The Impact of Temporary Projects on the Ecological Environment and Their Corresponding Protection Measures in the Construction of Highways in Northern Tibet

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Abstract. In order to facilitate the construction of highway projects, temporary works are generally set up along the road. The temporary works of the highway project mainly include borrow yard, spoil yard, gravel stockyard, stone field, construction plant and construction road. The setting of temporary projects will cause damage to the surrounding ecological environment. Taking the Nala Highway as an example, this paper will analyze the ecological environment impact brought by the temporary construction in detail, and propose corresponding protection measures.

1. Foreword
In the design stage, there are twenty-four borrow yards, one spoil yard, five stone fields, four gravel stockyards, thirty-two construction plants, and 51.7km construction roads. The temporary land occupation has a direct impact on the surrounding ecological environment.

2. The impact of the temporary works on the ecological environment

2.1. The impact of operations of borrow yard on the ecological environment
The main affected objects of the operations of borrow yard is the surface vegetation, the structure of the soil, the natural landscape and the habitat of the wild animals[1]. And the features of the impact belong to the plaque diffusivity. Taking the soil from the surface of the land will damage the surface vegetation as well as the structure of the soil and change the geology and the landform, thus causing the decline of vegetation coverage and the fragment of the landscape. Meanwhile, it may also drive the nearby creatures away from this area. But the above effects are all temporary. As the works come to an end, the impacts will disappear and the wild animals will come back gradually. However, the ecological environment in the northern part of Tibet is so delicate that the ability of self-regulation is poor and the recovery cycle of vegetation is slow. Therefore, the borrow yard Aggravates the ecological problems such as soil erosion and sandstorm activities to some extent.

2.2. The impact of operations of spoil yard on the ecological environment
Altogether 7 tunnels have been set up across the Nala Highway, and the amount of tunnel waste is relatively large. The abandonment of tunnel slag will occupy plenty of land and will also cause pollution...
of resource and environment. The spoil yard of this project mainly occupies gully wasteland, which will have a permanent impact on vegetation, resulting in a biomass loss of about 760t. At the same time, the process of discarding slag will also cause soil erosion. And the probability of artificial debris flow will increase after the discarding of slag.

2.3. The impact of operations of stone field on the ecological environment
The exploitation of the stone will change the geology and the landform, the natural landscape and the surface vegetation of the stone field. Restricted by the stone material conditions, the selected site is mostly in the stone mountains. The impact of the stone field on the ecological environment is mainly landscape changes, soil erosion, vegetation destruction and interference with wildlife activities\textsuperscript{[2]}. And the features of the impact belong to the plaque diffusivity. But highway construction lasts a short period of time, and its impact on animals is temporary. Because the project is located at high altitude, the flora is simple, the ecological environment is fragile, the ecosystem recovery ability is poor and the cycle is long, the impact of vegetation destruction should be long-term impact. At the same time, because the stone field is in the process of mining, it is easy to cause a large color difference between the mining surface and the surrounding environment, which has a relatively large impact on the overall landscape around the stone yard. The noise produced by stone mining will have a certain impact on the wildlife along the route. According to relevant information, the instantaneous noise generated by the normal dose of explosive can reach 130dB (A) during the blasting of quarrying in the mountain, and the mining in stone field may drive wild animals away from the engineering operation area and move to other areas. The effect is only temporary and will not affect the distribution and quantity of wildlife in the area.

2.4. The impact of operations of gravel stockyard on the ecological environment
Restricted by the condition of sand and gravel, gravel stockyard is mostly chosen in the riverbeds and beaches. The main factors of the affected ecological environment are surface vegetation and soil structure. Through sand mining, the natural landscape and surface vegetation are changed, and the river hydrology is obviously affected. Because of the destruction of the surface structure, it is easy to cause soil and water loss. At the same time, the concentration of suspended matter in the water will increase in the process of sand and gravel mining, which will have a certain impact on river water quality and fish.

2.5. The impact of operations of construction plant on the ecological environment
The precast yard and mixing plant shall be cemented when being built, and the impact on the ecological environment is mainly manifested in the direct impact on the encroachment of living space of vegetation, and the indirect impact on the pollution of nearby soil and water environment by production sewage and production garbage. In addition, construction production sites generally close to the highway. After the construction, the regeneration of temporary buildings and abandoned to ecological and landscape environment along the highway construction waste will cause long-term adverse effects. Therefore, necessary measures shall be taken in the setting of construction production sites, the treatment of construction waste and domestic waste of construction workers, and the aftermath, to reduce or eliminate these effects, and to do a good job in ecological and landscape restoration in a timely manner.

2.6. The impact of operations of construction road on the ecological environment
The construction roads set up in this project are mainly subgrade construction roads and access roads leading to temporary construction sites such as reclaiming yard and mixing plant. The existing Qinghai-Tibet Highway should be used as a defecation road as far as possible in subgrade construction. The footpath leading to the material collecting field and construction site will inevitably occupy the grassland, resulting in the loss of vegetation biomass of about 205t. Due to the repeated rolling of transport machinery, plants die and the surface soil is easily exposed, resulting in dust and destruction of the original landscape.
3. The measures to protect

3.1. Principles of site selection, utilization and ecological restoration of temporary land
(1) It should be located beyond the visual range of the highways along the route.
(2) It should be far away from village settings to reduce the impact of construction dust and mechanical noise on residents' production and life.
(3) Try to use the existing construction road and rural road as the material yard road to reduce the new land area.
(4) The material yard should be located at the back of the mountain, away from the engineering material yard, so as to reduce the impact on the landscape along the highway.
(5) Appropriate combination of materials, should follow the principle of centralized material collection to reduce the occupation of the grassland.
(6) Under the premise of meeting the needs of the project, try to make use of the existing old material yard or construction site to reduce the damage to the original environment.
(7) Based on the principle of adjusting measures to local conditions, based on specific land use conditions, local climate conditions and ecological conditions, reasonable selection of economic and reasonable land reclamation strategies can be carried out to select local species for ecological restoration[3].
(8) It is strictly prohibited to set up materials fields in nature reserves, scenic spots, geoparks and other environmentally sensitive areas.

3.2. Ecological protection and restoration measures of borrow yard
(1) The principle of subsection and concentration of soil collection should be followed in engineering soil collection. The old pits along the highway should be used first, and the soil collection field should be set in the sparse vegetation zone. After the work, the soil should be leveled, and measures such as covering should be taken if necessary.
(2) Due to the harsh natural conditions in this area, the vegetation restoration period is long, so the principle of protection, reduction of disturbance and natural restoration should be taken as far as possible.
(3) In the process of collecting soil, construction behavior and scope should be strictly controlled. Vehicles are forbidden to get off the road at will, and the scope of rolling should be reduced as far as possible, so as to reduce the impact of collecting earth on the surrounding environment.
(4) Before taking the soil, the topsoil and turf should be peeled off and piled up. After peeling, the topsoil and turf should be temporarily piled up to the slope of the soil taking field and well preserved. The peel thickness of the topsoil can be judged according to the local geological environment and is generally controlled around 0.3~0.5m[4]. After the completion of soil collection, the site should be leveled, the slope should be repaired, the topsoil should be backfilled and the sod should be paved, and the grass seed should be spread to promote the restoration of vegetation and landscape.
(5) Do a good job of slope protection for earth-taking pits. The slope protection technology is mainly to improve the anti-scour ability of the slope by applying face painting, face beating and spray protection technology[5].
(6) When collecting earth, it must be mined in the designated soil collection field. The earthen collection site shall be put on record on the basis of delimiting the scope of temporary land use and making clear the amount of land use, which shall be used as the basis for construction management. It shall not be expanded at will. If the project really needs to expand the scope of land use or open up another earthen collection site, the alteration design procedure shall be performed to the local environmental protection, land and other competent authorities.

3.3. Ecological protection and restoration measures of spoil yard
(1) It is strictly prohibited to discard slag anywhere along the project. All slag should be discarded in the designated slag dumping site.
(2) According to the actual situation, the abandoned soil and slag of the project part can be nearby abandoned in the soil collection field or as a roadbed slope greening soil. After the slag is discarded, the site is leveled in time and the topsoil is backfilled. If the discard slag height is higher than the soil collection site, it must be blocked before discarding. In order to create conditions for vegetation restoration, it is suggested to discard waste rock first and then waste soil cover.

(3) The surface soil of the spoil yard should be stripped before the slag, and the surface of the slag yard should be leveled immediately after the construction is completed, and the surface soil should be backfilled. Reclamation of land, transformation of barren ditch into woodland and arable land.

(4) The waste slag yard reserves trenches on the side of the ditch and mortars them. Planting shrubs on the slope of the waste slag yard will reduce soil erosion and compensate for the loss of vegetation biomass. The waste slag yard adopts protective measures combined with storage and drainage, that is, the slope of the slag yard is transformed into an inverted slope inclined upstream of the ditch to prevent rainwater from directly washing the waste slag slope. At the junction of the empty slope and the original slope, a mortar-masonry drainage ditch is built, and engineering protection measures are adopted on the slope. To prevent soil erosion during construction, a mortar-masonry retaining wall is first built at the slope corner.

(5) The slag dumping site shall do a good job in engineering protection and drainage works to prevent the occurrence of local disasters such as collapse, landslide and debris flow in the slag dumping site, and avoid inducing secondary geological disasters.

(6) Before the slag is abandoned, the slag retaining wall should be built first, and then the waste rock should be abandoned first, and then the waste soil cover should be abandoned in order to create conditions for the natural restoration of vegetation.

(7) In the actual construction process of the project, if it is necessary to increase the number of slag dumping sites, it is suggested to choose the grassland with low vegetation coverage along the project as far as possible for slag dumping, and it is strictly prohibited to set slag dumping sites in river courses, nature reserves, scenic spots and geological parks.

3.4. Ecological protection and restoration measures of gravel stockyard and stone field

(1) Principle of setting the stone yard: The stones needed for the project are to be used as far as possible from the roadbed and tunnel excavation waste stones, and the secondary use of vertical deployment will reduce the environmental impact of the stone yard. The stone collection site should be selected on the exposed mountain of the bedrock to reduce the damage to the vegetation on the surface of the mountain. The sand quarry should be located on the unvegetated river beach, and the existing old reclaiming yard should be used as much as possible. It is recommended that the layout of the stockyard should avoid areas such as nature reserves, scenic spots, and geological parks. Strictly control the operation boundary and prohibit cross-border construction. The material yard set up by the project should be selected as far as possible outside the visible range along the highway. In addition, long-distance transportation should be prevented, and the construction access road should be set to be too long, which will cause great damage to the meadow vegetation along the way.

(2) Engineering protection measures: Mountain quarrying, river digging and sand extraction will undoubtedly cause certain damage to the natural landscape and ecological environment. The construction unit should carry out careful planning and design to minimize the damage. Formulate environmental protection plans and recovery measures after the completion of construction, and report to the environmental protection administrative supervision department for review, survey and approval, and then apply for the resource mining license to the land and resources department and the river management department to achieve the license for mining. The construction unit shall set up obvious signs around the mining area approved by the relevant competent authority, and it is forbidden to expand the mining area at will. Achieve orderly mining and civilized construction. In addition, for sand and gravel yards in river valleys, attention should be paid to river protection and engineering protection measures for unstable slopes to ensure the stability of river bank slopes and indirectly protect the ecological environment and biodiversity of the river. During the construction process, the sand quarry
shall be excavated in different areas, so that the excavation and backfill shall be carried out. The excavation pit shall be leveled in time to dredge the river course to prevent water erosion and soil erosion caused by the river course relocation. The sand washing field should be equipped with a sedimentation tank, which can be equipped with a primary or secondary sedimentation tank, and the area depends on the amount of water used for sand washing. Sandbags should be used to build a cofferdam around the sedimentation tank. Discharge the muddy and turbid water used for sand washing into the sedimentation tank for precipitation. After reaching the discharge standard, it may be recycled or discharged into the river water body. It is forbidden to directly discharge the turbid sand washing water into the river polluted water body.

(3) Vegetation restoration measures: Vegetation restoration is mainly a natural restoration process. For example, the community structure and succession of sand and gravel fields in sandy and gravel valleys are mainly affected by the sandy and gravel habitats in the river bank and the hydrological process of the river. Seasonal flood plays an important role in the process of vegetation change. After the completion of engineering construction, the natural restoration of vegetation can be promoted through river regulation. For the stone material field located in the bare rock area of the mountain, the surrounding area land disturbed by the material extraction should be leveled after the completion of the material extraction. If there is meadow vegetation cover, it should be stripped first, stacked to a special area for protection, and returned to the sod after the construction.

3.5. Ecological protection and restoration measures of construction plant
(1) Management should be strengthened during construction. Construction sites should be set up centrally, and the number of construction sites should be reduced as far as possible. Bridge prefabrication yard and mixing station should be set up as far as possible in roadbed, project interchange, service area and other permanent land area. It is strictly prohibited to set up construction sites in woodland with high vegetation coverage, nature reserves, scenic spots, geological parks and other areas.

(2) Before construction, the bridge prefabrication plant and mixing station shall occupy the temporary land. The topsoil or turf of the construction site shall be peeled off. After peeling, the topsoil or turf of the construction site shall be temporarily piled up in a corner of the construction site, and the tarpaulin and drainage measures shall be taken. After the completion of the construction, remove the surface hardening in time, level off the land, backfill the topsoil or back to the sod, sow grass seeds to promote the recovery of vegetation. The project will reduce the temporary occupation of grassland vegetation and minimize the impact on the ecological environment.

(3) Sedimentation tank, evaporation tank and impervious dry toilet are set in the construction site to collect and treat construction waste water and domestic sewage. Sewage is forbidden to be discharged freely, which will pollute the ecological environment.

(4) Garbage collection pool shall be set in the construction site to collect and treat production wastes and household wastes, etc., which shall not be discarded at will to pollute the environment and destroy the ecological landscape.

3.6. Ecological protection and restoration measures of construction road
(1) The Nala Highway is accompanied by the Qinghai-Tibet Highway and Qinghai-Tibet Railway, and the inspection roads of the Qinghai-Tibet Highway and the Qinghai-Tibet Railway can be used as the access roads. New construction of the access roads is prohibited, so as to reduce the damage of the construction to the grassland vegetation.

(2) The construction footpaths shall be carried out as far as possible by the left footpaths of local roads and railways, and the newly opened footpaths shall be laid as far as possible within the scope of permanent land acquisition.

(3) Reasonable planning and design of construction road and road width, special personnel for construction guidance and management, all kinds of machinery and vehicles are required to fix the driving route, not to expand the scope of construction road without authorization.
(4) It is strictly prohibited to set up construction roads and occupied farmland across the boundary at will. Before the construction, the topsoil or turf of the construction pavement shall be peeled off, and then temporarily piled up in a corner of the construction site, and the tarpaulin and drainage measures shall be taken. After the completion of the construction, it is necessary to level the land in time, plant grass and do other work.

4. Conclusion

During the construction period, construction management shall be carried out in strict accordance with the requirements of environmental protection design and EIA report, and environmental supervision and control shall be strengthened. Advanced construction techniques, methods and advanced machinery and equipment shall be adopted to strengthen environmental protection education for construction personnel. By taking corresponding engineering measures and ecological restoration measures, the impact of temporary highway construction on ecological environment can be reduced to the greatest extent.

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