REPORT OF THE ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION MEASURES ON ROAD CONSTRUCTION IN THE REGION OF TSAGAAN DAVAA.


"ENCO" CO., Ltd

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Reviewer:  
Dr. L. Dolgormaa  
Senior Officer of the MNE,  
State Senior Inspector

On Behalf of Contractor:  
Dr. A. Namkhai  
Director - General “ENCO” CO., Ltd

Recognised EIA:  
Mr. B. Enkhtur  
Vice Director of Dept. Roads,  
Mongolian Government Implementation Agency

Recognised EIA:  
T. Batjargal  
Project Leader of World Bank

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Preface

At the request of the World Bank experts, in the process of implementing the project for selective upgrading of the Kharkhorin-Tsetserleg-Tosontsengel unpaved road there posed a necessity to change the road track going along the Tsagaan Davaa. In this connection, during October 14-17, 2000, an expert group including forest expert B. Bayarsaikhan, botanist Dr. D. Khishgee, soil expert Dr. R. Baatar and environmentalist Dr. A. Namkhai conducted a field survey and appropriate measurements at a 6.5-km-long road track that is to be built in the region of Tsagaan Davaa.

This report has been made on the basis of this survey concerning a 6.5-km-long road track to be built in the region of Tsagaan Davaa as an amendment to the detailed environmental impact assessment of the Kharkhorin-Tsetserleg-Tosontsengel road made with respect to the most sensitive to expected road construction activities environmental components as forests, soils, flora, and land use.

Apart from this, possible negative impacts that may arise during the road construction period and proposed mitigation measures are included in the report.

Considering that such environmental components as climate, ground water resources, etc. that are likely to be most affected during the road construction activities, were highlighted in the report mentioned above, it is decided that there is no necessity to duplicate it.

1. Legal basis of the land use

Section of unpaved road covered upgrading by this project is not really connected to the special protected areas and areas planned to be protected. Tsagaan Davaa is loaded near to the border of natural monument mount Bulgan.

Special protected areas are divided in the article 3 of special protected area law as following.

- Strictly Protected Areas
- Natural Conservation Park
- Nature Reserves
- Natural Monument

Natural monument mount Bulgan is located behind of Tsetserleg town and Tsagaan Davaa is 3.5km from the middle of the mount. Historical and cultural monuments of the mountain Bulgan are not seen from Tsagaan Davaa.

Within 0.1-3.0 km of the territory of Natural or Historical and Cultural Monuments, it is prohibited to construct buildings which spoil the view and scenery, to plow or dig land, to use explosives, to explore or mine natural resources, to touch, erode or remove Natural or Historical and Cultural Monuments, or conduct any other activity which causes damage to them. Construction of road within the border of special protected areas which are under straight control of Ministry of Nature and Environment is permitted by the law (article 17 para4) so ground work and explosion for road upgrading rear mount Bulgan which is about 3.5km is not violate legislation. For a safety reason of autotraffic it would be possible to cut some trees in the back side of Tsagaan Davaa in order to change old road can be solved by the local government according to the Land Forest Law.

In the course of activities undertaken in order to ensure more safer conditions regarding the Tsagaan Davaa's northern slopes' protrusive sections by laying down the track round them, there may appear a need to cut down some of the trees. In compliance with the Mongolian Law on land and forest, this issue shall be resolved on the basis of decisions issued from the local administration.
In pursuance with the provisions of this law appropriate requests have been submitted to the Ministry of Nature and Environment of Mongolia, Arkhangai province's Governor's Office, and Arkhangai province's Ikh Tamir soum's Governor's Office, respectively.

In reference to those requests by Resolution No. 207 of Ts. Badrakh, Governor of Arkhangai province, on October 11, 2000, a 7.0-ha area has been assigned along the exploratory track made for building the Tsagaan Davaa road. Also, an official permit to lay down a new road track for the Tsagaan Davaa road has been granted according to official paper No. 3/1042 issued by the Minister of Nature and Environment of Mongolia, Mr. U. Barsbold and official paper No. 3/1029 from the Head of the Minister of Nature and Environment's Policy Implementation & Regulation Department, Mr. Ts. Damdin. The official paper signed by the Minister of Nature and Environment, Mr. U. Barsbold, is attached hereto.

To: Mr. Bud Head of the Road Department (Governmental Implementing Agency)

In reply to your paper No. 1/930 of 2000

Taking into account the fact that the road track around the Tsagaan Davaa in the province of Arkhangai that is to be built under the schemes of the project for selective upgrading of the Kharkhorin-Tsetserleg-Tosontsengel road crosses the boundaries of the Bulgan mountain preserve but does not violate the regime of a limited access zone stipulated under the provisions of Article 17 of the Law on areas under special protection, the road upgrading activities are not considered to be contrary to the requirements of environmental protection.

U. Barsbold
Minister of Nature and Environment of Mongolia

Also, Mr. D. Battulga, head of Arkhangai province's Environmental Monitoring Department, and Mr. G. Zundui, head of the Khangai range's Natural park Department's Protection Administration, also gave their permissions and supported the work on building a road track in this region. In accordance with Resolution No. 44 of the Governor of Arkhangai province's Ikh Tamir soum, to which the territory of Tsagaan Davaa is

World Bank, Road Department (Government Implementation Agency) of Mongolia.

Scale 1:50 000

LEGEND

Selected new route
Current road
Number of bore pit
Number of observation point

Figure 1. The scheme of route over the Tsagaan Davaa
referred administratively, he also granted his permission to assign a track for road construction activities. As can be seen from all the above, the construction of a road track in the region of Tsagaan Davaa will not be contrary to the laws on land and on areas under special protection.
2. Existing Environmental Background of the Region Tsagaan Davaa

2.1. Flora

As the Tsagaan Davaa is located not far from Tsetserleg, being Arkhangai province's center, its vegetational cover has been overgrazed, in particular in its southern side.

The vegetations of the territory in the vicinities of somon's centre are subject to strong pasture degradation. Here grow Carex Duriuscula, Potentilla anserina, serratula centouroides, stipa krylovii, Iris lactea, Poa attenuata, Agropyron cristatum, Achnatherum splendes, Adenophora stenantina, Allium senescens, Androsace septentrionalis, Arenaria capillaris, Artemisia changaica, A. Frigida, A. microphylla, A. sieveriana, Astragalus adsurgens, A. galactites, A. Mongolicus, Atriplex sibirica, Bupleurum bicaule, A. scorzonerifolium, Capsella bursa pastoris, Carduus crispus.

Out of the local flora, it is its forests that are to be most affected by the road construction activities.

2.2. Forest

The area studied falls under the category of forest vegetation region's central and southeast forest spur according to the forest vegetation-zoning scheme.

The area is characterized with a sharp continental climate, which means that the winter is cold and long, the summer is short with occasional frosts, daily air temperatures are high, and nights are cold, winds are strong in daytime and mild in nighttime, precipitation is low. Because of all this, each group of forests has its own biota formed around it. While the forest restoration capacity of the Tsagaan Davaa's northern slope's forests is quite high, but much will depend upon the growth conditions and soil moisture capacity.

The Tsagaan Davaa situated at 6 km to the northwest from Tsetserleg city being the center of Arkhangai province, is one of the country's biggest passes. In the pass region there are such difficulties as huge snowdrifts in winter and spring seasons due to which the pass region's traffic often has to stop nearly completely and in summer and autumn seasons the local roads are frequently made impassable by rain and mud. Therefore, the upgrading of the Tsagaan Davaa road will be of significance not only for the province of Arkhangai, but also with respect to the economy of the whole country.
A detailed measurement has been carried out and an ecological and economic estimation made to the forests located along a new 6.5-km-long road route. Larch trees dominate in the forests in the north of the Tsagaan Davaa along this 6.5-km-long route, with birth groves that can be met here and there.

2.2.1. Forest evaluation data

It is planned that along the Tsagaan Davaa new route that is to be built, such sub-compartments of the 1324 compartment as 11, 12, 14, 15 are to be cut down.

In the Figure below there are the major data relating to the forest area to be crossed by the road track. The data are given for each of the above sub-compartments, comparing the lines planned on paper with the real situation.

1324 compartment: 11 sub-compartment - The sub-compartment forest is located inclined by 25 degree in the north-eastern direction, being a mature larch forest with 30% of birch trees. The forest's average height is 19 m, average diameter 28 cm, 0.5 density rate; the undergrowth makes up 3,000 per hectare, 2 m tall, 20-year-old. (Fig. 2, 4)

Dominating are motley grass ritidum moss, montane taiga grass soils, out of shrubs there are Spiraea and occasionally dog rose. The average reserves per hectare are 120m³, its structure consisting of birth and young larch trees making up 20%.

The structure could be expressed in the following way:

5L/130/2L/70/3B/50,

which means that: (5L/130/ - 50% is larch 130 year-old).

According to the above parameter of this sub-compartment, the area's soil water storage is adequate, and its forest capacity is high. The road track makes its way through the lower part of the sub-compartment for approximately 500 m in length.

12 sub-compartment - The compartment's forest is being under reafforestation. To be under reafforestation means that for the time being there are no forests but there are provided proper conditions for forests to grow. Along the area, 2.5-m-tall young trees are recorded 500 per hectare. The area is 25 degree inclined in the southwest, and in future
Figure 2.b. Larch forest of 11 and 14 sub compartments.

Figure 3. Reafforestation section of 14 sub compartments.
there will be forests with larch trees dominating. As far as its species, soils, etc. are concerned, those parameters are similar to those of the 11 sub-compartment, only there are much more shrubs. The road route is to cross the sub-compartment for about 460 meters along. (Fig. 3, 4)

14 sub-compartment - This area, being the highest part of the Pass's northern forest, will be the least affected by the route - only for approximately 80 meters. Its forest area is 30 degree inclined and birch trees make up 20% of the forest structure with 140-year-old larch trees. The structure is as follows:

8L/140/2B/40

The forest capacity is -4, density rate 0.6, reserves per hectare 140 m³, with respect to other characteristics they are close to those of the 11 sub-compartment, but it should be noted that this area's restoration capacity is moderate. (Fig. 2, 4)

15 sub-compartment - This area will be affected by the route the most, and the route will make its way along the sub-compartment for about 1,300 meters. It also differs in terms of its forest structure where dominating are larch groves. The forest site is 25 degree inclined to the north and larch trees make up only 40%.

The birth grove sub-compartment's average height is 14 m, average diameter 14 cm, density rate 0.6; undergrowth makes up 4,000 trees per hectare, of which 50% are birth trees and 50% larch trees, respectively. The young trees' height is 2 m, age 15. The forest types are birch groves with motley grass, Cowberry bushes and larch trees. The birth groves' forest capacity is good, growth rate is high. The average reserves per hectare is 110 m³. (Table 1.) The structure is as follows: 5B/50/5L/150/

2.2.2. Amount of deforestation along the route and its evaluation
Deforestation will affect an area of 3.7 hectare along the route to be built around the northern sides of the Tsagaan Davaa, and according to estimates, it is envisaged that 234 m³ of larch forests and 170 m³ of birth groves will be cut down.

Along the route will be cut a total of 404 m³ of timber and its fees evaluation makes up 517,974 tugrugs.
World Bank, Road Department (Government Implementation Agency) of Mongolia
Report of Environmental Impact Assessment and Mitigation Measures on Road Construction in the Region of
Tsagaan Davaa. (Amendment to the Report of the Detailed Environmental Assessment and Mitigation Plan for
Selective Rehabilitation of Kharkhorin – Tsetserleg – Tosontsengel Road).

Tsagaan Davaa
(Mountain pass)

Legend

Current road

New road

Forest to be cut

Larch forest

Birch forest

Compartment boundary

Sub compartment boundary

Area of Reforestation

Section of road structures

1324- number of compartment

11-15 - number of sub compartment

Figure 4. The forest schema of Tsagaan Davaa

Table 1.

Amount of timber and timber cutting fee evaluation

<table>
<thead>
<tr>
<th>Assortment classification</th>
<th>Tree species</th>
<th>Amount of trees to fell m³</th>
<th>Value per cubic meter of timber (¥)</th>
<th>Total value (¥)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>Larch</td>
<td>12</td>
<td>3258</td>
<td>39096</td>
</tr>
<tr>
<td>Half-commercial</td>
<td>Larch</td>
<td>36</td>
<td>2712</td>
<td>97632</td>
</tr>
<tr>
<td></td>
<td>Birch</td>
<td>13</td>
<td>1632</td>
<td>21216</td>
</tr>
<tr>
<td>Petty</td>
<td>Larch</td>
<td>73</td>
<td>2226</td>
<td>162498</td>
</tr>
<tr>
<td></td>
<td>Birch</td>
<td>51</td>
<td>1380</td>
<td>70380</td>
</tr>
<tr>
<td>Firewood</td>
<td>Larch</td>
<td>113</td>
<td>720</td>
<td>81360</td>
</tr>
<tr>
<td></td>
<td>Birch</td>
<td>106</td>
<td>432</td>
<td>45792</td>
</tr>
<tr>
<td>Total</td>
<td>Larch</td>
<td>234</td>
<td>-</td>
<td>380586</td>
</tr>
<tr>
<td></td>
<td>Birch</td>
<td>170</td>
<td>-</td>
<td>137388</td>
</tr>
<tr>
<td>Sum total</td>
<td></td>
<td>404</td>
<td>-</td>
<td>517974</td>
</tr>
</tbody>
</table>

2.2.3. Ecological and Economic Evaluation of Forest Reserves

Initial methodology of ecological and economic valuation of forest resources was developed in early 1990's. But the criteria of the valuation was differential rent, which is defined on the basis of marginal cost and private cost. Therefore in the connection with market economy relations we have faced for reconsideration of economic valuation methodology. During this study period Ministry of the Nature and Environment redeveloped economic valuation methodology for forest resources on the base of market prices of forest products.

Total economic value of forest resources consists by following its components:

i. valuation of timber resources
ii. valuation of non timber material resources
iii. valuation of forest land
iv. valuation of useful functions of forest resources
The framework of using economic valuation of forest resources

i. valuation of forest resources in monetary terms for including that into the national capital;

ii. scientific basement of establishing forest resources user payment, leasing tax and repayment fine system;

iii. for assessment of forest resources restoration activity and to make cost benefit analysis on forest resources use;

iv. to account the amount of damage to forest resources;

v. for assessment of transferring forest land to other types of land use, such as to agriculture, industry, mining, road construction, etc.

vi. to strengthening the quality of forest resources inventory and management activity.

The ecological and economic evaluation of the forest reserves has been made as per the Instructions for ecological and economic evaluation of forest reserves approved by Minister of Nature and Environment's Order No. 11 of 1998.

Economic evaluation:
The area under study is referred to the 3rd region of the forest reserve evaluation:

Larch 8,660 tugrugs x 234 m³ = 2,026,440 tugrugs
Birch 5,196 tugrugs x 170 m³ = 883,320 tugrugs
Total 2,909,760 tugrugs

Ecological and economic evaluation:
Larch 21,650 tugrugs x 234 m³ = 5,066,100 tugrugs
Birch 12,990 tugrugs x 170 m³ = 2,208,300 tugrugs
Total 7,274,400 tugrugs

Table 2.

<table>
<thead>
<tr>
<th>Kind of evaluation</th>
<th>Evaluation (tugrugs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest yield evaluation</td>
<td>517,974</td>
</tr>
<tr>
<td>Economic evaluation</td>
<td>2,909,760</td>
</tr>
<tr>
<td>Ecological and economic evaluation</td>
<td>7,274,400</td>
</tr>
<tr>
<td>Sum total</td>
<td>10,702,134 tugrugs</td>
</tr>
</tbody>
</table>
Upon assessing the ecological impacts to be imposed in connection with the cutting of timber along the route and thus changes to occur in the area, it is estimated that in terms of money it will make up 10,702,134 (ten million seven hundred two thousand one hundred thirty four) tugrugs.

2.3. Soil

The soil study along a 6.5-km long road section to be upgraded has been carried out in two stages - around the Tsagaan Davaa's northern and its southern sides, and laboratory analyses made to the profile samples taken.

Black earth clayey soils cover an area extending to 5.9 km starting from the water culvert to the east of Tsagaan Davaa located in the northwest of Tsetserleg city. The first profile represents the soil of this section of the road.

**Profile 1** - performed in the western side of the northwestern road near the stream to the west of the Bulgan Mountain at the foot of Tsagaan Davaa (Fig. 5)

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag 0-5 cm</td>
<td>Black, rooty, argillaceous, thick lumpy layer</td>
</tr>
<tr>
<td>A. 5-35 cm</td>
<td>Black, argillaceous, thick, moist, rooty, with distinctive textural change of layers (horizons), humus, HCe non-volatile</td>
</tr>
<tr>
<td>B. 35-70 cm</td>
<td>Yellowish brown, light argillaceous, Hce non-volatile, gradual textural change of layers</td>
</tr>
<tr>
<td>C. 70-90 cm</td>
<td>Yellowish, sandy, with friable stones, sand here and there, non-carbonate</td>
</tr>
</tbody>
</table>

Areas along the both sides of the road section are not subject to overgrazing and erosion, being mostly pastures with fertile soils.

The soil contains in its humus layer 6.0% of humus and 0.32% of nitrogen, bases absorbed in the soil come to 29.2 mg-eq/100 g in total, including 28 mg-eq of ions of calcium, 1.2 mg-eq of ions of magnesium. The concentrations of volatile phosphorus and potassium being plants' major fertilizers are 0.9 mg/100g and 26 mg/100 g, respectively. Approaching to the top of Tsagaan Davaa its soil's humus layer tends to get thinner, and the amount of gravel and stones is likely to increase. Also, in some of the places there took place drifting of stones and gravel, and the soil layers' formation has not been developed completely.
Figure 5. Soil profile in the Tsagaan Davaa.

Figure 6. Used quarries in the region of Tsagaan Davaa.
As the pass's upper northern slopes are steep, under the influence of water drifting traces are observed around the sides of the road and the soil is heavily eroded. The humus layer tends to increase towards the lowlands. Meadow soils cover the lowlands around the bridge to the north of the pass. In the northern and southern slopes of the pass there are old pits once used that were abandoned without conducting reclamation actions. Areas along the both sides of the road section are not subject to overgrazing and erosion, being mostly pastures with fertile soils.

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The soil humus and black earth layers up to the Tsagaan Davaa pass are observed to be thinning, stones, and gravel in their composition increasing. Apart from this in some places, there were landslides, boulders, and gravel, showing that the soils' layers are not quite stabilized completely. The new road section to be built along the sides of this pass makes its way through birth groves where there are montane taiga soils. These soils are clearly distinguished with its forest subsoil from the black earth soils that are observed to cover a bare area at the Tsagaan Davaa's southern sides' lower parts.

Now we shall take the second profile as representing montane taiga soils.
Profile 2.

A01 0-3 cm. Forest subsoil consisting of grasses, rocks, leaves and other plant leavings

A02 3-7 cm. Dark brown coarse-grained humus (half-decayed plant organic substance).

There are many thin roots and the transformation line is quite clear

A1 7-16 cm. Thin brown to dark gray fine-grained soils with medium clay texture, rooty, non-carbonated, the transformation line is smooth

AB 16-26 cm. Gray-brown, medium clay, moist, granular, rooty, fragmental, non-carbonated, the transformation line is clear

B1 26-36 cm. Brown, clay, highly fragmental, occasional roots, stones, non-carbonated, the transformation line is clear

BC 32-52 cm. Yellowish brown, with big stones, fragmental, granular, non-carbonated, the upper layer is of light clay, and the underlying layers of sand texture

The soils have in their 0-3 cm-thin topsoil about 70% of organic substance. To a depth of 3 to 7 cm, the content of organic substance reaches 56%. As to the soils' humus content, in their A1 layer the amount of humus makes up 7%, and in AB layer 3%. The soils were formed over the eluvial-deluvial deposits appeared in the course of granite weathering. The soils are not devastated due to human activities; their natural fertility rate is high and fit to be applied as pastures. The state of the soil cover along the new road section to be built as aforesaid, preserves its natural condition, so far has not been affected due human actions neither used for pastures, and is characterized with high fertility capacity.
3. Environmental impacts to the road construction and operation stages

3.1. Flora
- Whereas the vegetative cover in the surroundings of the accommodation for workers and quarries as well as along the work route is expected to undergo heavy or medium degree of overgrazing, if upon the completion of construction works the relevant sites are cleared and levelled, all damaged sections and quarries restored in compliance with the prescribed rules, then the direct impacts to affect the vegetation are expected to be minimal and it will eventually restore gradually. With the view to accelerating the process of re-establishment of vegetation in the quarry and borrow areas the seeds of perennial or grass plants are required to be scattered.
- During the operational period impacts are expected to be caused with respect to vegetation through dust and silt generation, noxious fuel fumes, some kinds of heavy metals to be absorbed by the plants growing within a 50-100 m zone on the both sides of the road. The vegetation is to be affected mostly in summer seasons while in winters its effects will be comparatively lower. However, impacts to take place during the operational phase are not expected to cause any fundamental changes with respect to the locality’s plant species.

3.2. Forest
The most important role of forests is that they are essential in terms of soil protection and regulation of water regime. Therefore, the cutting of woods may have such negative impacts as deterioration of its soil protective capacity or a surface water flow increase, as a consequence of which the area’s soil may be subject to erosion. In order to mitigate those unfavorable consequences we are to recommend the following measures:
- to take measures to make the new routing as much winding as possible
- to reafforestate the old track and restore its afforestation capacity conjugating it with the native forest
- as there is a high probability that forest’s primary and secondary vermin will intensify their activity under the influence of wood cuttings, it is necessary to take measures for immediate removal of cuttings from the forest.
- to transfer the payment specified as per to the ecological and economic evaluation to the governor's office of the province and undertake urgent measures for afforestation of the old road track.

In view of this, it is desirable to take immediate actions for reafforestation of the old road track trying to conjugate it to the native one instead of waiting when the track would be able to restore itself naturally.

The restoration costs shall be estimated and included in the costs of road construction activities. Upon accomplishing the construction activities appropriate actions shall be taken immediately for conducting re-planting and reafforestation activities with the involvement of specialized organizations and experts in forestry.

### 3.3. Soil and land use

The soils have a 30 to 40 cm thick black humus layer, and in the course of road construction activities the fertile soils and their vegetative cover will be removed from an area that will be 6.5 km in length, 10 m in width or approximately 6.5 hectares. With the removal of a 30-cm-thick topsoil from this 6.5-hectare area together with the earth will be removed from the ground the following amounts of humus, nitrogen required for plants, volatile phosphorus, potassium:

1. \(6.5 \text{ ha} \times 30 \text{ cm} \times 1.3 \text{ g/cm}^3 \times 6\% \text{ humus} = 1521 \text{ tons of humus substances}\)
2. \(6.5 \text{ ha} \times 30 \text{ cm} \times 1.3 \text{ g/cm}^3 \times 0.32\% \text{ nitrogen} = 81 \text{ tons of nitrogen}\)
3. \(6.5 \text{ ha} \times 30 \text{ cm} \times 1.3 \text{ g/cm}^3 \times 0.9 \text{ mg-% phosphorus} = 228 \text{ kg of volatile phosphorus}\)
   and
4. \(6.5 \text{ ha} \times 30 \text{ cm} \times 1.3 \text{ g/cm}^3 \times 26 \text{ mg-% potassium} = 6.6 \text{ tons of volatile potassium, respectively.}\)

Around the southern side of the Tsagaan Davaa that is to the east of the road, and also nearby its northern and southern edges there are some old quarries once used for mining gravel and sand to repair the road and then abandoned without any reclamation efforts made.
Upon using those quarries for obtaining sand and gravel in the process of road construction, they shall be ploughed, back filled and covered with earth. In the course of those activities, it is important that the soil removed from the above 6.5-ha area, and first of all, its 30 to 40 cm-thick black earth topsoil be piled up separately, and then applied for covering the backfilled quarries with this black earth topsoil. Also, it is highly recommendable to carry out restoration activities trying to do them in such a way that the scarps and slopes located along the road sides were not collapsed; and level them upon covering with black earth, re-seed and re-plant with local species of perennial plants.

If the restoration activities would be duly carried out, any negative impacts are expected to be mitigated and the region will be able to restore its natural condition. Also, it is advisable to cover the former road track with a black earth topsoil piled separately to a depth of 20 to 25 cm and re-plant with perennial vegetation species.

- In the course of the activities for making a road track in the region of Tsagaan Davaa it is projected that an area 6.5 km in length, 10 m in width will be excavated to a depth of 3 to 4 meters.
- However, there is some positive aspect, as no new quarries are to be dug for this because there are two abandoned quarries located in the southern and northern sides of Tsagaan Davaa that are supposed to be used.
- In the course of transportation of sand from the pits to the road sections upgraded preconditions will be created for multitracking, deterioration of soils and vegetation, a considerable area will be denuded, its ground rammed, making thus it prone to wind and water erosion.
- As for such places of the road sections being upgraded where workmen's camp, parking places of heavy machines and technical facilities are to be located temporarily, their soils and vegetation will be destroyed and polluted with fuel and lubricants and cluttered up.
- If there appear a need to break through the mountain and lay the road along the bluff it may cause such adverse impacts upon the soils and vegetation as rockslide, landslide, sand and gravel shifting from the nearby cliffs and highlands.

• If the location of drainage culverts, dry streambed's water outlets is wrong it may cause additional erosion and devastation with respect to the soil.

• Though CO, CO2, H2S gases and heavy metals (Pb, Zn, Cr) being available in the composition of fuels will be emitted from vehicles, adding to the pollution of the vegetation growing along the road sides, but their effects are not expected to be significant. During blasting operations the dust generated is estimated to spread within a radius of 4,500-5,000 meters.

• The road pollution rate may be increased due to trash thrown on the wayside by the traveling public in view of which it is advisable to take such preventive steps as placement of warning posters and markings.

3.4. Air quality

• The dust to be generated due to earthworks, borrow pit and quarry operation, movements of vehicles will not extend more than 300 m away, and, accordingly, would not affect the local residents being a nuisance to construction workers only. In spring windy and dust stormy days dust plumes are possible to extend 500-1500 metres away but just for a while.

• However, no such serious effects are anticipated to be caused because of just a couple of vehicles usually passing along the road. The permissible levels of dust and fume will be exceeded only in the case of a flow of columns comprised by 20 and over tons vehicles and even then they are expected to be dispersed in 15-20 minutes.

• Such adverse effects are likely to take place but compared with the driving along the unrepaired road they are estimated to be much lesser in the long end.

3.5. Surface water

1. A 6.5-km-long road track that is to be built in the region of Tsagaan Davaa will pass by Gants Mod mineral spring located to the northwest of Tsetserleg, at a distance of 3.4 km. In this regard, it is recommended not to carry out any activities related to the road construction close to the area of this mineral spring.

2. Though there are no rivers and brooks with regular flows running in the road construction area, in summer's rainy seasons there usually appear some intermittent rivers and brooks used by local livestock for watering.
3. When the road track crosses rivers and brooks, piping, changing their stream by re-channeling, etc. it is estimated that there will be a high risk of contamination of the river or brook's waters. Because of this, it is recommended to carry out such activities as promptly as it would be possible. On the other side, such small rivers and brooks serve as watering points for the local livestock and animals, so it is necessary to consider that their diseases, or, sometimes, death may inflict losses to local herdsmen.

4. In the course of road construction activities it is advisable to keep in mind that in connection with the use of quarries for this purpose the natural regulating capacity of rivers, dry streambeds' flows may be seriously deteriorated and water evaporation and infiltration rates may increased.

5. Degradation of ground surface during the construction period in the form of depressions will cause problems in terms of soil erosion and human and animals security.

6. The major impacts to be caused to the surface waters upon the completion of the works will be the rubber compounds from tyres to affect the vegetation and soils along the road, toxic fumes contained in fuels, heavy metals which are possible to pollute rivers and courses being washed off with rains and water from melted snow.

7. On the other side, during rainfall and mud flows the river flow increases for several times compared with which concentrations of pollutants would be so insignificant that it would hardly affect the water quality. According to the road operation guidelines, by the year of 2018 an estimated 651 vehicles a day will go along the road and, accordingly, there are no grounds to consider that water would be polluted significantly. In the study area, organic pollution takes place temporally in low flow period, especially in springtime. Therefore, natural condition is such that, river waters and their aquatic life are sensitive to lubricant materials such as petrol and oil, organic and domestic wastes as negative impacts related to car wash, improper management of waste.

8. High concentration of hydro carbonate ions amounting to 1.95 to 2.0 mg-equiv/l in the river waters will negatively effect on accumulation of calcium in the construction materials of roads, bridges and culverts. It leads to degradation of quality of construction materials, consequently shortening the life time of buildings and structures built.
3.6. Fauna

- startling nesting birds which nests are nearby the workers’ accommodation and quarries
- disturbing mammals living in burrows to shy away by destroying their burrows
- reducing the habitat areas of foxes and corsaks
- destroying insects inhabiting the soils
- the road may halt passages for migratory animals to migrate
- Operation of vehicles and plant in the quantities beyond actual technological needs will make noise disturbance to exceed the permissible levels and disturb wild animals inhabiting the site causing them to startle away

The above direct impacts are expected to take place during the road construction phase but they would not make any principal changes in the ecology of the valley’s wildlife and they will be recovered in approximately 1-2 year-period upon completion of the road construction works.

The direct impact anticipated to be imposed upon the fauna during the road construction phase are supposed to be restored as soon as the construction phase is accomplished, thus, no direct impacts upon mammals, insects, etc. are projected to be caused.

As for the migratory animals and birds opportunities for whose migratory routes are expected to be restricted so that they will have to go round the site during the construction activities they will be provided with possibilities to return to their habitual routes. On the whole, during the road operation phase none of direct or permanent character impacts upon the faunal distribution areas are expected to be imposed.

3.7. Noise and vibration

- Tsagaan Davaa is located at a distance of 8 km from Tsetserleg city, and the noise to be generated during road construction activities will not exceed the permissible level or is expected to be far less than those for city regions. Anyway, even local households seldom settle close to the pass in any season of the year.
- As the road noise and vibration are dependent upon such factors as the traffic intensity, vehicles speed, road vibration, they are not expected to be at the same level
along the whole length of the road. Traffic flows will be low, the road site is away from
soums, settlements and isolated groups of households stipulating thereby that any noise
and vibration to be generated would not have any noticeable effects upon the settlement
and rural people’s life.

3.8. Socio-economic impacts

Social impacts

- In demographic and socio-cultural terms the project performance will benefit the
settlements and soums located along the route by assisting to upgrade their educational,
enlightenment levels, facilitating the distribution of press, mail, movies, arts and printed
matters.
- The upgrading of the Tsagaan Davaa road will allow to meet the traffic demands of
the populations of 7 soums situated along the road running to more than 50 thousand
people.
- As the concentration of population along the route constitutes just 1.7 per sq. km no
negative social and ecological effects are anticipated to take place.
- The project performance won’t entail any aftermath with respect to such factors as the
population age, sex, growth patterns.
- It will effect beneficially the population movements and settled state.
- The freight turnover will be increased and the rate of motor vehicles’ breakdowns and
delays will be reduced.
- The number of households residing along the road will rise and the opportunities for
linking them with market centres will be increased.
- The number of tourists visiting Taikhar and Khorgo tourist centres will be increased
which will provide preconditions for further development of crafts and commerce to
bloom.
- It will benefit the populations of the settlements along the route by reducing the
number of the unemployed and alleviating impoverishment.
- The traffic will become safer with minimising slippery, vibration and corresponding
risks and reducing the number of traffic accidents.
• nor accidents, risks neither damages are expected to be caused in the course of implementation of this project to the local populace and as far as social issues are concerned.

Economic impacts
Economic benefits to be brought by the project shall be defined according to its main showings including an increase in economic productivity and raising its efficacy which is as follows:
• it will provide incentives for the local residents to promote their traditional businesses supporting their interest in running farms that would be able to produce merchantable productions.
• the road will help to strengthen the local residents’ farms, establish new cooperatives gradually turning them into farms.
• the local residents will place more emphasis upon improving the quality of their agricultural production and make them marketable.
• As a consequence of all above, the local budget revenues will be increased and economic efficiency and development will be promoted.

3.9. Public opinion survey
In the course of our field survey, we carried out a survey of the local administration and common people concerning the importance and outcomes of the work for upgrading the road in the region of Tsagaan Davaa. The most of them held the opinion that if the environmental restoration activities would be carried out according to the legislation of Mongolia, they expected that it would have long-term beneficial impacts only.

Totally 15 persons were involved in the questionnaires. On summing up their answers provided with regard to the first question, namely, their position concerning the project, all persons covered by the questionnaire in total said that they were to support it 100%.

As to the second question about possible positive and negative impacts the road construction and operational activities would have upon the local nature and environment
majority or 76% said that the positive effects would outweigh, 24% considered that it would be of negative effects meaning earthworks, dust generation and soil contamination.

As to the third question about possible influences the project would have with respect to their soum's and their own life, 90% were confident that it would help to raise the area of pasturelands, any kinds of businesses especially transport would be promoted, breakdowns of vehicles and technical facilities would be minimised.

Being asked about any apprehensions might be excited in connection with the road upgrading activities, 80% replied they had no apprehensions, while the rest expressed their concern that the ecological balance, land outlook, soils might be destroyed, quarry and borrow pit be left without reinstatement, and the works might be ceased.

In reply to the question concerning any environmental protection traditions, customs, sacred ovoos, river bodies being available there, it was noted that the Gants Mod spa is regarded with worship; it was prohibited to cut down trees, and, also, there are some sacred mountains and ovoos. Regarding the point on any archeological monuments being available in the area, few people named the Bulgan Mountain.

Any possibility that the road would somehow affect the livestock pastures 80% considered that it was multitracking that affected the pastures and the construction of a new road would be of great help in reducing this pressure.

Any localities along the road that are characterised by heavy snowfalls, rainfalls, storms, strong winds?
-They said that the Tsagaan Davaa, Solongot Davaa and Ikh Tamir river used to overflow its basin.

Summing up, it is possible to draw a conclusion that most of the people residing and working along the road track that is to be built would like this work to be accomplished as quickly as it would be possible. Though, some negative impacts are expected to take place, but the positive ones are viewed as to overweight, especially in reference with the soums, locality, the public it would be of great economic significance.


4. Mitigation measures of the negative impacts during construction and operation stages.

Considering that the most of negative impacts upon the environment and nature are expected to take place during the road construction stage relevant actions designed to mitigate such impacts shall be carried out by the Contractor responsible for the construction works. In this light it is advisable that actions designed to mitigate the negative impacts be incorporated into the contract terms and conditions to be made with the Contractor responsible for the construction works.

4.1. Restoration of used land

Article 49 of the Law on Land specifies general requirements for rational use and protection of land. In order to meet the above requirements it is needed to take the following restoration actions upon the completion of earthworks:

- With the aim of putting an end to a practice of using the multi tracks existing around the road’s improved section to re-cultivate some of the tracks. In providing the upgrading of the road face's bottom take, measures that the slope's angle be not more than 45° and protect it from stone and land sliding.
- Upon completion of excavation works reinstate the borrow pits and quarries smoothing their edges so that they would look similar to their surroundings and topsoil.
- In order to prevent wildfires particularly in arid spring and autumn seasons when the grass is extremely dry impose some restrictions concerning open fires to be lit and ensure that cigarettes and matches are completely extinguished before being thrown away.
- To use in the construction activities as less multi tracks as would be possible.
- The areas designated for conducting road upgrading activities should be reclaimed and rehabilitated according to the design and transferred to the disposal of local authorities.
- as the lands adjacent to the road are used for pastures the trenches’ slopes shall be convenient for livestock to pass over them

- warning signs shall be erected to mark places of high risk of accidents or where livestock and animals may cross the road. Poles supporting such signs shall be made strong enough to withstand livestock’s scratching

- as part of general maintenance operations, rubbish and debris discarded by passing motorists should be collected up and disposed of in suitable waste disposal sites,

4.2. Utilisation and restoration of quarries and borrow pits
- the location of borrow pits shall be agreed with the local authorities and appropriate authorisations obtained and appropriate taxes and payments are paid according to the agreement reached.

- borrow pits and quarries shall be backfilled with overburden and construction wastes and compacted, their slopes be smoothed to be suitable for any livestock and animals to enter and go out

- Upon levelling the borrow pits and quarries they shall be topsoiled and seeded with seeds of local common plants to develop a vegetative cover over them

- if borrow pits or quarries could be used as a watering pond for livestock their sides shall be properly shaped to be of 5 to 1 gradient,

4.3. Pollution prevention
- Tanks for storage of fuels and chemical substances shall be placed on a base within an earth dam. The base and walls must be impermeable. US$ 1000 per 100 tonn.

- All valves and covers shall be in good condition and supplied with locks

- If there are spillages of fuels, lubricants and construction materials actions shall be taken to immediately clear and remove them to prevent watercourses from being contaminated.

- any solid wastes and effluents from the construction workers’ camp shall be removed and disposed of in a special landfill to be backfilled and reprofiled later.

- All wastes shall be removed from the construction site and disposed of in a waste disposal landfill agreed with the local authorities. Construction wastes may be used to backfill borrow pits opened up.
4.3.1. Air quality

A variety of techniques can be used to minimise dust generation and vehicle emissions. Paving or use of geotextiles on heavily trafficked area eg around batch plants, haul routes, site entrances.

- Carrying out bulk crushing and/or material storage inside sheds.
- Turning engines off when vehicles/plant is not in use and keeping vehicles well maintained.
- Clean wheels of vehicles when leaving site to prevent the spread of mud onto surrounding roads.
- Cutting and grinding operations should use equipment and techniques which minimise dust eg wet cutting saw or vacuum extraction.
- Spray and damp down with water, unpaved work areas, stockpiles and dust generating materials during loading and unloading.
- Reduce width and number of haul roads.
- The road, denuded areas and stock piles shall be sprayed or damped down.
- Materials transported to and from the site shall be covered by tarpaulin to prevent dust generation.
- In order to avoid excessive emissions of toxic fumes only vehicles and construction plant being in good condition shall be utilised.

4.3.2. Noise

- The noise level shall not exceed 70 dB
- if the workers’ camp is situated close to the construction site construction plant and vehicles must be operated in turn to avoid producing excessive noise
- vehicles and plant shall be furbished with sound absorbers
- engines of plant shall be turned off when not in use

4.3.3. Protection of surface waters, supervision

The following key measures are effective in minimising many of the identified above.

- General Site Management
- Management of silty water
A. General site management

- Ensure that all construction operations comply with relevant regulations concerning water pollution and land drainage. Manage and control construction works to ensure that best practice in water management and avoidance of water pollution is followed. Be aware that runoff quality is critical following a rainfall event or snowmelt.

- Ensure that site foremen know the location of surface water drains, of the foul sewers and of local streams. Nothing polluting, including muddy water, should enter the surface water drains.

- Position spoil and temporary stockpiles well away from watercourses and drainage systems. Direct surface water away from the stockpiles to prevent erosion.

- Do not wash tools and equipment in any watercourse. Washwater should not be discharged into a watercourse or into road drains or disposed of in any other way that could result in a discharge to a river or stream.

- If discharging to surface water, vehicle washing effluent on the construction site should be routed through a suspended solids lagoon and then through an oil interceptor but should not contain detergents. But, preferably, wash in a bunded area and discharge to sewer.

- Look out for underground pipes where these have not been identified during the site study prior to operations. Avoid disturbance breakage of pipes particularly those containing foul water or diesel.

- Where bridges and other structures over, or adjacent to, rivers are being cleaned or repainted, debris should be prevented from falling into the watercourse or into the embankments.

- Ensure that site personnel are fully aware of the potential impact to groundwater associated with certain aspects of construction works so as to minimise the incidence of accidental impacts on groundwater.

- Ensure that all containers are securely stored and labelled, so that appropriate remediation action can be taken.

B. Management of silty water

There are several ways to minimise the problems caused by silty water. These methods are described below.
i) **Prevention**

- To avoid the need to dispose of silty water, avoid water entering excavations in the first place. If surface water is flowing into excavations, then use cut off ditches or grade the ground to prevent flow. If groundwater is flowing into excavations, it may be worth installing cut off walls or using wellpoint dewatering.
- Use the corner of the excavation as a sump and avoid disturbing that corner.
- If there is water in the excavation, do not allow plant or personnel to paddle about in it and stir up particulate matter.
- Water running down the side of an exposed batter face may dislodge fine particles and take them into suspension. Consider cut off drains at the top on exposed sides.
- Water in an excavation which is open for some time can be controlled by stone filled edge drains leading to sumps. The quicker any free water (rain seepage etc.) is drained away the less opportunity to stir up and suspend particles.

ii) **Control of Discharge**

When deciding how to manage disposal of silty water the following options can be considered. Those at the top of the list are least expensive and cause least risk of accidental pollution.

(a) Pump to grassland or other excavation/soakaway - These areas should preferably be well away from excavations to avoid recirculation.

(b) Pump to sewer

(c) Pump to settling tank (see guidance below)

(d) Pass through a filtration system

(e) Use flocculants in conjunction with settling tank

Water containing oils or other chemical contamination should not be discharged to watercourses or into or onto the ground. Whichever system is used make sure that adequate controls are in place to stop things going wrong.

Basing upon the estimates and calculations made in the second chapter’s 2. and the results of the environmental impact assessment report’s [4] it is recommended to carry out the following actions in order to protect water resources and its quality, ensure its renewal:
1. Proposed constructions of bridges and culverts should be able to pass maximum discharges with different probability of occurrences (P=1, 2, 3, 4, 5, and 10%) required in the technical document of the project and for this case it is recommended to use in preliminary technical-economical studies maximum flood discharges estimated by method of maximum rainfall intensity.

2. It is necessary to elaborate maximum flow analysis conducted in preliminary study once more in construction period. It will contribute to prevention of high costed constructions and security of transport and passengers.

3. Wastes and sediments will be accumulated during the floods in river bed and blocking culverts, reducing their flood discharge passing area. Due to this effect will be rise water levels in upstream sites, creating artificial floods. Therefore it is recommended to organize activities within the project implementation concerning reduction of above mentioned negative impacts.

4. The catchment areas of selected rivers and streams are relatively small. However, due to steep slope during the flood events with probability of occurrences of 1-5 percent, flow velocity could reach up to 0.85-2.5 m/s. In addition that soil erosion also greatly encourages flash flood formation in the study area. Therefore should consider constructions for prevention road and bridges against harmful soil erosion processes.

5. Construction units, including parking of vehicles, buildings for workers should be set up outside of protected zones for small rivers. Considering that some of the companies being engaged in the upgrading of the road have violated the above condition it is necessary to take measures to prevent them to do so again.

4.3.4. Soils, siltation control

The cost of correcting erosion problems are often many times greater than the costs of simple preventative measures.

Typical slope protection methods include:

i) Vegetation techniques

ii) Impermeable membranes and surface coatings

iii) Revetments, including masonry, dry masonry etc

iv) Surface drainage
Embankments

Embankment erosion is usually initiated as a result of one or more of the following factors:

- the side slope is too steep or too long for the embankment materials withstand erosion
- embankment materials have not been compacted to specification
- concentrated road runoff is permitted to drain over the shoulder.

Embankment erosion very often starts at the road shoulder edge, where the level of compaction tends to be relatively low, rather than on the slope surface. Revegetation of embankment slopes is most rapidly achieved by planting with grass slips, by the spreading of collected topsoil containing roots and seeds or by sodding with turves. Turves should be cut from level, fallow fields, or from areas specifically cultivated for the purpose. Grass Slip planting is frequently the most effective. A tough grass with a low form and creeping habit should be used. Erosion of embankment slopes can also be prevented to some extent by careful selection of the material in which the embankment slopes can also be prevented to some extent by careful selection of the material in which the embankment is constructed, if a choice is available. Well-graded soils with some cohesive fraction offer better erosion resistance than single-sized non-cohesive soils. The use of shoulder drains or berms can prevent runoff from discharging over embankment slopes in those areas where erosion has already been initiated, but this can have the effect of concentrating runoff elsewhere.

One of the most effective ways to control erosion on embankments and on natural slopes below a road is to take reasonable precautions to prevent its initiation. The following guidelines are recommended:

- avoid concentration of runoff water wherever possible
- avoid disturbing the natural ground outside the areas to be used for construction
- do not allow construction plant to track natural ground in an uncontrolled manner (a track mark can be to be sufficient to concentrate flow and start an erosion channel)
- pilot tracks should not be constructed unless it is possible to guarantee that erosion prevention measures will be in place prior to the onset of the next wet season
every effort should be made to prevent spoil from being dumped outside the limits of designated spoil areas, as spoil is highly erodible, can smother vegetation and serve to concentrate flow sufficiently to initiate erosion

- do not allow runoff to discharge, either temporarily or permanently, onto unprotected natural ground, other than in pre-existing drainage channels.

**Cut slopes**

In the chapter 5. of AIE report’s Kharkhorin – Tsetserleg – Tosontsengel [2,4] illustrated the range of measures regularly used to treat cut slope erosion and failure along mountain roads. Usually, factors of cost, availability of materials and practicality will limit the selection of measures to those that can be applied on a low technology, labour-intensive basis. It is apparent from Table 5-2 (above mentioned report [4] ) that a number of measures may be required to solve each particular problem. These will often involve slope trimming, vegetation applications, revetments and slope drainage. Many of these measures will be applicable to the prevention and control of slope erosion as well as to the stabilisation of shallow slope failure.

In order to diminish the rate of soil erosion and siltation it is necessary to stabilise the soils disturbed around the culverts upstream and downstream. Also it is necessary to take erosion protection measures as gabion mattresses, masonry aprons, water flow check facilities.

* Environmental Consulting Company "ENCO" Co., Ltd, Ulaanbaatar, Mongolia, 2000. 33
Recommendation and Summary

One of the prerequisites for carrying out road construction activities with less adverse impacts on the environment and nature is to arrange by the contractor company appropriate training for its staff, and the training and seminars shall be conducted on the topics specified in Table 5.

Due supervision and control to be enforced over the restoration work to be carried out by the contractor upon completing the road construction activities will be of no less importance for the environmental protection. In this view, restoration supervision activities and relevant costs are presented in Table 6. It is necessary to underline that the above measures will be of importance for mitigating anticipated negative impacts pointed out in the report.

It is recommended to carry out the actions specified in the management plan, and monitoring program that are included in the report on the detailed environmental impact assessment of the project for selective upgrading of the Kharkhorin-Tsetserleg-Tosontsengel unpaved road. (Table 3, 4).

It is considered that the laying down of a new road track and the construction of a road in the region of Tsagaan Davaa will not violate the provisions of the laws on land and on areas under special protection. On the other side, a total of forest area to be destroyed due to the construction of this road track will make up 404 $m^3$, and according to the ecological and economic evaluation all the losses will amount to 10702134 tugrugs or 9730 US$ in total. This sum shall be transferred to Arkhangai province's Governor's Office for restoration actions to be carried out upon completing the road construction activities.

Conclusion

Proceeding from the above we can conclude that activities related to the construction of a 6.5-km-long road track in the region of Tsagaan Davaa won't much disturb the surrounding environment and nature provided appropriate actions will be implemented for mitigation of anticipated negative impacts indicated in the recommendations that should be abided by in the period of road construction, particularly with respect to such vulnerable environmental components mentioned in the report as air, soils, water, flora and forest.
References

1. Bidding Documents Tsetserleg-Tosontsengel Road Selected short section improvement Drawings Contract I, II, III, IV, Ulaanbaatar 1998,

2. Mongolia Transportation Rehabilitation Project, Environmental Assessment and Management Plan, (Unit Report), Ulaanbaatar, Mongolia, 2000


5. The instructions for ecological and economic evaluation of forest resources approved by Ministry of Nature and Environment, Order No. 11 of 1998.

6. World Bank, Transport Rehabilitation Project Road Subproject. Feasibility study of upgrading of unpaved Road Section and Selective Rehabilitation Ulaanbaatar, Mongolia

A. Mitigation and Environmental Management Plan for Upgrading Tsagaan Davaa Unpaved Road.

Road Construction Phase

<table>
<thead>
<tr>
<th>Environment</th>
<th>Measures taken or to be taken for mitigation of impacts</th>
<th>Implementing organisation</th>
<th>Organisation in charge</th>
<th>In which chapter should be included technical documents</th>
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<tr>
<td>1. Lands</td>
<td>• to obtain respective permissions and authorizations from the local authorities with respect to the lands to be used for the road building workers’ accommodation, fuel, lubricants and construction materials storage, borrow pits for sand, silt and gravel&lt;br&gt;• to prepare drawings of landfills for disposal of the workers’ camp’s solid wastes and effluents, for removal and disposal of construction wastes, inner roads for transportation to be laid within the construction site, take measures required to ensure that the least possible impacts be caused to the lands, soils and vegetation, supervise their fulfilment&lt;br&gt;• to store the topsoil from the borrow pits and quarries separately in stock piles&lt;br&gt;• to reinstate the borrow pits and quarries by smoothing their excavation slopes to the form of the site, topsoiling and replanting&lt;br&gt;• to clean and remove any leakage of fuel, oil and construction materials in order to prevent the ground be contaminated</td>
<td>Road construction company</td>
<td>Department of Roads</td>
<td>Technical requirements Ulaanbaatar&lt;br&gt;Chap. 500 (504, 506, 507, 510, 515)&lt;br&gt;Chap. 600 (603, 605, 606, 607)</td>
</tr>
<tr>
<td>2. Rivers and streams</td>
<td>• if in the process of laying down the bridge, pipes the river-bed has to be changed, take actions to restore it and reinstate to the original form&lt;br&gt;• to supply appropriate fastening and securing to the inlet and outlets of quarry trenches and connecting pipes to prevent the ground be washed away and degraded&lt;br&gt;• to take steps to protect the road structures from being flooded by Manuukhai river’s waters&lt;br&gt;• to change the siting of the Khujirt river’s bridge to be in consistence with the river-bed’s shape</td>
<td>Road construction company</td>
<td>Department of Roads</td>
<td>Chap. 800 (802, 804, 806, 812, 813, 815)</td>
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### 3. Soils erosion, contamination of soils and waters
- to perform the construction works associated with the river-bed in shortest possible term so that to enable water animals restore their habitual lifestyles and the watering of livestock not be hindered for a long while
- to surround fuel, lubricants and chemical substances by an earth dam to protect the soils and waters from being contaminated with rainy water
- fill-in fuel containers and ensure that fuel refilling activities be carried out only in the daytime under due supervision

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<th>Road construction company</th>
<th>Department of Roads</th>
<th>Chap. 500, 600, 800</th>
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### 4. Wildlife
- to avoid producing excessive noise and driving vehicles and plant outside the road construction site in order to prevent any disturbance to startle wild animals
- to prohibit construction workers and drivers' hunting without appropriate permits

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<th>Road construction company</th>
<th>Department of Roads</th>
<th>Chap. 600, 900.</th>
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### 5. Noise
- in the event the construction plant and transportation vehicles have to be operated together take measures to ensure that noise levels be checked within 70 dB
- it would be appropriate if during the road construction stage none of local people would be let to settle down within a distance of 150 from the road and ensure that any noise disturbance not be allowed in the night-time from 22.00 till 06.00

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<th>Road construction company</th>
<th>Department of Roads</th>
<th>Chap. 500, 600, 70</th>
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### 6. Accident risks
- ensure that the construction site be provided with respective enclosures, lighting and alarm signalling system
- in the course of construction activities take precaution measures meeting safety rules and provide opportunities for travellers and transportation facilities to go by the road without any delay

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<th>Road construction company</th>
<th>Department of Roads</th>
<th>Chap. 900 (904, 905, 906-908)</th>
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<td>Chap. 1700 (1700-1703)</td>
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Road operational Phase

1. Lands and soils
   - after the upgrading of the road section is accomplished to put in specific places signs and warnings noting that multitracking is stopped up
   - to put warning signs in any place that is of traffic accident risk

<p>| Table 4. |
|---|---|---|
| 1. Air | A. During the road construction stage | B. Monitoring plan |
| | 1) number of monitoring raids to be carried out: once a week | Road construction company |
| | 2) duration: one day | Department of Roads |
| | 3) points subject to monitoring: sections undergoing improvements, material transportation, critical areas | Chap. 500, 600, 80 |
| | B. During the road operational stage | C. National Standard of Mongolia. |
| | 1) Items subject to monitoring: Nox, CO | UST 3867-85, UST 0017.0.0.06-79, UST 0017.2.1.01-78 |
| | 2) number of monitoring raids to be carried out: twice a year (April, October months) | |
| | 3) duration: three days | |
| | 4) points subject to monitoring: Ikh Tamir soum, Tariat soum | |
| | | |
| | | UST 3867-85, UST 0017.0.0.06-79, UST 0017.2.1.01-78 |</p>
<table>
<thead>
<tr>
<th>2. Noise</th>
<th>A. Number of monitoring raids to be carried out</th>
<th>Road construction company</th>
<th>Department of Roads</th>
<th>Chap. 600, 700</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. during construction stage: once a week</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. road operational stage: twice a year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Points subject to monitoring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) during construction stage: within a 150 m distance around the sections under improvement, critical areas</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2) during operational stage: Ikh Tamir, Tariat soums</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. National Standard of Mongolia. UST 3827-85</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Water quality</th>
<th>A. Points subject to monitoring: BHH, HHH substances, oil products</th>
<th>Road construction company</th>
<th>Department of Roads</th>
<th>Chap. 800</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Number of monitoring raids to be carried out:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) during construction stage: twice a year, once a day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) during operational stage: once a year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Points subject to monitoring: Tsagaan Davaa, Khoit Tamir river, Gants Modny mineral spring, National Standard of Mongolia UST 900-92</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
### Training program

<table>
<thead>
<tr>
<th>Training topic</th>
<th>Expenses $</th>
<th>Organization responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Training</strong></td>
<td>400</td>
<td>• Department of Roads</td>
</tr>
<tr>
<td>Measures to diminish environmental pollution during road construction activities:</td>
<td></td>
<td>• “ENCO” Co, Ltd.</td>
</tr>
<tr>
<td>a). To decrease air pollution rates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b). To minimize the rate of water contamination and turbidity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c). To prevent the soils from unregulated devastation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d). To protect the soils from being polluted with building materials and oil products (material and oil product transportation, storage and utilization)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e). Actions designed to reduce the noise level</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2.</strong> Monitoring over the enforcement of technological and environmental designs, the assessment's conclusions and requirements to be satisfied during the road construction period:</td>
<td>600</td>
<td>• Department of Roads</td>
</tr>
<tr>
<td>a). Activities on digging, application and restoration of quarries</td>
<td></td>
<td>• Road upgrading contractors'</td>
</tr>
<tr>
<td>b). Control over access track to be used during the construction period including their rational choice, sign posting, restoration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c). Monitoring over the compliance with technological and environmental standards relevant to the construction of bridges, ditching and piping; check for a serious contamination of water bodies for a prolonged period, pollution with building materials and oil products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d). Control whether the slopes of the road embankment and ditches are sufficiently gentle to be passed over by cattle and wild animals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e). Control over the fixture and reinforcement of the road embankment, ditch slopes including re-planting, lining with stone, etc. and examine their quality</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### World Bank, Road Department (Government Implementation Agency) of Mongolia


<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Environmental monitoring control to be enforced on the part of the local authorities and traffic department</td>
<td>350</td>
</tr>
<tr>
<td></td>
<td>a). Control on the part of local authorities concerning the excavation and maintenance of quarries, the state of places specifically assigned for disposal of domestic garbage and construction waste</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b). Control and monitoring over the outcome of measures taken with the view to minimizing the air, water and soil pollution rates</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c). Technological control to be enforced on the part of the Traffic Department concerning the road construction drawings and designing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To discuss the quality and results of actions taken for leveling and reclaiming quarries, temporary roads and workers' camps upon the completion of road construction activities, ensuring that incomplete actions or done at an improper level be accomplished, drawing up relevant statements to be submitted to the local authorities</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Department of Roads</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local authorities</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1600</td>
</tr>
</tbody>
</table>

---

### Restoration, Monitoring and Supervision Expenses

<table>
<thead>
<tr>
<th>Names of expenses</th>
<th>USD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B. Restoration works</strong></td>
<td></td>
</tr>
<tr>
<td>• To fill quarres and borrow areas and make them even with surrounding slopes</td>
<td>3000</td>
</tr>
<tr>
<td>• To scatter surface soil and cover with it</td>
<td>2500</td>
</tr>
<tr>
<td>• To take and remove of cutting forest</td>
<td>600</td>
</tr>
<tr>
<td>• To sow plant seeds</td>
<td>700</td>
</tr>
<tr>
<td>• Reforestation of old road</td>
<td>3500</td>
</tr>
<tr>
<td>• To sow seeds in places affected by access roads</td>
<td>800</td>
</tr>
<tr>
<td>• To multi-tracks and sow plant seeds</td>
<td>1400</td>
</tr>
<tr>
<td>• To clean place of workers’ camp, material stores and machinery and equipment</td>
<td>450</td>
</tr>
<tr>
<td>• To remove solid wastes</td>
<td>300</td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td><strong>12250</strong></td>
</tr>
<tr>
<td><strong>C. Monitoring and supervision</strong></td>
<td></td>
</tr>
<tr>
<td>• Joint inspection to be carried out by the Ministry of Nature and Environment, Department of Roads and “ENCO” Co., Ltd.</td>
<td>550</td>
</tr>
<tr>
<td>• Inspection of local government and administration</td>
<td>300</td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td><strong>1500</strong></td>
</tr>
<tr>
<td><strong>D. Unprovoked total</strong></td>
<td><strong>1500</strong></td>
</tr>
<tr>
<td><strong>All Total</strong></td>
<td><strong>14600</strong></td>
</tr>
</tbody>
</table>