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Characteristics of soil and water loss and its control technology in Power grid construction in the Loess Arid Area

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Abstract: Due to the variety of power transmission and transformation projects, through different types of erosion along the way, affected by topography, topography, climate and other factors, the forms of soil and water loss are also different. Taking A Power Supply Project In An Arid Arae (Part Of Qinghai Province) As An Example The Characteristics And Intensity Of Soil And Water Loss Caused By The Project Are Described From The Perspective Of Soil And Water Loss Prevention Area. Damage area of soil and water conservation facilities, soil and water loss risk analysis, soil and water loss prediction, etc. According to the prediction results, the project construction period (including construction preparation period and construction period) is determined as the main runoff area. This paper analyzes and evaluates the distribution of soil and water conservation measures, ecological restoration and effective management measures, and predicts the benefits of soil and water conservation measures. The Results Show That The Measures Adopted In Different Control Areas are reasonable And effective, and have good effect on Soil erosion control during the construction period. It can provide reference for soil and water loss prevention and control of the same production and construction projects in dryland and desert areas.

Keywords: Plateau arid desert area; Power transmission and transformation engineering; Soil and water loss; Prevention and control measures

1. Introduction

Due to the long path, power transmission and transformation line projects often involve multiple administrative areas. Due to the difference of climate, soil, vegetation and hydrological conditions, serious soil erosion is often caused. In view of soil and water loss caused by power transmission and transformation projects, experts have conducted a lot of studies and achieved many results [1.2.3]. In Qinghai, due to low rainfall and large evaporation, the vegetation in the transboundary area is scarce or even unsustainable, and the soil and water loss is usually dominated by wind erosion, which has the characteristics of drought and plateau desert [4.5.6]. There are many researches on the characteristics of soil and water loss and the measures of soil and water conservation in the construction of energy transmission and transformation lines in this area. Power transmission and transformation project is a typical point road project. Among them, the substation construction is a point project, and the transmission line construction is a linear project. Soil and water loss mainly occurs in the construction period of power transmission and transformation project. Foundation excavation, leveling and maintenance, tower infrastructure construction, engineering construction, channel construction and transmission line layout in many substation areas can cause soil erosion properties to vary over time and over time. Space. In this paper, the characteristics, causes and harms of soil and water loss in power transmission and transformation projects in arid areas are analyzed by means of comprehensive analysis and typical case analysis. The principle and method of soil and water conservation monitoring in power plant are introduced. Power transmission and transformation engineering; Terrain, soil, vegetation, water resources, hydrology, sediment and other natural conditions, from land area, earthwork to power transmission and transformation projects, comparison and selection of water and soil conservation schemes for main projects, monitoring of water and soil conservation, etc., combined with the responsibility of the Department of water and soil energy transmission and transformation project loss prevention and control, comprehensive consideration of the social and economic conditions in arid areas, Wang Ke et al. 27

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provided soil and water to save water for UHV power transmission and transformation project construction and measured the prevention and control effect of soil and water conservation measures. Conduct water analysis; Based on the study of the characteristics of soil and water loss in power transmission and transformation projects, Gao Baolin summarized the technical evaluation procedures and analyzed the problems that need to be considered in combination with the work practice. Liu Huifang, Xu Yongnian et al. [7.8]Bu Bo made qualitative and quantitative analysis of soil and water loss in power transmission and transformation projects, and found the protection principles and prevention of the main areas of soil and water loss in power transmission and transformation projects.

2. Analysis of soil characteristics and water loss in power transmission and transformation project

Power transmission and transformation project is a typical point road project. Among them, substation construction is a point project, in the construction process need to excavate the surface, the project area will destroy the original terrain and vegetation, resulting in man-made erosion. Acceleration from the ground. The construction of transmission lines is a linear project. Due to its large space span and diverse topographic landscape types, soil erosion characteristics change with time and space.

Soil and water loss mainly occurs in the construction period of power transmission and transformation project. Surface excavation activities such as foundation excavation, leveling and maintenance, transmission line tower foundation construction, engineering construction approach road construction and site layout and stretching in many power transformation areas have caused some damage to surface vegetation and soil erosion in construction projects.[9.10]

2.1 The surface disturbance is scattered in the form of point strips

The power transmission and transformation project is mainly composed of substation and transmission line, and the construction line is long. In the construction of substation and tower foundation, a lot of earthwork and excavation are needed, which is the main point source of soil and water loss in power transmission and transformation project. Road points scattered, combined with each other, if not properly handled, will also cause a lot of soil erosion.

2.2 Diversification of erosion causes

According to the distribution of soil erosion types in different regions, hydraulic erosion is the main form of soil erosion in areas with high rainfall. Wind erosion is the main form of arid sandy land. In an earthquake zone or an area of unstable formation susceptible to gravity. Erosion. Transmission lines cover many areas along the way, sometimes even the various areas above.

2.3 Gradual erosion of soil and water

The construction content of power transmission and transformation project is different, resulting in different degree of surface disturbance. For example, in the construction of substation, in the construction stage of three-way and one-floor, civil construction will cause great disturbance to the soil surface, resulting in great soil erosion intensity. As the construction enters the equipment installation stage, the disturbance to the surface is relatively mild, and the intensity of soil and water loss caused by the construction is significantly reduced. In addition, the sustainable construction and operation of various soil and water conservation facilities will further reduce soil erosion caused by project construction.

In the construction of power transmission and transformation project, the loss of disturbed surface after excavation or piling is raw soil, and the loss is large. During and after the construction of soil and water conservation project, the loss is soft soil and the loss is small. Soft soil loss is not only the loss of quantity, but also the loss of nutrients in soft soil. The total construction period of

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the power transmission and transformation project is generally 1-2 days, and for some sites, it can be completed within 1-2 months. In the process of substation construction and foundation excavation, due to the need of earthwork excavation, the amount of soil and water loss is large, while in the process of wiring, installation and operation, the surface disturbance is small, and the amount of soil and water loss is large. Is small. Land loss in power transmission and transformation projects has different degrees at each stage.

2.4 Extensive ground fault area

Power transmission and transformation engineering of basically has the following kinds of the type of soil and water loss, constructional surface (such as embankment slope), flat (station ground leveling, temporary construction of hardening surface), open-air excavation surface (such as Kentucky) excavation surface), the excavation of soil slope (excavation soil, rock, excavation soil surface), surface soil accumulation, etc., after the implementation of soil and water conservation work of constructional surface and the excavation face. The soil and water loss of these disturbed surfaces is obvious in the process of engineering construction.

3. Design of soil and water conservation scheme for power transmission and transformation project in the Loess arid area

According to the soil characteristics and water loss of power transmission and transformation projects in arid areas, combined with the regional climate, topography, soil, vegetation, water resources, hydrology, sediment and other natural conditions, as well as the current situation and characteristics of soil and soil, Soil and water loss, land area power transmission and transformation project, soil volume, comparison and selection of soil and water conservation programs of the main project and soil and water conservation monitoring combined with the responsibility scope of soil and water conservation, the power transmission and transformation project is started, and then the social and economic conditions of the arid areas are comprehensively considered, according to the soil and water conservation planning of the energy power transmission and transformation project. Energy transmission and transformation projects in several fields are analyzed. Project area soil and water conservation planning, combined with the project area surface shape, landform and other factors of comprehensive analysis, with reference to wind erosion and hydraulic erosion intensity grade table. And calculate according to the relevant position. Soil erosion data and field investigations to determine the original terrain background. Soil erosion module. For soil and water loss module after disturbance and natural recovery period, according to project characteristics and construction methods, the existing projects with the same project type and similar natural landscape characteristics are selected for analysis. And so on. The intensity of soil and water loss in different control areas caused by project development is analyzed by analogy. The soil erosion modules in different periods of the project are shown in Table 1.

The background value of soil erosion in sandy soil area was the largest, reaching 2600 t/(km2) in each control area.

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The prevention and treatment of partition		Erosion modulus /[t/(km².a)]		
		The background value	Construction	Natural recovery period
Gravel Gobi area	Taki District and Taki construction area	1200	6000	1300
	With this area	1200	6000	1300
	Across the construction site area	1200	6000	1300
	Construction road area	1200	6000	1300
Sandy area	Taki District and Taki construction area	2600	10800	2700
	With this area	2600	7200	2700
	Across the construction site area	2600	7200	2700
	Construction road area	2600	9000	2700
Saline soil area	Taki District and Taki construction area	500	5000	600
	With this area	500	4000	600
	Across the construction site area	500	4000	600
	Construction road area	500	4500	600

Table 1 Soil erosion modulus in different periods of the project

The building area of this project is the disturbance surface area. According to statistics, the area of soil and water conservation facilities destroyed is 74.99 hm2. The largest land area is 74.5%, other grasslands account for at least 2.0%, mainly due to the project area of low rainfall, high altitude, cold and drought, resulting in sparse vegetation. According to the nature of tenure, the permanent land area is 29.3%, which is occupied by Taki district and Taki construction district, and the temporary land area is 70.7%, which is extended construction land. The entire road at the construction site was temporarily occupied. Upon completion of the project, the restoration of the construction site will be completed as required. According to the characteristics of soil occupation, Gobi gravel area accounts for 77.4% of the land area, sandy soil and saline soil area accounts for 9.3% and 13.3%, respectively. The statistics of project area are shown in Table 2.

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Administrative areas	The project area	By occupation type				According to the nature of the land		Divided by land occupancy characteristics			A combined
		The other grass	Saline-alkali land	The sand	Bare land	Permanent	Temporary	Gravel Gobi area	Sandy area	Saline soil area	
Geermu	Taki District and Taki construction area	1.18	5.48	3.53	23.29	14.15	19.33	24.47	3.52	5.48	33.48
	With this area	0.15	1.05	0.66	4.54		6.40	4.69	0.66	1.05	6.40
	Across the construction site area	0.01	0.09	0.07	0.49		0.66	0.50	0.07	0.09	0.66
	Construction road area	0.15	3.33	2.73	3.69		9.90	3.84	2.73	3.33	9.90
	Subtotal	1.49	9.95	6.99	32.01	14.15	36.29	33.50	6.99	9.95	50.44
Mountain cliff line committee	Taki District and Taki construction area				18.72	7.81	10.91	18.72			18.72
	With this area				3.50		3.50	3.50			3.50
	Across the construction site area				0.83		0.83	0.83			0.83
	Construction road area				1.50		1.50	1.50			1.50
	Subtotal				24.55	7.81	16.74	24.55			24.55
A total of		1.49	9.95	6.99	56.56	21.96	53.03	58.05	6.99	9.95	74.99

Table 2 Project area statistics hm²

3.1 Prediction results of soil and water loss

Production and construction project of soil and water loss prediction is based on project characteristics, general layout and construction technology by complete field investigation of the project, mainly based on the data collection and analysis, such as surface, destroying the soil distribution and soil disturbance estimation may occur in the process of construction and operation of soil and water loss, from the perspective of soil and water conservation important basis of evaluation main body project feasibility Soil and water-saving measures that provide scientific basis for layout [7]. Determining project regionalization and soil and water loss module is the premise of soil and water loss prediction in production and construction projects. Up to now, according to the research object and the research emphasis, different researchers have put forward the analogical analysis method, the mathematical model method, the survey field test method, the erosion record division method, the expert prediction method, etc. Each research method has a different focus. In the application process, the correct prediction method must be selected according to the actual project. Scholars also studied the prediction methods of soil and water loss module of construction projects, summarized and analyzed the comparative test method, design analogy method, erosion

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rate method, factor analysis method, weighted average method and other methods, and provided the basis for predicting the final soil erosion.

	The prevention and treatment of partition	These areas	Natural recovery area	Background amount of loss	New soil and water loss
Gravel Gobi area	Taki District and Taki construction area	2591	1099	1555	2135
	With this area	410	213	295	328
	Across the construction site area	67	35	48	54
	Construction road area	294	139	192	241
	Subtotal	3362	1486	2090	2758
Sandy area	Taki District and Taki construction area	381	184	275	290
	With this area	48	36	51	33
	Across the construction site area	5	4	5	4
	Construction road area	246	147	213	180
	Subtotal	680	371	544	507
Saline soil area	Taki District and Taki construction area	247	64	82	256
	With this area	42	13	16	39
	Across the construction site area	4	1	1	4
	Construction road area	150	40	50	140
	Subtotal	470	118	149	439
	A total of	4512	1975	2783	3704

Table 3 Prediction statistics of soil erosion in engineering

3.2 Prevention and control objectives

Because Golmud City, where the project is located, is included in the provincial soil and water loss control area of Qaidam Basin, and Manya Bank Supervision is included in the provincial soil and water loss control area of Qaidam Basin. In view of the relatively fragile regional ecological environment, surface disturbance will lead to soil erosion. Therefore, the soil erosion prevention and control standard of this project adopts the first-level standard, and the target control value is 95% of the consolidation rate of disturbed soil, 95% of the total degree of soil erosion control, 0.8 of soil loss control rate and 95% of slag retention rate. Due to the local rainfall is far less than 300 mm, the project area climate is very dry, sandstorm serious, serious water shortage, drought resistance strong crops can rarely survive vegetation or grass, can not ensure water irrigation, crops difficult to survive. If the vehicle carries water for irrigation, the economic cost is too high to play

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the role of soil erosion prevention or water saving measures according to soil and water conservation. Therefore, in this project, measures such as leveling and compaction of stones are taken in a small part of the original vegetation area, so as to control soil erosion and spray salt water hardening. Therefore, vegetation restoration rate and coverage rate of forest and grass are not mandatory indicators in the implementation of this project.[11.12]

4. Measure layout and ecological restoration

In order to effectively prevent and control the water and soil loss caused by the construction of power transmission and transformation projects, the project has formulated three types of preventive measures, treatment measures and management measures to minimize the amount of water and soil loss. The Layout Of soil and Water conservation Measures in the project is based on the principle and economic benefits of combination of control and prevention, local and global control, coordination of individual control measures and comprehensive control measures, and consideration of ecology. On the basis of the analysis of soil and water conservation function and the prediction of soil and water loss, the scientific and rational layout of soil and water conservation engineering actions and temporary measures. Due to various factors affecting soil and water loss in the Gobi gravel area, sandy soil area and salt soil area, different soil and water conservation measures have been formulated. The preventive measures system is shown in Figure 1.[13]

Figure 1. Preventive Measures System

5. Conclusion

The power transmission and transformation project is a typical point and line project. Among them, the substation construction is a point project, and the transmission line construction is a linear project. The excavation, leveling and maintenance of substation area foundation, construction of transmission line tower foundation, construction of project access road, tracing of stretch site and other surface excavation, disturbance and restoration activities have caused certain damage to surface vegetation and topography, leading to soil erosion, which changes with time and space.

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Ackonwledegment

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