

5.4.4 Discharge and Water Level of Proposed Short Span Bridges and Culverts

A return period of 20 years is used. Valleys along the planed route are selected from topographic map.

(1) Hydrological data

Hydrological data is shown in Table 5-4-11.

Table 5-4-11 Summary of Hydrological Data of Short Span Bridges and Culverts

Bridge (Box-C.)	River (Valley)	Elevation difference from Source (m)	Channel Length (m)	Average Slope	Catchment Area (km ²)	Proposed Structure
B1	Khujirt	750	32000	0.023	153.6	Bridge
B2	Khutsaa, Nariin	760	51600	0.015	321	Bridge
(BC1)	(Kharzat)	200	5000	0.040	7.4	Box C.
(BC2)	(Yumt)	190	4300	0.044	6	Box C.
(BC3)	(Dund Bulag)	250	5400	0.046	5	Box C.
(BC4)	(Shoboi)	270	7300	0.037	10.6	Box C.
(BC5)	(Ust)	320	15700	0.020	56.8	Box C.
(BC6)	-	260	5100	0.051	4.1	Box C.
(BC7)	-	260	5700	0.046	6.3	Box C.
(BC8)	-	220	4400	0.050	8	Box C.
(BC9)	-	200	2800	0.071	4.4	Box C.
(BC10)	-	280	7100	0.039	19.5	Box C.
(BC11)	(Bor Xujir)	260	5900	0.044	13.4	Box C.
(BC12)	(Ullan Chuluun)	290	6600	0.044	15.1	Box C.
(BC13)	-	210	5600	0.038	6	Box C.
(BC14)	(Bogin)	380	10800	0.035	35	Box C.
(BC15)	(Toson)	380	6300	0.060	8.1	Box C.
(BC16)	(Byatskhan Bulag)	250	4700	0.053	7.8	Box C.
(BC17)	(Urgun)	350	24800	0.014	104.1	Box C.
(BC18)	-	230	4700	0.049	8.9	Box C.
(BC19)	(Ar Khadagtai)	250	11400	0.022	33.1	Box C.
(BC20)	Uvur Khadagtai	250	7600	0.033	20.9	Box C.
(BC21)	(Zuulun)	130	4100	0.032	7	Box C.
B4	(Urt)	340	25100	0.014	107.3	Bridge
(BC22)	(Ulaan Khudag)	210	10000	0.021	28.9	Box C.
(BC23)	-	110	4400	0.025	8.1	Box C.
(BC24)	Duut	180	16500	0.011	65.9	Box C.
(BC25)	(Duut)	200	9900	0.020	22.8	Box C.
(BC26)	(Tsagaan Morit)	210	7500	0.028	22.4	Box C.
(BC27)	(Del)	160	5300	0.030	5.8	Box C.
(BC28)	-	180	6000	0.030	7.3	Box C.
(BC29)	(Khatan Uul)	270	11800	0.023	22.5	Box C.

(2) Design Discharge

Design discharge is calculated by rational formula. Since this formula tends to overestimate, the ratio is multiplied to the result of it. Two other methods described below are used to get the ratio for some valleys.

- Mongolian formula (1)
- Russian formula (2)

The ratio is 0.61. The maximum ratio is used for the study. Details are shown in Table 5-4-12.

Table 5-4-12 Design Discharge of Short Span Bridges and Culverts (1)

No.	River (Valley)	Catchment Area (km ²)	Rational formula (3) (m ³ /s)	Mongolian formula (1) (m ³ /s)	Ratio (1) / (3)	Russian formula (2) (m ³ /s)	Ratio (2) / (3)
-	(Chandaruu)	113	181	85	0.47	69	0.38
-	Delger	35	86	52	0.61	39	0.45
-	Rashaant	29	65	40	0.61	30	0.46
(BC17)	(Urgun)	105.4	138	77	0.56	68	0.49
(BC19)	(Ar Khadagtai)	33.1	94	34	0.36	34	0.36
(BC20)	Uvur Khadagtai	20.9	88	13	0.15	11	0.13
B5	(Urt)	107.3	137	71	0.52	62	0.45
(BC22)	(Ulaan Khudag)	28.9	88	22	0.25	19	0.22
(BC23)	-	8.1	42	18	0.43	15	0.36
Maximum Ratio				0.61		0.49	

The design discharge is in the table 5-4-13 and the details of calculation are in the Appendix.

Table 5-4-13 Design Discharge of Short Span Bridges and Culverts (2)

Bridge (Box-C.)	River (Valley)	Catchment Area (km ²)	Rational formula (m ³ /s)	Design Discharge Q _p (m ³ /s)
B1	Khujirt	153.6	181	111
B2	Khutsaa, Nariin	321	207	128
(BC1)	(Kharzat)	7.4	41	26
(BC2)	(Yumt)	6	36	23
(BC3)	(Dund Bulag)	5	28	18
(BC4)	(Shoboi)	10.6	48	30
(BC5)	(Ust)	56.8	125	77
(BC6)	-	4.1	24	15
(BC7)	-	6.3	34	21
(BC8)	-	8	50	31
(BC9)	-	4.4	34	21
(BC10)	-	19.5	91	56
(BC11)	(Bor Xujir)	13.4	71	44
(BC12)	(Ullan Chuluun)	15.1	75	47
(BC13)	-	6	31	20
(BC14)	(Bogin)	35	123	76
(BC15)	(Toson)	8.1	45	28
(BC16)	(Byatskhan Bulag)	7.8	48	30
(BC17)	(Urgun)	104.1	137	84
(BC18)	-	8.9	53	33
(BC19)	(Ar Khadagtai)	33.1	94	58
(BC20)	Uvur Khadagtai	20.9	88	55
(BC21)	(Zuulun)	7	40	25
B4	(Urt)	107.3	137	85
(BC22)	(Ulaan Khudag)	28.9	88	54
(BC23)	-	8.1	42	26
(BC24)	Duut	65.9	105	65
(BC25)	(Duut)	22.8	69	43
(BC26)	(Tsagaan Morit)	22.4	90	56
(BC27)	(Del)	5.8	29	18
(BC28)	-	7.3	34	21
(BC29)	(Khatan Uul)	22.5	63	39

(3) Design Cross Section

Design cross section is based on results obtained by using Manning's formula. The results are shown in Table 5-4-14. The calculation table of passing Discharge is in the Appendix.

Table 5-4-14 Design River Depth of Short Span Bridges and Culverts

Bridge (Box-C.)	River (Valley)	Design Discharge Qp (m ³ /s)	Type of Structure	Proposed Section (m)	Passing Discharge Q (m ³ /s)	Design River Depth (m)
B1	Khujirt	111	Br	1@15.0	118	2.0
B2	Khutsaa, Nariin	128	Br	1@17.5	135	1.8
(BC1)	(Kharzat)	26	D	1@2.5*2.5	28	2.0
(BC2)	(Yumt)	23	D	1@2.5*2.5	28	2.0
(BC3)	(Dund Bulag)	18	D	1@2.5*2.5	56	2.0
(BC4)	(Shoboi)	30	E	2@2.5*2.5	56	2.0
(BC5)	(Ust)	77	F	3@2.5*2.5	84	2.0
(BC6)	-	15	D	1@2.5*2.5	28	2.0
(BC7)	-	21	D	1@2.5*2.5	28	2.0
(BC8)	-	31	E	2@2.5*2.5	56	2.0
(BC9)	-	21	D	1@2.5*2.5	56	2.0
(BC10)	-	56	E	2@2.5*2.5	28	2.0
(BC11)	(Bor Xujir)	44	E	2@2.5*2.5	56	2.0
(BC12)	(Ullan Chuluun)	47	E	2@2.5*2.5	56	2.0
(BC13)	-	20	D	1@2.5*2.5	28	2.0
(BC14)	(Bogin)	76	F	3@2.5*2.5	84	2.0
(BC15)	(Toson)	28	D	1@2.5*2.5	28	2.0
(BC16)	(Byatskhan Bulag)	30	E	2@2.5*2.5	56	2.0
(BC17)	(Urgun)	84	F	3@2.5*2.5	84	2.0
(BC18)	-	33	E	2@2.5*2.5	56	2.0
(BC19)	(Ar Khadagtai)	58	F	3@2.5*2.5	84	2.0
(BC20)	Uvur Khadagtai	55	E	2@2.5*2.5	56	2.0
(BC21)	(Zuulun)	25	D	1@2.5*2.5	28	2.0
B4	(Urt)	85	Br	1@15.0	90	1.7
(BC22)	(Ulaan Khudag)	54	E	2@2.5*2.5	56	2.0
(BC23)	-	26	D	1@2.5*2.5	28	2.0
(BC24)	Duut	65	F	3@2.5*2.5	84	2.0
(BC25)	(Duut)	43	E	2@2.5*2.5	56	2.0
(BC26)	(Tsagaan Morit)	56	E	2@2.5*2.5	56	2.0
(BC27)	(Del)	18	D	1@2.5*2.5	28	2.0
(BC28)	-	21	D	1@2.5*2.5	28	2.0
(BC29)	(Khatan Uul)	39	E	2@2.5*2.5	56	2.0

Design Riverbed slope is set to 1.0%. Manning's roughness coefficient is set to 0.015 for the reinforced concrete culvert surface and 0.03 for Bridges. The details of type of structure are referred to in section 9-4-3.

5.4.5 Discharge Capacity of Existing Bridge

The discharge capacity is calculated of the existing RC-slab Bridge. The result was there is not enough section area for the river flow. The Location of it is on the asphalt-paved road in Baganuur region. The detail of this bridge was on the inventory survey, which is on the Appendix C-2. A return period of 20 years is used for Analysis.

Discharge capacity is calculated by Manning's formula. The results are shown in Table 5-4-15. The calculation table of passing Discharge is in the Appendix.

Table 5-4-15 Design Discharge of Existing Bridge

Bridge (Box-C.)	River (Valley)	Design Discharge Qp (m ³ /s)	Proposed Section (m)	Passing Discharge Q (m ³ /s)	Design River Depth (m)
Exist. RC-Slab Br.	Khujirt	111	2@4.0*2.0	72	2.0

Design Riverbed slope is set to 1.0%. Manning's roughness coefficient is set to 0.03 for the natural riverbed and checked in site investigation.

5.4.6 Roadside Discharge and Road Surface Drainage

(1) Rainfall Intensity

Rainfall intensity for designing roadside discharge is proposed in the table 5-4-16. 3 return periods are set, which is 3, 5, and 12 years. The details of calculation are in the Appendix.

Table 5-4-16 Design Rainfall Intensity

Erdene -Jargalkhaan	Rainfall Data of Baganuur		
Time of concentration	12 years	5 years	3years
5min.	92	76	38
10min	68	56	28
20min.	45	37	19
30min.	33	28	14
40min.	26	22	11
60min.	18	15	8
Jargalkhaan - Undurkhaan	Rainfall Data of Undurkhaan		
Time of concentration	12 years	5 years	3years
5min.	108	77	38
10min	80	57	28
20min.	53	37	19
30min.	39	28	14
40min.	31	22	11
60min.	22	15	8

(2) Roadside Discharge and Road Surface Drainage

Drainage system will be planned and installed along the route. The details are as follows:

- Side ditch will be installed on the roadside.
- Culverts will be installed to drain both roadside and road surface water.
- Location and type of culverts will be designed in coming terms of the study.
- Natural and transportation conditions will be considered to set rainfall intensity.

Values are selected from table 5-4-16.

5.4.7 Suggestions

Adequate precipitation data for long term was available for design. However, very few data of discharge and water level was available except for the Kherlen River. The peak data for Kherlen River was not reliable because it was based on visual rather than automatic recording. Rainfall intensity data was only available in Ulaanbaatar. Considering these facts, suggestions are made as below:

- More extensive data should be collected in order to allow design bridges and river training, and the observation system should be improved.
- According to interviews with local inhabitants there was a large flood on the Kherlen River in 1961 and severe damage was caused. The recorded discharge is only $598\text{m}^3/\text{s}$. This disagrees with estimates based on results of interviews ($1100\text{m}^3/\text{s}$). Further investigation of this discrepancy should be made.

- Non-uniform flow analysis should be carried out based on the results of topographic survey.
- Investigation of grain-size distribution should be carried out to set more reliable Manning's roughness coefficients.
- Guide banks should be constructed where the flow velocity for the proposed bridge section exceeds 2.0 m/s.

5.5 Surveys on General Conditions of Land Use

5.5.1 Present Land Use of the Project Area

Generally, present land use conditions in the study area, are almost pastureland or wasteland, and covered by snow in winter.

There are Baganuur coal mine and Chandgana coal mine, Baganuur city and small village mainly, and slightly fields at Chandgana steppe and Murun.

Land use is described follows, dividing five sections.

(1) Erdene -Kherlen River

Road goes over Dutluur pass, and through Bayandelger village on the north until Baganuur district. There is wasteland on Dutluur pass. Flatter pastureland spread along the Togos River.

At western T-shape intersection in Baganuur, road is divided into north route and south route, north route reaches to Baganuur city, south route passes under railway. Baganuur coal mine is located between two routes. North route passes through pastureland on Nuga steppe. On the way, route passes between coal mine facilities area and Baganuur urbanized area. South route also passes through pastureland, and marshy along the Khujirt river spread in front of coal mine. After crossing railway, there is Ikh Gun lake and vast marshy on the east. Again, route crosses siding at grade. After crossing siding, prison is located on the east. And, road advances east, crosses the Khutsaa River without bridge and then merge with north route.

After two routes merge, road runs parallel with the Khustaa River, and reach to the Kherlen River. There is marshy at confluence, the Kherlen and the Khustaa River. There is desolate bluff on both sides of the Kherlen River.

(2) The Kherlen River -Tsenkhermandal

After crossing the Kherlen River, road is divided into two ways, one is Ust valley to the east, another is Jargalant valley on the north side of the mountains. Gentle pastureland spread at Ust valley, however Marshy is located on the bottom of valley. And, road goes deep into valley, however pastureland slope gradually,

became pass. On the other hand, road goes up north along the Kherlen river on the west until Jargalant valley. On the east, there are wasteland and innumerable wadi, stuck on precipice. Gentle pastureland also spread at beginning of Jargalant valley, and become river terrace. There are lake and marshy at bottom of valley, and numberless wadi on river terrace.

After two routes merge, road is divided into north route and south route again, north route goes over Naran pass, south route goes over Bor Khujirt pass. North route crosses marshy on Bor Khujirt valley and beside the Tsenkher River. On the other hand, south route also crosses marshy area at two locations.

Tsenkhermandal village is located beyond Tsenkher River at junction of two routes.

(3) Tsenkhermandal -Jargalkhaan

After two routes merge, the route runs parallel with the Tsenkher River, which located on the north until Tsenkher Bridge. On opposite side, there are mountains. Some “ger” restaurants and a filling station are located beside Tsenkher Bridge on the south. Between Tsenkher bridge and Jargalkhaan sum, road across some small gentle hill.

(4) Jargalkhaan -Murun

On Chandgana steppe, there is Chandgana coal mine toward south of existing road, and relatively vast wheat field in the study area. There is slight field in Murun sum.

At east of Jargalkhaan sum and north of existing road, there is vast marshy area and Tsagaan salt lake. In winter, it is possible that driver run on the marshy area and salt lake, which are frozen over. And, three small lakes forms north-south line at east of Oont Pass.

(5) Murun -Undurkhaan

There is only pastureland except Undurkhaan city.

5.5.2 Right of Mining and Land Property

(1) Land Property

Land was state property under socialism. Therefore, landownership was not admitted. After changing to capitalistic economy, land had still been state property for the present. Although, Landownership institutions were formulated, in the interest of a growing tendency to liberalize land.

Now, state property is administered by State Property Committee under the direct control of Prime Minister, and is transferred or disposal to enterprise or private person. But, law of ownership is a transitional period in the account of variance

with other laws. And, it is seemed that legal acknowledgement and the intention of compliance with the law are low by people. This circumstance have caused that fence is built up freely.

Bureau of Immovable Property Registration under the jurisdiction of the Ministry of Justice and Inter Affairs was established institutionally. The Bureau controls registration of land and building property. Branch office is set up in the provinces, and works the same.

But, Office of Geological and Mining Cadaster, Mineral Resources Authority under the jurisdiction of the Ministry of Industry and Trade control registration and issue of license regarding mining concession.

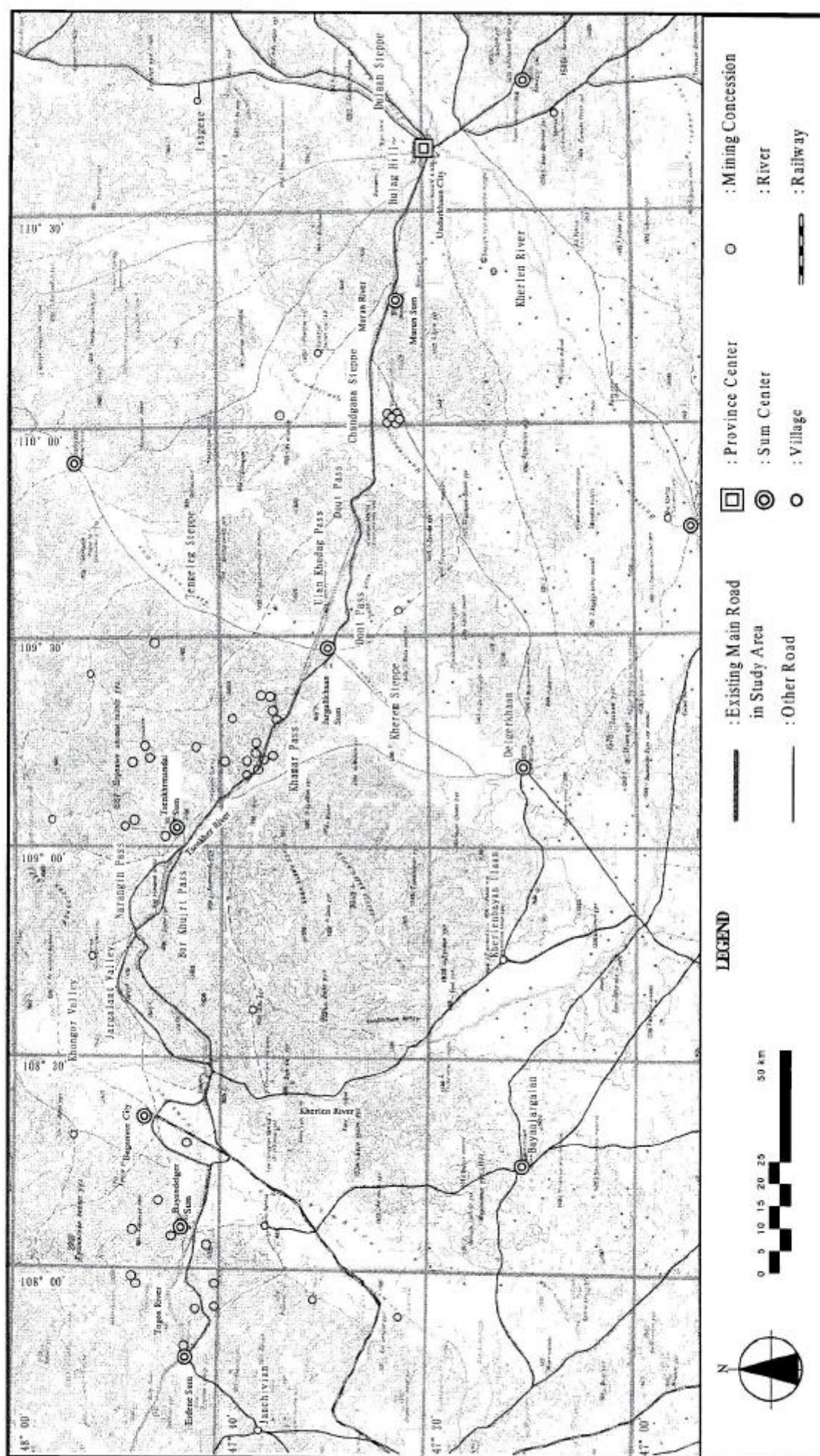
Moreover, the thought that land is common is remained in rural. Therefore, it is necessary for village headman and the villagers to explanation regarding route and land acquisition. Especially, the route passes beside village.

(2) Mining Concession

Mining concession is divided two types, exploration and operation. Normally, the term of validity is only three years for exploration, sixty years for operation.

Figure 5-5-1 shows the location of the mining concession in the study area. And, detail of registered concession is attached in Appendix-D.

The number of registration is approximately forty in the study area, which is almost exploration. The number of operation is nine including Baganuur coal mine, Chandgana coal mine and gold mine. Registered concessions are almost located surroundings Erdene, Khamar pass and Chandgana steppe.



CHAPTER 6 ENVIRONMENTAL ASPECTS



CHAPTER 6 ENVIRONMENTAL ASPECTS

6.1 Objectives

This Chapter presents the results of the Initial Environmental Examination (IEE) for the Feasibility Study on Construction of the Eastern Arterial Road in Mongolia which covers approximately 250 km of National Road No.A0501 from Erdene to Undurkhaan. Figures 6-1-1, 6-1-2 and 6-1-3 are maps of the Study area.

Details of the scope of the investigation were set out in the Minutes of Meeting between the Ministry of Infrastructure Department of Roads and the JICA Study Team on April 6, 2001. The objectives for Social environmental impact and Natural environmental impact as well as pollution are as follows:

(1) Social environmental impact

To survey current social conditions items that may be affected such as relocation of houses and decrease of pastureland.

(2) Natural environmental impact

To examine the existing environmental conditions along the project road and determine positive and negative effects for the short, medium and long term, including the construction period.

Parallel work has been carried out on data collection of laws, regulations and other existing relevant data.

6.1.1 The Study Area

(1) Overview

The study area is Steppe and Forest steppe. For hundreds of years Mongolians have coexisted with nature with sustainable use of natural resources under severe climatic conditions.

The country is an ecological transition zone in Central Asia where Siberian taiga forest, Central Asian steppe, Altai mountains and Gobi desert meet. These different ecosystems provide habitats for a variety of plant and animal species, some of which are endangered. Mongolia has a large territory with current population of 2.3 million people, 55% of whom live in urban areas. Hence, population density is very low.

The climatic conditions are severe with extremes of temperature, low precipitation, and storms. It is an extreme continental climate with marked differences in seasonal and diurnal temperatures and low rainfall. Most rainfall occurs in summer, between June and August.

Topsoils are thin with low fertility and permafrost limits crop production. Semi-nomadic herding of cattle, sheep, goats, camels, and yaks provides livestock production. Unsustainable use of natural resources (soil, surface, and ground water, forests, grasslands, wildlife, and fish) is occurring.

Most of the country is flat with rolling hills, and there are several significant mountain ranges. Half of the land is at 1,400m or more above mean sea level.

(2) Natural Diversity

Mongolia has been divided into six broad vegetation zones which are composed of Desert, Desert-Steppe, Steppe, Forest-Steppe, Taiga and Alpine zones. The Study area belongs to Steppe and Forest steppe zones.

1) Steppe

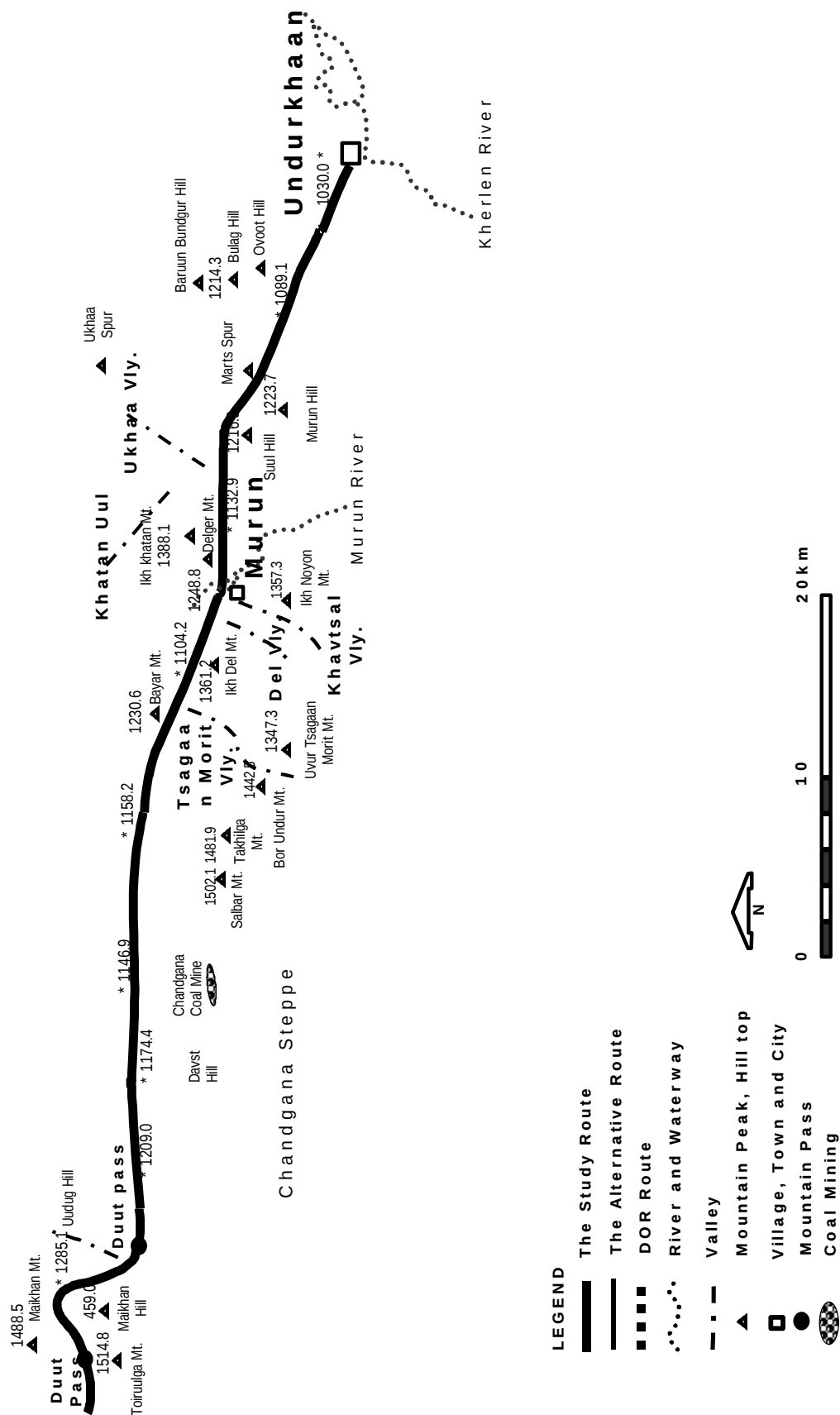
This zone is characterized by flat plains and rolling hills covered in feather grass and shrubs.

2) Forest-steppe

This zone lies between the steppe and taiga, in the Orkhon and Selenge river basins and the Khyangan Mountains of eastern Mongolia. Coniferous forests are found on the northern slopes, while the southern slopes are covered with open steppe vegetation.

(3) Pasture and Forestry

Grazing of livestock is the major form of land use in the Study area and has been the traditional way of life for Mongolians for thousands of years. Grazing of large herds of yak, horses, cattle, sheep, goats and camels has a large role in determining the vegetation cover and species composition of the grassland. The sharp increase in livestock numbers is causing overgrazing in certain places and has led to a marked overall decline. In addition, overgrazing results in more bare ground, and lower species diversity. There are considerable human influences on forest ecosystems, including timber cutting, livestock grazing and burning. Tree planting started in early 1970's; since then forest shelter-belts have been established by the Mongolian government, but the survival rate of saplings is low.



6.1.2 Background of Environmental Conservation in Mongolia

Most of Mongolia's rural area is still undisturbed and its biodiversity is influenced relatively little by human activities, because of low population density and undeveloped industry. However, Mongolia has an extreme continental climate, and its ecosystems are fragile and sensitive to natural pressure from human activities. Environmental conservation such as biodiversity conservation is said to be one of Mongolia's priority strategic issues. The Mongolian Government considers that conservation must be integrated into development which must be sustainable and compatible with survival of living nature.

To conserve biodiversity, the government has been following a policy of protecting ecosystems, threatened species and species of economic importance. To date this has been done through appropriate management and habitat protection of species. The Government has achieved some positive results. Other many remaining issues will be solved through improved enforcement, combining traditional and modern conservation methods, and increased public concern for environmental conservation.

In recent years, the Biodiversity conservation Action Plan had been developed within the framework of the Biodiversity Project. The Plan's concept was discussed with many representatives from government and non-government organizations.

Mongolia's desire is that the proposed actions will ensure the heritage of its magnificent biodiversity and culture for future generations. The guiding principles on which this vision is based are:

1. All Mongolians depend on diversity and have a responsibility to contribute to its conservation.
2. An ecological approach to resource management is essential to achieve conservation and sustainable development.
3. Development must be ecologically and economically sustainable.
4. Biodiversity is best conserved in natural rather than artificial settings.
5. Broad public participation in conservation planning and actions is required.
6. The knowledge of local people, such as the nomadic herders, should be preserved, respected, and used.

Sustainable development will require new approaches, such as the use of clean environmentally safe and renewable energy, and strict pollution control. The carrying capacity of the land and water must not be exceeded.

6.1.3 Outline of the Present Environment of the Study Area

The following are present environmental conditions throughout the Study area.

Erdene is the beginning point of the Study route, with scattered community settlements, factories, schools, and public facilities located on both sides of the Road. Coniferous trees are planted in front of the public facilities. Figure 6-1-4 shows the beginning point of the project road where the paved road ends. At present time, DOR is conducting development of the road construction up to 5 km point from Erdene. Figure 6-1-5 shows a scene of the route in the mountain section.



Figure 6-1-4
Beginning Point of the Study at Erdene



Figure 6-1-5
Study Route of Mountain Section

A wooden bridge crosses the small stream on the Alternative North Route of Baganuur. The bridge has deteriorated and the water of the stream looks polluted due to discharge from a nearby industrial facility. Figure 6-1-6 shows a sketch of the wooden bridge. On the Alternative route leading to the water reservoir, urban rubbish dumps are located along the road and piles of rubbish are exposed and degrading, leading to poor environmental conditions. Figure 6-1-7 shows a sketch of a waste site adjacent to the road.



Figure 6-1-6
Wooden Bridge near at Baganuur



Figure 6-1-7
Waste Site Adjacent to the Road

At the crossing of the Kherlen River, the access road embankment extends into the river flood plain. The existing reinforced concrete bridge is in poor condition. Figure 6-1-8 shows the bridge from the north bank. At the south bank there is a cattle breeder's station. The unpaved road has settled adjacent to the bridge end. On the north slopes of the mountain range near the Kherlen River, larches (*Larix* species), planted coniferous forest and some birches (*Betula* species) are observed. Figure 6-1-9 shows a forest scene. At the Tsenkher River, random river crossings with many vehicle tracks can be observed; this has led to degradation of the natural environment.



Figure 6-1-8
Bridge view of the Kherlen River



Figure 6-1-9
A forest Scene at the Mountain Range

At Jargaltkhaan, the existing route passes through the center of the town, and the town is in two community blocks. The Proposed Study route will consider shifting the route south of the town to avoid community separation. Figure 6-1-10 shows the existing route in Jargaltkhaan. In the rolling hill section near Toiruulga Mountain, many vehicle tracks are found over a large width and grassland is heavily disturbed. Air pollution caused by dust from passing motor vehicles is severe. Furthermore the soil surface worsens with the erosion. Figure 6-1-11 shows a number of vehicle tracks in the rolling hill section.



Figure 6-1-10
The Existing Route in Jargaltkhaan



Figure 6-1-11
Number of Traces in Rolling Hill

Towards Murun is flat land with cattle ranges and mining areas observed in the distance. Some camels are also grazing. Figure 6-1-12 shows a group of grazing camels in the grassland. Undurkhaan is the end point of the Study route. The main street has well organized roadside trees harmonizing with the line of public facility buildings. Figure 6-1-13 shows a street scene in Undurkhaan.

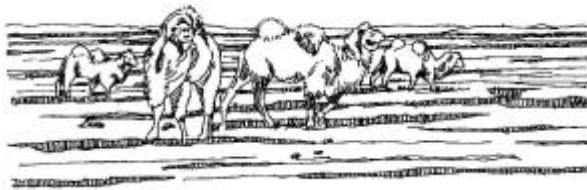


Figure 6-1-12
Group of Grazing Camels on Grassland



Figure 6-1-13
Street Scene in Undurkhaan

6.2 Law Related to Environmental Impact Assessment

Historically Mongolia had several Environmental Laws, which focused primarily on securing rights to natural resources for relevant Ministries. Subsequently, in the early 1990's, the Government adopted a package of environmental laws, which focused more on ecosystem protection.

In addition to General Law on Environmental Protection a second package includes laws concerning resources such as water, air, forest, wildlife and natural plants as well as other factors, which have a direct impact on the environment such as Laws on Toxic Chemicals. A third package of laws covers the natural resources use fees designed to respond to the needs of the market economy. The fourth package of laws related to natural disaster is being developed, the first one of which, the Law on Forest Fire Protection, has already been adopted.

1. The Mongolian Law on Land

This Law consists of 60 articles with chapters entitled General Provisions, The Unified Land Territory of Mongolia and Its General Classification, Special Need Land, State and Local Self-Governing Organizations Plenary Rights on Land Relations, Land Management, Records and Reports on Unified Land Territory, Land Possession and Use, Efficient and Rational Land Use and Protection, and Miscellaneous. The Law was enacted in November 11, 1994 and effected April 1, 1995.

2. The Mongolian Law of Special Protected Areas

This Law consists of 44 articles with chapters entitled General Provisions, Strictly Protected Areas and their Protection Regime, National Conservation Parks and their Protection Regime, Nature Reserves and their Protection Regime, Monuments and their Protection Regime, Plenary Rights of State Organizations for Special Protected Areas, Land Use Research and Investigation Activities in Special Protected Areas, and Miscellaneous. The Law was enacted in November 15, 1994 and effected April 1, 1995.

3. The Mongolian Law on Environmental Protection

This Law consists of 39 articles with chapters entitled General Provisions, Environmental assessments, Databanks, and Research, State Organization Plenary Rights on Environmental Protection, General Measures on Environmental Protection, Use and Restoration of Natural Resources, Environmental Monitoring, Obligations of Economic Entities and Organizations for Environmental and Natural Resource Protection, and Miscellaneous. The Law was enacted in March 30, 1995 and effected June 5, 1995.

4. The Mongolian Law on Air:

This Law consists of 21 articles with chapters entitled General Provisions, Administration, Quality Control and Information on Air Protection, Measures on Air Protection, and Miscellaneous. The Law was enacted in March 31, 1995 and effected June 5, 1995.

5. The Mongolian Law on Hunting.

This Law consists of 29 articles with chapters entitled General Provisions, Hunting and Trapping of Animals, and Miscellaneous. The Law was enacted in April 10, 1995 and effected June 5, 1995.

6. The Mongolian Law on Water

This Law consists of 30 articles with chapters entitled General Provisions, Protection and Restoration of Water, Water Use and Miscellaneous. The Law was enacted in April 13, 1995 and effected June 5, 1995.

7. The Mongolian Law on Forests
This Law consists of 33 articles with chapters entitled General Provisions, Strict Zone Forests and Their Protection Regime, Protected Zones Forests Their Protection and Use Regime, Utilization Zone Forests and their Use Regimes, Protection and Restoration of Forests, Forest Utilization and Miscellaneous. The Law was enacted in March 31, 1995 and effected June 5, 1995.
8. The Mongolian law on Natural Plants
This Law consists of 22 articles with chapters entitled General Provisions, Plant Protection and Restoration, Plant Use and Miscellaneous, and described the List of 133 numbers of very rare plant species in scientific name. The Law was enacted in April 11, 1995 and effected June 5, 1995.
9. The Mongolian Law on Protection from Toxic Chemicals.
This Law consists of 19 articles with chapters entitled General Provisions, Requirements for Protection from and Use of Toxic Chemicals and Miscellaneous, and it was enacted in April 14, 1995 and effected June 5, 1995.
10. The Mongolian Law on Hunting Reserve Use Payments, and on Hunting and Trapping Authorizations.
This Law consists of 12 articles and it was enacted in May 22, 1995 and effected July 1, 1995.
11. The Mongolian law on water and Mineral water use Fees,
This Law consists of 13 articles and it was enacted in May 22, 1995 and effected July 1, 1995.
12. The Mongolian Law of Fees for Harvest of Forest Timber and Fuel wood.
This Law consists of 12 articles and it was enacted in May 19, 1995 and effected July 1, 1995.
13. The Mongolian Law on Natural Plant Use Fees
This Law consists of 13 articles and it was enacted in May 19, 1995 and effected July 1, 1995.

6.2.1 Law of Environmental Impact Assessment (EIA)

The Mongolian Law on Environmental Impact Assessment was enacted January 1998, and the Law consists of thirteen Articles within four chapters of General provision, Environmental Impact Assessment (EIA), Rights and obligations of participants in EIA and Miscellaneous. The following are the major components of the Law.

1. Purpose of this law (Article 1)
The purpose of this law is to protect the nature and environment, to prevent any damages to the ecological balance, to regulate the use of natural resources, to assess environmental impact of projects and to regulate relation arising from the decision making on the implementation of projects.
2. Legislation on EIA (Article 2)
The EIA legislation is comprised of the Construction of Mongolia, the Mongolian Law on Environmental Protection, this law, and other relevant legislation, which is consisted with them.
If an international treaty to which Mongolia is a party is inconsistent with this law, provisions of the international treaty shall prevail.

3. Screening of projects (Article 4)

Newly commencing projects as well as renovated and expansion of existing production or services or facilities and construction activities involving the use of natural resources in any form are subject to Screening.

- a. The Screening shall be conducted prior to the implementation of a project.
- b. The Khurals of Citizens' Representatives of provinces, cities, sums and districts and their Presidium, and local State environmental inspectors shall be responsible for executing the control over conducting the Environmental Impact Assessment by project proponents, such as citizens, business entities and organizations.
- c. The Project proponent shall submit project summary, drawings and other related documents to the Central State administrative body in charge of nature and environment or local administrative body for Screening in conformity with the Screening Criteria set forth in the Attachment to this Law.
- d. The Central State administrative body in charge of nature and environment shall approve Screening Methodology Guidelines.
- e. An expert shall conduct the Screening of a project within 12 working days and will issue following recommendations:
 - The Project implementation doesn't require a detailed EIA.
 - The project can be implemented under certain conditions.
 - The project implementation requires a detailed EIA.
- f. Experts with adequate qualification and experience in the area of conducting EIA shall be appointed by the decision of the Central State administrative body in charge of nature and environment.

4. Detailed Environmental Impact Assessments (Article 5)

The terms of reference (TOR) for Detailed EIA shall be defined in the Clause 6.3 of Article 4 of this Law.

- a. Detailed Environmental Impact Assessment shall be conducted by a business entity that has obtained a relevant license in accordance with Article 9 of this Law.
 - b. The license-holder shall issue a Report on a Detailed Environmental Impact Assessment.
- (3) The detailed Environmental Impact Assessment shall include the following issues:
- a. Environmental Baseline data indices.
 - b. Project Alternative.
 - c. Recommendation for the mitigation and elimination of potential and significant adverse impacts.
 - d. Analysis of and evaluation of the extent and scope of any adverse impact and its consequences.
 - e. Risk assessment
 - f. Environmental Protection Plan
 - g. Environmental Monitoring Program
 - h. Opinion of Local residents
 - i. Other issues related the project specifics
- (4) The project proponent shall officially provide his comments on the draft report on the Detailed Environmental Impact Assessment.

- (5) Any issues related to costs incurred during conducting a Detailed EIA and decision making, shall be resolved on the basis of a contract between both parties.
 - (6) The business entity, which conducted the Detailed EIA, shall retain the originals of the research work done by the experts who participated in the process of the DEIA. The report on the DEIA shall be executed in three copies. One copy shall be handed over to the central state administrative body in charge of nature and environment, second-to the project proponent, third shall be kept with the entity. All the copies are authentic.
5. Environmental Protection Plan and Environmental Monitoring Program (Article 6)
- (1) The project proponent shall develop an Environmental Protection Plan and Environmental Monitoring Program for the purpose of implementing the recommendations and conclusions of the EIA and to control its activities and monitor their results.
 - a. The Environmental Protection Plan shall include measures to reduce, mitigate or eliminate adverse impacts, which have been identified during the DEIA and a deadline for the implementation of those measures and estimated budget.
 - b. The environmental Monitoring Program shall contain activities to monitor changes revealed during the production process, and relevant analysis and ways of reporting of their results, as well as methods, forms and terms of their implementation.
 - (2) The environmental Protection Plan and Environmental Monitoring Program shall be approved by an organization, which conducted the Screening of the project.
 - (3) The project proponent shall report annually on the implementation of the Environmental Protection Plan to the organization, which conducted the Screening.
 - (4) The Khurals of Citizens' Representatives of related provinces, cities, sums and districts, and their Presidium, and local environmental inspector shall execute the control over the implementation of the Environmental Protection Plan and Environmental Monitoring Program.
6. Decision on the DEIA Report (Article 7)
- (1) The economic entity which conducted the DEIA shall submit DEIA Report and related documents to the organization which carried out the Screening.
 - (2) An expert who has received the DEIA Report shall complete its review within 18 working days and prepare a statement.
 - (3) Central State administrative body in charge of nature and environment shall make a decision whether to implement the project or not based on the statement on DEIA Report by the expert.
7. Audit (Article 8)
- (1) In case damage occurs to human health and environment due to the activities of a business entity implementing a project based on the recommendation of the DEIA, an audit shall be carried out to verify the results of the DEIA.
 - (2) In every case, Central State administrative body in charge of nature and environment shall appoint a working audit group consisting of related professional experts.
 - (3) Central state administrative body in charge of Nature and Environment shall bear all expenses related to the audit. A party found liable for the damage shall reimburse the expenses.
 - (4) The economic entity, which conducted, DEIA and the project proponent shall present all the required documents for the audit.

- (5) Central State administrative body in charge of Nature and Environment and relevant Parties shall determine the date of the audit.
- (6) If the audit finds the entity which had conducted the DEIA liable, the Central State administrative body in charge of Nature and Environment shall require that entity to conduct the DEIA again. And by its decision it may suspend the license right of the license-holder to conduct the DEIAs.
- (7) If audit reveals that the project requires additional study, all related expenses shall be borne by economic entity which conducted the DEIA.
8. Licenses for conducting DEIA (Article 9)
 - (1) Applications for licenses for conducting DEIA shall be made by interested Mongolian business entity to the Central State administrative body in charge of Nature and Environment.
 - (2) Enclosed with every application shall be following documents:
 - a. Introduction of activities of the economic entity
 - b. Curriculum vitae of qualified experts to be conducting DEIAs.
 - (3) In accordance with the Clause 9.1. of this Article, a Commission shall be examine the competence of the applicant and shall complete a recommendation within 26 working days.
 - (4) The Central State administrative body in charge of Nature and Environment shall appoint the commission.
 - (5) The DEIA license-holder shall direct its main activity to the conducting DEIAs.
 - (6) The license for conducting DEIA shall be issued to an economic entity in accordance with the Clause 5, Article 7 of the Environmental Protection Law.
 - (7) The Central State administrative body in charge of Nature and Environment shall make a decision on issuing a license for conducting DEIAs to an economic entity for period of two years based on conclusion of the Commission appointed in conformity with the Clause 4 of this Article.
 - (8) A license-holder willing to extend the duration of the license shall submit an application for extension and a report on its activities to the Central State administrative body in charge of Nature and Environment at least 2 months prior the expiry date of the license.
 - (9) The Committee shall review the application and the report and shall prepare its recommendations on extension of the license.
 - (10) Based on statement of the Commission the Central State administrative body in charge of Nature and Environment shall make a decision on the extension of the duration of the license for period up to two years for one time.
 - (11) In case a license-holder found liable for wrong DEIAs twice by audits, the Central State administrative body may revoke the license.
9. Rights and obligations of the project proponent (Article 10)
 - (1) The project proponent shall have the following rights:
 - a. to request a licensed economic entity to conduct a DEIA.
 - b. to select a licensed economic entity to conduct DEIA.
 - c. to demand from an economic entity conducting DEIA maintain confidentiality of information regarding its technology, equipment and business activity.
 - (2) The project proponent shall have the following obligations:
 - a. to provide authorized agencies and persons with additional information and documents related to conducting the DEIA of the proposed project as required.
 - b. to develop environmental protection plan and environmental monitoring program and report on the results of their implementation at a due date.

6.2.2 Legal Procedure of EIA and Initial Environmental Examination (IEE)

The procedure of Environmental Impact Assessment (EIA) is illustrated in Figure 6-1-14. EIA is managed by the Department of Information, Inspection of the Ministry of Nature and Environment (DNE). The Minister of Nature and Environment appoints specialists as investigators to evaluate submitted EIA's. The term Initial Environmental Examination (IEE) is not used in Mongolia at present time, but the concept is close to that of the Mongolian EIA.

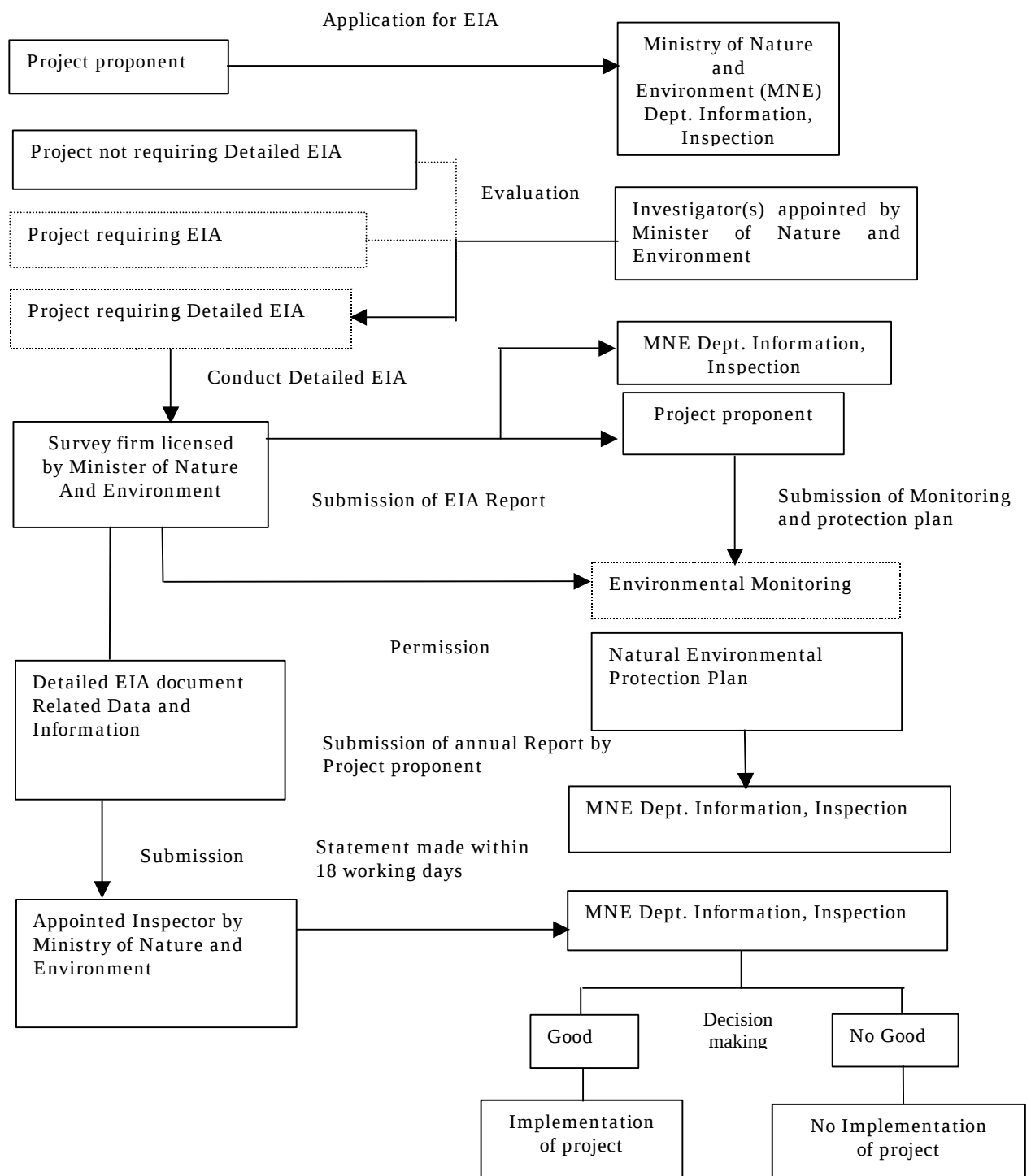


Figure 6-1-14 Procedure for EIA in Mongolia

6.3 IEE on the Study Route

In accordance with the Mongolian Environmental Impact Assessment the JICA Study Team appointed a local consultant to carry out survey and investigation. The Minister of Nature and Environment appointed six Specialists for each environmental field as Investigators and one correspondent administrator for the project.

The specialists areas of expertise are:

- (1) Hydro-geologist (Permafrost specialist)
- (2) Soil Science specialist
- (3) Geophysical specialist
- (4) Biological specialist
- (5) Air pollution, Noise and Vibration specialist
- (6) Social Science specialist

The JICA Study Team made an informative survey on the Study route with the local consultant party at the end of April 2001, and the local consultant team made further surveys in mid May to the end of June with a final confirmation survey in early July. The local consultant finalized the report.

Review was by the appointed six investigators and correspondent administrator of the DNE. The anticipated expected impact caused by construction of the road was evaluated by the DNE, and recommendation on environmental conservation measures, management and control made together with outline cost estimate for environmental mitigation measures.

6.3.1 Study Contents

This Section sets out the contents of the study, and the findings.

- (1) The main contents of the study are (where required):

- 1) Social Environmental Conditions
 - Population distribution
 - Income distribution
 - Social Employment Structure
 - Local communities
 - Public Facilities distribution
 - Land use plan and Zoning
 - Drainage and Sewerage System

- Solid Waste Management Systems including Construction Waste and Surplus Soil during Construction Stage
- Distribution of Transportation Systems and Public Utilities
- Compensation Systems for the Resettlement and Removal of housing
- Historical remains and cultural assets
- Common Right such as fishery right, use right of grassland and forest

2) Natural Environment

- Meteorological Conditions (monthly temperature, rainfall, wind conditions, speed and direction)
- Geographic and Geological Conditions
- Vegetation (Fauna and Flora including endangered species)
- Natural Monuments
- Distribution of Forest
- Surface and Underground Water
- Other related Items such as permafrost and melting affect.

3) Pollution: Current Status of Air and Water Pollution

- Air Pollution: NO_x, CO, HC, SPM, SO_x
- Water Quality: pH, BOD, COD, SS, Fecal Coliform
- Soil Pollution: Hazardous Substances
- Odor Level
- Current status of Noise * Noise Level: Ln, Leq
- Vibration Pollution

(2) Survey Methods used are:

1) Data Collection and analysis of the existing information

Data of Mongolia and Tuv province and Baganaur city, Khentii province and Undurkhaan city

- Relevant environmental laws, guidelines, regulations and standards including Environmental Protection Laws, Environmental Impact Assessment Law
- Pollution Control Regulations,
- Natural Environmental Protection Regulations,
- Landscape Protection Regulations

2) Interview with Environmental Experts

Experts related to environment of Mongolia

- Social Environment
- Economic Activities
- Local Communities
- Condition of Conservation of Historical Structures
- Natural Environment
- Terrestrial Flora and Fauna
- Aquatic Flora and Fauna
- Permafrost
- Other necessary items.

(3) Field Exploration Survey

Photographs to ensure/ confirm all data collected

6.3.2 Social Environment

The 273 km long strip passing through the center of Erdene, Bayandelger sums in Tuv province and Tsenkhermandal, Jargaltkhaan, Murun in Khentii province with a width of 15 km both sides of the road was considered.

(1) Population distribution

Population distribution along the road is shown in Table 6-1. Population density is 0.5-3 person/km² in Sum territory, but higher in settlements.

Table 6-3-1 Population Distribution of the Study Area (2,000)

Province	Name of the Sum county	Total	Male	Female
Tuv	Erdene	3,110	1,582	1,528
	Bayandelger	2,058	1,060	998
Ulaanbaatar	Baganuur	21,118	10,768	10,350
Khentii	Tsenkhermandal	2,147	1,083	1,064
	Jargaltkhaan	2,068	1,067	1,001
	Murun	2,500	1,290	1,210

(2) Health

In the Sum center there is a hospital; in small settlements there are no doctors. Recently airborne dust increased rapidly especially during spring and autumn due to dust generated by road traffic on the dirt road. Gripe and tonsillitis are common especially among children and elderly people.

(3) Roadside settlers' life style

In illustration of the lifestyle of roadside settlers, "The Tsenkher River" restaurant consists of 5 buildings and 23 kiosks serving 18 families totalling 100 people. Their service business is selling meals, food and consumable goods. Income level is usually less than 30 togrog a day. A Taxation inspector comes monthly from the Tsenkhermandal Sum center, and takes 8000 togrog tax from each cookery. The Licence price is about 13 togrog.

Residents of small settlements usually do not breed cattle, but they buy meat products from the cattle breeders and other food products from Ulaanbaatar and Baganaur city. There are electricity, communications, radios etc. The environment is dusty.

(4) Land use

a. Animal husbandry

Animal husbandry is dominated by cows and sheep and is low density along the route. Carrying capacity of the pasture is limited and is locally over used. Table 6-2 shows livestock numbers of Sums in the Study area.

Table 6-3-2 Livestock Numbers 2001 (Unit 1,000)

Place	Camel	Horses	Cows	Sheep	Goats	Total
Tsenkhermandal	0.1	7.7	8.7	35.3	18.2	70.0
Jargaltkhaan	0.4	11.4	10.2	40.9	20.9	83.9
Murun	0.6	14.3	12.8	50.8	18.2	96.7
Baganaur		4.8	7.0	29.2	12.2	53.3
Bayandelger	0.1	6.7	4.4	34.5	12.0	57.7
Erdene	-	8.7	10.9	40.2	17.2	77.1

b. Activities of Cattle breeders

Most cattle breeders are nomadic and move all four seasons of the year. They stay close to the mountains in winter to spring and move to the valley in summer. They stay near the small mountain streams in summer and autumn. Sometimes they stay in summer near salt-marsh lakes. Figure 6-3-1 shows a map of the movement of Domestic animals in the Study Area.



Figure 6-3-1 Movement of Domestic Animals in the Study Area

c. Agricultural land along the road

Agriculture developed in sums areas along the road until 1990, but since that time most cultivated fields remained fallow. Provision of a paved road will open the opportunity for agricultural activities to regenerate. At “Togos’s Larynx” there were formerly 72 ha of irrigated crop farming but this is now destroyed. The same has happened in Murun and Ulziit sums. Table 6-3-3 shows agricultural land use along the road.

Table 6-3-3 Agricultural Land Use along the Road (Unit ha)

Place	Cultivated area	Grain	Wheat	Barley	Oats	Other grains	Forage	Potatoes	Vegetables
Erdene	440	200			100	100	210	20	10
Bayandelger	3050	1400		407	900	93	1477	140	33
Jargaltkhaan	623	550			325	225	70	3.0	
Murun	2316	2123	1253		670	200	168	30	5.5

d. Side road tracks

When the dirt road becomes boggy in the rainy season, vehicles avoid the rutted area and form a new track. In places there are very many side tracks. From Undurkhaan to Erdene sum there are 46 side road tracks. From Erdene sum center to Argastai valley there are 26 side road tracks. Climbing the right side of “Baruun Dutluur” mountain there are 18 side road tracks but in the mountain range only 3 side road tracks. Most of the side roads exist in Argastai river valley, Togos valley, Jargalant valley, and Ust valley.

Side road tracks has a bad influence on both nature and the economy. They cause much soil damage and degradation. Since roads usually follow the river valleys and low lands, it is generally useful pasture area that is degraded. When there are agriculture activities, soils fertility is lowered by wind erosion of topsoil. Cattle cannot eat such dust-covered pasture grass.

(5) Solid waste

Along the roadside waste and litter is found near settlements and cookery places/ kiosks. Major waste and litter consists of paper, bottles, plastic bags etc.

(6) Historical remains and cultural assets

Throughout the Study route there is no recognized historical heritage yet, but measures are required should historical, archeological, paleontological sites or graves be found during road construction.

In Jargaltkhaan sum, 34 graves from Khunnu ancient state exist, in addition to turtle stones/rocks, but far from the project route. In Murun sum there is an ancient wall but also far from the project route.

(7) Historical heritages

There are several historical and cultural heritages along the road as follows:

a. Tsenkher River:

The river rises in the Tsarmin Tsagaan Gozgor Mountain in the north east extension of the Kherlenbayan Ulaan Mountains, 160 km up the Kherlen River. In the “Secret history of Mongolia” it was called the Sengir River (present name Tsenkher). Not far from Tsenkhermadal sum center, there is a stone inscription on the cliffs of Burgastai valley.

b. Baganuur mine:

The mine is located at the Bayandelger sum of Tuv province. It produces 5 million tons of coal annually. This is also the great writer D. Natsagdorj’s birth place. Gun Galuut Lake is found in this region.

c. Burgi River bank:

Steep bank located at the estuary of the Baruun-Baidlag River where it joins the Kherlen River. This bank is derived from quaternary sediment erosion by the Kherlen River. This river was quoted in the “Secret history of Mongolia”.

d. Kherlen River:

This is one of the three biggest rivers in Mongolia. Originating in the Khentii Mountain, the Kherlen River flows through 1264 km and joins Dalai lake in China. It is home to many types of fishes and water birds.

e. Khunnu tomb in Duulga Mountain:

Located in the Duulga Mountain, 27 km south east from Jargaltkhaan Sum of the Khentii province, there are 24 tombs of Khunnu. A map was drawn of these tombs with additional 12 stone walls by V.V. Svinin in 1975. Furthermore, at the small branch of the mountain 10 Khunnu tombs were found in 1988.

f. Square tombs of the Ust valley mountain pass

There are 2 tombs, 14 square burials and 6 small round burials in Ust valley located 5 km east from Kherlen River in Tsenkhermandal sum of Khentii province.

- g. Square tomb of the Ust valley mountain pass:
 - West wall: This is an ancient city ruin of Kidan city 2 km west from Zuun Herem in Murun sum of Tuv province.
 - East wall: This is a ruin of Kidan city known as Zuun Herem and 25 km west from Undurkhaan city.
- h. Stone inscription of Salbar Mountain:

Stone inscription of Salbar Mountain in Murun sum of Khentii province. It consists of the main part with 3 rows and 17 figures, and a smaller part with 1 row and 7 figures
- i. Tureg inscription of Tsenkhermandal

The inscription of called “Burgastain Bichigt Tsokhio” in the area of Khujkhan Bag to the west from Tsenkhermandal sums of Khentii province. This ancient Tureg inscription was written from down to up rather than in the usual up to down direction.

6.3.3 Natural Environment

(1) Meteorological conditions include the following:

- a. Air temperature

Average temperature of the month and year, absolute maximum and minimum temperature.
- b. Soil temperature

Soil surface and certain underground depths’ average temperature. Freeze and melt indicators.
- c. Air pressure and resource of wind

Air pressure, average and maximum speed, frequency of each direction of the wind.
- d. Air humidity and precipitation

Humidity and average sum precipitation data if available. Maximum precipitation measure per day has been taken.
- e. Average and maximum intensity of rain

Annually there is 191.6-264.0 mm precipitation in Erdene to Kherlen and 259-197 mm in Tsenkhermandal to Undurkhaan. Only 5 to 10% per cent out of this precipitation is snow in the cold season and remaining 90-95% is rain.

The country belongs to a dry zone. The relative humidity of air in Erdene to Kherlen averages 63-70%, and in Tsenkhermandal to Kherlen 59-60% with lower humidity in spring, autumn, and more in winter and summer.

f. Snow cover and atmospheric factors

Regarding stable snow cover, thickness and density of the snow cover indicators are used. Also index of days with rain, snow and thunder and average days with snow and dust storm.

g. Sun's illumination

The sun's illumination is a required for construction road to be possible. Day length is 5 to 6 hours in winter, 8 to 10 hours in summer and 8 hours on average in a year.

h. Temperature

The coldest month is January with monthly average temperature -23.4 to -27.9°C in Kherlen river valley, -18.8 to -20.9°C in another area. Absolute minimum reaches -38.8 to -50.0°C. The warmest month has average temperature of approximately +15.8 to +18.7°C. Absolute maximum is 35.0 to +40.1°C.

i. Wind direction

In Erdene to Baganuur, prevailing wind direction is North and North-West, near to Kherlen is North and North-East, Tsenkhermandal to Murun North and North-West, and in Undurkhaan is South-West.

j. Wind speed and loading

Wind speed increases in Spring and Autumn, decreases in Winter and Summer. Also per day wind speed increases from morning and decreases by evening, at night becomes less. Average wind speed in winter from prevailing direction is 1 to 3 m/sec, in spring 3.2 to 7.0 m/sec, in summer 1.0 to 5.5 m/sec and in autumn 1.6 to 4.5 m/sec. Max. wind speed reaches 20-34 m/sec.

k. Weather occurrence

Snow, strong wind, snow and dust storm, thunder, fog and mist occur in general.

1) Rain and snow:

23 to 48 days a year are rainy and 18 to 38 days are snowy in Erdene-Undurkhaan. The most intensive rain record in Erdene-Undurkhaan is 2.60 mm/min. Humid snow continues 3 to 5 hours within 5 to 10 days a year in Tuv province and 2 to 3 hours continues within 1 to 5 days in Khentii area.

2) Snow cover

Snow cover is thin as only 5-10% out of total precipitation is snow. From Erdene to Undurkhaan stable snow covers from 20th of Nov for 110 to 120 days. The snow cover fluctuates in range of 5-13 cm in depth.

1. Basic group of road climate in Erdene to Undurkhaan

1) First Climatic zone:

This area is at a relatively high altitude and includes Erdene-Kherlen. This area has a long, humid cold winter, with rain and thunderstorms and a cool summer with storms, a windy spring and many soil frozen days. Here there is even the possibility of avalanche due to heavy moist snow.

2) Second Climatic zone:

Selected from Kherlen to Undurkhaan and belongs to plain steppe area. Climatic condition is cold and dry winter, warm summer, hard spring and cool and sunny autumn. Regarding conditions there is more wind and rain with thunderstorms in this area.

(2) Geographical Conditions

1) Mountain forms

In the western part of the region, mountain area dominates and transfers to steppe in the eastern part. The highest point at the Bayandelger sum territory of the Tuv province reaches 1,800 m and the Kherlen river valley the lowest is 545 m. At the right side of the road, there are Khar Chuluut mountain 1,828 m, Bor Khonit mountain 1,839 m, Bayandelger mountain 1,848 m, Togost mountain 1,803 m and at the other side in left Bogino mountain 1647 m, Bayantsagaan mountain 1,661 m, Khukh Ovoo mountain 1,631 m and so on.

Mountains around Undurkhaan city are 1,100 m on average. In that region lower mountains formed rounded hills and hillocks mostly in groups and rarely one by one. Summits are generally rounded with gentle side slopes. Absolute and relative pitch is about 1,500 to 1,800 m and 200 to 300 m respectively. The higher mountains have more bare rock and granite at the summits, and are steeper on lower slopes. In such kind of mountain, granite crumb is common.

2) Geographical landscape of the arterial road

a. Main forms

The area of the arterial road between Erdene and Undurkhaan has a large variety of features. There are Khentii mountain forest and forest steppe

region, Mongolian forest steppe south border, eastern Mongolian steppe, arid-steppe region, and various sizes of lakes and rivers. Many kinds of landscape such as forest steppe, steppe, arid-steppe, meadow, and salt marsh can be found.

b. Cedar open forest

This landscape is typical of mountains over 1,500 m with rounded summits. These kinds of mountains are widespread. Grassy plants are dominant in the Dalt and Zalaa mountains.

c. Lowland mountain steppe

Here slopes are gentle and summits are rounded. It includes mountains of average height 1,500 to 1,800m as found to the east and southeast. Vegetation cover is dominated by larch and birch is sometimes found in Monostoi, Zalaa as well as Kharankhui Mountain.

d. Lowland forest steppe

Extension of the forest steppe, includes mountains with 1,300 to 1,700 m height. North slopes are steep in general and foot is flat. Steppe plants in general are found over Bayantsurkh, Buren, and Bayantsagaan mountains.

e. Southern slopes of plant-grass dominated mountains

Mountain south faces have active physical erosion. Rocky outcrops are common and there are many deep ravines with accumulated washout fans. Quaternary sediment of small pebbles and sand is present. This kind of landscape is common in Mandal, Naran and Dashbaljir mountains.

f. Grass and steppe gobica dominated vast valley

Around the border of Khentii, Tuv province and at the side of the Kherlen, Tsenkher Rivers vast valleys are found. Slopes formed by old river-beds, dried small lakes, and hummocks etc. are found.

g. Grassy dry steppe hills

The landscape of grassy dry steppe hills is common in the north part of the Kherlen river. Hills are found at the estuary of the Tsenkher and Murun rivers. The relative height of the hills is approximately 100 m with sides that are smooth and gentle. Summits are likely to be pointed and eroded.

h. Plant-grassy and bushy steppe hills and hillock landscape

The landscape of Plant-grassy and bushy steppe hills and hillock is common to the east of Kherlen. Relative height with steppe reaches up to 20 to 50 m; slopes are very gently. Here hummocks and hillocks are common.

- i. Marshy, steppe mixed meadow located on the river bank

Dominated by quaternary crumbly sediment formed by the accumulation and erosion process, this landscape belongs to the valley types that lie between the mountains.

It is very common at the Kherlen riverside.

- j. Salt marsh

Salt marsh landscape is found in the south and north of the Kherlen river. Hollows are not very deep, and generally at the lowest point salt marshes take place. Saline soil is considered as a main soil type and consists of *achnatherum splendens* meadow.

(3) Geological Conditions

The area of the study includes widespread lower, middle and upper Devonian sedimentary rocks and quaternary sediments, and in some places lower Cambrian, upper Permian sediment-acid extrusive and extrusive rocks. Besides these rocks, in the mountains there is widespread upper carboniferous, upper Triassic-lower Jurassic granitic type intrusive massifs. Therefore, the following geological units, rock classes and intrusive rocks can be identified in the study area in regards to geological sequence:

- a. Lower Cambrian sediment-extrusive rocks (E1)

These sediment-extrusive rocks are rarely found in the study area, only in the low mountains near Murun sum, Khentii province. The geological cross-section of lower Cambrian sediment-extrusive layers represented mainly by medium acid andezite, rhyolite and its tuff, tuff-porphyry, and sandstone, aleurolite.

- b. Lower Devonian sedimentary rocks (D1)

Lower Devonian sedimentary rock strata are found only in the east flanks in uplifted regions of Jargaltkhaan sum. Lithologically and petrographically these sedimentary rocks are sandstone, siltstone and aleurolite, rarely gravel stone and well rounded conglomerate. These rocks microstructure can be seen as flecks on the surface.

- c. Middle and Upper Devonian sediments (D1-2)

The middle and upper Devonian sedimentary rocks spread over the mountain region in the north and north west part of Erdene sum and east and north east part of Tuul river basin. Main composition of this sedimentary rock is fine grained and metamorphic sandstone, and well rounded siliceous argillaceous siltstone.

d. Upper Carboniferous intrusive massifs

Spread over north part of Tsenkhermandal sum and south east part of the upper Tsenkher river and Kherlen and near Undurkhaan. These massifs create a region of mountains. Petrographically, the massifs consist almost entirely of granite rocks. For example, granite-diorite formation is widespread in most areas. The main character of granite and diorite formation is medium to coarse grained and stable composition.

e. Upper Permian extrusive rocks (P2)

Found only in south west part of Tsenkhermandal sum. Extrusive rocks create high mountain regions. Petrographically, these rocks consist of andezite with dark gray color, reolite with blue pink, red pink, yellow color and its prophyry, prophyryte tuff and dacite.

f. Upper Triassic-lower Jurassic intrusive Rocks. (T3-J1)

Rock massifs spread in most territory of study. For example, in the upper Tuul River, most of Bayandelger sum, south and north east parts of Tsenkhermandal sum rock creates independent blocks and high range mountain regions. Petrographical composition is mainly granite, amphibol-boitite granodiorite, biotite granite. Main minerals are plagioclase, orthoclase, magnesium hornblende. The mineral structure is medium to coarse-grained.

g. Lower Cretaceous clayey sediments. (K1)

Lower cretaceous clayey sediments are rarely found in the study area, limited to the west part of the Murun sum, in a wide valley. Geological cross section of these rocks shows lithologically dark gray, green gray colored clay, rarely coaly clay, layers of clay, microlayers of conglomerate and sandstone. Average thickness of this layer about 400 to 600 m, max 800 to 1,200 m.

h. Quaternary loose sediments (Q)

In the Study area, in valleys of big rivers (Kherlen, Tsenkher, Murun etc), and in lower slopes of mountains quaternary loose sediments of 3 classes can be found.

- Medium - upper quaternary loose sediments (Qiii-iv)
- Upper quaternary and recent loose sediments
- Medium-upper quaternary loose sediments (Qii-iii)

i. Medium upper quaternary loose sediments (Qii-Qiii)

These loose sediments are found in the center of valleys between mountains, and in the lower slopes of large mountains. Lithologically, this loose sediments consists basically of various grained sands, sandy loam, gravel with

clay loam and loess and pebbles. In some locations there are micro layers of clay and clay loam. We can see these loose sediments in Bayandelger sum, and south of this, near the lake. Also in Gun Galuut, Togos valley, Jargaltkhaan sum. Average thickness is about 40-60m, max 80-120m.

j. Upper-Quaternary and Recent loose sediments

These sediments are found in the Tuul, Kherlen, Tsenkher and Murun river valleys.

Lithologically, consist of various grained sands, gravel, cobble round stone and rarely has pebbles and coarse clay micro layers. The thickness of the sediments depends on character of river. For example, in Tuul valley is 28 to 32 m, locally, 32-34 m, in Kherlen valley 25-30 m, in Tsenkher valley average 18 to 20 m, max 23 to 25 m, and in the Murun river average 20 to 23 m.

(4) Flora

1) Vegetation

With gradual changes from high mountain taiga, mountain forest steppe onto desert steppe and desert at the back bank of the Ongo River, eastern Mongolia represents the basic vegetation regions forming an independent natural zone. In Mongol Daguurian region, mountain and forest steppe dominates, and in the Middle Khalkha region, mostly arid steppe plants are found. Mongol Daguurian mountain forest steppe region includes the end of the Khentii Mountain range and it surrounds the Khentii region in an arc. Though some mountain ranges up to 1,400 to 1,800 m, average mountain height is 800 to 1,200 m, and valleys are 1,100 to 1,200 m. At the eastern and western side Larches such as *Laxir sibirica*, Pines such as *Pinus sibirica*, *Pinus Sylvestris* and *Betula* are found. The region, however, is dominated by plant species originating from the mountain steppe. Also grassy meadow steppe, and valley meadow is found. Gravel and stony soil is common thus stony type steppe is widespread. *Caragana microphylla* and other bushy steppe is common in the sandy region. Regarding plant species there are mongolian steppe plant species at the south border despite Daguurian mountain forest steppe region plant.

Eastern Mongolia is a vegetation transition zone between South Siberia, Manchu, and Mongolia. South Siberian mountain taiga plants spread south and on the other side desert plants penetrate deep inside Eastern Mongolia through salt marsh lowland areas.

Middle Khalkha region passes through the Kherlen River. At the bank of the river are salty, marshy feathered grass, along with them *Leymus chinensis* and *Iris lacteal* are common.

The field survey was conducted starting from Erdene sum of Tuv province (administrative unit) up to Undurkhaan center and made vegetation cover description on particular stops. During this field survey 40 vegetation descriptions were recorded and some important land surface and vegetation cover photos taken. The area between Erdene sum of Tuv province and Undurkhaan center of Khentii province is included in Mongolian Daguurian mountain forest steppe and Middle Khalkha steppe region as described in the botanical and geographical region of Mongolia (N. Ulziikhuyag).

Plant diversities within the area from Erdene Sum center of Tuv province up to Undurkhaan center of Khentii province were determined. Here 82 plant species of 803 different types of plants were counted and from them 705 types in Mongolian Daguurian mountain forest steppe and 518 types in Middle Khalkha steppe region.

The Middle Khalkha steppe region includes a small part of the Kherlen river valley. The reason for the high plant diversity of above region is not only that the area contains 2 botanic and geographical regions but also plant diversity has its own specificity.

The division of plant diversity into the basic types of the region is:

Lycopodiophyta	1 family	2 species	(0.28%)
Equisetopsida	1	6	(0.85%)
Pteridophyta	6	8	(1.13%)
Pinophyta	3	8	(1.13%)
<u>Magnoliophyta</u>	<u>70</u>	<u>681</u>	<u>(96.6%)</u>
	82	705	100%

Out of them the families having more than 20 species:

Asteraceae	106 species	(15%)
Poaceae	96	(13.6%)
Fabaceae	70	(9.9%)
Cyperaceae	45	(6.9%)
Ranunculaceae	36	(5.1%)
Rosaceae	33	(4.6%)
Cruciferae	28	(4%)
Scrophulariaceae	28	(4%)
Polygonaceae	27	(3.8%)
Labiatae	26	(3.6%)
<u>Umbelliferae</u>	<u>20</u>	<u>(2.8%)</u>
	515 species	(73%)

This region has 705 types of vegetation and that covers 23.5% of Mongolian plants. This demonstrates the richness of species in the region. Mongolian Daguurian region plant species plays an important role in this sector.

Classifying plant diversity according to their life types:

Woody plant:

Trees	2 species	(0.28%)
Shrub and Shrub like species	18 species	(2.55%)
Grassy plant:	685 species	(97.16%)

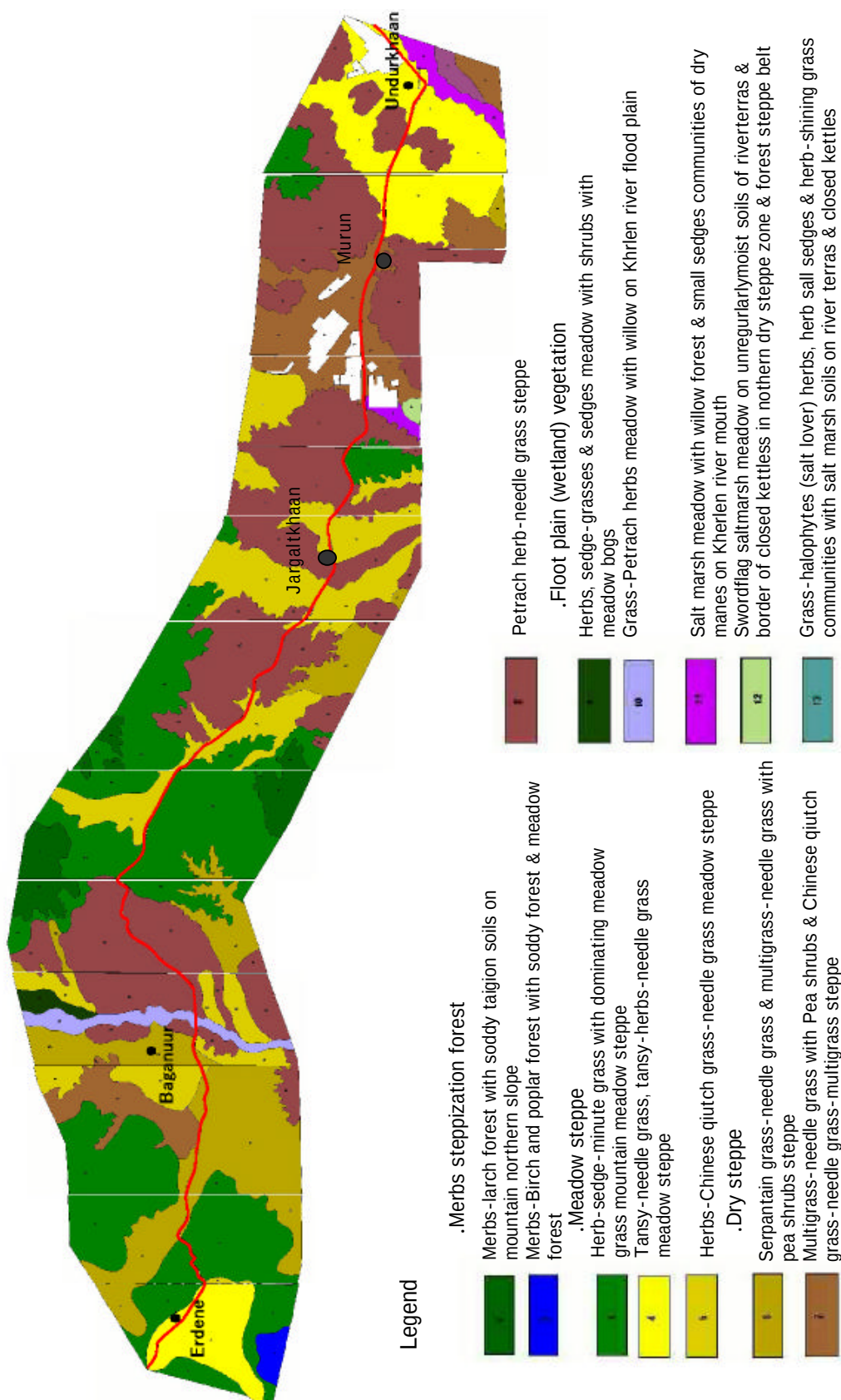


Figure 6-3-2 **Vegetation Map in the Study Area**

2) Primitive, endangered and threatened plant species

145 species of primitive plant were found in Mongolia and 12 species or 1.7% of the total primitive plants grow in this region. Moreover 47 species or 4.5% of the total primitive plant are found at the borders of the region. Including the Zuungol River, 47 species of endangered and threatened species (that is 6.6% of total plant diversity) grow in the region.

Possible changes and evaluation of the plant diversity due to “Zuungol road” that is going to be built between Erdene sum to Undurkhaan province will its effect in reducing land degradation and soil erosion, besides restoring vegetation cover by eliminating track roads (side tracks).

Because of human induced impacts, vegetation cover productivity around the settlement area is in very poor condition. Many branch roads exist and although in summer vegetation cover is quite good, it is mainly weeds.

(5) Fauna

The roads, which are expected to be constructed of asphalt and soil fill, are mostly expected to run in the forest-steppe and steppe regions of the southern part of Khentii mountain range. This will follow the existing road which has been in use for a long time. As a result, the road will not cause serious damage to the fauna in the region.

1) Fishes

All rivers on the left side of Bayan mountain pass which flow into the Kherlen river (Khutsaa, Tsenkher, Murun) and fresh water lakes (Baganuur, Gungaluutai) located in the region, have fish. Fish include Lenok, Amur pike, Amur umber, *Leuciscus waleskii*, which swim upstream in spring and downstream into the Kherlen River in autumn.

The rivers, which flow down from Baganuur town and the coal mines into the river Kherlen, have no fish in winter because they are frozen solid. In the part near the bridge of the Kherlen River, the number of species of fish is greater than in other parts. Except for the above mentioned fish, there are also Hucho taimen, *Hemibarbus laleo*, *Hemibarbus maculatus*, *Pseudaspius leptcephalus*, *Carassius auratus*, *Cyprinus carpio*, *Parasilurus asotus* in small rivers.

In deep depressions there are also *Ayagiin khonkhor*. Such fish as *Brachymystax* and *Thumallus Arcticus* inhabit the rocky parts of the Kherlen riverbed but fish that feed on the plants, algae and animals inhabit the sandy and muddy bottom of some parts of the River Kherlen.

The number of fish is much less in the fresh water rivers near Undurkhaan because of pollution and reduced speed of flow. In the last decade, the fish

resource has decreased because of overfishing and their body size is observed to decrease.

Among the fish that inhabit the system of river Kherlen, only *Hucho taimen* is registered in the Red Book of Mongolia in 1997. Reduction of the number of other fish is directly connected with human activities. For example, the water of a stream which flows through the “ger” dwelling housing is very dirty. This stream flows into the lake which is located in Baganuur suburb situated in 145 km-s from Ulaanbaatar.

The water pollution appears because of domestic animals of the families living and engaged in activities around the lake, both drink from the lake and defecate there. Also the waste matter from the open coal-pit is considered as one cause of water pollution. It is dangerous for people to use the water from the lakes, the water of which has become brownish. The reasons of this pollution are animal dung and use of water as a washing bath. In the lake, fish such as *Pseudorasbora parva*, *Leuciscus waleckii*, *Carassius auratus* and *Cyprinus* are few in number.

The fish in this lake are smaller, uglier than the fish in healthy, wild lakes. Also most of them have swellings in their abdomen and their stomach is pinkish and friable. From the observation made on the 21st of July, the size of sperm and caviar of *Cyprinus caprio* was smaller than it might be, and they are unable to breed here. A species of fish called *Carassius auratus* is more adaptable in the lake of Baganuur than other fish. Nowadays it is important to urge the people not to pollute the lake.

A lake located in the southern-west side of the bridge of the Kherlen River is not as polluted as Baganuur, so grasses are higher. In the region of this lake birds nest and fish spawn. Though the road is not far from the lake, there are hardly any human negative influences on the fish.

2) Amphibia

Of tailed amphibians, only one species *Salamandrella keyserlingii* is found in Mongolia. They are mostly common in the northern part of Mongolia, and are included into the Red Book of Mongolia. Before they were seen in the Rivers Tuul and Onon, and they may be seen in the riverhead of Kherlen, not far from the concrete bridge. It is necessary to pay attention to water pollution problems in this part.

3) Anura

Bufo raddei is one of the most widespread species. They are seen along the river bank of Kherlen from the beginning to the end, also they are found not only in the vicinity of small rivers but also in the steppe. Among frogs, the

most common species is *Rana amurensis*, which is found in the region from Erdene sum along the river bank of Kherlen.

4) Reptiles

Reptiles: From Lacertidae, Mongolian lizard *Eremias argus* is found along the road, in the forest-steppe, steppe regions. It is a very common species.

Lizard: The lizard *Lacerta vivara* is seen in the forest-steppe region of the Khentii mountain range. Because they live mostly in forest they could be found at the territory of Erdene and Tsenkhermandal sums. Though it is considered a common species, it is rarely seen.

Snakes: /Serpentes/ From thin snakes /Colubridae/ you can see *Elaphe dione* anywhere in Mongolia. Full grown snake reaches to 12 cm. Cobras. /Crotalidae / A species called *Aqkistrodon halys* is seen along the road. They can be found in rocky regions and in the areas with long grass. They are poisonous; that's why you must be careful with them. The biggest one is about 170 cm in length. Along the road which is expected to be built there could be seen one species of tailed amphibian, two species of untailed amphibian, two species of lizards and two species of snakes. Among them *Salamandrella keyserlingii* is a rare species which is registered in the Red Book of Mongolia.

5) Birds and Aves Birds

From Erdene sum to Undurkhaan, there are no regions without birds. There are 35 species of birds here near open waters, rivers, streams and lakes. Birds of passage fly over the Kherlen River, Bayandelger sum and the localities Argastai and Buurelj in large numbers in their migration period. Along this route of passage there are seen such birds as *Antropoides virgo*, *Tadorna ferruginea*, *Anser fabails*, *Tadorna tadorna*,

A small number of *Anser anset*, *Grus grus*, *Grus vipio*, *Otis tarda*. White-naped crane (*Grus grus*) and Bustard (*Otis tarda*) are birds of the Red book of Mongolia. Such birds as *Ardea cinerea*, *Anser indicia*, *Anser cygnoides*, *Cygnus sygnus*, *Anas formosa*, *Anas platyrhynchos*, *Anas crecca*, *Anas clypeata*, *Aythya ferina*, *Aythya fuligula*, *Bucephala clangula*, *Mergus merganser*, *Charadrius dubius*, *Vanellus vanellus*, *Tringa ochropus*, *Actitis hypoleucos*, *Gallinago gallinago*, *Larus argentatus*, *Sterna hirundo* and etc.

From the birds included in the Red Book of Mongolia, goose and other birds have their nests at the high bank near the bridge of the Kherlen River. So it is necessary to protect this region and to give the birds opportunity to live in a calm condition.

6) Forest and grove birds

There are no forested or willow regions along the route, except at 2 localities: Erdene Sum and a small part of Kherlen. Also in the northern thick forest of the Khentii Mountain where firs and cypress dominate. Because the trees in this forest are young, only 20-30 years old, there are no old and large trees in the forest.

On a few tall trees you can see falcons and you can find some nests of magpies. In the wood near the bridge, Birds such as *Falco amurensis*, *F.tinnunculus*, *Streptopelia orientalis*, *Cuculus canorus* etc.

In the area of the Study birds are rarely seen. Most areas are steppe. There Mongolian steppe birds are dominant. From Erdene sum to Baganuur, from Tsenkhermandal sum to Murun sum and Undurkhaan *Buteo hemilasius*, *Aquila nipalenses*, *Falco cherruq*, *Antropoides virgo*, *Calandrella cinerea*, *Melanocorypha mongolica*, *Eremophila alpestris*, *Alauda arvensis*, *Antjus campestris*, *Ocnanthe ocnanthe*, *Ocnanthe pleschanka*, *Oisabellina* are most common.

Along the road altogether, 32 species of birds live in winter. According to our long term observation, as many as 135 species of birds have been recorded. As for their living patterns, 28 of them are permanent, while 107 of them are migratory.

7) Positive and negative influences on birds

The birds, which feed on dead fish, protect rivers and lakes from pollution. Such birds as hawks, vultures feeding on dead animals, which die because of natural disasters, illnesses, accidents etc. are considered as cleaners of nature. But on the other hand, it is a dangerous fact that because of eating dead animals, some birds carry the virus of epidemic diseases such as plague, foot and mouth disease. People must be careful not taking things from their nests, feathers.

8) Mammals

The summits of the northern mountains are vast, and a large number of holes in rocks, also soft soiled land give wide opportunities for mammals to live. At the end of Argastai Mount, 10 wild sheep from the south and are living still now. There is one kind of insect-eating hedgehog-*Erinaseus dauricus* in this forest-steppe region included in the Red Book.

It's important to take measures not to kill *Erinaseus dauricus* on the new road with car wheels.

Lepus tolai can be seen along the Study route. They live along the River Kherlen. Foxes, wolves, eagles and falcons feed on them. It is considered as one of the basic animals of which is hunted. They are occasionally seen near Erdene sum.

Siberian marmot- *Marmota sibirica*, inhabits almost all mountains, hills and valleys near Erdene sum nowadays. They are plentiful in the areas around Jargaltkhaan sum. Since the density of marmots is high near the roads, it could cause trouble by infecting people with epidemic disease, and low flying birds could hit cars when they are hunting marmots.

There is another serious danger. The marmots hibernate from the middle of September until the 15th of June. According to the above mentioned negative influences of marmots on the road, we consider that it is better not to have them along the road.

Grey wolves- *Canis lupus*. They are seen in the lights of automobiles and sometimes they are seen in daytime. It's important to guard against the attack of mad wolves.

Yellow foxes- *Vulpes vulpes*. They are widespread in all areas. There are often seen along the Study route, in the light of cars. Corsacs-*Vulpes corsac*. It is a common animal in the steppe. It is useful that they feed on rats. Lynxes- *Felis lynx*. This can be seen in the forested and rocky areas of the Erdene sum along the road.

Caprcolus caprcolus. There is a small number of this kind of gazelle in the north-western forest of Erdene sum and in the left side of the Kherlen River. White-tailed gazelle- *Gazella qutturessa* are seen near the road from Murun sum until Undurkhaan. They cross the road.

Conclusion

- There are altogether 21 species of birds, 35 species of mammals along the road. Altogether there are 199 species.
- In total 13 animals are registered in the Red Book of Mongolia. They are: taimen, amur carp, white-naped crane, great bustard, steppe goose, whopper swan, mute goose, wild duck, black stock, osprey, white- tailed eagle.
- 31 species of animals are registered in the list of CITES.
- It is necessary to remove dead animal carcasses from the road after sterilization, to prevent spread of epidemic disease such as plague and foot and mouth disease.

- It is necessary to reduce the number of rodents such as marmots, which could carry virus of epidemic diseases in order to form suitable environmental conditions for passengers.
- It's important to protect water from pollution during the construction period, paying attention to the fact that fish get disease when water is polluted.

9) Insects

In the researched areas, the insects of 2 orders, 7 kinds, 151 species have been registered. In the areas along the roads there are sparse plants and as a result there is poor fauna. Only two kinds of beetles *Carabidae* and *Tenebrionidae* live here. In the pasture, species of *Orthophagus* and *Aphodius* are plentiful. There are not any rare insects or insects which are included into the Red Book of Mongolia.

3 kinds of beetles (*Meloidae*) are plentiful in the bushy areas and the insects become richer in the forest boundary.

Along the roads grasshoppers are seen in large numbers. Observation shows there is an increasing number of them in this region and it could negatively affect the pasture. There is no negative influence for the road.

(6) Natural Monuments

There are several natural parks/ natural monuments located in the vicinity of the road, some of the following have already been described in the previous sub sections.

1) Tsenkher River:

It rises from the Tsaramin Tsagaan Gozgor Mountain in the north east extension of Kherlenbayan Ulaan Mountain, 160 km up to Kherlen River.

2) Baganuur mine:

Open mine located at the Bayandelger sum of Tuv province

3) Burgi River bank:

Steep river cliff located at the confluence of the Baruunbaidlag River and the Kherlen River. This bank is derived from quaternary sediment erosion by the Kherlen River.

4) Kherlen River:

This is the one of the three biggest rivers in Mongolia. Rising in Khentii Mountain, Kherlen River flows through 1264 km and joins Dalai Lake in China. It is inhabited by many types of fishes and water birds.

(7) Distribution of forest

Forest in the vicinity of the road

1) Main form of forest

The area of the arterial road between Erdene and Undurkhaan has some variety of features of forest. There are Khentii mountain forest and forest steppe,

2) Cedar open forest

This is typical of mountains over 1,500 m with gentle slopes and rounded summits. These kinds of mountains are common. The most common plant is cedar. Bushes and shrubs are rare, including *Salix berberifolia* and sweet brier. Trees grow at a low density and having open space allows grassy plants to grow. These grassy plants are dominant in the Dalt and Zalaa Mountain. Figure 6-3-3 shows protected areas of Mongolia.

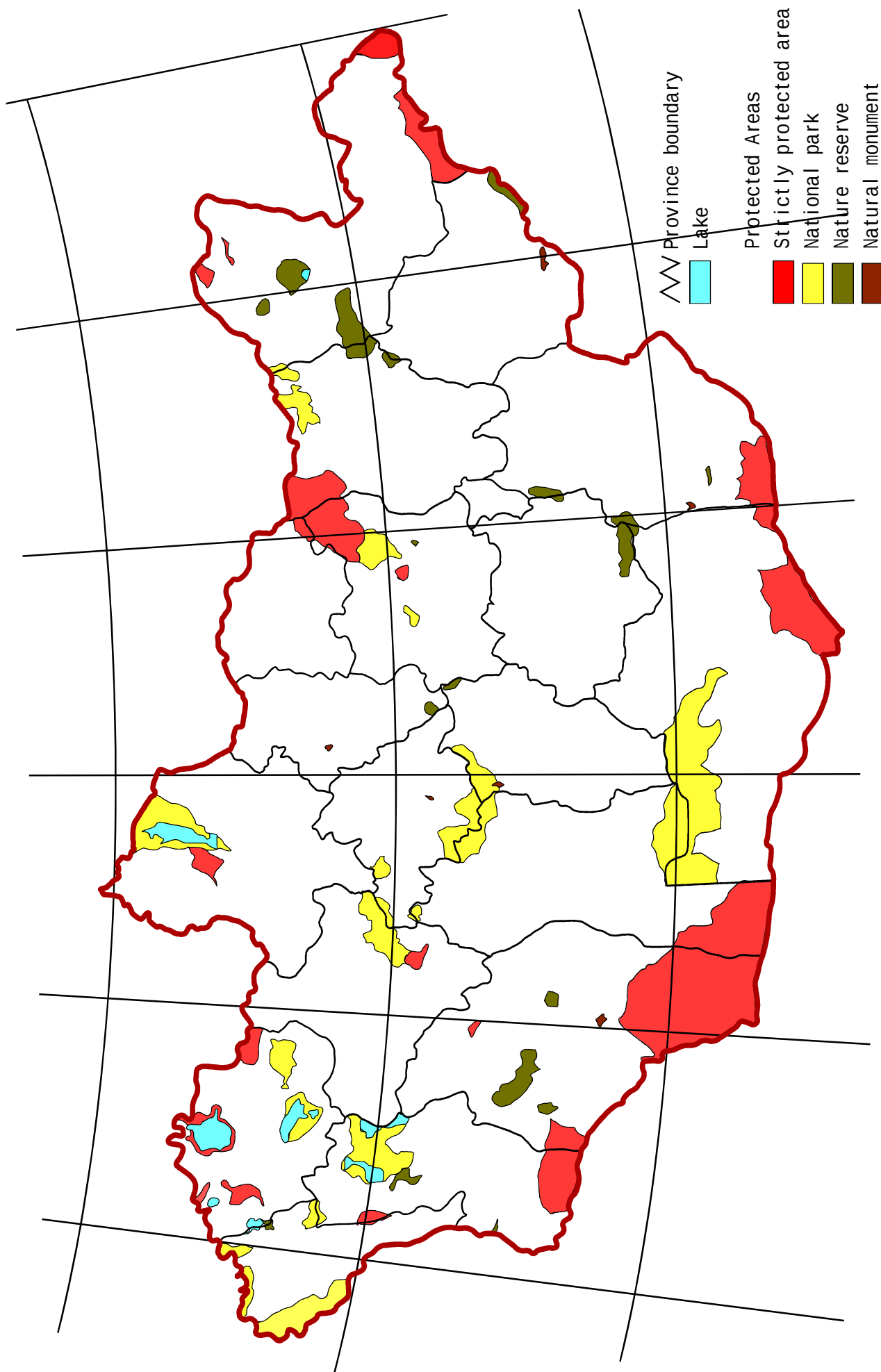


Figure 6-3-3 Protection area of Mongolia

(8) Surface and Underground Water

1) Hydrological situation of Eastern arterial route

In the early stage of a Study for road or bridge projects, meteorological parameters and the main parameters of the river network are required, together with information on their hydrological regime. The results of the Hydrological study of project will be the main basis for design of bridges, drainage pipes, embankments and other road construction.

- Characterization of hydrometric sections on road (Erdene to Undurkhaan)

The route begins at the end of the asphalt road to Erdene. From this point the survey began with findings as follows:

HS-Hydrometric section

Z-distance from last point (km),

D-depth of riverbed, dry bed and hydrometric section (m),

W-width of riverbed, dry bed and hydrometric section (m),

L-length of riverbed, dry bed and hydrometric section (km).

Main route No.1

HS-1. Dry bed with two arms (tributaries) in upper side. Z=41194.0 km, D= 0.70m, W=2.0-5.0 m, L=2.2 km.

HS-2. Dry bed. Z=41194.8 km, D= 0.40m, W=3.0m, L=0.3 km.

HS-3. Dry bed with V form. Located 100 cm pipe. L=0.4-0.5m.

HS-4. Spring-Shand- fresh water, with two arms (or tributaries) in upper side. Z=41198.0 km, D= 0.4m, Depth of water stream-0.08m, Rate of flow of flowing -0.22 m/s, W=2.0-5.0 m, L=2.2 km.

HS-5. Mountain pass- Avdrantiin Zoo. Z=41202.0 km, D= 3.10m, W=7.0m, L=1.2 km.

HS-6. Togos valley - Dry bed with flat profile. Z=41194.0 km, D= 0.70m, W=2.0-5.0 m, L=2.2 km.

HS-7. The Togos River. Dry bed with meanders. Flat profile. W=12m, right bank D=0.80 m, left bank is small slope. Therefore, during flooding width of stream rises to 120m.

HS-8. The Rashaant River. Located 1.20 m pipe. D=0.40m. W=1.20m

- HS-8a. The Khujirt River. Originates from point with elevation 1725 m. Located in south Khushanga Baga Khentii Mountains. The Khujirt river inflows to Lake Baganuur near Baganuur mining city. Baganuur asphalt road crosses this River. Balance of the Khujirt river researched by hydrologist Ts.Sugar and D.Tuvshinjargal (1995, 1996) and Russian specialist (1975, 1975). Results of the study shows that discharge of Khujirt is 0.127 m³/sec. (Summertime), mean rate of flow of flow 0.13-0.19 m/sec, depth of stream 0.13 m, Width of River bed 2.5 m (under bridge). Rainfall of 20.1 mm in a 34 second intensity (July 29.1995) caused the Khujirt River level to rise by 16 cm and max discharge was 0.4694 m³/sec.
- HS- 8b. Khutsaa River. Begins from point with location N 47 57 00, E 108 00 00 flows to North east and then flows to South and inflows to lake Ayaginuur, located south side of Baganuur city. After begin of coal mining runoff direction of this river changed to the Nariin River. Originally, length of river was 53 km. Now, discharge of river 0.138 m³/sec, mean rate of flow 0.42-0.60 m/sec. Width of riverbed 2.0-2.5 m, average depth 0.17 m.
- HS-9. The Nariin River, Under Bridge of this river. Riverbed with flat profile. D= 0.70m, W=4.0 m, velocity- 0.5 m/s, discharge-0.6 m³/s.
- HS-9b. The Kherlen River. Bridge -Kherlen bridge. Kherlen origin from point south slope of Ikh Khentii with elevation 1750.0 m. A first Kherlen flows to south through the bridge of Kherlen. Slope bottom is 0.0012 per mile. Main discharge of Kherlen is completed in upper side of bridge near (Baganuur) and town side of bridge beginning zone (discharge) dispersion. Catchment area (upper bridge) is 7350 km². Length is 152 km (from origin) average actual elevation 2200 m. Long-time average discharge 11.5 m³/sec. P75% discharge 17.7 m³/sec, P50% discharge 23.0 m³/sec. Under the bridge, main parameters of Kherlen are as follows: Width 75m, average depth 1.2 m, turbidity 1.4530 g/l. Turbidity shows Kherlen river flooding and erosion intensity.
- HS-10. The gully is deeply eroded by water which only flows during storm and times of snowmelt. Used roads affected by intensity of erosion. 47 43 43 N and 108 29 47 E. D=4.0 to 4.5 m, W=12 to 15m .L=0.15 to 0.17 m

- HS-11. The gully (ravine) eroded by mud flow, with V form. Z=41260.0 km. D=2.10m, L=0.70 m.
- HS-12. Dry bed. Z=41260.8 or after 800 m last section. In time of storm there may be mudflows.
- HS-13. Dry bed. Z=41264.5.or after 3700 m from last section. In time of storm there may be mudflows.
- HS-14. Dry bed. Z=41273.5.or after 8.8 km from last section. In time of storm there may be mudflows.
- HS-15. Dry bed. Z=41275.2 or after 1.9 km from last section. There may be mud flows in the time of storm.
- HS-16. Dry bed. Z=41279.2.or after 4.0 km from last section. Located in the rear side of Seruut Mountain. In time of storm and melting snow there may be mudflows.
- HS-17. HS-16 and HS-17 are located at the rear side of Seruut mountain riverbed of the Jargalant River flows near high slope (25 m) of Seruut Mountain. In spring storm time river width rises to slope line and will be difficult to cross. Also there is swampy ground near here. In storms there may be mud flows. Therefore, this route is not suitable for the road. 47 50 43 N and 108 40 94 E. Z = 412805 km.
- HS-18. The Jargalant River. This river originates from Shand and Togoot springs and flows down 15, 14, 13, 12, 11, 10 HS-s to Kherlen river, with platter from bed. Z=41281.1 km. W=12.0 m. D=0.15 to 0.27 m. Rate of flow 0.4 m/sec. Discharge 0.29 m³/sec.
- HS-19. Dry bed with V form. Dalbain valley. Z = 41285.1 km.
- HS-20. Dry bed with flat bed profile. Z = 41285.1 km. D = 0.70 m. W = 3.0 to 3.5 m
- HS-21. Bor Khonit valley. Dry bed ravine. Z = 41297.9 km. D = 0.60 m. W = 10.5 m. During the melting of snow it flows.
- HS-22. Upper side of spring Sharbulag of old bridge.
- HS-23. Border of the Tsenkher river and high slope of Elst mountain. There is a high deeply eroded Gully. D. max = 21.0 m. L= 30 m. It needs reinforcement. The Tsenkher River bed with discharge 2.5 to 3.0 m³/sec in this point.

- HS-24. Z = 41325.7 km. Dry bed directed to right side of road and left side Tsenkhermandal mining. During the melting of snow there is flow.
- HS-25. Tsenkher River Bridge. The Tsenkher River originated from south west Ikh Shorgooljit, Khentii mountains with elevation of 1816.7 m. Bagabuural, Uvur Monostoi rivers inflows to the Tsenkher river and across arterial road east side Tsenkhermandal sum. Length from origin to the bridge is 61.0 km. In the bridge main parameters of river as follows: Width of channel 19.6 m. D. max =0.4 m. Rate of flow 0.4 m/sec. Rate of discharge 3.2 m³/sec. Turbidity 0.9795 mg/l.
- HS-26. Urgun valley. During the melting of snow there is more intensive runoff.
- HS-27. Dry channel downstream of Urgun valley. During the melting of snow there is runoff with more intensity Z = 41333.9.
- HS-28. Dry bed directed from left and crosses the main road, location is behind a brigade Tsenkhermandal sum.
- HS-29. Ar Khadagtai valley. The riverbed is not clear. Information from local residents that last 4 to 5 years has shown no flow. Near here there are Russians and Koreans engaged in gold mining. In time of storm there may be surface flow.
- HS-30. Uvur Khadagtai valley. Bed is not clear. According to local residents no flow noted for last 4-5 years. Also, near here Russians and Koreans are engaged in gold mining. In time of storm it may have surface flow.
- HS-31. Zuulun valley. Dry bed with meanders. Flat course and not clear. W=1.5m, D=0.5m, Elevation 1462.0m, Location E109 20 00, N47 33 74.
- HS-32. Urt Valley. Dry bed not clear. W=1.0m,D=0.30 m,
- HS-33. The Murun River. Riverbed meandered. The Murun river originates from Modot, Baga Khentii mountains with elevation point 1852.8m, and Joined Tengeleg River in upper side and flows to Murun sum and to the Kherlen River. Near the bridge of this river, W=7.0m, Velocity 1.2 m/s, Discharge (flooding) 0.43 m³/s, Turbidity- 0.5435 g/l.
- HS-34. Downstream of dry bed, the river begins from the north west side of Martsat mountain. The bed is not clear.

- HS-35. Dry channel downstream of Urt River. This channel is located 6.5 km from Undurkhaan. The bed is not clear.
- HS-36. Dry channel 960 m from last channel. Also, the bed is not clear.
Z=41461.0 km. Undurkhaan city
- Hydrometric section route -2
- HS-37. Wide valley located after mountain from Murun to Ulaanbaatar. Here there may be permafrost. W=0.8 km. (JPEG Image MVC-0.17 F)
- HS-38. Wide valley located after mountain from Murun to Ulaanbaatar. Permafrost is more widespread than last section.
- HS-39. Dry bed.
- Hydrometric section route -3
- HS-40. Erdene Chuluun Valley. Dry bed after the Ust River.
- HS-41. Seruun Bulag Valley. Dry bed down to the Ust River from west of the arterial road. The bed is narrow. W=0.5-0.7m, D=0.3m
- HS-42. Kharkhiraa Valley. Dry bed down to the Ust River from west of the arterial road.
- HS-43. Shoboi Valley. Dry bed down to the Ust River from west of the arterial road.
- HS-44. Dund bulag. Dry bed down to the Ust River from west of the arterial road, 2.8 km from Shomboi Valley.
- HS-45. Yumt Valley. Dry bed down to Ust River from west of the arterial road, 3.0 km from Dund bulag.
- HS-46. Kharaat Valley. Dry bed down to Ust River from west of the arterial road, 3.0 km from Yumt Valley.
- HS-47. Dry bed, which has no name given, is located 3.7 km from Yumt Valley.
- HS-48. Dry bed across road from west of the river in valley Ust, near to Kherlen river-bridge.
- HS-49. The Khutsaa River with waste water of Baganuur city. The bed crosses the road near Kherlen bridge (6 km north west of the bridge). The riverbed is meandered. Generally, width of bed is 13.5 m, flow width is 2.5m. Velocity 0.2 m/s. Discharge 0.15 m³/second.

- Hydrometric section route -4
 - HS-50. Dry bed of Rashaant River. Riverbed is not clear.
 - HS-51. Dry bed ,W=6.0m, D=0.30-0.40 m.
 - HS-52. Tsagaan Chuluut valley. Riverbed is not clear. It need a drainage pipe.
 - HS-53. Khetsuu Hutul. Small channel, not requiring any more pipe.
 - HS-54. Dry bed from west side to the Arkhust river.W=0.8 m, D=0.2 to 0.3m.
 - HS-55. Angalt valley. Dry bed. W=1.2m, D=0.4m. In storms maybe surface flow and flooding.
 - HS-56 and 57. Antrophogen gullies. These gullies may develop and become larger.
 - HS-58. Small dry bed. W=2.7, D=0.7m.
 - HS-59. Dry bed. W=2.7m, D=0.80.7m. In storms it may include mud flows.

Figure 6-3-4 shows a hydrological condition map in the Study Area.

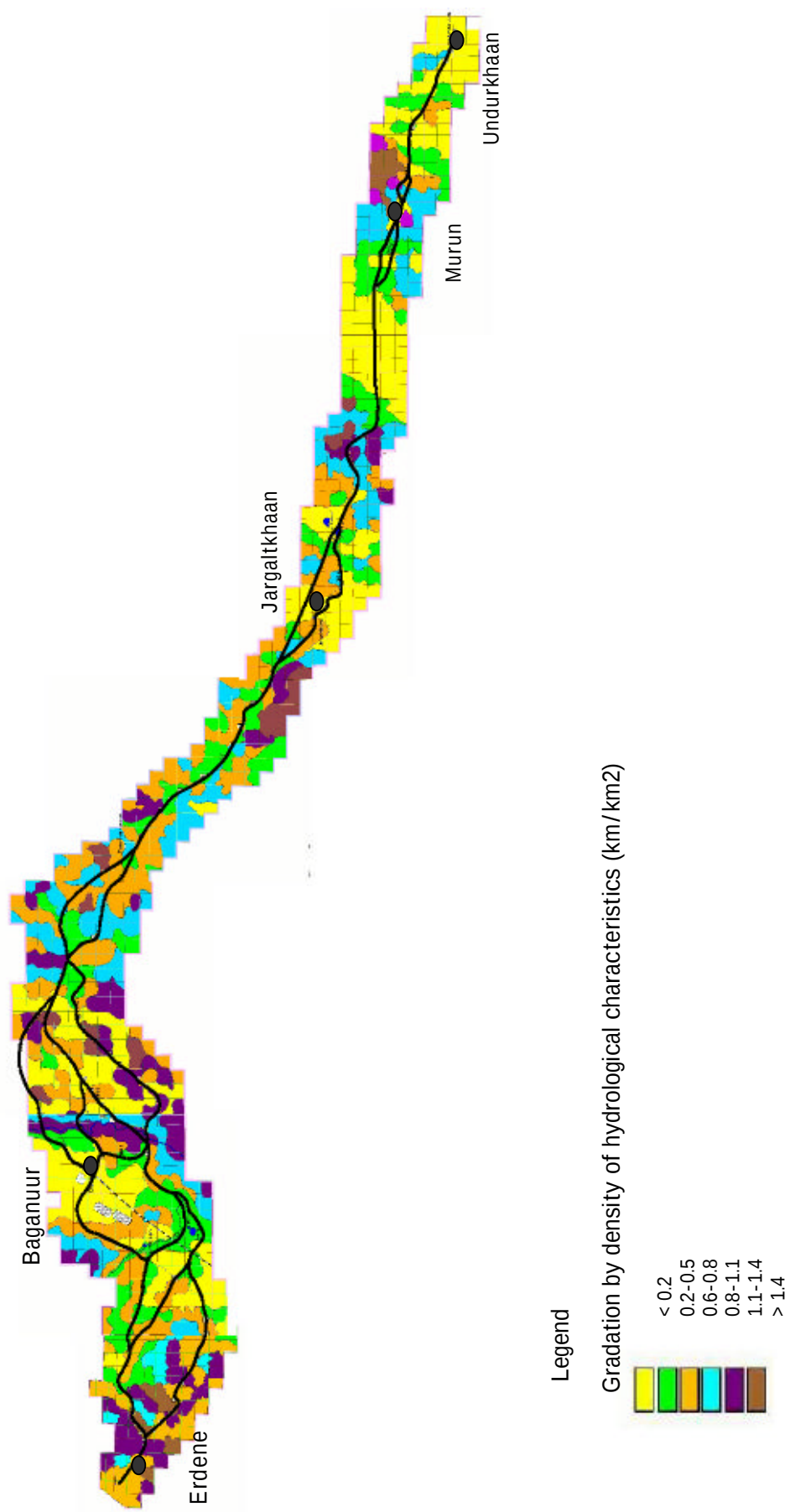


Figure 6-3-4 Hydrological Condition map in the Study Area

2) Permafrost

Permafrost has an essential role in sustaining growth of a forest as it maintains water in the strata of permafrost especially during the warm and hot season. Once permafrost is damaged, sustained water transmission is lost and trees at the location will have less water reaching their root system. Meanwhile permafrost causes many problems for physical structures especially on the foundation of structures when the phenomenon of freeze/thaw is a major factor.

According to the result of the permafrost location survey, HS-37 and HS 38 sections are assumed to be the locations of permafrost near to the Murun River. Several other areas are also considered to be possible locations of permafrost requiring further detailed survey.

3) Drainage density of the Study area

In Mongolia, drainage density and density of fragmenting of surface are very important when determining maximum discharge. In carrying out the IEE study all hydrometric parameters were calculated. According to the results it is possible to calculate maximum discharge 1% reliability. Maximum fragmenting occurred near Avdrant, Seruut and Ust mountain, Minimum fragmenting was in Chandgana steppe and near Baganuur City.

The maximum discharge depends on 2 groups of natural factors. Firstly climate, precipitation, evaporation and temperature of air and soil. Secondly fragmenting surface, geological conditions, soil and vegetation cover.

4) Soil degradation and erosion in the Study area

Soil is Mongolia's most precious natural resource. The soil is, in effect, a nonrenewable resource since once it is destroyed, it is extremely slow to regenerate. The present dangerous state of the soil is not caused by drought but by overgrazing of an already thin soil covering. The thin covering, built up by centuries of dead grass, has been ploughed in areas which are unsafe even for heavy cattle-grazing on its thin grasses.

The soils of the eastern main road are degraded by both natural factors and due to human activity. Creation of parallel tracks by vehicles during wet conditions have destroyed soil cover. For example: There are, 20-42 parallel ground roads in the areas of Zuunmod, Togos valley, 2 km from Baganuur to the Kherlen bridge in the territory of Tuv province, and at Khunkh's Baruun hutul of Jargaltkhaan, 40 parallel ground roads east of Murun Sum bridge. Usually 5-12 parallel roads occur along the eastern main road. Along the

roads mainly in the mountain slope areas there are also many erosion gullies. Some of them are 0.5-2.5 m deep.

Figure 6-3-5 shows a soil erosion map in the Study Area

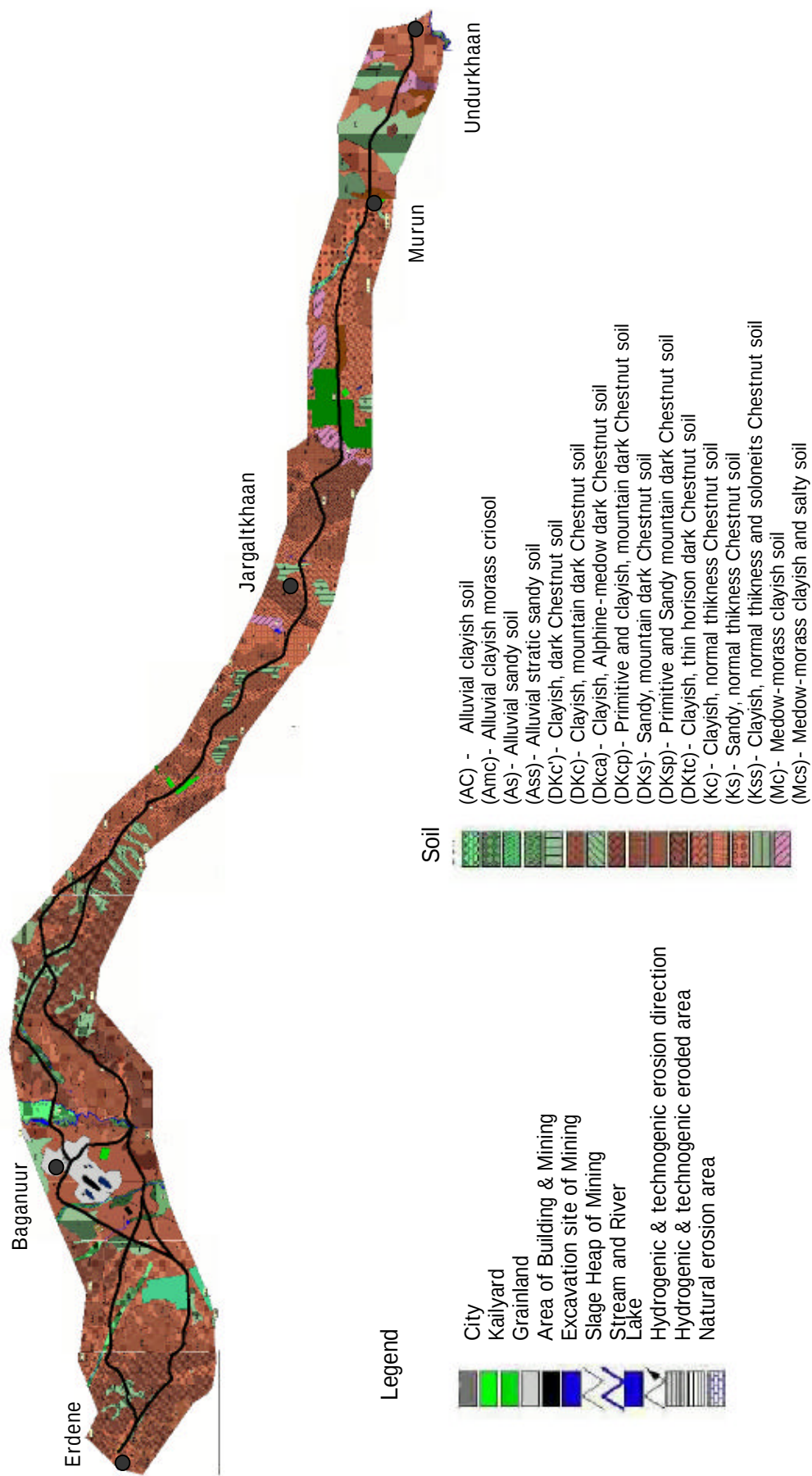


Figure 6-3-5 Soil erosion map in the Study Area

(9) Soil Contamination

Levels of heavy metals (Pb, As, Cd) in the soils were measured by the Spectroscopic laboratory at the Physical and Technical Institute of MAS. Table 6-3-4 shows heavy metals in the soils in specific locations.

Table 6-3-4 Heavy Metals in the Soils (mg/kg)

Profile No Location	Depth, cm	Soil	Pb	Cd	As
4 - Erdene	0-10	Alluvial	48	2.1	1.36
10 - Tsenkhermandal	0-10	Mountain chestnut	80	4.5	1.44
31 - Arhust	0-10	Chestnut	50	5.2	2.70
Baseline	Kabata-Pendias. A 1989		10	0.5	3.0

High levels of heavy metals (Pb, Cd, As) were identified in results of analyses for the surface layer of soils near the eastern road.

6.3.4 Major Environmental Issues

(1) Result of interview

The findings of the IEE Study regarding major environmental issues from a socio-economic point of view, according to interview with local representatives are as follows.

1) Erdene sum:

- a. Even if the Sum center is divided by the road into two parts, no impact on people's activities such as movement to work and schools is expected.
- b. No impact is expected on cattle movement, but road users must take care about them.
- c. When traffic levels rise, put "Special signs" warning of cattle nearby. At present no problems are envisaged.
- d. A new Naadam horse racing course will be chosen due to existence of the horse racing course near the main route.
- e. Along the road, 50 families and 7,000 to 8,000 cattles are found. But no obstacles to the sum's cattle breeder's activities and cattle's pasture ground are expected.
- f. There should be no special impact for crossing the road in winter or spring time, as even some cattle breeders stay in Winter and Spring at "Mogot" and "Khujir Dutluur".
- g. People desire that the road be constructed urgently, and the Sum's people are ready to participate in the road construction work.

2) Jargalkhaan Sum

- a. In the Sum there are four small country units, located near the road. There is no need to relocate the road to other location.
- b. Wild mountain animals exist in the mountain, steppe animals in the steppe, but no impact is expected to them.

3) Khentii Governor's office

- a. Expectation of smooth traffic connection between the province and Ulaanbaatar due to increase of socio-economic development opportunity to the province and neighboring 3 provinces.
- b. Expectation of other employment opportunities other than cattle raising.
- c. Expectation of business opportunity at road frontage for other local business.

(2) Major environmental issues for the natural environment

1) The paved road has both negative and positive impact:

The positive impact is prevailing. After the construction of a new paved road, many of parallel tracks (roads) will disappear, eroded soil will be restored and pasture area will increase.

2) Soil degradation:

During the construction period - access roads are used randomly by heavy vehicles and machines. The affected soil surface may be potholed and compacted if construction management is not closely controlled.

3) Geographical and landscape degradation:

Selection of location of borrow pits for earth work materials and quarries may cause morphological changes due to their large volumes.

The site of the excavated borrow pits may be visually unattractive and may cause other disturbance if reinstatement works are not undertaken.

4) Water pollution:

During the construction period earth moving operations will give rise to silt contamination of water courses during storms.

Oils and chemicals can spill from construction machines or construction yards if construction activities are located close to watercourses.

Solid wastes and sanitary sewers originating in the construction yard or workers camp should not be allowed to impact on water resources.

5) Air pollution and odor:

During the construction period dust may be caused by operating vehicles and affect the surroundings if there are residents living near the construction site.

Chemicals used in construction may cause impact to the peoples if there are residents living near the construction site.

6) Noise and vibration:

Heavy duty machines and operating vehicles may cause vibration affecting residents located near the construction site.

7) Permafrost:

Ecological problems may be caused to the forest and Bosquet area if the area of permafrost is damaged.

Foundations of large structures may have physical problems when the structures are located on permafrost area.

6.3.5 Consideration of Mitigation Measures and Management

Preliminary suggested mitigation measures with regard to socio-economic factors are as follows:

1. Place traffic signs, especially in area of high cattle density, to warn drivers to take care.
2. To control speeding drivers: place traffic signs and lights in necessary locations, enforce traffic regulations together with driver education and public relations.
3. Administrative budget allocation to the Sums to remedy soil damage on side tracks.
4. Ensure sum's budgetary allocation for labor force for improvement of access roads for the benefit of the local community, and the Government's help to improve the living conditions of local people.
5. Administrative provision is required for waste control, maintenance of road damage and potholes.
6. Development of connection roads to settlements located far from the main road. Car parks near the road are required near settlements.
7. Proposed route is better to pass behind Jargalkhaan sum center if possible.

8. Necessary treatment and reinstatement will be required on the areas used during the road construction.
9. Protection of drinking water resources from pollution during the construction and operation period is required.
10. Project management and planning should take into account the settlement needs of local people during the road construction.

6.4 IEE Conclusion Evaluated by the Ministry of Nature and Environment

Based on conclusion by the Ministry of Nature and Environment on the initial environmental evaluation of the project “Feasibility study for construction of eastern arterial road in Mongolia” made in accordance with the Law on Environmental Impact Assessment, it is concluded that environmental impact assessment is required. And the conclusion of initial environmental evaluation is as follows:

REASON FOR THE ENVIRONMENTAL IMPACT ASSESSMENT

1. To assess based on EIA Erdene sum - Undurkhaan road route from the viewpoint of rationality and environmental impact of the road, to make clear the basic assessment of the environment of the current territory.
2. Conclusion made by the team of experts assigned by the Ministry of Nature and Environment and results of the site survey.
3. To make plan of environment protection, environment monitoring program and estimate cost of their execution.
4. To conduct assessment of probable accident during the construction and project implementation.
5. Project executing agency has made a request to conduct EIA (Letter of the General Director of the Department of Roads of May 3, 2001, Ref. No. 1/350).

OTHER ASPECTS

1. To always execute on schedule the additional requests made by the local administrations and environment inspection institutions and related to the road construction and site survey.
2. To cooperate with environment protection and sanitary and hygienic institutions in order to pursue legislation on environment and optimal exploitation of natural resources.
3. To reach conclusion on EIA report within the terms fixed by the IEE.

4. Site surveys, information and related conclusions are utilized in this conclusion under direct permission of specialized experts and environmental assessment companies.
5. To utilize basic survey data of this road in the EIA report.

The following is the Schedule and direction of EIA by Information, Monitoring and Assessment Department of MNE.

Table 6-4-1 Schedule and Direction of EIA

Content of works	Term	Remark
1. To attach video and photo materials showing existing natural and environmental conditions of the project implementation site in the report	Initial stage of the EIA	
2. To conduct additional studies in order to define basic condition of the project implementation environment and environment protection measures: <u>a. Hydrology</u> - To determine in detail catchment area, length, minimum and maximum width and network density of rivers and wadis crossed by the project road. - To conduct detailed hydrological study of rivers and wadis not covers by the previous study. - To make detailed calculation of water passing facilities and formulate measures to mitigate affect to river and wadis basins. - To define changes and stability of riverbed because of periodic cycle of years with low and high water level and to find out its affect. - To calculate inundation water discharge and to find out its affect. - To make detailed calculation and measurement of about 59 wadis crossed by the road. <u>b. Soil</u> - To carry out agrochemical study of soil. - To assess existing condition of soil erosion and wear. - To determine basic condition of soil quality of the territory along the road. - To assess surface and base soil, rock and their stability. - To determine parameters of gradient of probable erosion, to formulate actions to mitigate negative affect. - To determine permafrost distribution, to assess its affect. <u>c. Flora and Fauna</u> To define list and distribution of flora of the area to be affected by the road construction, to make conclusion on existence of rare and very rare flora and in case of their affection by the construction to estimate cost for their protection and transplantation.	From Aug. 15, 2001	

- To determine location, distribution and quantity of fauna in the current area, to define negative affect by the project implementation. - To assess crossings appropriate for fauna migration. d. <u>Climatic condition</u> - To determine climatic conditions and changes of the current area and its probable affect to the project works. e. <u>Socio-economic condition</u> - To assess socio-economic affect of the project. f. <u>Quarry</u> - To make optimal selection of location of quarries with widely distributed materials, to define their resources, to make plan of recovery measures. g. <u>Settlement area</u> - Based on road capacity and expected traffic to define level of exhaust gas and other pollutants to be spread into air, dust, fly ash and noise during the road construction and operation. - To define optimal structure of plants and trees for neutralization of noise and pollutants. - To formulate and reflect proposals on construction of the road in accordance with the regulations on urbanization. h. <u>Territories with historical heritage and specially protected areas</u> - To define areas with ancient heritage, to make plan of measures for their protection. - To determine boundaries of specially protected and surrounding areas, to mention required measures.		
3. To formulate nature and environment protection plan and monitoring program.	Within the EIA	
4. To negotiate and make a contract with authorized enterprises to conduct EIA.	From Aug. 2001	
5. To hear during the EIA opinion of people living in the current area and attach in the report.	Within the EIA	
6. To assess probable accidents that may occur due to project implementation and natural calamities, to mention in the report measures for their prevention, mitigation and clearance.	Within the EIA	
7. To select and mention optimal options for road marking, installation of road signs preventing traffic accidents and showing local features, directions and kilometer posts.	Within the EIA	
8. To submit report on the EIA study carried out in accordance with the EIA law to the Ministry of Nature and Environment for making conclusion and decision.	1 st quarter of 2002	

In case of not carrying out of above-mentioned measures on schedule, unavoidably required to be implemented, IEE conclusion shall lose its force and responsibility shall be counted in accordance with the Law on EIA.

6.5 Formulation of EIA

Various considerations including environmental aspects will be made in determining the recommended route. The EIA, namely the detailed EIA according to the Mongolian system, will be conducted covering each environmental item and location highlighted by the DNE's conclusion.

After finalization of a recommended route, the detailed alignment as well as road facilities and structure will be clearly identified. Furthermore, construction methods, location of construction material resources such as borrow pits, and choice of a construction management system will be determined.

The EIA for the Study has to proceed in parallel with the Feasibility Study made by the Study Team and the EIA consultant together with the Department of Roads since the project proponent will submit EIA report documents to the DNE before the F/S Study is finalized. If there are any additional requirements identified by the DNE, the EIA consultant with the project proponent will clarify and specify requested item(s) to submit to the DNE for finalization.

6.5.1 Consideration of EIA

The EIA for the Study has to take considerations of the environmental background of Mongolian biodiversity conservation philosophy and historical, cultural heritage of use of natural resources.

Due to severe climatic condition, land and its environment of Mongolia is maintaining the status in quite sensitive balance. Meanwhile modern Mongolian people and the Government as well as local government are willing to engage in activate social, economic development for their prosperity and welfare. Thus sustainable environmental resource management will be essential from the point of view of the EIA study.

The EIA study will also focus to view points of environmental management and monitoring during and after construction of the road beside the most important mitigation measures for the construction activities. Recommendation of environmental management and monitoring for the construction activities and operation, maintenance of the road will be most essential components to further maintaining of sustainable environment for both Department of Road and DNE as well as peoples of Mongolia.

6.5.2 Scope of Work for EIA

According to the IEE evaluation and the Schedule and direction of EIA by Information, Monitoring and Assessment Department of MNE, JICA Study Team has set the Scope of work for EIA as follows:

1. EIA Items

(1) Social Environmental Conditions

1) Socio-economic condition

- Assessment of socio-economic affect of the project.

Road crossing of local community peoples and livestock, safety traffic management and measures.

2) Quarry site

- Making optimal selection of location of quarry sites with widely distributed materials, and define their resources, making plan of recovery measures.

3) Urbanized area

- Formulation and reflection of proposals on construction of the road in accordance with the regulations on urbanization.

4) Solid waste management system including surplus soil during construction stage

- Management of construction wastes, solid wastes and surplus soil.
- Disposal site for these waste materials management and their impacts, considerations and mitigation measures.

5) Territories with historical heritage and specially protected areas

- To define areas with ancient heritage, and to make plan of measures for their protection if the planned road is situated nearby,
- Determination of boundaries of specially protected and surrounding areas, and mention required measures.

(2) Natural Environmental conditions

1) Hydrological conditions

- Determination in detail catchments area, length, minimum and maximum width and distribution density of rivers, streams and dry washes crossed by the project road.
- Conducting detailed hydrological study of rivers, streams and dry washes not covers by the IEE study.
- Detailed calculation of water conduct facilities and formulate measures to mitigate affect to river and streams and dry washes basins.
- To define changes and stability of riverbed because of periodic cycle in years with low and high water level and to find out its affect.
- To calculate inundation water discharge and to find out its affect.

- Detailed calculation and measurement of objective sections (objective numbers out of about 59 streams and dry washes crossed) by the road shall be made.
- 2) Soil
 - Agro-chemical study of soil.
 - Assessment of existing condition of soil erosion and wear.
 - Determination of basic condition of soil quality of the right of way along the road.
 - Assessment of surface and base soil, rock and their stability.
 - Determination of parameters of gradient of probable erosion, and formulating of actions to mitigate negative affect.
 - Determination of permafrost distribution, and assessment of its affect, Boring test at locations of Muren area and other locations identified.
 - 3) Flora and fauna species
 - To define list and distribution of flora of the area to be affected by the road construction, to make conclusion on existence of rare and very rare flora and in case of their affection by the construction, and to estimate cost for their protection and transplantation.
 - Determination of location, distribution and quantity of fauna in the current area, and to define negative affect by the project implementation.
 - Assessment of crossings appropriate for fauna migration.
 - 4) Pollution
 - Determination of weather (atmospheric air) conditions and changes of the current area and its probable affect to the project works.
 - Based on road capacity and expected traffic, to define level of exhaust gas and other pollutants to be spread into air, dust, fly ash and noise during the road construction and operation in the populated areas.
 - To define optimal introduction of plants and trees for neutralization of noise and pollutants in populated areas.
 - 5) Formulation of nature and environment protection plan and monitoring program.
 - 6) Negotiation and contract with authorized enterprises to conduct EIA.
 - 7) Interview research during the EIA collection of opinions of people living in the current area and attached in the report.
 - 8) Assessment of probable accidents that may occur due to project implementation and natural calamities, and to mention in the report measures for their prevention, mitigation and clearance.

- Environmental protection and risk management during the construction and operation stage.

9) Selection and mention optimal options for road marking, installation of road signs preventing traffic accidents and showing local features, directions and kilometer posts.

2. Survey Methods

(1) Interview and field Survey with Environmental Experts

Experts related to environment of Mongolia

- * Socio-economic activities, entities
- * Flora and Fauna
- * Soil and Permafrost
- * Air pollution
- * Hydrology
- * Other necessary items.

(3) Field Exploration Survey

Video and photographs to ensure/confirm all data collected

- * At each proposed site and all points where it is concerned to be in environmentally critical situation in Study road.
- * The number of videos will be one (1) cassette x three (3) sets
- * The number of photographs will be about fifty (50) x three (3) sets.
- * The photographs with the explanation shall be prepared in the format designated by the Study Team.
- * Negative film or image data disk shall be attached separately.

The objective of the data analysis is to evaluate the anticipated impact which might be caused by construction of road. The works of EIA shall be conducted in accordance with Mongolian Environmental Laws, and relevant administrative guidelines of Tuv province and Baganaur, Khentii province and Undurkhaan city.

Recommendation on Environmental conservation measures, management and control, monitoring plan shall be made. Outline cost estimation for environmental mitigation measures and monitoring shall be calculated.

3. Implementation Schedule

The works of EIA shall be implemented in according to the following schedule:

Collection of data --- Period of the end of September to early November 2002

Data analysis for EIA--- period of the middle of October to early December 2002

Site Exploration--- Period of the end of September to early November 2002

Preparation of Draft report--- Period of the early December to late January 2003

Submission of Final report--- Period of the rate January to end of February2002

The EIA study has begun and the local consultant is in the process of survey, and near to analyzing and documenting their report. As for further schedule the results of the EIA surveyed items will be evaluated by the Minister's appointed investigators under the DNE.