, together with international tourism, will contribute to the solution of this task [Dong Suocheng, Cheng Hao et al., 2016]. It is necessary to create free economic zones, utilizing the existing national special zones (e.g., in Russia, "territories of advanced development"), in the "economic corridors" along these high-speed railroads. Such zones are especially effective in border areas and cities located close to each other (for example, Kyakhta—Suhbaatar, Erlian-haote–Zhamyn–Uud, Manzhouli–Chita, Hongchun–Vladivostok–Hunchun).

CONCLUSION

The success of the Chinese SREB strategic initiative largely depends on ensuring "green growth" in the implementation of related projects, that is, developing the economy without increasing or even reducing the burden on the environment. The solution of this task requires fundamental scientific justification [Sun Jiulin et al., 2015] – large-scale interdisciplinary research throughout the SREB zone aimed at deeper understanding of the laws of interaction between nature and society in the face of global changes and international economic integration. It is crucial to consider the experience of environmental programs and projects, accumulated in recent years in China, where the goal of transition to "ecological civilization" has been proclaimed.

These studies cannot be successful without extensive international cooperation. Its

priority area at the current stage should be a permanent communication network between the scientific institutions of the SREB countries and regions and publication of joint research on sustainable development. Such a network structure can be alternately headed by "on duty" institutes or departments backed by a permanent secretariat. One of the objectives of cooperation in the field of sustainable development can be organization of joint expeditions, exchange of researchers, especially young talents, and utilization of international expertise.

It is necessary to establish an International Data Center and joint collection, systematization, exchange, and publication of scientific information [Cheng Hao et al., 2016]. Joint research should be based on a special scientific platform and a system for making collective decisions, including automated systems. ■

REFERENCES

1. Bezrukov L.A. (2016) The Trans-Siberian Railway and the Silk Road: Global infrastructure and regional development. EKO (Economy and organization of industrial production), N7 (505), pp. 21–36 (In Russian)

2. Cheng Hao, Sun Jiulin, Dong Suocheng, Guo Peng, Li Fujia, Li Yu, Li Zehong, Wang Juanle (2016) Informatization Patterns and Strategy of the Belt and Road[J]. Bulletin of Chinese Academy of Sciences, 06:656–662.

3. Diener A.C. (2015) Parsing mobilities in Central Eurasia: border management and New Silk Roads, Eurasian Geography and Economics, vol. 56, No 4 (56), p. 376–404, (IN/10.108 0/15387216.2015.1078736

4. Dong Suocheng, Cheng Hao, Guo Peng, Li Fujia, Li Yu, Li Zehong, Zhang Xiaoxiao (2016) Transportation Industry Patterns and Strategy of the Belt and Road [J]. Bulletin of Chinese Academy of Sciences, 06:663–670.

5. DONG Suocheng, HUANG Yongbin, LI Zehong, SHI Guangyi, MAO Qiliang, LI Jun, YU Huilu (2014) Economic Development Patterns and Regional Economic Integration Modes for the Silk Road Economic Zone [J]. Resources Science, 12:2451–2458.

6. DONG Suocheng, LI Zehong, LI Yu, SHI Guangyi, YU Huilu, WANG Juanle, LI Jun, MAO Qiliang, HUANG Yongbin (2015) Resources, Environment and Economic Patterns and Sustainable Development Modes of the Silk Road Economic Belt [J]. Journal of Resources and Ecology, 02:65–72.

7. Dong Suocheng, Zhao Minyan, Guo Peng, Shi Guangyi, Li Yu, Li Zehong, Wang Junni, Zhu Shaoqing (2016) Development Mode and Countermeasures for International Ecotourism Zone along the Belt and Road [J]. Bulletin of Chinese Academy of Sciences, 06:647–655.

8. Glazyrina I.P., Zabelina I A. (2016) Prospects of "green" growth in the east of Russia and the New Silk Road. EKO (Economy and organization of industrial production), N7 (505), pp. 5–20 (In Russian).

9. GUO Peng, DONG Suocheng, LI Zehong, LI Yu, CHENG Hao, YUAN Liang (2014) Progress and Its Prospects of Research on Resource Economics and World Resources in China [J]. Resources Science, 12:2459–2467.

10. Laruelle M. (2015) The US Silk Road: geopolitical imaginary or the repackaging of strategic interests? Eurasian Geography and Economics, vol. 56, No. 4, 360–375, http://dx.doi.org/10.1080/15387216.2015.1098555

11. Li Fujia, Dong Suocheng, Yuan Linna, Cheng Hao, Chen Feng, Li Yu, Li Zehong, Gu Yingying (2016) Study on Agriculture Patterns and Strategy of the Belt and Road [J]. Bulletin of Chinese Academy of Sciences, 06:678–688.

12. Li Yu, Zheng Ji, Jin Xueting, Wang Zhe, Li Zehong, Zhao Minyan, Huang Yongbin, Dong Suocheng (2016) Comprehensive Assessment and Countermeasure of Investment Environment for Countries along the Belt and Road [J]. Bulletin of Chinese Academy of Sciences, 06:671–677.

13. Li Zehong, Dong Suocheng, Shi Guangyi (2015) Science and Technology Supporting Program for Key Projects Construction and Safety of Silk Road Economic Belt [J]. Bulletin of Chinese Academy of Sciences, 01:37-45+31.

14. LI Zehong, WANG Juanle, ZHAO Zhongping, DONG Suocheng, LI Yu,ZHU Yunqiang, CHENG Hao (2014) Eco-Environment Patterns and Ecological Civilization Modes in the Silk Road Economic Zone [J]. Resources Science, 12:2476-2482.

15. Sun Jiulin, Dong Suocheng (2015) Accelerating Scientific Supporting Action on Promotion of Silk Road Economic Belt Program [J]. Bulletin of Chinese Academy of Sciences, 01:24–31.

16. Tracy E.F., Shvarts E., Simonov E., Babenko M. (2017) China's new Eurasian ambitions: the environmental risks of the Silk Road Economic Belt, Eurasian Geography and Economics, vol. 58, N 2, http://dx.doi.org/10.1080/15387216.2017.1295876

17. Vision and action aimed at promoting joint construction of the "Silk Road Economic Bel" and the "21st Century Maritime Silk Road." Published April 23, 2015. Website of The Embassy of China in Moscow, http://ru.china-embassy.org/rus/zgxw/t1257296.htm

18. WANG Zhe, DONG Suocheng, LI Zehong, LI Yu, LI Jun, CHENG Hao (2015) Traffic Patterns in the Silk Road Economic Belt and Construction Modes for a Traffic Economic Belt across Continental Plates [J].Journal of Resources and Ecology, 02:79–86

19. Wang Zhe, He, H. and Fan, M. The ecological civilization debate in China. Monthly review, 2014, 66. Accessed February 3, 2017. http://monthlyreview.org/2014/11/01/theecological-civilization-debate-in-china/

20. Wang, Q. and Chen, Y. (2010) Energy saving and emission reduction revolutionizing China's environmental protection, Renewable and sustainable energy reviews, vol. 14, N 1, p. 535–539.

21. YU Huilu, DONG Suocheng, LI Yu, LI Zehong, SHI Guangyi, HUANG Yongbin, WANG Zhe, LI Fei (2014) Resource Cooperation Development Modes in the Silk Road Economic Zone Based on Resource Distribution Patterns [J]. Resources Science, 12:2468–2475.

22. Yu Huilu, Dong Suocheng, Li Yu, Li Zehong, Shi Guangyi, Li Fei, Li Fujia, Chang Yongzhi (2016) China's Geopolitical Strategy of the Belt and Road Initiative Based on Theory of Externality [J]. Bulletin of Chinese Academy of Sciences, 06:697–706.

23. Yu Huilu, DONG Suocheng, LI Zehong, LI Fei, CHENG Hao, LI Fujia (2015) Evolution of Regional Geopolitical Pattern and Its Impact on the Regional Resources Cooperation in Northeast Asia [J].Journal of Resources and Ecology, 02:93–100.

24. Zhao Minyan, Dong Suocheng, Wang Zhe, Cheng Hao, Qin Fangming, Li Yu, Li Zehong, Li Fei (2016) Assessment of Countries' Security Situation along the Belt and Road and Countermeasures [J]. Bulletin of Chinese Academy of Sciences, 06:689–696.

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