

Some Problems Should Be Paid Attention to in the Ecological Rehabilitation in China

*Niu Chonghuan*¹, *Lu Shengli*¹ and *Zhang Ruizhen*²

¹Department of Water and Soil Conservation Ministry of Water Resources, Beijing, 100053
E-mail: lushl66@163.com

² The Monitoring Center of Soil and Water Conservation, MWR

Abstract: This paper describes the goal of the ecological rehabilitation in China is mainly to rehabilitate, protect and optimize the ecological environment taking the water and soil resources as its basis and the vegetation cover as its important contents. The task of the ecological rehabilitation is mainly to rehabilitate the damaged ecological environment to the maximum and to protect the ecology that will be probably damaged. The formulation and implementation of the planning of ecological rehabilitation should take the county as basic unit. This paper also stresses that it should be fully recognized the ultimate importance of water in the ecological rehabilitation and the comprehensive application of various modern technologies such as engineering, planting, water-saving and monitoring. It also should be fully recognized that the ecological rehabilitation is a long-term, arduous and weak-economic project. This paper also points out clearly that ecological rehabilitation should focus on the village close to town, the industrial and mining areas near farmland, and the areas around rivers and roads where the production and living activities are frequent. The authors put forward that the ecological rehabilitation should adopt the unified administration and the Central Government should support the works of five aspects, (1) the sciences and technologies, (2) the ecological supervision and monitoring, (3) the hydraulic engineering construction, (4) the input of the improved breeds of livestock and the improved seeds and seedlings of trees and grasses, and (5) the ecological relocation.

Keywords: ecological rehabilitation, goal, task, planning, measures, management

A good ecological environment is the infrastructure of sustainable and harmonized development of economy, society and nature. The ecological rehabilitation and environmental protection are the persistent strategies in our country. In China, the poor ecological situation is caused by a long-term result of natural factors and human activities. Therefore, the realization of green mountains and clear rivers will be a long-term, arduous and complicated systematic project. It not only should have a rehabilitation goal suitable to the actual conditions of China but also should adopt scientific methods and measures in keeping with the natural laws. At present, the following problems should be paid attention to and should be solved well.

1 The goal of ecological rehabilitation

The determination of the goal correct and suitable to local conditions is the first key problem in the ecological rehabilitation. Because the ecological deterioration in China is a result of long-term natural factors and human activities, the ecological deterioration types in different areas present in different ways due to its different effects and importance of affecting factors. But their deterioration essence is that water, soil, vegetation, and other resources are damaged and unbalanced. Therefore, the goal of ecological rehabilitation is to rehabilitate, protect and optimize the ecological environment taking water and soil resources as its basis and taking the vegetation as its important content.

From a long time, the ecological rehabilitation will firstly focus on improving the existence and living conditions of human and fauna and flora. The main objective of production practice of human is to meet the needs of the increasing material life and the spiritual and cultural life, including the needs of the

increasing environmental quality. The uninterrupted deterioration in ecology, especially the occurrence of continuous drought and soil and water losses, has resulted in the uninterrupted growth of “desertification” and “stonification” and has greatly damaged the living conditions of human and the existing environment of fauna and flora. Therefore, the fundamental task of ecological rehabilitation is to rehabilitate and improve the damaged water, soil and vegetation conditions in order to provide a good ecological environment for the sustainable development of human and nature. Secondly, the ecological rehabilitation is to provide the basic conditions for the social and economic development. The shortage and exhaustive utilization of resources and the less-developed economy are now the prominent problem in China, which is also an important factor of the ecological deterioration of our country. But the ecological deterioration aggravates greatly the shortage of resources and restricts the economic development. Therefore, the important task of ecological rehabilitation is to alleviate or remove the restriction of ecological environment on the social and economic development and to guarantee the sustainable and coordinate development of economy, society and nature.

At the present stage, the main objectives of ecological rehabilitation in China are as follows. Firstly, it is to realize the sustainable development of water, soil and vegetation resources. At present, the bearing capacity of local water, soil and vegetation resources should be taken as the basis for adjusting the industrial structure and production patterns and removing the irrational development and utilization of soil and water resources and the over-bearing and denudation of vegetation resources, so as to change the ecological deterioration factor into the ecological rehabilitation factor. Secondly, the key ecological rehabilitation works of protecting town and village, river and water bodies, farmland and mines should be done well, in order to improve the ecological conditions quickly and to ensure the implementation of the policies of “reform and open to outside” and the economic development. Thirdly, closing hillside to facilitate afforestation and protecting vegetation should be implemented in a large scale, which depends on the self-restoration force of nature to rehabilitate natural vegetation and to realize the ecological improvement.

2 The main tasks of ecological rehabilitation

The first is to rehabilitate the damaged ecological environment to a maximum, that is, to rehabilitate and improve the damaged ecological environment caused by artificial factors. These factors include the abuse of water, improper reclamation, overgrazing, trampling, reclamation in steep slope, over-cutting, etc. For example, the ecological deterioration in the Tarim River Basin and the Heihe River Basin is caused mainly by the abuse of water. The spread of sand lands in E'erdusi, Hunshangdake, and Ke'erqin is caused mainly by the overgrazing and improper reclamation. The soil erosion in the upper and middle reaches of the Yellow River, Yangtze River and Peal River is caused mainly by the reclamation in steep slope and over-cutting.

The second is to protect the ecological environment that will be probably damaged. In the course of economic development and social progress, the activities and ways of destroying the ecological environment are still difficult to avoid. Some ecological areas and systems such as rivers, lakes, forests, grasslands and wetlands suffer the threat of the ecological deterioration. Therefore, the work of ecological protection should be strengthened in order to curb new artificial ecological deterioration.

The third is to improve the ecological environment in the local areas such as town, village and mining areas. With the economical development, it is necessary and possible to rehabilitate, improve and enhance the local ecological environment, in order to set up a higher ecological system that exceeds the ecological quality and quantity under the natural conditions.

The fourth is to maintain the stability of some ecological conditions. After some local ecological environments have been disturbed or damaged, it is difficult to restore their original states, such as the sedimentation of the Dongting Lake and Poyang Lake, the shrink of some wetlands and the flow pattern change of some rivers. We should determine to take effective measures to avoid the further ecological deterioration and to give full play to the existing ecological functions.

3 The planning of ecological rehabilitation

On the basis of the basic conditions of PRC, the ecological rehabilitation should adopt the unified planning taking the county as a unit. In China, the county is the most effective and active basic element in the implementation of various policies. In the light of ecological rehabilitation, the plan taking the county as a unit has the significance of guide and practice and is comprehensive, coordinate and easy to implement. The practice has showed that the formulation of ecological rehabilitation planning and the implementation of the planning on the basis of the county's planning will be a more effective measure for solving the repeated investment, poor quality of project, low benefits and crossing-management in the ecological rehabilitation at present.

Firstly, the planning of ecological rehabilitation should embody the coordinate development of nature, economy and society, that is, to serve the economic and social development. It should aim at raising the people's living standards and quality. It should lay equal stress on both prevention and treatment in ecological rehabilitation and fully present the importance of protection. Meanwhile it should take practical measures to control the damage and deterioration of the existing ecology and should avoid the situation of treating while damaging.

Secondly, the planning of ecological rehabilitation should carry out the principle of giving priority to natural recovery. The study and practice have showed that the accelerating worsening of ecological environment is mainly caused by the human activities. When removing the disruption and damage factors of human activities on nature, the ecological environment in most areas can, depending on the self-recovery capability of nature, gradually recover to its corresponding allowance level of the local natural conditions. Under this condition, the ecological rehabilitation activities only can quicken its recovery process. Therefore, the planning should make full use of such nature recovery capability, so as to gain the maximum ecological rehabilitation benefits with the minimum input.

Thirdly, the planning of ecological rehabilitation should be in accordance with the actual conditions and avoid carving for greatness and success. The objectives of ecological rehabilitation should meet the needs of improving production conditions and enhancing the people's living standards and quality. The procedures of ecological rehabilitation should put the priority on ensuring the ecological environment in those areas such as town, village, mines, farmland, river and road where is closely related to the economic development and people's living level, to be protected, improved and rehabilitated. Then it spreads gradually to remote mountains and lands and the sources of rivers. The engineering measures of ecological rehabilitation should be suitable to the local natural conditions and the economic development level. The management of ecological rehabilitation should be favorable to arouse the enthusiasm of different sectors and numerous cadres and masses, so as to ensure the ecological rehabilitation and the follow-up management.

4 The relationship between ecological rehabilitation and economic development

The basic conditions in China determine the relationship of ecological rehabilitation and economic development is very close. Without considering economic and social development, the ecological rehabilitation would loss its goal and power. Without considering ecological rehabilitation and environment protection, the sustainable economic and social development would be end in talk.

Viewed from the full process of historic development, the maintenance and improvement of good ecological environment should be the first priority, the foundation of sustainable economic development and the guarantee of human existence and development. With the development of productive force, the improper production practice brings a huge damage on the natural ecology. Especially in some aspects and in some areas, such damage will be irretrievable. There are many such irretrievable damage examples in the world. For instance, the disappearance of Loulan ancient civilization in China showed that if good natural ecology could not be maintained, any economic benefit and social progress would be temporary, just as some one drink poison to quench thirst. Therefore, the behavior of giving up ecology for making way for economy should be forbidden.

The economic development is a guarantee of the ecological rehabilitation. The economic and social development is the positive requirement of historic advance and the reflection of human civilization progress. The ecological environment without human civilization progress has no social significance.

Only the continuous development of economy and society could effectively carry out ecological rehabilitation. Firstly the scientific and technical development and application will greatly enhance the utilization efficiency of resources and reduce the pressure on natural resources. Secondly, the economic development will provide effective material security for ecological rehabilitation and improvement. Thirdly, the economic development will promote the progress of social civilization and raise the people's cultural life, so as to strengthen the close relation of ecological environment with the people's life and effectively ensure the stability and improvement of ecological environment.

5 The role of water resources in ecological rehabilitation

Water, soil, air and heat are the most important factors in natural ecological system. Without water, there would be no life, no vegetation, and no agriculture and pasture. So water is the most active factor in natural ecology, especially in artificial ecology.

The rational utilization of water is the most basic problem in the ecological rehabilitation. One of the main causes of the ecological deterioration in the lower reaches of the Heihe River and Tarim River in China is that the bearing capacity of water resources in the basin was neglected. But one of the main factors of the successful development in the Colorado River Basin in the west region of United States is that the optimal arrangement and sustainable utilization of water resources was reached.

Water is the important restriction factor in the ecological rehabilitation. The water resources will determine the ecological bearing capacity and vegetation capacity. Damaging water resources conditions will reduce ecological bearing capacity and vegetation capacity but improving water resources conditions will increase ecological bearing capacity and vegetation capacity. The nature in a long-term change forms different natural ecological patterns in various regions that are suitable to the local conditions of water, air, light and heat, and produces different natural ecological landforms such as forest, grassland and desert. Therefore, the specific environment conditions producing a specific ecological system is natural law that should be obeyed. Under the conditions of natural water resources, it is not realistic to change desert into grassland and then grassland into forest. Under the same conditions, transforming the natural forest, lake and wetland into farmland and grassland is a waste of ecological resources or even is a destructive damage.

6 The technical requirements in the ecological rehabilitation

The ecological rehabilitation is not simple combination of traditional technologies but is a re-combination of traditional technologies and the extension and application of new hi-tech. It integrates the modern planting, aquiculture, water saving, engineering, chemical and monitoring technologies.

The development of the planting technology can increase the plant species suitable to the local conditions and improve the survival rate and growth of trees and grasses, so as to fasten the rehabilitation of vegetation. The progress of aquiculture technology is an important factor for ensuring the success of ecological rehabilitation and is the key to gain effect in closing hillside for afforestation, shifting farmland into pasture and resuming grassland. The extension of renew, optimization, shed-raising and intensive production technologies of cow and sheep species will greatly promote the ecological rehabilitation.

In the areas with shortage of water resources, the water-saving technology should be extended in the ecological rehabilitation. While extending the engineering water-saving technology, we should pay great attention to the adjustment of industrial structure and the optimization of ecological structure, that is, developing water-saving-oriented industries and limiting and canceling high water-consumption industries, in order to enhance the satisfaction degree of ecological water demands. With the optimization of ecological structure, the high water-consumption plants would be eliminated and the low water-consumption plants should be adopted in priority so that the water-saving-oriented vegetation is developed.

The application of engineering technology is the prerequisite of enhancing the quality and speed of ecological rehabilitation. Without land leveling and water supply works, the construction of vegetation cannot be effective. Without the construction of basic farmland irrigation facilities, the land productivity increase could be difficult. Without the organic combination of slope and gully works, the soil erosion

cannot be effectively controlled. Therefore, the ecological rehabilitation should adopt low-cost and high-effect engineering measures suitable to the local conditions, in order to ensure the success rate of ecological rehabilitation.

At present, we should be paid great attention to the development and application of chemical technology that can reduce the moisture evaporation and increase soil capacity of resisting water and wind erosions. It will be effective and prospective in enhancing the productivity of ecological rehabilitation and is bound to bring a revolutionary change to the ecological rehabilitation.

7 The role of human in the ecological rehabilitation

Human will bring great destructive force to the natural ecological system. With the development of production, such destructive force also increases. The long-term uncontrolled and exhaustive land reclamation and the over-development and over-utilization of water, forest and grass resources are the direct causes of accelerating soil erosion and resulting in the sedimentation of rivers, the shrink of lakes, the land deterioration and the grassland desertification.

The capability of human in the ecological rehabilitation is weak opposite to its destructive force. At present, the human's productivity can play determinative role in only local ecological rehabilitation. On the one hand, the natural conditions in the weak-ecology areas always has the characteristics of the ecological deterioration acceleration, which makes the short-term ecological damage to need a long-term rehabilitation and protection to correct or even to be a irretrievable damage. On the other hand, our economic capacity and technical capability are weak for treating the ecological problems. For example, we can not change the conditions of moisture, soil and geography and the growth characteristics of plants in a large range. Therefore, we should fully recognize that there is a limitation for human to treat the complex ecological rehabilitation and the ecological rehabilitation is a long-term, arduous and weak-economic work. The ecological rehabilitation should focus on the village close to town, the mines near farmland, and the areas around rivers and roads where the production and living activities are frequent, in order to gain rapidly the economic, ecological and social benefits.

8 The main measures in the ecological rehabilitation

On the basis of summing up the long practice and successful experience in the ecological rehabilitation at home and abroad, there are three main measures adopted in the ecological rehabilitation, that is, protection, natural restoration and artificial treatment.

Protecting the natural ecology that has not yet been damaged up to now is the basic prerequisite of doing ecological rehabilitation well. The overall control of all kinds of economic construction activities should be strengthened, especially in the land development, the construction of town, mine and road, the over-utilization of forest and pasture, which will increase and aggravate soil erosion. We also should eliminate the situation of "damaging while treating" and "damage is larger than treatment" that exists in China for a long time, which is very important for controlling the continuous ecological deterioration and worsening.

The realization of ecological self-restoration relying on the natural forces is an important way in the ecological rehabilitation in China. It complies with the basic national conditions, that is, the ecological rehabilitation in China is huge in scale, difficult to treat, short of investment, and the nature law in most regions where the ecology has self-restoration capacity. The investigation results showed that about 1/3 or more of ecological deterioration areas in China can be rehabilitated and improved by the ecological self-restoration capacity to form new fauna and flora community suitable to the local conditions. This is very important to formulate correctly the planning and decision of the ecological rehabilitation in China and to enhance the service functions of ecological rehabilitation for economic and social development.

The artificial comprehensive treatment is an important measure in the ecological rehabilitation and is an inexorable selection for quickly meeting the needs of economic and social development on ecological environment. The comprehensive treatment should give up the concept that "artificial forest is ecology". The water, soil, forest and grass in the ecological rehabilitation area should be treated comprehensively and arranged optimally to set up a artificial or semi-artificial ecological system complying with

production and living demands and to realize the coordinate development of production, living and nature. Since 1980s, China has extended and carried out the small watershed management for soil and water conservation and gained good effectiveness. The achievements have proved that it is a very successful experience for the ecological rehabilitation. Its essence of small watershed management is that all measures are suitable to the local conditions and are of comprehensive treatment. In recent years, this method has been popularized and applied in the ecological rehabilitation projects, sand prevention and control works, and ecological agricultural construction programs in China. This strongly showed that its guiding ideology and planning principles not only are suitable to the ecological rehabilitation in the mountainous and hilly areas but also has certain guiding and reference significance for the ecological rehabilitation in the city and town, farmland, and industrial and mining areas.

9 The input of national funds into ecological rehabilitation

The contradiction between the huge fund demand in the ecological rehabilitation and the limited investment capacity in China will exist for a long time, which determines that the national ecological rehabilitation funds should select its input directions.

Due to the huge restriction of soil erosion on economic development, the weak ecological area always is less-developed economic area, where the local government and the public are often unable to develop large-scale ecological rehabilitation and environment protection. Especially those ecological rehabilitation projects taking water problem as its main always have larger fund demands. Therefore, without outside investment, especially from the national funds, it would be very difficult to do the ecological rehabilitation in these regions well. Meanwhile, the implementation of the Great Western Development Strategy in China and the policies of quickening the economic and social development in the poverty areas also determine that such areas will be the key to the national fund input in the ecological rehabilitation.

Although the governments and the public in the developed economic areas often have enough capacity to carry out the ecological rehabilitation and improvement, the administrative and technical support from the Central Government is needed. Therefore, the Central Government should set up ecological demonstration project including supervision, protection, and comprehensive management and development in such area, in order to develop, demonstrate and extend the policy mechanism, management methods, control patterns and technical measures and to promote the coordinate development of economy, society and nature.

The national ecological rehabilitation funds will be mainly used in the implementation of the national key control projects. These control projects are mainly located in the upper and middle reaches of the Yangtze River and the Yellow River, the upper reach of the Pearl River, the northeast black soil areas, and the northwest wind and sand sources areas. The following five aspects will be stressed in the ecological rehabilitation. The first is the science and technology, that is, to import, study, develop, demonstrate and popularize the advanced technologies suitable to the ecological rehabilitation and protection, the engineering machinery and materials, the production ways that can change those traditional ecological rehabilitation, and the productivity forces of enhancing ecological rehabilitation. The second is the ecological supervision and monitoring in order to control the artificial destruction and master the ecological deterioration and its development trends to serve as the basis of the management and decision. The third is the construction of hydraulic works. We should actively construct the water storage, saving, use and drainage works, in order to guarantee the living and ecological water demand while meeting the water demand of production to a maximum degree. The Fourth is the input of the improved breeds of livestock and the improved seeds and seedlings of trees and grasses, in order to support the adjustment of planting and cultivating structures and to solve the fund shortage of the masses. The Fifth is to increase the ecological relocation input, reduce the ecological pressure and promote the natural restoration of ecological environment.

10 The management of ecological rehabilitation

At present, our country adopts the method of the multi-department management and the unified implementation of county and village governments in the ecological rehabilitation, which mobilizes the enthusiasm of sectors to develop the ecological rehabilitation and quickens the pace of ecological rehabilitation. To a certain extent, it also causes the overlapping and repeating of works. Meanwhile, due to the big unbalance of input intensity and standards and the inconsistency of technical requirements, it will affect the people's participation enthusiasm in the ecological rehabilitation to a certain degree. It causes the waste and low efficiency of rehabilitation funds and results in adopting the ultra-low or ultra-high standards for constructing ecological rehabilitation projects, which greatly affects the ecological engineering benefits and the realization of ecological rehabilitation goals. Therefore, the implementation of unified management in the ecological rehabilitation is of very important significance for further mobilizing the enthusiasm of different governments and departments at different levels and the people, for strengthening the project management and optimizing the project planning and design, for raising the treatment standards and the fund benefits and for guaranteeing the sound and quick development of ecological rehabilitation.