

On Environmental Innovation and Sustainable Development: an Exploration into the Environmental Development in the Region of Northwestern China

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Abstract: Since the late twentieth century, the human being has been facing various increasingly serious “ecological problems”, and thus the issue of sustainable development becomes a hot topic of the human’s concern. As a new model and concept of development, sustainable development has also increasingly rooted deeply in people's mind and come into practice in more and more countries as a social development strategy, which is a qualitative leap forward in the course of human civilization. However, as viewed from the current situation, people still have incompletely consistent understandings to the connotation of sustainable development and even not yet reached a consensus on some basic issues like the status of mankind in sustainable development, which is a fundamental issue directly related to how to grasp the essence of the sustainable development concept and even whether or not sustainable development can be truly achieved.

Keywords: Economy, Present stage, Environmental resource issue, Region of northwestern China

1 Introduction

Before World War II, the bearing capacity of the ecological environment on the Earth still allowed for economic development; after World War II, developing countries, especially the Third-World countries, came to an independent development path and the capitalist countries also embarked on a period of rapid development (for example, the United States and Japan entered into the stage of highly industrialization). In the 1960s-70s, the human began to get faced with some issues like lack of resources, ecological crisis and so on.

Non-sustainable development issues in the world today include: 1) Global warming, and rising sea levels; 2) Serious soil erosion and desertification, and decrease in cultivated land; 3) Dwindling forest resources; 4) Water shortages constrain development, affecting life; 5) Ozone depletion, threats to life on Earth; 6) Accelerated species extinction, drastic reduction of biological resources; 7) Population explosion, endangering the ecology and the environment; 8) Spread of harmful synthetic compounds, harming human; 9) The transfer of hazardous waste, harming the world; 10) Residues damage the environment.

Consulted a number of materials and documents, current researches mainly focus on the following issues. Economic growth refers only to growth in the economic quantities, e.g. increase in the national income, gross domestic product (GDP) and gross national product (GNP). It mainly aims at industrialization, holding the opinion that economic growth is the embodiment of social wealth and national strength, and the symbol of national well-being. Economic development refers to the overall economic, social and political improvement that comes along with the economic growth in a country or region. It includes three parts: 1) Economic quantities growth, i.e. through increased investment or improved efficiency, a country or region gain more output in its products or services, constituting the material basis for economic development; 2) Optimized economic structure, i.e. the coordination and optimization of various structures of a country or region, such as the investment structure, output structure, distribution structure, consumption structure and population structure. It is a necessary part of economic development; 3) Economic quality improvement, i.e. a country or region’s economic benefits, social and personal well-being, people's actual life quality, economic stability, natural ecological environment improvement, as well as the political, cultural and human modernization. It is the final mark of economic development;

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their needs. Sustainable development has six principles: the principle of fairness, the principles of sustainability, the principles of harmony, the principle of demand, the principle of efficiency and the principle of conservation.

Generally speaking, economic growth is the motivation, means and basis for economic development while economic development is the result and target of economic growth. Development is

the core of sustainable development, but economic and social development should be conducted under the premise of strict control of population, improvement of population quality, environmental protection and sustainable use of resources. A true development is sustainable and on the long run.

2 Analysis of the Environment in the Region of Northwestern China

2.1 Natural environment pattern

The project scope of the study includes the inland river basin (including the international rivers in Xinjiang) and the Yellow River basin in six provinces and autonomous regions of Xinjiang, Qinghai, Gansu, Ningxia, Shaanxi and Inner Mongolia (together called as “Northwestern China” in the report).

Northwestern China has total land area of 3,450,000 square kilometers, according to the different natural environment can be divided into three parts: the inland arid region in the west of the Helan Mountains (hereafter called “inland arid region”), the semi-arid grassland in the east of Helan Mountain (hereafter called “semi-arid grassland”), and the semi-arid and sub-humid area of the Yellow River basin (hereafter called “the Yellow River basin”).

2.2 Socio-economic situation and problems

Since the founding of new China, Northwestern China has achieved huge social and economic success, which has in general laid the preliminary foundation for the realization of a well-to-do society. At present two main problems exist: firstly, the economy is relatively backward, secondly, the ecological environment is deteriorating in some parts of the area.

2.3 Overview of water resources

(1) Average Quantity of Perennial Water Resources. For years, annual average water resources in Northwestern China were 163.5 billion cubic meters, only 5.84 of the national total.

(2) Water Resources Per Capita. Water resources per capita in Northwestern China in 2000 were 1,781 cubic meters, counted for 80.5% of the country’s national per capita of the same year. Among which, Yellow River in Ningxia 217 cubic meters, Weihe River in Shaanxi 326 cubic meters, Huangshui River in Qinghai 618 cubic meters, Shiyang River in Hexi Corridor of Gansu 761 cubic meters. Water resources per capita in the above-mentioned areas were much lower than the territory average, thus become serious water shortage areas.

(3) Water Usage and Water Consumption. In 2000, total water usage in Northwest China was 81.7 billion cubic meters, agricultural water use accounted for 89.3%. Apart from the return flow of agricultural, industrial water and domestic water, net water consumption for the territory in 2000 was 54.7 billion cubic meters. Water consumption rate (ratio of water usage to water consumption) was 62.8%.

(4) Water Use Efficiency. Although water resources are short, problems like high water consumption per capita, high agricultural irrigation water quota and high unit GDP water consumption exist in Northwestern China. Average agriculture irrigation quota per mu is 617 cubic meters, 40% higher than the national average, while unit GDP water consumption is 1,736 cubic meters, 1.85 times higher than the national average.

(5) Water Resources Utilization Rate (ratio of water use to total water resources). At present, national average water resources utilization rate is 20 while Northwestern China is 53.3%. Among which, rivers of Hexi Corridor in Gansu Province, Tarim River in Xinjiang and rivers of northern slope of Tianshan Mountains exceed 70, some even over 100%.

2.4 Main ecological crisis – desertification

In the long history evolution of ecological environment in Northwestern China, various problems has emerged, e.g. drought and water shortage, rivers and lakes drying up, soil erosion, vegetation degradation and so on.

(1) Definition of desertification. Results of 2nd National Desertification Monitoring show that the total area of desertified land in the country in 1999 was 2,674,000 square kilometers, of which about 2,183,000 square kilometers were within this project research scope.

Studies suggest that, to guide the practical work in a targeted manner, research should focus on degradation of existing arable land, grassland and forest due to unreasonable human activities. In Northwestern China, study should focus on desertified lands which caused by irrational use of water resources and land resources in the dry climate background and which can be controlled under certain conditions. Roughly estimate, the total area of desertified lands in Northwest China would be 600,000 square kilometers.

(2) Desertification caused by irrational use of water resources. (1) In the inland arid region,

excessive water use at upper and middle river resulting in downstream rivers and lakes dried up and the desert area expanded. (2) At desert borders, over-exploitation of groundwater resulting in vegetation withered and lands desertified. (3) In large and medium-size irrigation districts, improper irrigation caused groundwater level raised and secondary soil salinization.

(3) Desertification caused by irrational use of land resources. (1) Overgrazing in grasslands resulting in large areas of land degradation or desertification. (2) Over collection of wood and over exploration of land resources in pastoral areas resulting in large areas of land degradation or desertification. (3) Unreasonable farming structure and farming system in agricultural areas resulting in large areas of land degradation or desertification. (4) Denudation and over-reclamation in some mountainous areas resulting in forest degradation. (5) Damages happened in the progress of conversion caused soil erosion area increased

(4) Desertification is a major cause of increasingly serious dust storms. From the point of view of laws of nature, dust storm is a natural phenomenon that is unlikely to be eliminated. However, human irrational economic activities undermine land coverage in some areas, thus accelerate the occurrence and scale of dust storms.

Dust storm happens in arid, semi-arid regions. Except those formed by geological history, all of the underlying surfaces of the areas with high frequency sand-dust occurrence belong to the desertification scope. So, expansion of land desertification in Northwestern China in recent years is one of the main reasons for the occurrence of increasingly intensified dust storms in our country. Comprehensive measures rather than localized emergency measures should be taken to protect the ecological environment of the dust storm source ground, taking advance measures to control and manage land desertification in Northwest China.

2.5 Ecological crisis in urban industrial and mining areas - water pollution

According to statistics in 2002, pollutions in Northwestern China can be divided into three types: heavily polluted, moderately polluted and minor polluted. Population in heavily polluted and moderately polluted areas counted for 79.1% of the total population. Among which, Weihe River Basin has become one of the country's most heavily polluted areas. Inland rivers have no oceanic outfall, while sewage discharged from Yellow River not only will endanger the local, but also pose a threat to water environmental safety in middle and low parts of the Yellow River.

3 Human's Subject Status and Achievement of Sustainable Development

Human's subject status refers to the position of human in nature relationship, in which human is the subject, nature the object. The relationship between man and nature is very complex and will be different seeing from different angles or different point of views. Among which, "Subject – object" is only a basic relationship and can not stand for the entire relationship between nature and people. Therefore, the role of "subject – object" relationship is limited due to its limited definition. Generally speaking, the relationship between man and nature can be confirmed from two perspectives. First, from the ontological point of view, as other beings in nature, human is one part or a composition of the natural ecosystem and human is "equal" with other being in nature. In this sense, it is different to tell the subject from object. Second, from an axiological point of view, human is special from other beings in nature in its autonomy and creativity.

Human, coming from nature yet beyond nature, has the ability to make good use of objects in nature or natural objects transformed by human by understanding, utilizing and transforming objects in nature. Meanwhile, Human also has the self-awareness and ability to understand and transform itself, that is in their activities towards nature, human has transformed itself by transforming the nature, for active transformation towards nature and conscious transformation towards human themselves holds the same meaning. The interaction, reciprocal causation and inseparably interconnection between "conscious" self-transformation and active transformation of nature maintain the coordination, co-exist and mutual benefit between man and nature. It is thus clear that human's subject status in the relationship between man and nature is validated by the "subject – object" relation in the sense of axiology. However, human practices and natural science studies have shown that, even in the sense of ontology, human activities also reflect human's subject status to some degree, "because the broad and extensive human activities on Earth have been constantly changing or influencing Earth's natural environment, and has become the dominant ecological factor in the biological ecosystem".

sum up, in the relationship between man and nature, man, the main body status of connotation is mainly for:

(1) based on their own survival and development, people shall use and transform the nature actively, achieving the principal object;

(2) through practical activities people will be external to the person's natural "internalized " to enrich, improve and develop their own, achieving the main object;

(3) the status of human subjectivity is the essence of people is the goal. On the nature of the relationship between man and nature, the person is with the purpose of value, the value of the natural world with the means. Because for humans, to understand the relationship between man and nature correctly or deal it effectively, is definitely in compliance with the objective needs of human survival and development, being the ultimate values and criteria. Of course, this does not negate the nature, in front of people's activities, confirmed the objectivity and independence of its existence, that nature exists independently of the others, it has the people's will not follow the objective law and the nature.

However, the existence and the laws of nature, are given the "value" by human existence and needs. On one hand, the existence and laws of nature play a restrictive role on humans, as the goal and its implementation, that is, before nature people can not "do whatever they want", yet must recognize the real nature, respect the laws of nature; on the other hand, the existence and the laws of nature is valuable in that it provides for human survival and development of the conditions for the activities of human services, human services, the purpose of achieving. This is the basic meaning of the dominant position of people, but also the basic provisions of the basic content of the "subject - object" relations between man and nature. The status of the human subject defines nature of the relationship between man and nature, and determines the scope of man's activities and the role of nature.

To highlight the status of human subjectivity, promote harmony between man and nature achieve sustainable development of society, it is necessary to correctly understand and properly treat the following relationships, which can be divided into two levels of understanding and practice:

3.1 On the level of understanding

First, understand of the relationship between ends and means correctly. Ends and means here is the meaning of the purpose the sustainable development (including the harmonious relationship between man and nature, and of the human relations, harmonious development of all aspects of the society) and valuable meaning of the means for this purpose. The purpose, means and effects in the interaction between man and nature, in the specific space-time, that make the development of human beings, also the protection of the natural environment, thus achieving sustainable development of the natural evolution and social harmony. It is the relationship of purpose, means in the interaction between man and nature in the specific space-time that constitutes the ethical relationship between man and nature, which is the human moral responsibility of the reality of natural objects, is fundamental to "environmental ethics " and the scope of its role and the existence Limits.

Second, understand the relationship of scientific rationality and the value rationality correctly. The traditional concept of development of the "anthropocentrism", is both the conceptual foundation of industrial civilization, but also the product of its consciousness. It puts man's rationality and irrationality unprincipled "generalization", artificial "promotion" to the whole of nature, and then again have the inherent property of natural objects to be "human" to describe and understand, and then "imposed "to humans, which is another distortion people's rationality. Therefore, adherence to the sustainable development concept should be scientifically and comprehensively understanding of human rationality, the rationality of the scientific nature and value of people's consciousness in the combination of unity, that, understands problem and evaluate things from the combination of science and technology and the human spirit.

3.2 At the level of practice

First, handle the relations of transformation of nature and human correctly. Sustainable development is about the harmony of people and nature, and the unity of human harmony. As for sustainable development, the harmony between man and nature is the "core", and interpersonal harmony is the "real", the "core" is determined by the "real". Therefore, the strategy of sustainable development should not only focus on "core", but also to grasp the "real", it is necessary to link the transform of nature and human(Note: transformation of nature includes the protection of the natural, and both relationships often reinforce each other.) and should put the transform of people into the first place.

Second, handle the relations of the scale of matter and human correctly. When Marx explains the difference between human activities and animal activities noted that animals can only produce materials by a scale, the scale of matter, but human can use two scales during their production activities, " animal can only build according to the scale and the need that belongs to it, but people understand how to accord to any scale when produce, and know how to use in regard to the object within the scale

everywhere.” For human activities, the sustainable development concept is to ask human beings insist on human scale with the premise of the ultimate meaning, the integration of the two scales are united in the person's activities, to ensure proper realization of harmonious coexistence and reciprocity between man and nature, to serve the ultimate goal of comprehensive development of human social development.

4 Conclusions and Solutions

4.1 Reasonable arrangements for the ecological environment

Drought trends and geographical pattern in Northwestern China, is due to the gradual uplift of the Qinghai-Tibet Plateau formed more than 2000 million years ago. In Northwestern China, the Loess Plateau region in the change process from pastoral area to agricultural, result in the destruction of natural vegetation, the increasing of soil erosion. After the founding of new China, the enhancement of human ability to transform nature, the irrational exploitation of natural resources leads to more severe environmental problem. In the west of Helan Mountains inland river basin, the construction of plains reservoirs in some parts of the middle reaches of the river basically controls the river runoff. Although with the development of irrigation, the day of building the plain reservoir is the beginning of the downstream drying. When develop the production in the pastoral areas, the grasslands face overloading and degradation because of the one-sided pursuit of growth in the first few Livestock. In traditional farming-pastoral and pastoral areas, further large-scale land reclamation farming leads to growing area of land desertification

In view of this situation, we should carry on reasonable arrangements of the ecological environment. Through the construction of a reasonable Vegetation layout, protection and restoration of natural rivers and lakes, pollution prevention and mitigation measures and other measures to improve the current poor ecological environment, and continuous optimization

4.2 Construction of efficient water saving and pollution prevention economy and society

The main problem in agriculture and animal husbandry in Northwestern China is low input, low output, and high consumption of resources. The northwestern China accounts for 18% arable land and 19% water resources of those in the country, and yet produces only 8.8% of foodstuff and 6.7% of meat in the country. The whole region has 2630 million mu grassland, accounting for 64% of the country, while its animal husbandry output value is only 7.5%.

The direct cause of this situation is the structural dislocation between agriculture and animal husbandry and soil and water resources: in the region's agricultural structure, farming accounts for about 70%, yet animal husbandry accounts for only 28.5% This industrial structure is in a severe dislocation with resources structure that water resources are scarce, while resources of grassland are the rich in this region. In the plantation house, the proportion of food crops with high water consumption is too large; in the crop structure, summer grain area is too large. Pastoral and agricultural areas are separated with each other, which can not form the pastoral space layout of regional strengths.

The construction of efficient water saving and pollution prevention economy and society needs to improve the overall efficiency of water use, gradually adjust the industrial structure, and actively promote urbanization. With the goal for modern agriculture, control and gradual reduction of agricultural water, we build a modern agricultural system of efficient water saving and pollution prevention. Comprehensive improvement of the quality of the population and scientific and technological level is to build efficient water saving and pollution prevention in towns and villages

4.3 Rational allocation of water resources

In recent years, in the context of global warming, our climate tends to be warming, but with significant locality and volatility. Changes in precipitation have a greater regional difference, while the trends were less apparent than temperature. Over the past 50 years, the change of precipitation in the Northwestern China shows trends the East down while the West rise, and its eastern boundary roughly in the Hexi Corridor. The decreasing runoff rate of Yellow River is bigger than the precipitation, but Inland river basin runoff has increased. This presumably because the glacial melt water has increased, because of climate warming.

From a strategic point of view, we should be based on "strive for the best, prepared for the worst", as far as get the driving position. Xinjiang region, where the river runoff is large in the current, should seize the current favorable opportunity to increase the intensity of the restoration of habitat, while preventing water blindly increasing socio-economic scale

We should allocate water resources rationally in the Yellow River Basin in Northwestern China. Ecological environment to a reasonable arrangement should primarily rely on natural precipitation to

restore vegetation. The socio-economic development in Yellow River basin in Northwestern China should also be emphasized the construction of efficient water saving and pollution prevention. In order to ease the water crisis in the Yellow River, in the long run, we should add the appropriate amount of water by South-Western line. When ensure the rational use of water of the ecological environment and socio-economy, we must ensure the sustainable use of water resources, and leave appropriate room for it. To this end, we not only on the integrated river downstream, but also take full account of the complexity of surface water and groundwater transformation and sustainable use of groundwater.

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