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Development and Utilization of Saline Lake Resources and Protection of Ecological Environment in Qaidam Basin in Qinghai Province

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Qaidam basin is an important part of National Key Development Area–Lanzhou-Xining Area, is a key region of resource development in Western Development, is a National Circular Economy Pilot Zone. The focus of development is the circular economy industrial system with saline lake chemical industry as the system's core in Qaidam basin.

The eco-environment of Qaidam basin is relatively independent. The water resources is lack and the solar energy resource is rich in Qaidam basin. Qaidam basin is one of 19 key ecological fragile regions with the sparse vegetation and the serious wind and sand damage. Water is a key factor for eco-environment protection and saline lake resources's development and utilization in Qaidam basin.

The extensive development and utilization of saline lake resource had led to the ecological destruction and the environmental impact. The comprehensive development and utilization of saline lake resources and the construction of the circular economy industrial system with the core of the saline lake chemical industry are the better future of the scientific and rational use of the saline lake resources and the long-term and gradual process. Water resources, eco-environmental carrying capacity and market are very important for the scale, the layout and the temporal priority of the saline lake industry and eco-environmental protection.

The natural oasis, the salt meadow, the lakes and wetlands has the important functions, such as the windbreak, the sand fixation and the biodiversity protection. The space suitable for living is small and need the better protection in Qaidam basin. The main area of influence on the natural oasis and the salt meadow is the downstream of the water intake area for the development and utilization of saline lake resources. The main area of influence on the lakes and the wetlands is the excavation

area of saline lake and the downstream of the water intake area for the development and utilization of saline lake resources. The main impact area of the development and utilization of the saline lake resources on the urban living environment is the lee of the saline lake industrial district with heavy atmospheric pollution. Water is the key factor of development and utilization of the saline lake resources and eco-environment protection and construction. Third grade partition of water resources is relatively independent in Qaidam basin and is with different resources, eco-environment and industrial characteristics. It is suitable for studying the relationship between the development and utilization of saline lake resources and the eco-environment protection and construction according to the third grade partition of water resources.

Golmud district in Golmud River is the region with the oldest development history, the higher comprehensive utilization level, the richer saline lake resources and the larger planning capacity of saline lake resources in Qaidam basin. Water resources quantity is large, but the demand of water resources is larger. The overload of water resource will more than 2 billion m³ and will occupy the ecological water requirement nearly 0.7 billion m³ in the future and in the district. Salt meadow between the Golmud city and the east Dabuxun lake will degrade because of the lack of water and its ecological function for windbreak and sand fixation will be weakened. The city environment and the oasis agriculture production environment in Golmud will be affected. It may be necessary to optimize the comprehensive development and utilization base, to improve the sequence of development and utilization, to control the exploitation strength, to optimize the direction and path of the comprehensive development of saline lake resources.

Water resource is rich, the flood threat is large and the combination of saline lake resources such as lithium, boron, potassium is good in Wu-tu-mei-ren district in Na-

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ling-guo-le river basin (including East Taijinar Lake, West Taijinar Lake and Yiliping Saline Lake). The comprehensive development and utilization of saline lake resource has already a certain basis. The same water resource will be shared by three lakes in the district. The nature oasis with the ecological function of windbreak and sand fixation and blocking the sand eastward movement will face the degradation risk when 1.78 billion m³ water is transferred from Wu-tu-mei-ren river to West Dabuxun lake and the saline lake industry develops rapidly. It may be necessary to actively promote the construction of the comprehensive utilization base of saline lake resources such as lithium, boron, potassium, to overall coordinate the layout and the strength of development and utilization of saline lake resources, to strengthen the allocation of water resources and the flood control, and to formulate the comprehensive utilization plan of saline lake resources in the district.

Water is lack, soil's sand content is high, vegetation is sparse and the damage from wind and sand is large in Mahai district of Yuka river. De-zong-ma-hai lake has serious atrophy and will face the risk continue to atrophy when "Solid to liquid" project is implemented on a large scale. It may be necessary to strictly limit the saline lake resources development mode or intensity and to protect the natural oasis in the surrounding Mahai lake and in the downstream of Yu-ka river.

Boron resource is rich in Da-chai-dan lake. The Da-cai-dan area was historically the important boron chemical industry base. Raw material-solid boron ore are mainly exploited in open pit mining in Dachaidan lake and Tibet. Open pit mining in Dachaidan lake had caused the enormous ecological damage. This may be a beneficial attempt using the boron from the comprehensive utilization of saline lake resources instead of the boron from the solid boron ore.

Water resource is lack and the sensitive goal of ecological protection is the Keluke lake - Tuosu lake Provincial Nature Reserve with rich and unique biodiversity in the Delingha district in Bayin river. The Nature Reserve, the agricultural oasis, the wetland, the Delingha city and the industrial park mainly depends on the same water source – Bayin river. It is necessary to strictly limit chlor alkali industry scale in Delingha industrial park, to promote the construction of water-saving society in Delingha city and to implement the industrial waste water "zero" emission into the Bayin river.

Delingha industrial park and Dachaidan boron industry park are upwind from the city or the town. Atmospheric pollutants such as the smoke (powder) dust, SO₂ and NO_x, the acid waste gas, coming from chlor alkali

industry and boron industry have an adverse impact on the urban living environment. It is necessary to optimize the layout of industrial parks, to control the industrial scale with serious air pollution and to establish or improve the industry clean production standard.

"Balance of chlorine" is very important for chloride type saline lake and depends on the PVC pathway. Chlorine and hydrogen chloride mainly comes from the production of metal magnesium, potassium hydroxide and caustic soda. "Balance of chlorine" faced with the multiple pressures such as shortage of water resources, natural gas prices, the mercury pollution. The output of chlorine should be controlled and the production scale of caustic soda should be priority controlled.

The ecological civilization idea to respect for nature, to comply with nature and to protect nature should be set up for the development and utilization of the saline lake resource in Qaidam basin. The principle of the development and utilization of saline lake resources is the priority to saving resources and protection of ecological environment. The thread of the development and utilization of saline lake resources is the optimization of comprehensive development and utilization and the construction of circular economy industrial system with the core of saline lake chemical industry.

To implement the "red line" management of resource utilization and environmental protection. According to the strategic need of ecological civilization and the basic requirement of ecosystem safety, it is necessary to study and formulate the red lines of resource development strength, the environmental performance, the ecological protection and utilization of water resources.

To implement the differential resource and environment management. It is necessary to explore and establish the ecological capital balance sheet, to establish the check list management of resource utilization, environmental performance and withdrawal mechanism, to study and formulate the requirements and the standards of ecological and environmental protection for special habitat such as Keluke lake, Bayin river and eastern Golmud river. It is necessary to study the ecological compensation mechanism for the comprehensive development of saline lake resources and the environmental tax system for the same products and the different raw materials.

To support the construction of ecological and environmental protection through policy. It is necessary to support the technological transformation project of saving water, sewage treatment and reuse project, the comprehensive utilization projects of solid wastes and the ecological restoration projects of saline lake mine.

To optimize the recycling industrial system. It is suitable to develop steadily the potash fertilizer, to

improve the low cost and low energy consumption technology of lithium, magnesium utilization. It is necessary to study and formulate the development strategy and direction of chloride products.

To optimize the regional division and layout. The comprehensive utilization base of saline lake resources with the core of Chaerhan salt lake should be developed steadily and optimally. It is necessary to study and formulate the development strategy and plan of saline lake resources in the downstream of Na-ling-ge-ne river. The scale of chlor alkali in Delingha industrial park. The

development of solid boron ore should exit gradually in Da-chai-dan.

Key words: saline lake resources, development and utilization, protection of ecological environment, Qaidam Basin.

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