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ECOLOGICAL & ENVIRONMENTAL STUDIES OF IDIP-II PROJECT

Environmental Assessment

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The Main Report

1. Executive Summary

Executive Summary of Environmental Assessment (EA) -IDIP-II Project

The Environmental Assessment (EA) describes potential impacts of irrigation and drainage improvement and rehabilitation of 220,000 ha including all pilot project design areas in South Kazakhstan , Kyzyl-Orda, Zhambul and Almaty.

The legal framework requires to carry out “State Ecological Expertise” (SEE), report, which is the public review of the environmental impact assessment caused by IDIP-II. The Client (CWR) has to sent this document or adjust this EA document to fit SEE, and send it to MOEB for approval.

The IDIP-II project description:
In 2004, the index of poverty has decreased below 12.2 % and the quarterly minimum cost of living is 5.537 Tenge. Total population of the IDIP-II project was not obtained. The potential for water logging and secondary salinization will be managed by vertical drainage, and with cleaned and deepened interfarm and on farm collector drains.

Kazakhstan is a land locked country bordering Russia to the north and north West, Tukmenistan, Uzbekstan and Kyrgyzstan to the south and China to the East. Current environmental problems and degradation of natural resources in IDIP-II arises from past economic policies and practices of former soviet union (FSA). Following problems are identified as constraints on environmentally sustainable agricultural development:

- Waterlogging and salinization of soils due to poor design and construction, reduced O&M and in some cases non operation of irrigation and drainage system.
- Inadequate environmental standards and policies , that are in some cases incompatible with international norms, which in turn are not appropriately implemented, enforced or monitored due to ineffective environmental management and monitoring system.

The project areas were chosen to have good to moderate saline areas, but some Sub-project within the rayons have some strongly saline or unsuitable land due to high water table (<2 meters) for agriculture. When combined, high salinity and water table resulted in totally unsuitable land for commercial agriculture.. The subregions of Makhtaaral & Kyzyl-Orda have the greatest concentration of strongly saline soils

The effect of IDIP-II on natural and social resources can be described as follows.
Under the IDIP-II an area of 220,000 ha has been outlined for. As proposed , after leaching the land will be returned to intensive farming . With drainage rehabilitation, changes in land use are expected . The impact assessment has been simplified into three main components: (1) Project design , (2) Project Construction and (3) Project operation. Out of 7 project related activities , no adverse environmental impacts are expected.

If the irrigation and drainage situation is not improved in IDIP-II Project areas , the whole agriculture system in South Kazakhstan will collapse. The whole region would become waterlogged and saline.

However, most of the potential impacts that are created will be effectively mitigated. The environmental impacts related to project design, construction and operation will not effect the environment. Environmental Management information will be prepared on :

1. Mitigation information for closed vertical bore holes and destroyed horizontal canals to avoid contamination of ground water for village water use.
2. Integrated Pest Management (IPM) training for persistent chemical weed and pest killers. A guide to safe use of agricultural pesticide & herbicide.
3. Reforestation of indigenous plants for environmental sustainability and biodiversity preservation.

The consultant proposes that the Committee of Water Resources (CWR) and Ministry of Environment and Biological Resources (MOEB) will be responsible for project development and environmental management. To do so , a small number of Rayons and WUA will be trained in water and soil salinity, reforestation and biodiversity conservation, monitoring with equipments and procedures. One or more short courses for professional development will be organized in project institutions or training centers.

An Environmental Monitoring Program (EMP) will have to be formulated to avoid any unforeseen negative or adverse environmental effects when implementing IDIP-II Project. This is required to guarantee effectiveness of mitigation measures. And a monitoring program very much needed to see how the Environmental Management Plan is working. Please refer to Environmental Monitoring Plan (Table 15) of IDIP-II project and the main objective of the monitoring plan as follows:

- Regular soil physical and chemical analysis . Other components involved are weed , pest and fertilizer.
- Regular surface, ground and drainage water sampling and analysis inside the irrigation and drainage project. Depending on the initial result of the monitoring the space and intensity of analysis could be increased or decreased , and
- The fodder crops , animal tissue and milk should be analyzed for pesticides. Depending on the results, the analysis could be continued or discontinued.

During the Environmental Assessment (EA) process, all important Government Departments (MOEB, CWR, Hydromet, MA) were consulted, and information collected from concerned institutions. Public Consultations were held in Makhtaaral, Kyzylkum, Arys Turkestan and Kyzyl –Orda. Interviews were taken for project residents and farmers , their views on impact on the environment. . They are presented in ANNEX for future references.

No NGO’s are involved in any of the project area . To upgrade the environment and effectively run the monitoring program , individual farmers or Rural Consumers Cooperatives (RCC) and farmers under WUA will undergo training paid by IDIP-II project. This training program will be on “Environmental Awareness “, monitoring soil and water component , reforestation along main, secondary and tertiary canals, community composting and bio-gas programs. Training are planned to monitor soil and water salinity, community composting and reforestation on canals and vertical drainage sites.

The total monitoring cost for IDIP-II project (220,000 Ha) USD $ 1,284,992 (Table …16). If we spread the cost for monitoring over the whole IDIP-II (220,000 ha) Project it comes to about US $ 5.84 / ha . It is worth to spend that money on monitoring.

The findings and recommendations from Environmental Assessment (EA) report are as follows:

1. There are no negative environmental impacts due to IDIP-II project formulation , design, implementation and operation.
2. The only negative impacts identified are transitory ones and can be mitigated during design , construction and operation.
3. All other impacts are positive
4. There is no need for an Environmental Impact Assessment (EIA) studies and subsequent (EIA) report.

2. Policy, Legal and Administrative Framework

The policy and the law on "Environmental Protection " was published in June 1991 in order to clarify the state ownership of natural resources including water , land , forests and wildlife. The law also shows the conduct of the State Ecological Expertise (SEE), which is the public review of the environmental impact assessment caused by the proposed project or program. According to the law of "Environmental Protection", SEE is required for all investment project including all foreign or International Body (WB,ADB) investment. In line with this law several , several regulation have been published since 1992; water code , land code , forestry code and law on animal world. Furthermore, the large number of other laws also affect the environment.

From 1992, the Ministry of Ecology and Biological Resources (MOEB) has been responsible for the coordination of all federal environmental activities within Kazakhstan. The MOEB is the successor of the State Committee on Ecology and Nature Use and Ministry of Forestry. The MOEB is responsible for not only the above Ministry but also environmental standard setting, permits and licenses issuing, environmental monitoring and implementation of SEE &EIA. Further , the 19 Oblasts department were also established as the provincial environmental foundation and important channel to local governments or agencies.

During the Former Soviet Union (FSU) time , the Kazakhstan developed a large environmental monitoring system including plan , analytical method and standards. Many agencies were involved into this environmental monitoring system. At present time, Kazakhstan is not capable and financially able to provide the adequate budgetary resources to manage the proper environmental monitoring system. This has resulted in dramatically decrease of staffs, stations and monitoring samples throughout South Kazakhstan.

2.1 Environmental Impact Assessment System

In 1993, the MOEB has published one “Temporary Instruction for Performance of Environmental Impact Assessment (EIA). The content of this instruction is mainly as follows:

- Brief description of ecological and social resources, and
- Identification of environmental impact , especially to natural resources caused by the project

The MOEB implementation of SEE was very limited. Their limited experience and lack of qualified multidisciplinary staffs makes it very difficult to conduct an Environmental Impact Assessment (EIA) for agricultural development project including irrigation and drainage. Considering the above facts the World Bank and the MOEB after long discussion agreed that under the Irrigation and Drainage Improvement Project (IDIP-II), the foreign and local consultant may be allowed to prepare EIA / EA to improve the above situation and to enhance the quality of Environmental Assessment (EA). The content of this guideline is as follows:

- Introduction
- Policy , legal and Administrative Framework,
- Project Description
- Baseline Data,
- Environmental Impact Analysis
- Mitigation Plan ,
- Environmental Management and Training, and
- Environmental Monitoring Plan

The foreign and local consultants of IDIP-II , after this Environmental Assessment (EA) finds it necessary to conduct an Environmental Impact Assessment (EIA) for some sub projects , it will be carried out accordingly.

3. Description of the Project

3.1 Type of the Project
The project is associated primarily with integrated agriculture and land improvement

3.2 Environmental Category of the Project
With the advice and assistance from Regional Environmental Division (REDS) of the World Bank , the Task Managers (TM) has classified and screened this project into Category B. This means that more limited environmental analysis is appropriate, as the project may have specific environmental impacts. Should EA concludes that no significant environmental impacts are likely to result; the EA serves as the completed Environmental Impact Assessment (EIA) for the project.

3.3 Need for the Project

The Government of Kazakhstan (GOK) regards reclamation and rehabilitation of key irrigation and drainage facilities as important to protect the livelihood of the large rural population. The project addresses this while aiming to reduce the level of rural poverty which is intense and widespread in the target oblasts. The incidence of poverty in the country follows a complex pattern and pockets of high concentration of poverty are widely found .

3.4 Location

In the Republic of South Kazakhstan :
For IDIP-II Project, the location map is shown on Figure: PA-1 of this main report.
The project has covered more than 220,000 hectares primarily in the southern Kazakhstan oblasts. The IDIP-II would cover:

Pilot Areas for Feasibility level design: It was accepted by the committee of Water Resources (CWR) chief consultant and the SMEC consultant that nominated pilot areas would be as per World Bank TOR which is presented in APPENDIX –A of the contract for Consultants Services, Assignment –A , between consultants SMEC and the Ministry of Agriculture, Committee of Water Resources. The agreed 4 pilot areas are from the I&D System of :
-- Mahtaaral and Kyzylkum Canal Phase-1 in South Kazakhstan Oblast (2 areas)
-- Bukharbaiski in the left Bank Main Canal in Kyzylorda Oblast
-- Shengeldy in Almaty Oblast

a)South Kazakhstan Oblast

Two subprojects namely , Makhtaaral Raion and Kyzylkum System in Shardara Raion . In Makhtaaral I &D System , 40,000 ha including a pilot area of 6,907 ha. In Kyzylkum I&D System , 73,800 ha including a pilot area of about 6,000 ha and a detailed design area of 12,000 ha are included.
Rehab. Works involved:
-Vertical drainage boreholes (depth 64-82 m) -161 nos.
- Collectors- 310 km; Flume- 61 km; Irrigation Canals-657 km
- Irrigation Flumes – 21 km; Irrigation Structures-5,505 nos.
- Pump stations- 28 nos. (Nos. of pump & motors-39, capacity -0.3 to 1.0 km
- Observation wells (depth 6m) -240 nos.; Piezometers (depth 36 m)-11nos
- Hydrometers- 2,428 nos.; Electric Transmission Lines for pump stations-318 km
- Road to wells (asphalt 4.0 m wide)- 42 km
- Transformers including KTP – 207 nos.
- Concrete canal lining – 51 km (volume of concrete- 53,294 m3

b) Kyzyl-Orda

The Kyzyl-Orda left bank is the study area with 30,000 hectares , of which Djalagash Rayon occupies 15,123 hectares and Syr Darya Rayon occupies the remaining 14,877 hectares. The Djalagash Rayon includes the rural doistricts of Akkum, Bukarbay Batyr, Tan and Madeniet. The Syr Darya Rayon includes the rural districts of Akjarmin, Shagan, Shyrkeliy and N.Ilyasov.

The major cleaning of North and South collectors, rehabilitation of irrigation and drainage structures.

c) Zhambul Oblast (25 , 000 ha)
Five sub-projects total 25,000 ha in different Rayons have been identified
1. Baizak Rayon – 5,000 ha (Utemis IDS Original)
2. Shuysky Rayon – 5,000 ha (PMK, Tasotkel IDS
3. Kurdaisky Rayon- 5,000 ha (additional area)
4. Merkensky Rayon-5,000 ha
5. Zhambylsky Rayon- 5,000 ha(Original)

d) Almaty Oblast (25,000 ha)

Four sub-project areas totaling 25,000 ha have been included .
1. Akdalinsky Irrigation area- 5,000 ha (Original)
2. Malai- Sarinsky Irrigation System -2,500 ha (original)
3. Karatalsky Irrigation System- 5000 ha (Original)
4. Big Almaty Canal "BAC" – 12,5000 (Additonal)

4. Description of the Environment

Kazakhstan is a land locked country in Central Asia bordering Russia to the north and northwest, Turkmenistan, Uzbekistan and Kyrgyzstan to the south, and China to the East, and is bounded by the Caspian Sea in the west. The national territory is 2.72 million Km2 and extends 3200 km east to west and 1,800 km north to south.

Kazakhstan has a semi-arid continental climate with cold snowy winters and hot dry summers. Annual precipitation ranges from less than 150 mm in the north to 450 mm I the southern foothills. Kazakhstan's land ranges from semi-arid steppes in the northern and central regions to desert and mountains in along the southern borders with Uzbekistan and Kyrgyzstan. Most irrigated agriculture occurs in the south along the Syr Darya River. Crop land includes about 34 million hectares, of which 32 million hectares is rain-fed and about 2.4 million hectares is irrigated. Soils are moderately fertile.

Deserts and steppes account for more than 80 % of the total area. The central part of the country consists of a sandy plateau with small hills named Kazakh Melkosopochnik, surrounded in the north and northeast by the west Siberian plain, in the south by the Turan Plain , and in the west by Caspian lowland. In the east and southeast , mountain chains (Altay , Tien Shan , Djungar Altau) alternates with depressions (Zaisan, Balkhash-Alakol, Ili and Chu-Talas) which comprise sandy deserts (Sary-Ishikotrau and Muynkum). The country highest peak (Khan Tengry) stands at 6995 m above sea level in the Tien Shan mountain range in the south east.

The cultivable area, including the area suitable for pasture / grazing and notably the steppe, is estimated at 222 million ha , or 82% of the total area. The culvated area was estimated at 34.4

million ha in 1993, or 15% of the cultivable area, of which 99% consisted of annual crops. Fodder accounts for more than 10 million ha. There has been a dramatic increase in the cultivated area since 1950, mainly due to political decision taken in 1950 to develop agriculture on semi-desertic land , called “virgin land” , notably in the northern and central part of the republic. From 7.8 million ha in 1950 , the cultivated area increased to 28.5 million ha in 1960. In 1993, *SOVKHOZ* (state farms) and *KOLKHOZ* (collective farms) were still predominate in Kazakhstan., with private plots covering less than 1% of the cultivable area, and the joint stock companies and farmers association less than 8% of the cultivated area (Figure 1). The land reform process was extended through private ownership or long term leases (99 years). With the possibility of selling private land, transferring land lease, an increase in the average farm size has been reported, up from 5 ha to more than 7 ha per farm between 1994 and 1997.

4.1 Nature and Extent of degradation of Natural Resources

Current environmental problems and degradation of natural resources in Kazakhstan arises from past economic policies and practices of the former Soviet Union (FSA) that fixed quantitative targets sets for the economy of the whole former Soviet Union and its different sectors by central planning authorities. These policies were accompanied by pricing policies under which natural resources were under valued and the environment as whole treated as a free good. This notion prevailed both in productive sectors and by consumers. Simultaneously, the lack of sound and realistic environmental policies, legislation, standards, has led over the years to overuse of natural resources and their degradation, as well as to pollution levels with increasingly adverse effects on the public health.

The following problems are identified as constraints on environmentally sustainable agriculture development in South Kazakhstan Oblasts.

a) Surface and underground water scarcity and uneven seasonal and territorial distribution accompanied by increasing water losses in irrigated agriculture for IDIP in South Kazakhstan.
b) Surface and underground water pollution by agriculture, including run-off due to past over application of agro-chemicals.
c) Soil fertility depletion due to poor agricultural practices.
d) Increasing wind, soil and water irrigation due to reduced afforested efforts.
e) Waterlogging and salinization of soils due to poor design and construction, reduced O&M and in some cases non operation of irrigation and drainage system.
f) Inadequate environmental standards and policies , that are in some cases incompatible with international norms, which in turn are not appropriately implemented ,enforced or monitored due to ineffective environmental management and monitoring systems ;and
g) Lack of capacity to develop and implement projects in an environmentally sustainable fashion.

Table 1: Project Area Soil and Water Condition

Project Name		Area (ha)	Water Table Depth (ha)		Ground Water Salinity (ha)		Irrigation Water (ha)		Saline Soil (ha)		
			<1 m	<2 m	<1g/L	>3g/L	<1g/L	>1g/L	None	Weak	High
Maktaral District		7777		1944		4666					7777
Kyzyl-Orda		1069	703	366		1069		1069	914	155	
Zhambul		1144	266	874	323	266	1144		661	483	

Source: Staff Appraisal Report, GOK, IDIP Project , The World Bank, May 1996

In 1993, about 242,000 ha (10.5%) of the irrigated area in Kazakhstan were classed as saline by Central Asian Standard (toxic ions exceed 0.5 % of total soil weight). These areas are mainly concentrated in the south of the country.

Little maintenance has been done on the drainage network since 1990. Moreover, part of the agricultural drainage system does not work properly because of deficiencies in design and construction. It is estimated that about 90% of vertical drainage system are not in use due to high cost of pumping. A significant problem also exists with the disposal of highly mineralized water.
(ref. Kazakhstan Country Profile, Govt. of Kazakhstan , version 1980).

According to the Table1, most of the soil in Mahtaaral are highly saline. About 60% of the ground water are above the 3gm / L (much above the normal value of 1gm/L). Whreas, the soil of Kyzyl-Orda and Zhambul are none to weakly saline. Recently, this figures has changed very little. Most of Kyzyl-Orda and Zhambul project areas are less than 2 m depth to water table. This high level of saline soils in Mahtaaral are major environmental problem in IDIP-II project area.

4.2 Description of Components

The four project components are described in Table 2, and the projects civil I&D rehabilitation scope of works are described in Table 3. This is the Summary of Scope of Principal Works for the Project Areas.

Table 2 : Project Components

Project Component Numbers and Name	Component Description
Component 1 : Increased irrigated agricultural production, better income and employment through improved agricultural and drainage system.	Promote better Irrigation & drainage in farms, improved land reclamation technologies, innovative efficient and equitable water management. Increased agricultural production, better income and employment through improved agriculture & drainage system.
Component 2: Better operation and maintenance (O&M) and water efficiency through water user association (WUA) institution.	The rehabilitation of irrigation & drainage systems and associated structures for the improved efficiency and timely delivery of water to WUA needs better O & M. Capacity building through staff training , basin management and operation & maintenance (O&M) procedures.
Component 3: Improved agricultural practices and better farmers information services on agriculture (agricultural extension), environment and health.	Establishment of farmers information services for management & implementation of projects at national , 4 oblasts and ten sub project levels. This will manage agriculture including agriculture extension, environment and health of farmers.
Component 4 : Strong soil and water conservation , irrigation and drainage management, environmental management and monitoring.	Establishment of on farm soil and water conservation, irrigation and drainage management institutions. This will further oversee integrated pest management, environmental management including reforestation & composting, sustainable environmental management & monitoring.

Table 3: Summary and Scope of Principal Works for Project Areas

Oblasts	South Kazakhstan			Kyzylorda	Zham-byl	Almaty
	ATK	Makhtaaral	Kyzylkum			
Size of Irrigated Area	26.0 thousand ha, including cotton crop rotation 26.0		74.0 thousand ha, including rice- 48.4, cotton – 25.6	30.0 thousand ha, including rice crop rotation 30.0		
Nature and Scope of on farm drainage network Improvement and Improvement of I&S structures	Improvement of ID systems		Rearrangement of rice irrigation systems into cotton crop rotation. Reconstruction of irrigation network to cotton crop rotations.	Improvement of ID systems		
Nature and Scope of Main & Inter farm Collector / Drainage Network Improvement	Mechanical cleaning Rehabilitation of structures and WVD. Equipment		Cleaning, Rearrangement and reconstruction of structures	Mechanical cleaning Rehabilitation of structures		
Associated Main and Inter Farm Irrigation and Drainage Structures	Farm canals, collectors and WVD		Reconstruction of Shardara, canal, construction of canal for Kokseit (water delivery from KMC), reconstruction of KMC 78,8 km	SC, NC		

Table 3 (Continuation): Summary and Scope of Principal Works for Project Areas

Oblasts	South Kazakhstan			Kyzylorda	Zhambyl	Almaty
	ATK	Makhtaaral	Kyzylkum			
Size of Irrigated Area		39757 ha			15000 ha	25000 ha
Nature and Scope of on farm drainage network Improvement and Improvement of I&S structures		Rehabilitation of irrigation and drainage infrastructure on the area 39757 ha for cotton cultivating			Rehabilitation of irrigation and drainage systems on the area 15000 ha for vegetable growing	Rehabilitation of irrigation and drainage systems on the area 25000 ha for rice, vegetable growing
Nature and Scope of Main & Inter farm Collector / Drainage Network Improvement		Rehabilitation of inter-farm irrigated canals – 112,9 km; on-farm canals – 785,25 km;hydro technical structures on canals – 1431 pieces			Rehabilitation of inter-farm, farm, on-farm canals and HTS for them	Rehabilitation of inter-farm, farm, on-farm canals and HTS for them
Associated Main and Inter Farm Irrigation and Drainage Structures		Inter-farm collectors - 182,4 km; on-farm collectors – 380,6 km; HTS – 424 pieces; WVD -25 pieces			Rehabilitation of inter-farm, farm, on-farm collectors and HTS for them	Rehabilitation of inter-farm, farm, on-farm collectors and HTS for them

Although the project areas were chosen to be non saline to moderate saline areas (Table 4) , the subproject within the Kyzyl-Orda still have some lands (Table 4) very highly saline or unsuitable for agriculture(about 28%). They are also unsuitable for having high water table of less than <2 meters (Table 5). This is true for Makhtaaral (29%), Kyzylkum (11%) and Kyzyl-Orda (13%). When combined, salinity and high water table resulted in land totally unsuitable for commercial agriculture. Of South Kazakhstan and Kyzyl-Orda have the greatest areas of such land , and will provide the Project with its greatest land improvement challenges(Tables 4 &5).

It is noted that the soil salinity and water table depth data used is aggregated and reported at rayon level , not the irrigation system level . Rayon level data although too general for definitive analysis. However it is still capable of giving qualitative information on soil and water conditions. This is possible by simplifying the data and making major assumptions with regards to uniformity. This is possible to identify areas worthy of more detailed study.
The distribution of soil salinity severity is presented in soil maps in the Annex of the Mid Term Report. The GOK collected quantitative data on ground water table. The maps are provided by the Ministry of Agriculture and Water Resources and reproduced in Soil Reports.

Table 4: Extent Of Salinity Within Sub-projects

Target oblasts	Target Sub-projects	Total Area, thousands of km^2	Non Saline, <1gm/l % of Total Area	Moderate salinity, 1-3 gm /l, % of Total Area	High salinity, 3-10 gm / l, % of Total Area	Very High salinity, >10 gm /l, % of Total Area
1. South Kazakhstan	1. Maktaaral	48000	0	44,67	49,44	5,89
	2. Kyzylkum(Shardara)	74900	1,3	97,3	1,4	0
	3. Turkestan	26000	41.0	55.0	1.0	3.0
2. Kyzylorda	1. Kyzylorda	42638	0	24,5	47,2	28,3
3. Zhambul	1. Bauzak raion, Utemis	5200	0	64.7	35.3	0
4. Almatynsky	1. Karatalsky Irrigation system	5000	85.39	12.68	1.93	0
	2. Akdalinsky Irrigation system	5000	89.0	11.0	0	0
	3. Malaisarinsky Irrigation system	2500	45.1	36.0	18.9	0
	4.Enbekshi-Kazakhsky raion	12500	62.0	25.0	13.0	0

Source: State Institute of South Kazakhstan Hydro-geological and Land Reclamation Survey, Committee of Water Resources , Ministry of Agriculture, Govt. of Kazakhstan , 2005

Table 5: Extent of Water Table Depth Within Sub-projects

Sub-project Area	Water Salinity, gr/l	Oblast	Rayon	Total Area (ha)	The Depth of Ground Water Table < 2 m, as % of Total Area	The Depth of Ground Water Table from 2 m to 5 m, as % of Total Area	The Depth of Ground Water Table > 5 m, as % of Total Area
1	1,15	South-Kazakhstan	Maktaaral (Syrdarya river)	48000	28,8	71,2	0
2	1,2	South-Kazakhstan	Kyzylkum (Shardara) (Syrdarya river)	74900	10,5	89,5	0
3	0,42	South-Kazakhstan	Turkistan raion ATK	26000	4,0	50,0	46,0
4	1,8	Kyzylorda	Kyzylorda (Syrdarya river)	42638	12,6	87,4	0
5	0,46	Zhambul	Bayzak (Talas river)	5200	82,5	17,5	0
	0,76		Shu (PMC, Shu river)				
6	0,28	Almatinsky	1. Karatalsky Irrigation system	5000	21,94	78,06	0
7	0,41	Almatinsky	2. Akdalinsky Irrigation system	5000	44,0	56,0	0
8	0,58	Almatinsky	3. Malaisarinsky Irrigation system	2500	33,0	67,0	0
9	0,75	Almatinsky	4.Enbekshi-Kazakhsky raion	12500	45,91	54,09	0

Source: State Institute of South Kazakhstan Hydrogeological- Land reclamation Survey carried by the Committee of Water Resources, Ministry of Agriculture, Government of Peoples Republic of Kazakhstan,2005

4.2.1 Participatory Planning

The project development and design process, as well as the rules and responsibilities of the WUA's would be discussed with WUAs and concerned GOK agencies at the National, Oblast, and Rayon levels.

4.3 The Soil and Water –Table Quality Maps

The ground water depth and the soil salinity data are examined together and presented in Table 6. (Indicative, Qualitative condition of Soil Degradation) .The irrigated lands and the Soil Maps are presented in Annex …
Soil map shows the location of the saline of the IDIP-II project areas, the map.shows the areas with "BAD" , "MEDIUM" and "GOOD " conditions as defined in Table 6. The Makhtaaral rayon and the Kzyl-Orda Oblasts are where there are occurrence of the most "BAD" lands .
However, the areas indicated as having a "BAD" condition , are located where drainage system are the worst, usually in locations at the end of command area. The high salt level in the irrigation water compounds the problem of poor drainage. Please look soil map for further information.

Table 6: Indicative , Qualitative Assessment of Soil Degradation in Soil Map

Salt / 100 gm of soil	**Ground Water Table (GWD) in Meters**		
	< 2 Meters	**2-5 Meters**	**> 5 Meters**
0.3 – 0.6 %	BAD	MEDIUM	GOOD
0.6 – 0.9 %	BAD	MEDIUM	GOOD
> 0.9 %	BAD	BAD	MEDIUM

Source: JSC "Yuzhkazvod" Project in 2001 and South Kazakhstan Hydro-geological Land Reclamation, 2004.

The ground water in the Syr Darya basin has regular presence of residues of the insecticides DDT and benzene hexachloride and the herbicide 2,4-D in excess of allowable limits. A small percentage (less than 0.3 percent) of foodstuffs from the same region analyzed in 1992 also contain DDT in excess of allowable limits. The presence of these chemicals more than two decades after their supposed removal from use is indicative of serious indifference on the part of farm managers to the environmental and health effects of the chemicals (Staff appraisal Report, The World Bank, 1996). Their presence should be properly investigated in all sub-regions.

A. Physical Environment
Kazakhstan is in the northern sub-zone of the Turan climatic region. Kazakhstan climate is classified as continental, with summer and cold winters. Summer temperature often surpass 40C ; winter temperature average about -23 C , but may fall as low as -40 C. Most of the country is quite arid , with average annual rainfall of between 100 and 200 millimeters (mm) and occurring mostly in winter and spring. There is little rain between July and September.

For the most part, the project area soils are desert zone soils. General properties of desert zone soils are: very low in organic matter (<1-1.5 percent), have carbonate in the profile, and solonchalks, extremely high degree of dehydration of the profile in the xerothermic period.
In terms of Eco-Climatic Zones, the south (project area) occupies approximately 40 percent of the national area, are brown to grey brown, "Takyr like " desert soils. The content of organic matter declines from 7-8 percent in the north of the country to 0.3-.05 percent in the south. Gross nitrogen and phosphorus levels drop from 0.4 and 0.12 percent to 0.01 percent, respectively. Cation exchange capacity (CEC) declines from 40-45 to 10-15 mg / eq/100 gm. Over the same distance from north to south, the soil tend to become more alkaline, pH rising from near neutral (6.8- 7.0) to moderately alkaline (7.5 -8.3). All the soils of Kazakhstan are weak in the hydrolyzed compound of zinc, molybdenum, and cobalt, average in copper and well provided with manganese. In south Kazakhstan , some areas show high levels of Boron and / or Soda-sulphate.

a) Soil and Water Table Quality
The ground water depth and the soil salinity are examined together. The qualitative condition is presented in Table 6. The qualitative condition of Irrigated Lands are classified as "BAD" , "MEDIUM" and "GOOD" . They are indicative of " Qualitative Assessment of Soil Degradation " as defined in Table 6.

Table 7: Irrigation Water Quality and Salinity Class (gm/l)

Salt Content (gm/l)	Salinity Class	Crop Response	Microbial Response
0-1	Non Saline GOOD	Almost negligible effect	Very few organism affected
1-2	Slightly Saline MODERATE	Very sensitive crops are affected	Selected microbial process altered . (Nitrification / denitrification)
2-8	Saline BAD	Yields of most crops restricted	Major microbial process influenced (respiration/ammonification)
>8	Very Saline VERY BAD	No Crops can grow on this level	Salt tolerant microorganism predominate (fungi, actinimycetes some bacteria)

Adapted from Soil Survey Staff (1963) , Janzen (1993) , and Smith and Doran (1996).

developed by Hogg and Henry (1984).

B) Biological Environment

The world Bank's , "Country Environmental Analysis for Kazakhstan " 1996, list the protected areas of Kazakhstan and these are protected in Table 7. Presently the area under protection is about 16,000 km2 or 0.5% of the nation's territory. This is the lowest of all countries in Central Asia and is very small by international standard. Even this is also underfinanced. A relatively small activities funded by GEF have been implemented to protect the key ecosystems and their components such as the Tian –Shan mountains.

In 1990, the forest cover was 3.7% of Kazakhstan territory. The Government Program "Forest of Kazakhstan" (Phase 1 during 1999-2003, and phase II in 2004-2006) forecasted an increase to 4.6% by 2010 and 5.1 by 2020.
According to the National Biodiversity Conservation Strategy and Action Plan (approved by the President in 1996) the main threats to biodiversity in Kazakhstan are habitat loss and major habitat alteration. The following three groups of human activity have the strongest impact of natural ecosystem in Kazakhstan.

- Irrigated agriculture development clearance / disturbance , agrochemicals, salinization, changed hydrological factors;
- Unsustainable use of natural territories for pasture; and
- Mining and energy industries

The most impacted ecosystems belong to:

- Southern Kazakhstan low land territories;
- Flood land and riverine areas being developed for irrigated areas;
- Wetlands; and Aral and Caspian Sea region.

Table 8: Parks and Protected Areas of Kazakhstan in 2004 (in thsd. Ha.)

Reserves	National Parks	Strict Forest Nature Reserves	Centre for Propagation of Rare Animal Species	Monuments of Nature
126.2	20	20		Unknown

Source: Statistical Yearbook of Kazakhstan, 2005

Table 9: Land Use of Available Lands in the Republic of Kazakhstan (mln. Ha)

	2000	2001	2002	2003	2004	
Total Land Area	272.5	272.5	272.5	272.5	272.5	
Lands for Agricultural Enterprise, industry, Transport	93.4	91.2	86.5	83.6	82.5	
Especially protected Territories	1.2	1.2	1.4	2.7	2.9	
Forested Land	22.2	22.3	22.4	22.4	23.3	
Water bodies	3.6	3.6	3.6	3.6	3.7	
Reserve Land	118.7	120.8	124.7	126.4	126.2	

Source :Statistical Yearbook of Kazakhstan ,2005.

Project activities will primary takes place in Southern Kazakhstan, especially in the above mentioned project areas. The IDIP-II Project activity will generally halt and improve environmental protection.

a) The fisheries

The fisheries in the project area is not a significant factor in the proposed project's environment.

b) The Aquatic Biology

The aquatic biology in the project area is not significant factor in the proposed project's environment.

c) Wildlife

The regions in the Syr Daria River flood plain once supported abundant wildlife. The flood plain of Ili River in Almaty also supported abundant wildlife. However, Almaty , Zhambul, South Kazakhstan and Kzyl-Orda oblast project areas have been farmed for more than 30 years and little wildlife remains within these project areas.

d) Forests

For all practical purposes , the project areas do not have any large strand of forests. The project work will only take place in cultivated areas.

e) Rare or Endangered Species

The Government Of Kazakhstan lists Fauna of 4 Oblasts and presented on **Table 17 .** The rare and endangered species are also listed in italics. They may be kindly consulted from time to time and especially for bio-diversity conservation planning in 4 Oblasts.

The list of flora is also presented on **Table 18**, incuding rare and endangered plants. Latin names are also given in italics.

However, only for Kyzyl-Orda there are detailed reports on rare and endangered species for the IDIP-II project areas and sites in the irrigated areas, and there is not enough knowledge about the environmental requirements of sustainability and bio-diversity planning for the project. It is difficult to determine whether the fish or birds will have any impacts on their numbers with the proposed project activities.

f) Protected Areas

There are no protected areas within the project areas. However, **Table 8** talks about "Information on Specially Protected Natural Reserves"

g) Coastal Resources

There are none in the project areas.

C) Socio- cultural Environment

The only cultural heritage sites within the Project activity areas are in Arys-Turkestan Rayon, South Kazakhstan Oblast. The big Mosque of Kodzha Akhmet Yassauyi is avery ancient memorial, local and national Government is taking good care of this ancient monument. This cultural heritage sites are about 10 km away from the project area and project intervention will not have any detrimental effect or impact on the cultural sites. With the greater network of rehabilitation of collector drainage network, thus lowering ground water tables, the IDIP-II project may contribute a direct or indirect benefit of these sites with positive environmental impact. There are no other cultural heritage sites in the project area.

1. Population and Communities

The following Table provides main Socio-economic data for the four Oblasts.

Table 10 : Population and Communities

	Area in Km2	Number of People In thousand		Growth / Decrease	Speed of Changes
		2005	2006		
Almaty	224,0	1589,8	1604,2	14,4	100,9
Zhambul	144,3	992,1	1001,0	8,9	100,9
Kyzyl-Orda	226,0	612,1	618,1	6,0	101,1
South Kazakhstan	117,3	2193,6	2233,3	39,7	101,8

Source: Socio-Economic Development of Almaty Oblast, Department of Statistics, Taldykorgan,2006 (page 73).

It can be shown from the above table that population of 4 Oblasts have risen slowly with slight positive growth. Distinct growth can be marked in South Kazakhstan Oblast where city /urban population is about 892 thousand, compared to rural population of 1342 thousand. Total population of South Kazakhstan Oblasts is 2233 thousand peoples (Table 10).

Ethnic Groups:

The IDIP-II project area is ethnically diverse with Kazakhs as the dominant ethnic group. The mixture and the percentage of ethnicity is explained in the following Table11. However this is available for 3 Oblasts only.

Table 11: Ethnic Groups for 3 Oblasts

Ethnic Groups	South Kazakhstan Oblast	Kyzyl-Orda Oblast	Zhambul Oblast
Kazakhs	69,0 %	95,2 %	67,7 %
Russians	7,2 %	2,4 %	15,5 %
Uzbeks	17,1 %	0,1 %	2,3 %
Ukranians	0,5 %	0,1 %	0,6 %
Tatars	1,0 %	0,3 %	1,0 %
Korean	0,5 %	1,3 %	1,3 %
German	0,2 %	0,0 %	0,7 %
Others	4,5 %	0,6 %	10,9 %

Source: Department of Statistics, Statistics Reports for South Kazakhstan , Kyzyl-Orda and Zhambul Oblasts, 2004 -2005.

Religions:

Kazakhstan as a nation has never been particularly religious. Islam , the indigenous faith, draws most of its followers from the southern towns of Taraz, Shymkent, and the pilgrimage town of Turkestan. Around 47% of the Kazakhs call themselves Muslim although less than

3% actually practice the faith. Around 36 % of people claim to be Russian Orthodox, again, the practicing number is single digits. There is also a sprinkling of Russian Jews, mostly in Pavlodar and Almaty. Specific information on religion for 4 Oblasts is not available.

II. Health Facilities

In the post –Soviet era, the Government health care and quality of Kazakhstan's medical service has fallen. However, private health care has much improved. Between, 2000-2004 , spending on health care and ration of hospitals beds to population both slightly increased to about 4 percent . The Russian medical practitioner emigration after 1997 deprived the health system of many medical doctors and technicians. In 2002 Kazakhstan had 106 hospital beds per 10,000 of population. Basic medical supplies in Govt. health care such as disposable needle , anaesthetics , and antibiotic are in short supply.

III. Education Facilities

The project areas are well supplied with primary and secondary education facilities.

IV. Socio-Economic Condition

In 2005 Kazakhstan reformed its state –funded pension system, which has suffered from ineffective funds collection and an uneven funding burden that motivated enterprises to avoid support payments. The new system reallocated payment responsibility and collection authority.

V. Physical or Cultural Heritage

The only cultural heritage sites within the city of Turkestan of IDIP-II project , of South Kazakhstan Oblast. This is currently well protected and efficiently maintained.
This cultural site may very well contribute a direct and indirect benefit to IDIP-II project, thus producing a positive environmental impact.

5. Significant Environmental Impacts

This will determine and distinguish between significant positive and negative impacts, direct and indirect impacts, immediate and long term impacts. The consultant will also identify impacts which are unavoidable or irreversible. Wherever possible, the consultants will describe impacts quantitatively, in terms of environmental costs and benefits.

The consultants will assign economic values when feasible. Characterize the extent and quality of available data, explaining significant information deficiencies and any uncertainties associated with prediction of impacts. When impact could not be quantified , qualitative judgement will be used based on professional experience.

Relying on field data , the SMEC multi-disciplinary team has developed environmental description of the study area. The Important Environmental Components (IEC's) have been identified through a scoping process.

Scoping Process

Scoping has been carried out to identify the important environmental issues to arise from IDIP-II project and the IEC's.

The sources of information for the scoping process have been :

- Work sessions and discussions among professionals of the various technical disciplines represented at IDIP-II , South Kazakhstan State University, Ministry of Agriculture and Ministry of Ecology and Biological Resources (MOEB).
- Information collected through interview of local communities of project areas, local officials; and
- Direct experience with the implementation of IDIP-II project.

Through the scoping process , the IEC's identified for the IDIP-II project are presented below. In order to avoid repetition, some of the environmental components have been grouped.

1. Downstream Water Use and Drainage Flow Discharge Issues.
2. Surface water quantity and quality.
3. Ground water quantity and quality.
4. Soil salinity and reclamation of saline –alkali soils.
5. Appropriate design standard for O &M.
6. Soil contamination due to agrochemicals.
7. Integrated pest management (IPM).
8. Improved water management (WUA's); and
9. Bio-diversity conservation.

Projects Main Components:

In order to simplify the impact assessment, the project is divided into its main components, which are distinct activities for group of activities. Only the activities likely to interfere with the environment are considered (for example , design, tendering, surveys and data collection activities have not been considered). The components considered important are design, construction and operation (post construction).

Following Table 12 prepared for Makhtaaral Sub Project gives an idea how project related activities can affect the components such as design, construction & operational environment. These effects may have positive(+) or negative (-) environmental impacts. In the Table 14 they are expressed as yes (+) or no (-) adverse environmental impacts.

About 70 % of the project sub regions (Makhtaaral, Kyzylkum, Arys-Turkestan and Kyzyl-Orda) has been subjected to field based environmental review (EA) which indicates its overall positive impact on the environment. The IDIP-II project would not expand irrigation to new areas but would improve irrigation technology on existing agricultural land, leading to improved water conservation and agricultural practices. The proposed drainage improvements on these lands would reduce present and potential waterlogging and salinity problems. The project would have an additional positive environmental impact by reducing water losses through improved system conveyance and flow control. Pesticide runoff would be reduced through disseminating information to farmers and training on the safe use of pesticide , following WB requirements on techniques for IPM. This will reduce water pollution and soil contamination. However, the adverse impacts will be limited to construction phase but mitigation measures will be adopted (Section EMP). This project would not involve involuntary resettlement and is not anticipated to have an impact on known archaeological or historical sites in any of the sub-project areas.

Table 12: Environmental Impacts by Sub-Project Related Activities

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project Makhtaaral I&D System			
1.Improved Irrigation &Drainage Management.	No (+)	Yes (-)	No (+)
2. Improved Agronomic Practices	No (+)	No (+)	No (+)
3. Improved Soil and Land Improvement / Reclamation	No (+)	No (+)	No (+)
4. Agricultural Extension Activities	No (+)	No (+)	No (+)
5. Integrated Pest Management	No (+)	No (+)	No (+)
6.Biodiversity & Reforestation	No (+)	No (+)	No (+)
7. Improved WUA Management	No (+)	No (+)	No (+)

D = Project design ; C= Project construction and O= Project Operation

No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures)

In section 11, Environmental Impact by Sub Project Related Activities is further described In more detailed manner. A separate description for each sub-project areas are given in the ANNEX.

6. Analysis of the Alternatives to the Proposed Project

If the irrigation and drainage condition is not improved in IDIP-II project the whole agriculture system will collapse. The following scenarios would be a real possibility:

- According to SANIIRI (Scientific Justfication of Agricultural Crops Irrigation Regime, Irrigation Technique and Reconstruction of Vertical Drainage Feasibility Study, Tashkent, 1990) Data if the current level is maintained, soil fertility will decline, harvesting volume will decrease and ground water level will rise.
- Vertical drainage bore-holes will collapse. This is already happening.
- The agriculture would turn into sporadically irrigated cultivation, changing to cropping patterns with lower efficiency.
- Economic conditions will become worse for all the all agricultural workers. Cultivation will decrease , which will cause local economy to shrink and employment to suffer. Immigration of the young workers is very likely.

The alternative to the Irrigation and Drainage Improvement Project (IDIP-II) phase- II, is a complete environmental disaster. The 30 years irrigation and drainage infrastructure of the project area has completely broken down. The IDIP-II project needs improved irrigation and drainage technology on existing agricultural land , leading to improved water conservation and agricultural practices. The proposed IDIP-II will improve drainage on these lands and would reduce present and potential waterlogging and salinity problems.

Presently there is 40% water loss, may be more, by present system conveyance and flow control. Without new extension work and farmers training , fertilizer and pesticide use will make the project area very toxic and unsuitable for human living. The project area needs an Integrated Pest Management (IPM) to reduce water pollution and soil contamination, which is impossible without this project (IDIP-II).

The activities of IDIP-II will increase positive impacts on the environment. The adverse impacts may occur on the construction phase but mitigation measures will be proposed in the environmental management and monitoring stage. The procedure to mitigate adverse impacts during construction will be included in the bidding documents. This will take care of site stabilization , collection of construction materials and wastes, procedure to ensure environmental protection , and the safety and health of workers.

7. Mitigation Management Plan

7.1 Screening of Project Activity by Component

Based on the environmental screening of project components and following environmental guideline of the World Bank (OD 4.00, Annex A-1) , the project activities are assessed as shown in Table 14.However funding for EMP input could not been worked out due to shortage of information during this report. The Table 14 is placed at the end of this report.

7.2 Environmental Impacts related to project design

7.2.1 Land Acquisition

Irrigation and Drainage improvement under IDIP-II project infrastructure improvement will not affect land or property. The consultant have assessed the project intervention and designated 10 sub project sites. There is no need for resettlement or compensation as all main and inter-farm I&D rehabilitation construction will be confined to Government easements which do not contain residents , habitation, or agricultural production. On farm I&D civil works will only be commenced following both farmers and WUA participatory agreements to proceed with both design and construction, hence negating a need for compensation. Construction will be done to suit seasonal cropping, State Plan orders and farming and irrigation requirements and needs. However, the consultants have prepared “Project Affected Person” (PAP) plan for the project and will ensure that any loss of land and property will qualify for compensation as PAP. Under this framework all PAPs will be entitled for compensation from their lost assets, incomes and business according to a replacement costs determined through agreement between PAP and the WUA or its equivalent.

7.2.2 Obstruction of movement of people

The shaping and widening of canals and construction of drains as part of infrastructure improvement may restrict movement of peoples and animals, and the accessibility to site by vehicles and carts. This can be mitigated by the provision of crossings made of permanent materials and adequately sized culverts. The design proposals includes provision for piped culvert crossings on all canals and drains where it is considered appropriate and location have been assessed as suitable to farm and village access routes. There is not a large demand for new crossing , as the previous design included sufficient crossing to satisfy human and vehicular traffic for both human and farm operations and tasks. The project has made provision for the rehabilitation and construction of new crossing structures on both canals and drains.

7.2.3 O & M Problems

Poorly designed facilities may cause difficulties in operation and maintenance (O & M) by Water User Association (WUA). Thereby causing ineffective and inefficient O & M and total system failures in some extreme cases. Therefore, it is critical that the structure should be designed in a manner for which O & M is easily undertaken with local technologies and with affordable costs. For this purpose , the will review and prepare appropriate design standard

7.3 Environmental impacts related to construction

7.3.1 Pollution from Excavation

Infrastructure improvement will involve excavation which will result in temporary increase in fine sand and silt runoff. Mitigation measures will include (1) adequate supervision of construction operations , (2) the use of silt traps and (3) careful deposition of spoils arising from excavation work , ensuring that it is not cast directly over canal embankments. To the extent possible , spoil should be used as fill, either where required for the scheme or to construct level surfaces , as desired by farmers. In all cases, it must be compacted and treated either using bio-engineering techniques, or by using dry stone walls or stone pitching.

There are government regulations with respect to the cleaning of drains and irrigation canals and the depositing of excavated spoil. Table 13 presents the government regulations with respect to *irrigation canals and collectors drains* prescribed for Uzbekistan. Similar guideliune and restrictions should also be applied for Kazakhstan. No informatioin on this guideline has been received by the International Environmental Specialist. A minimum width of 5m must be provided and maintained either side of the collector drains for use as inspection and access roads. The deposition of spoil from the collector drain , not removed from sites , must be stockpiled by bull-dozer into trapezoidal formation. In order to prevent impact on the ecology due to wind erosion , the stockpile is to be stabilized by planting of suitable drought resistant plants.

7.3.2 Temporary irrigation system closure

Construction operations may also involve the temporary closure of irrigation systems. Because construction will take place mainly during the dry season, this may have significant impact on crops and livestock and the overall livelihood of the farmers depending on such assets. This can be mitigated by the use of temporary diversion , either in channels or by the use of flexible hose pipes. In each case , the need for mitigation measures should be assessed during detailed design, and appropriate quantities included in contract documentation. The WUA will also be involved in scheme planning and construction, ensuring that local farmers are aware of the construction schedules which will further mitigate the effects of temporary closure.

7.3.3 Other Impacts

Other possible environmental impacts would include:

(1) Dust generation caused by certain construction operation such as excavation, which ca be mitigated by wetting excavation sites and other sources of dust to control its emission , and public information.
(2) Noise generation which can be mitigated by use of properly maintained equipment and public information, and

(3) Land use conflicts caused by temporary use of land for temporary facilities for construction contractors (accommodation, camp canteen, camp facilities , medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction.

(4) . Projects may face other possible impacts such as (1) dust generation caused by certain construction operation , such as excavation, which can be mitigated by wetting excavation sites and other sources of dust control its emission, and public information. (2) noise generation which can be mitigated by use of properly maintained equipment and public information; and (3) land use conflict caused by temporary use of land for temporary facilities for construction contractors (accommodation , camp canteen, camp facilities, medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction. Planning “Buffer Zones” in irrigation Canals and drains, specified Government Regulation has to be followed as follows (Table 13) :

Table 13 : Government Regulations- Buffer Zones (Irrigation Canals and Drains)

Capacity of Irrigation Canals (m^3 / sec)	Width of the Inner Buffer Zones for inspection Roads and Deposit Sediment from Canal (m)	Width of the Outer Buffer Zone for Vegetation and limited Agriculture (m)
1	6	
5	10	
25	20	
50	75	
100 or more	100	

Collector Drains Buffer Zones- Provided by CWR and MOA- (both sides of the Collector Drain)

10	5m for inspection road and 10-20 m for spoil 10-20 m for agricultural traffic & field drains
10-20	100 meters (either side of the collector)
21-50	200 meters (either siude of the collector)
.50	300 meters (either side of the collector)

Source: Ministry of Agriculture , Republic of Uzbekistan

This regulation should be strictly enforced on IDIP-II Projects.

Environmental Impacts related to project operation

7.3.4 Effects of downstream water use

About 70% of the project area comprising of South Kazakhstan and Kyzyl-Orda Oblasts drains to Syr Daria River. The other 30% from Almaty and Zhambul Oblasts drains to River Illi and River Shu The construction of new drains, collectors and rehabilitation of existing drains will not increase the amount of salts and agricultural chemicals entering natural waterways. These are for the two simple reasons:

1) The salinity content of project drains is low (2-3 g/l) due to present location, and
2) The quantity of water carried by the drains is low when compared to the discharge of the rivers.

The collector drains from the majority of Kzylkum and Mahtaaral area could drain into desert sinks or desert swamps like “Arnasay Swamp”. The usefulness of this new outlet for disposal of irrigation and drainage water should be investigated.

7.3.5 Downstream water use and drainage flow discharge issue

Water Sharing of The Syr Darya

Monthly inflow to Shardara reservoir is affected by the water uses in the upstream Republics (Kyrgystan, Tajikistan , Uzbekistan) and by the regulation of natural discharges operated by the upstream reservoirs. The interstate agreement between Republics of Kazakhstan, Kyrgyztan, Tajikistan, Uzbekistan and Turkmenistan for the use of Syr Darya River water has been signed on February 18, 1992 at Almaty. Accordingly , the annual share of Kazakhstan is 10 BCM at 75% guarantee and 8.7 BCM at 95% guarantee . Average annual inflow to Shardara Reservoir was 13,668 MCM (1970-1996) that is higher than the internationally agreed volume.

Figure 2 shows the comparison between the annual inflow to the Shardara Reservoir and annual release from the reservoir into the Syr Darya River during 1970 -1995. Syr Darya river water Inflow into Shardara Reservoir is more than the discharge.

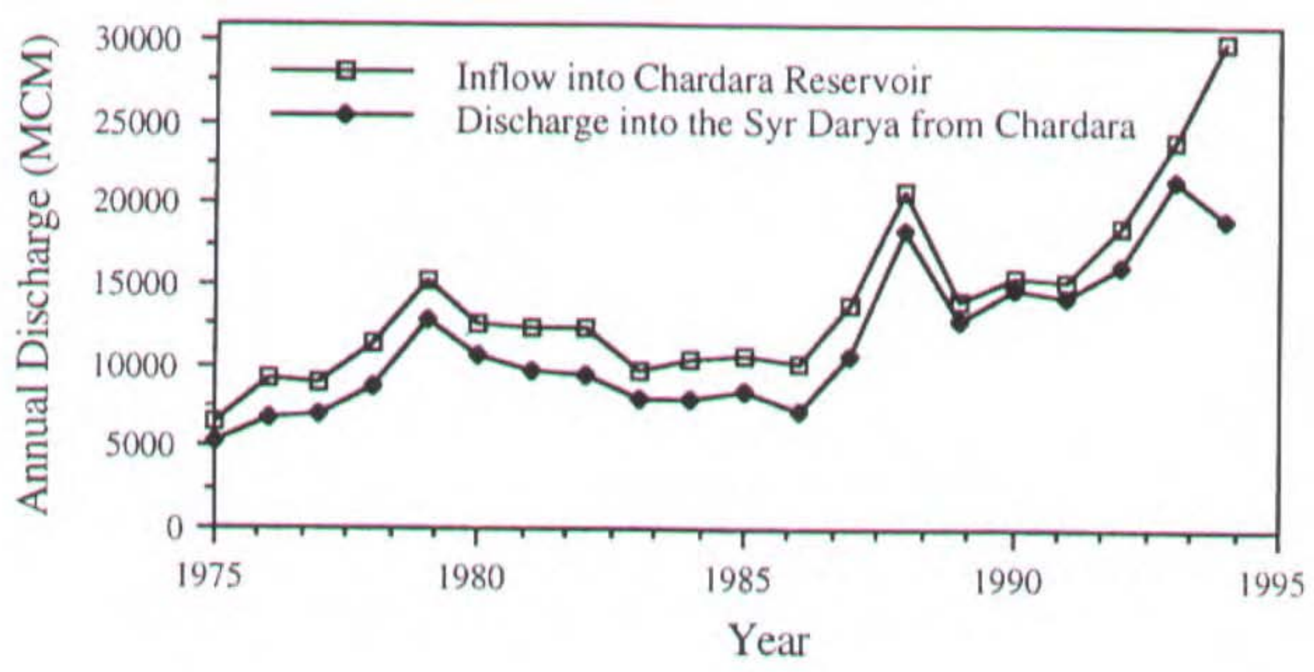

Figure: 1. Annual Discharges at Shardara Reservoir

7.3.5.1 South Kazakhstan Oblast

The water is provided by four inter farm irrigation canals K-11, K-13 , K-15 , K-17, that are fed from Kirovsky Main Canal. Kirovsky Main Canal receives water from the feed canal of Farkhad Hydro- Power station on the Syr Daria River, Republic of Uzbekistan , near Bekabad.
The total canal is 113 km long with 40 km in Kazakhstan. Its capacity is 260 m3/s at the canal headworks and that at Kazakh territory is 130 m3/s. The water quality of this canal is the same as that of Syr Daria River. The water salinity is 0.6- 1.5 g/l (annual average 1.17 g/l) and it is polluted with pesticide and herbicide.

The estimated flow of Golodnaya Steppe Collector will be increased from 24 m3/sec at its head to 149 m3/sec at its discharge after the reconstruction.
The Kirovsky Main Canal and K-!!, K-13, K-15 and K-17 canals are operated by Exploitation service of Ministry of Water Resources. There are water level recorder on the head work canals K-11, K-13, K-15 and K-17. The down stream of Syr Daria River Water is distributed according to an international agreement.

The Mahtaaral I&D system off-takes from Dostyk canal, which originates also at Farhad Dam in Uzbekistan.

If mitigation and monitoring plan are not strictly implemented, the IDIP-II program could affect the Syr Daria River which are International Waterways in accordance OP. 7.50, para 1a and b. However, a notification for the activities under the project is not required for the following reasons:

(a)the proposed works are limited to the rehabilitation of existing schemes. The sub project would not expand irrigation to new areas or alter the nature of the original schemes. The areas that would be rehabilitated are relatively small. ; the average area with on farm works is about 2000 ha.
(b) Because of the smaller size of the individual sub-projects, their implementation is not expected to adversely change the quality or quantity of water flows to the other riparian. The improvement in irrigation would have positive environmental impact by reducing water losses through improved conveyance and flow control. New drainage construction is very limited so that increases in drainage discharges will be very small as compared to the water flows in the receiving water bodies.
(c) There is no indication that any ongoing or planned projects in the riparian countries could adversely affect the sub-projects.
(d) A review of existing international agreements and arrangements between Kazakhstan and riparian countries has shown that none of these legal instrument would require notification for IDIP-II activities to be carried out by the project.

7.3.5.2 Kzyl-Orda Oblast

The Syr Darya River flows a length of 1650 km from the Chardara reservoir to Aral Sea. For 920 km till Kyzyl-Orda town , the river bed is well confined in both banks and the irrigation area is developed mainly in the left side of the river. Downstream Kyzyl-Orda till Zhusali (220 km), river becomes very flat on both sides and the Syr Darya branches into Karaozek (right side). From Zhusali till Aklak (400 km) , the river has narrowed. The Syr Darya River width varies from 150 to 200 m and depth from 2 to 5 m . The flow speed is 0.8 m / sec and high water lasts from 6 to 7 months (September to March). The river freezes in December and is open in February –March. Along the Syr Darya River, mainly downstream of Kyzyl-Orda , during very low temperature in winter months, there are ice formation obstructing the hydraulic structure and limiting the discharge capacity of the river.

The river bifurcates into two channels, namely the Syr Darya and Karaozek Rivers about 35 km downstream of Kyzyl-Orda and rejoin about 190 km downstream of the bifurcation. Only two tributaries join the Syr Darya River from the right side, the Keles River just before the Chardara reservoir and the Iris River, some 250 km downstream of Shardara. The contribution of these river water to Syr Darya is very little, since their flows are mostly diverted for irrigation along their upstream reaches.

7.3.5.3 Zhambul Oblast

The PMK system originates from an old dam “Tasotkel””, built on Shu River. The total irrigated land is 33,190 hectares, of which sub project area is 5,172 ha. The Capacity of the canal is about 8-9 m3/sec.
The area lies in the flood plain of two rivers Shu and Syr Su, and starts at foothill of elevation of 500 m extending along the right bank of Shu Riverin, a relatively flat terrain to an elevation of 420 m.

The Akasi and Kokasi originate from from the mountain region of “ZHULEV” and head works built on streams of Akasi and Kokasi. The discharge of Akasi canal is 2.0 m3/sec and Kokasi canal is 3.0 m3 / sec.
Kapal I&D system originates from Talas River at head work with capacity of 6.0 m3 / sec.
Utemis Canal from Levoberesesniy obvodnoi main canal , which off takes from Talas River.

7.3.5.4 Almaty Oblast
Malai –Sarinsky System is in the lower reach of Ili River. The system consist of a pump station taking water from the river Ili.
Karatal I&D system: is located at the right bank of River Karatal in its middle reach.
Big Almaty Canal-
Akdala-

7.4.3 Soil & Salinity Control Issue

It is a misconception that soil salinity is a major constraint to agricultural production in Kazakhstan. Other factors like restricted root growth due to poor drainage, perched ground water tables and low irrigation efficiencies are seemingly more important for low yields.

It is a common practice to measure salinity by measuring by total dissolved salts (TDS) or the percentage of soluble salts(PSS). These measurement is not a good index of salinity as they measure (TDS& PSS) all gypsum ($CaSo^4$) dissolved in soil water .

Gypsum is the dominant salt in the soil & water over most of Aral Sea basin but it has no adverse effect on crops unless it is present in very high levels (>25% of soil by weight) or gypsum is presented in cemented or indurate layers. Localized secondary salinity by magnesium sulfate (Mg So4), sodium sulfate (Na2So4) and sodium chloride (NaCl) is much more serious than where gypsum is the dominant salt.

In Kazakhstan and IDIP project areas, most soil salinity is secondary. It occurs under number of circumstances but most commonly associated with poorly –managed irrigation schemes. There are three principal reasons:

- Water leakage from supply canals;
- Excessive applications of water, and ;
- Poor drainage.

Most salinity problems in the field are the direct result of poor management of water. Generally, about 20% of the water abstracted from the irrigation canal is required to satisfy the crop requirement , about 15% is wasted or lost in the main canal, and abut 65% is wasted on farm , and discharged to groundwater and adding pressure on an inadequate and dysfunctional drainage system (World Bank , Dec 2000).

Places, where salinity is a problem, plant growth is directly impaired by salinization through its effect on osmotic pressure and by direct toxicity. There are two distinct mechanism for crop damage by salinity :

- Induced physiological drought by osmosis
- Specific toxicity by Sodium (Na+) and Chloride (Cl)

7.4.3.1 Need for Leaching

Leaching makes soil salinity a continuous and unending process. If we leach a soil by 2-4 ML/ha, and if all the water percolates, then 0.2- 0.4 m of water is discharged into the ground water raising it by 0.9 -1.8 m (assuming a steady state with no lateral drainage). Leaching does not resolve the salinity and high ground water problem, leaching only sustains secondary salinization and high ground water tables. The key to managing saline soils is to control the flow of water into the crop rooting zone, and reduce on-farm water losses.

7.4.3.2 Soil Salinity Control and Improved Water Management

Salinity control will depend on proper land preparation (leveling, deep ripping) and improved irrigation scheduling and water management procedures.
Deep ripping will improve soil drainage, by breaking up the compacted subsoil and plough pans , and by removing any perched water table, it will increase both the rooting depth of the crops as well as drawing back the water table.
Improved irrigation scheduling and water management procedures will reduce the amount of water being added to the crop at any one time , reducing water losses into the drainage system and associated risk of rising water tables (both real or temporary).
Salinity damage often occurs just before irrigation by forming salt crust on soil surface. The longer the interval between irrigations, there will be more salinity problems. Presently, many summer crops receive only an average of 3 irrigation at intervals of about 1 month. This interval is too long.
In areas of moderate salinity, keeping the soil moist by increasing the number of summer irrigation could reduce any salinity effects. The total amount of water required in one cropping season may not increase, but should be reduced as a result of improved water efficiencies.

7.4.3.3 Soil modification and improved drainage

As a result of infrastructure improvement, agricultural practice will also intensify. The nature and extent of change will be influenced by dominant agricultural practices. The changes in agricultural practices may result in formation of hardpan below the topsoil, reduced nutrient status and impaired structure if organic matter content is not maintained. The hardpan condition below can be avoided by proper plowing practices. By promoting soil & water conservation, proper land use and agriculture extension the above mentioned soil condition can be avoided.
The introduction of more organic based farming, soil & water management, minimum and /or zero tillage that are planned for model farms, may be practiced for other project areas.

The IDIP-II project will address all these issues of improved irrigated agriculture and their impact on soil and water conservation. The benefit of crop rotation, integrated pest management and sustainable agriculture development will also be developed for the project.

The services of agricultural extension together with improved seeds that are planned for model farms will also be utilized for other project areas. Through a comprehensive farmer training program and with the help of Agriculture Dept. extension program, all these good agricultural practices will be replicated to other project areas.

7.4.3.3 Soil and Water contamination by harsh agro-chemicals

While the use of agrochemicals has been decreasing and there has been a an increased emphasis on the use of biological pest control, the intensification of agriculture may result in increased use of agrochemicals including chemical fertilizer, herbicide and pesticides. This may result in soil and water contamination. Currently the use of agrochemicals is far less then the level applied in high productive agriculture systems. The future application need to be carefully monitored and should follow agriculture system that advocates agricultural extension that follows:

(i) optimum fertilizer- balanced dose of mineral fertilizer in combination with organic manure, mulching and green manuring.
(ii) Promotion of the concept of integrated pest management (IPM). Looking at the possibility of environmentally friendly and cost effective pest management techniques.
(iii) Strong discouragement of the use of persistent pesticide , and
(iv) Application of internationally recognized agricultural practices, eg minimum or zero tillage system and IPM, crop rotation and sustainable land use planning that can me applied to Kazakhstan irrigated agriculture.

7.4.3.5 Water Resources Conflicts

There is no potential for water resources conflicts as all water is controlled by Government of Kazakhstan (GOK).

7.4.3.6 Biodiversity

After some 30 to 50+ of irrigated agriculture in the Project areas, native (indigenous) flora and fauna are still in abundance. Herewith , list of flora and fauna are given below for IDIP-II projects . They are taken from the " Atlas of SSR , Kazakhstan, and are found as indigenous to the project areas. No species on this list are registered as endangered species or "Species Survival commission's (SSC) Red List" , and therefore not recognized as extinct or endangered. The current flora and fauna seem to have adopted to the irrigated IDIP-II agricultural environment.

With any proposed changes in irrigation and agricultural interventions, biodiversity (flora and fauna) may be affected by a possible increased use of agro-chemicals and the introduction of high yielding varieties (HYV) at the expanse of traditional low yielding varieties. The substantial increase in agriculture cropping intensity are not expected in the near future but there will be changes in agricultural cropping patterns (land use planning and crop rotations) which will be planned as being advantageous to environment and the soil improvement (Integrated pest management –IPM, minimum and /or zero tillage). All these new ideas will have a beneficial impact on agriculture, environment and the flora –fauna which use the agricultural area / cultivated area as their habitat.

There will be impact of the changes in agricultural practices through the project interventions. This can be mitigated by the following steps:

- Raising of awareness through the agricultural extension component and through training and support to WUAs and farmers of the importance of maintaining diversity of farming practices and local landscape;
- Under the agricultural extension component promote the maintenance of variety of production of both cash and subsistence crops;
- Also under the agricultural extension component promote the use of indigenous multipurpose trees for soil protection , watershed management and cash crop production; and stated earlier
- The "Agricultural best management Practices" in planning (mulching, crop rotations, crop diversification , adding green manure , organic manure, minimum and /or zero tillage and Integrated Pest Management -IPM).

8. Environmental Management and Training

A long term Environmental Management Program is necessary for the sustainable development of Irrigation and Drainage Improvement Project (IDIP), Phase-2. The purpose of the Environmental Management is to ensure that the project has no future significant negative environmental problems.

A special training plan will be conducted by the project team through the project design, construction and operation phases. Training and workshops are planned for the project participants at beneficiary , rayon and oblasts level.
Training and practical education will take place in design, construction , post –construction and operation phases. These mainly include the following:

- Project concept, components and impacts;
- Environmental issues, hazards, impacts and responsibilities;
- Awareness raising through the agricultural extension component;
- Promoting under agricultural extension component the maintenance of variety of production of both cash and subsistence crops;

- Under the agricultural extension component the use of indigenous multi purpose trees for soil protection(field boundaries). Watershed management and cash crop production (fruit trees) ;
- Agricultural Best Management Practices(crop rotation, crop diversification , minimum and / or zero tillage mulching);
- Obtain samples and data currently collected within the project areas;
- Collect and process additional samples and data needed to ensure that the unit operates a comprehensive data analysis and information reporting system;
- Provide farm managers and farm families with the information generated by the data analysis and reporting system;
- Organization and strengthening of beneficiary and village committees.

Personnel Training.

First environmental programs were introduced into Kazakhstan University curricula in 1994. Environmental planning is to be integrated into project development on all levels , so it will be necessary to train specialists for environmental management programs. A short courses should be presented for MOEB and MOA staff to train them in the preparation of environmental assessments and in subsequent environmental management and monitoring. For monitoring of samples, technicians should be properly trained for surface water ,ground water , plant and other sample required for monitoring .

9. Monitoring Plan

The EMP model is built on the structure that management depends on measurement . Without measurement , management has nothing to depend on which has to base its decisions. The EMP will have two components:

- Within the PMO which will support the monitoring program and
- Within the MOEB which will monitor surface and ground water and soil quality.

The PMO will be responsible for monitoring the performance all project activities. This will be done through a coordinated program that starts with a baseline survey and then continues through the life of the project. The project Monitoring Plan is presented in Table 15 and placed at the end of this report.

9.1 Institutional Requirement for Environmental Monitoring Program

The current project institutional framework is not capable of supporting the IDIP-II project monitoring work. The reader is requested to go through the description of “Institutional and Legal Frame work of the Kazakhstan for Irrigation and Drainage Improvement Project” , Staff Appraisal Report, The World Bank, May 23,1996. They are considered as legal and institutional requirement for carrying out the IDIP-II project monitoring.

In order to establish a proper mechanism for environmental management and monitoring, a well structured institutional arrangement needs to be identified. The principal stakeholder for environmental management will include CWR, PMO, performance and environmental monitoring unit, environmental management specialist, oblast office of the CWR, rayon environmental inspector , Contractors, and World Bank review / supervision mission.. The division of work and suggested responsibility will be as follows:

- PMO (CWR) : The Project Management Office will be performing the following work-
    1. Establish performance and project environmental monitoring unit (PEMU).
    2. Support PEMU to develop environmental monitoring action plan.
    3. Coordinate with CWR and solve the key environmental problems occurred in the project implementation.
    4. Report environmental implementation measures into project progress report and submit to World Bank for review.

- PEMU : The performance of Project Environmental Monitoring Unit (PEMU) within the PMO will be following:
    1. Include environmental design/measures into construction contractor contact.
    2. Recruit and coordinate Environmental Management Specialist (EMS).
    3. Hire and coordinate rayon office laboratories to analyze and soil samples.
    4. Organize and implement the environmental management training.
    5. Organize spoil and garbage disposal facilities.
    6. Review report of EMS and environmental monitoring.
    7. Produce semi-annual report, note, summarizing environmental progress of the sub-project and submit it to the World Bank (WB)for review.

- EMS: Environmental Management Specialist will be contracted by the PMO. The EMS He will help in site supervision of environmental implementation measures in construction area, workers camp, and training WUA members and coordinating rayon environmental inspectors (ANNEX T- TOR of EMS)

- Rayon Office Laboratory (ROL): Field office will be set up to periodically monitor key environmental parameter with the PEMU. The report from ROL /CWR will have-
    1. Assessment on the changes in salinity, changes in water use and changes in soil productivity. This may include baseline survey and subsequent periodic survey.
    2. Report on the extent and severity of the environmental impacts against the predicted impacts.
    3. Assessment on the on the overall effectiveness of the project environmental mitigation measures.

- Contractor: Check implementation for both construction engineering and environmental mitigation measures in construction. The specified mitigation measures should be highlighted in the contractors contract.

- MOEB : It is the Environmental administrative authority for the Government of Kazakhstan and it will monitor , supervise and manage environmental issues occurred in the project , including review / approval of EA and supervise / monitor environmental matters during constructions and operations.

9.2 Environmental Monitoring Plan

The objective of water and soil quality monitoring program is to ensure that project activities have a beneficial effect on these two basic natural resources. The EMP was developed in collaboration with the CWR and with WUA representatives and takes into account input from farmers made during the public consultations. This is presented in Table 15.

Monitoring is necessary with respect to (i) water resources quality and quantity ; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance management, including inspection and proper repair of river banks, structures, canals and drains.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources(CWR) , MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate to evaluate the success or failure of IDIP-II proposed project intervention in the South Kazakhstan , Kyzyl-Orda, Zhambul and Almaty Oblasts.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information . Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project , the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as:

1. Soil salinity and high ground water tables;
2. Water salinity and bio-diversity.

The variables to be analyzed are described in Table 19. It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15.0..and for one water samples is about USD 10.0. Most of the project farmers interviewed that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient. Such sampling density for 220,000 ha over 7 year life of the project would be extremely expensive. We propose to do it for 2 years period.

The other alternative is to sample the pilot area (6,907 ha in Makhtaaral area) fully and for other project areas , sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project. During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M , it will be easier for them to take this additional responsibility . This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that US$.1,284,992 (2006 prices). will be required to implement and maintain the Environmental Management and Monitoring Plan (EM & MP). However, this figure were based on Hazra Engineering Company 1996 EIA report. Overall 4.25 % increase in inflation is made on the US$ 847,500to reflect the reality (Table 16). This includes cost of inflation during the 10 years period and comes to about US$ 1,284,992 for IDIP-II total monitoring cost for 2006. There are three categories of inputs to the EMP. They are as follows:

1. Planning and Surveys and consultant assistance US$ 231.3(17.86%)
2. Mitigation & Monitoring US$912.3(71.14%)
3. Equipment & Training US$ 141.3 (10.99 %)

This is detailed in Table 16 and adapted from Potential Environmental Impacts in Table 15. This lists Potential Environmental Impacts, Possible Mitigation, Responsible Agencies and Funding for EMP input. It is estimated to cost is about $ 5.84 per hectares (Table 16).

Table 16: Estimated Budget for Environmental Management Plan (EMP IDIP-II)
(For 220,000 ha , cost is $5.84 /ha based on total 2006 prices of $1,284,992)

Item	Qty	Unit Cost	Total Cost US$	Total Cost '000 tenge
Capital Cost-Equipments for Rayons				
GPS units (Hand held), Computer download	80	250	20,000	2,440
Electrical Conductivity Meters (11 sub regions)	80	250	20,000	2,440
Capital Cost- Equipment for WUA				
GPS units (Hand held), Computer download	80	250	20,000	2,440
Electrical Conductivity Meters (11 sub regions)	80	250	20,000	2,440
Total at 1996 prices			**80,000**	**9,760**
Total at 2006 prices			**121,297**	**14,798**
Recurrent Costs				
Support to PMO for baseline survey	Lump sum	20,000	20,000	2,440
Support to PMO for M&E activities over 2 years	Lump sum	110,000	110,000	13,420
Analysis for soil and water samples for 2 years by CWR &MOG	2	247,750	495,500	60,451
Support for reforestation & biodiversity by CF			222,000	27,084
Total at 1996 prices			**847,500**	**103,395**
Total at 2006 prices			**1,284,992**	**156,769**
		One dollar	**122**	**Tenge**
Year	Index			
1996	100.00	Inflation	4.25%	
1997	104.25			
1998	108.68			
1999	113.30			
2000	118.11			
2001	123.13			
2002	128.37			
2003	133.82			
2004	139.51			
2005	145.44			
2006	151.62			

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out. The suggested report systems for environmental monitoring programs are made on the following consideration:

1. Monthly report from the Contractor

    Contractors should regularly monitor the environmental –related issues and Environmental parameters based on the guidance from Environmental Management Specialist and requirements from Ryon Inspector. They should provide a monthly Report covering performance of environmental monitoring and progress of environmental related activities.

2. Monthly Environmental Management Report

    The requirement of Environmental Management Specialist is to produce a monthly performance report of environmental monitoring , summarizing the environmental monitoring of sub-projects and other related environmental problems.

3. Environmental Monitoring Report

    The Rayon office laboratories of IDIP-II need to submit PMO thematic monitoring report on the changes in salinity, changes in water use, changes in soil productivity, including baseline soil surveys and subsequent periodic surveys, as well as proposed suggestions for actions to solve key environmental problems if any (semi-annual monitoring and annual monitoring report).

4. Semi-Annual PMO Report

    Every half year, PMO needs to compile a quarterly environmental working report, summarizing the progress of EMP implementation , and monitoring status. The report from IDIP-II project and the Environmental Management Specialist should be attached to PMO report. This report may be integrated into “The Progress Report” and sent to WB for review. The copies may be sent to Oblast Office for reference.

10. Inter-Agency and Public / NGO Involvement

The International Environmental Specialist consulted with all Government of Kazakhstan's departments and agencies responsible for environmental assessment and management, environmental monitoring, and other agencies involved in the collection and measurement of surface and ground water quality, flora and fauna, soil and land ,agriculture and climate. The Departments and Agencies consulted are: the State University of South Kazakhstan and the Department of Ecology and Biological Resources in Shymkent, the Oblast office of the Ministry of Ecology and Biological Resources-The Department of Environmental Protection, Ministry of Agriculture at Oblast and Rayon levels, the Department and Section of Committee of Water Resources(CWR)

The training program on environmental awareness campaign, WUA involvement in soil and water monitoring and reforestation along main , secondary and tertiary canals, community composting and bio-gas program in the environmental management program (EMP) are oriented towards solving farmers problem . Such training is not currently provided by traditional education system. Therefore special training are planned by IDIP-II under PIU (Project Implementation Unit) to train individual farmers with WUA to monitor soil and water salinity , community composting and reforestation on canals and vertical drainage sites. They will either be handled by Rural Consumer Cooperatives (RCC) or farmers level under WUA.

To implement this program (EMP), the PIU will be assisted by International and local training specialist . Table 16 will give a breakdown of the expected cost that will be required in monitoring.

In ANNEX –P there are about 53 Public interviews from Makhtaaral, Kyzylkum, Arys-Turkestan , Kyzyl-Orda and Zhambul Oblasts. The farmers and residents of these areas were asked to complete a prepared questionnaire. This response will record their views and comments on the IDIP-II project. They are presented to to explain the opinion of the farmers to CWR, MOEB, MOA and the World Bank. This will help them to define and formulate policy for the future about the project.

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Table: 14 IDIP-II Project , Potential Impacts, Possible Mitigation, Responsibility and Cost for EMP Input.

Potential Effect	Mitigation Measures	Agencies Responsible for Planning and Monitoring	Funding (US$) Per EMP Input
1. Environmental Impacts Related to Project Design			
1. Effects of downstream water use	Mapping water resources availability and taking soil and water samples. Monitoring of impact at Shardara Reservoir and Arnasai Swamp. Training and support to WUA in Coordination of Water Use & practices. Treatment of drainage water before discharge to Syr-Daria or Shardara Reservoir.	PMO / CWR/Dept. of Hydro-geology / MOEB	
2. Restriction on movement of peoples and animals.	Provision of adequate bridges and culvert crossing in the design.	PMO / CWR	
3. Soil salinization and changes in water table levels.	Appropriate vertical / horizontal drain design measures	PMO / CWR/ MOEB	
4. Bio-drainage & salinity control	Organic matter in soil are poor. To increase the organic matter domestic and communal composting should organized/ designed.	PMO / CWR / MOEB	
2. Environmental Impacts Related to Construction			
1. Temporary increase in silt	Provision of standard contract documentation for adequate supervision of operation and adherence to them by contractors. Confining the operation to dry season, use of silt traps , careful deposition of spoils.	PMO / CWR / MOEB	

2. Temporary closure of irrigation system	Participation of WUA and farmers, information to them through.h dialogue and community awareness, permission to proceed.	PMO / CWR	
3. Disposal of excavated soil (spoil) from main and other inter farm drains	Spoil will be deposited alongside the drain in accordance with the guidelines laid down by GOK/ CWR with respect to easement dimension- either side of the drain and /or canal.	PMO /CWR	
4. Disposal of excavated soil (spoil) from on farm drains and canals.	Spoil will be deposited alongside the canal and drains in accordance with the traffic easements and with WUA & farmers instructions. Minor leveling on farm field but major leveling at the cost to farmers.	PMO / CWR	
5. Dust Generation	Appropriate time of operation wetting of surfaces and notice to involvement of public –workers on construction sites to have available to them (by contractor) the internationally recognized health and safety equipment for their use.	PMO / CWR	
6. Noise generation	Appropriate timing of operation and notice to/ involvement of public .	PMO /CWR	
7. Waste Material	Replacement and repair of the irrigation and drainage structures will result in waste material (concrete & steel). These are to be disposed of by the Civil Works Contractor as per CWR/ MOEB guidelines.	PMO / CWR	
8. Land Use conflict for construction	CWR/ GOK assurance that there will be conflict. Guaranteed access by the client (CWR). On farm negotiation with WUA and Landowner. Civil works only with participation agreement of land owners and WUA. PMO-CWR responsibility for dispute settlement.	PMO / CWR	
9. Establishment of construction camp sites and living facilities in an acceptable sanitary and sustainable manner as well as clean up to original standard.	CWR agrees for site allocation-free of charge. Negotiation with client , local authorities and project – funding to be provided by the contractor as a part of “Terms of Contract”. Establishment cost and clean up of site to the as received condition. Agreement with MOEB for environmental standard on sewage, water, soil, waste product and garbage condition.	PMO / CWR	
10. Establishment of tree lines on vertical drains, horizontal drains, pump locations, main on farm &	Organize nursery and chose indigenous plant for the purpose. Species and kind of spacing should be decided by the extension agent. WUA and farmers should participate in the selection and planting of trees. Input of fertilizer package and	PMO /CWR	

off farm canals .	seedling should be provided free of charge by the project.		
3. Environmental Impacts Related to Operation			
1. Soil modification as a result of intensified agriculture.	Continued use of traditional water management and use of deep rooting grasses and shrubs , incorporating green manure / organic manure into soil from composting., minimum/ zero tillage practices.	PMO / CWR	
2. Soil & water contamination due to increased use of agro-chemicals including fertilizer & pesticides.	Improved agricultural practices (IAP) & extension help on optimum and informed use of chemical fertilizer, promotion of Integrated Pest Management (IPM), discouragement on the use of residual pesticide and training on green manure, composting, zero/minimum tillage should be practiced.	PMO /CWR	
3. Biodiversity concerns associated with reforestation & introduction of new plant species and varieties. The reduced diversity from monoculture. There will be land use from tree to agriculture.	Awareness raising to environmental sustainability & biodiversity issues and promotion in diversified farming and promoting planting of indigenous multipurpose trees.	PMO / CWR/ CF	

Table 15 : Irrigation and Drainage Improvement Project Monitoring Plan
Total 220,000 ha (Mahtaaral 75,000+ Kyzylkum 90,000+Turkestan 30,000+ Kyzyl-Orda + Zhambul + Almaty)
CALCULATION IS DONE FOR IDIP-II Project (220,000 Ha. about $5.86 / ha.)

Parameters to be Monitored	**Periodicity**	**Number of Samples**				Cost **of 1 analysis in $US**	**Total Cost in $US**
		Total Number of Samples	**Number of Indicators**	**Sum of Determination**	**Total/ yr**		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 2,200	3	6,600	6,600	15	99,000 **198,000**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 2,933	5	14,667	14,667	10	146,667 **293,333**
4. Water Quality							
4.a Ground Water Quality							
4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 2,200	1	2,200	2,200	10	22,000 **44,000**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 2,200	15	2,200	2,200	20	33,000 **66,000**
4.a.c Fertilizer	Annually	(1sample /1000 ha) 220	1	220	220	15	3,300 **6,600**
5.Pesticide residues in fish & fodder crops	Annually	13	20	260	260	20	5,200 **10,400**

6.Reforestation , composting and Tree Belts(Bio-drainage & Salinity Control)	Annually	1 $ Per /ha 220,000 ha		$220,000.0	$220,000.0	$1 Per Ha	**$220,000.0 (including yearly Maintenance)**
7. Equipments for Rayons &WUAs	Annually 100 hand held GPS units, computer download, 100 Electrical Conductivity meters				50,000 US$ 1 unit (GPS & Electrical Conductivity meters $250.0 X200	$250.0 for one unit	**$50,000** (one time purchase)
						Grand Total	**$877,933**

Source: Adapted from “The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1999.”

TABLE: 17 Fauna of IDIP-II (including Rare and Endangered Species)

<table>
<tr><th rowspan="2">Kind</th><th>The South Kazakhstan</th><th>Kzyl-Orda</th><th>Dzhambyl</th><th>Almaty</th></tr>
<tr><th colspan="4">1 Catch</th></tr>
<tr><td>1.Mammal</td>
<td>Gnawing animals
Common Vole Microtus arvalis Rall
House mouse Mus Musculus
Common field mouse Apodemus sylvaticus
Musk beaver Ondatra zibethica
Carnivore
Wolf Canis Lupus
Fox Vulpes Vulpes
Jackal Canis Aurerus
Russian polecat Mustela eversmanni
Badger Meles meles
Cloven-footed
Wild boar Sus scrofa
Tugai deer Cervidaeelapus bactianus Libbekker
(endangered species, included into The Red Book)</td>
<td>Gnawing animals
Common Vole Microtus arvalis Rall
House mouse Mus Musculus
Common field mouse Apodemus sylvaticus
Musk beaver Ondatra zibethica
Carnivore
Wolf Canis Lupus
Fox Vulpes Vulpes
Jackal Canis Aurerus
Russian [steppe] polecat Mustela eversmanni
Badger Meles meles
Jungle cat Felis chaus
Cloven-footed
Wild boar Sus scrofa
Tugai deer Cervidaeelapus bactianus Libbekker
(endangered species, included into The Red Book)</td>
<td>Gnawing animals
Common Vole Microtus arvalis Rall
House mouse Mus Musculus
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Carnivore
Wolf Canis Lupus
Fox Vulpes Vulpes
Jackal Canis Aurerus
Russian [steppe] polecat Mustela eversmanni
Badger Meles meles
Cloven-footed
Wild boar Sus scrofa</td>
<td>Gnawing animals
Common Vole Microtus arvalis Rall
House mouse Mus Musculus
Common field mouse Apodemus sylvaticus
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Carnivore
Wolf Canis Lupus
Fox Vulpes Vulpes
Jackal Canis Aurerus
Russian [steppe] polecat Mustela eversmanni
Badger Meles meles
Cloven-footed
Wild boar Sus scrofa</td></tr>
</table>

2. Birds	**154 species of nesters, the following ones occur in nature more frequently:** ***Columbus cristutus*** Heron *Ergetta ichba* Gray goose *Anser* Gadwall *Anas strepera* Dotterel *Charadrius* Pewit *Vanellus* Oyster catcher *Haematopus Ostralegus* Gallinule *Gallinula chloropus* Partridge *Lagopus Perdix* Pheasant *Phasianus colchicus* Kestrel *Falco tinnunculus* ***Tarrock Chilidonias*** Swift *Apus* Swallow *Riparia* Black kite *Milvus korchun* Long-eared owl *Asio otus* Cuckoo *Cuculus canorus* Beambird *Muscicapa striata Pall* Nightingale *Luscinia* ***Acrocephalus*** Oriole *Oriolus* ***Leucosticte*** **The following are Included into the Kazakhstan Red Book:** Little heron *Egretta garzetta* Glossy ibis *Plegadis falcinellus* White stork *Ciconia* Black stork *Ciconia nigra* Spoonbill *Platalea* Whooper swan *Cygnus* Stifftail *Oxyura Leucocephala Scop* Saker falcon *Falco cherrug Gray* (endangered species) Steppe eagle *Aquila nipalensis* Serpent eagle *Circaetus ferox* Eagle owl *Bubo* (rare species)	**98 species of nesters, the following ones occur in nature more frequently:** ***Columbus cristutus*** Heron *Ergetta ichba* Swan *Cygnus olor* Shelduck *Tadorna* Shoveler *Anas clypeata* Mallard duck *Anas platyrhynchus* Gadwall *Anas strepera* Dotterel *Charadrius* Pewit *Vanellus* Pied avocet *Recurvirostra avosetta* Common coot *Fulica atra* Gallinule *Gallinula chloropus* Rail *Rallus* ***Tarrock Chilidonias*** Swallow *Riparia* Marsh harrier *Circus aeruginosus* Black kite *Milvus migrans* Herring gull *Larus Argentatus Cachinnas* ***Gull Larus ribidundus*** **The following are Included into the Kazakhstan Red Book:** Little heron *Egretta garzetta* Spoonbill *Platalea* Marbled duck *Anas Angustirostris Menetr* Stifftail *Oxyura Leucocephala Scop* Saker falcon *Falco cherrug Gray* (endangered species) Golden eagle *Aquila chrysaetus* Imperial eagle *Aquila heliaca* Great black-headed gull *Larus ichthyaetus Pall*(rare species) Eagle owl *Bubo (rare species)*	**138 species of nesters, the following ones occur in nature more frequently:** ***Columbus cristutus*** Heron *Ergetta ichba* Bittern *Botaurus stellaris* Dotterel *Charadrius* Pewit *Vanellus* Oyster [pied oyster] catcher *Haematopus ostralegus* ***Gallinule Gallinula*** Rail *Rallus* Kestrel *Falco tinnunculus* ***Tarrock Chilidonias*** Swift *Apus* Swallow *Riparia* Black kite *Milvus migrans* Long-eared owl *Asio otus* Cuckoo *Cuculus canorus* ***Erithacus rubecula*** Indian chiff-chaff *Phylloscopus* Olivaceous warbler *Hippolais pallida* ***Leucosticte*** **The following are Included into the Kazakhstan Red Book:** Glossy ibis *Plegadis falcinellus* White stork *Ciconia* Black stork *Ciconia nigra* Whooper swan *Cygnus* Stifftail *Oxyura Leucocephala Scop* Saker falcon *Falco cherrug Gray* (endangered species) Steppe eagle *Aquila nipalensis Hodgs* Serpent eagle *Circaetus ferox* Eagle owl *Bubo* (rare species)	**135species of nesters, the following ones occur in nature more frequently:** ***Columbus cristutus*** Heron *Ergetta ichba* Bittern *Botaurus stellaris* Dotterel *Charadrius* Pewit *Vanellus* Oyster [pied oyster] catcher *Haematopus ostralegus* ***Gallinule Gallinula*** Rail *Rallus* Kestrel *Falco tinnunculus* ***Tarrock Chilidonias*** Swift *Apus* Swallow *Riparia* Black kite *Milvus migrans* Long-eared owl *Asio otus* Cuckoo *Cuculus canorus* ***Erithacus rubecula*** Indian chiff-chaff *Phylloscopus* Olivaceous warbler *Hippolais pallida* ***Leucosticte*** **The following are Included into the Kazakhstan Red Book:**

1.Mammal					Glossy ibis *Plegadis falcinellus* White stork *Ciconia* Black stork *Ciconia nigra* Whooper swan *Cygnus* Stifftail *Oxyura Leucocephala Scop* Saker falcon *Falco errug* *Gray* (endangered species) Steppe eagle *Aquila nipalensis Hodgs* Serpent eagle *Circaetus ferox* Eagle owl *Bubo* (rare species)
3.Reptile	**Amphibian** Lake frog *Rana terrestris* **Vermigrade** Desert lacerta *Eremias* Wood snake *Coluber* ***Taphometofon lineoaltum Brandt***	**Amphibian** Lake frog *Rana terrestris* **Vermigrade** Desert lacerta *Eremias* Wood snake *Coluber* ***Taphometofon lineoaltum Brandt***	**Amphibian** Lake frog *Rana terrestris* **Vermigrade** Desert lacerta *Eremias* Wood snake *Coluber* ***Taphometofon lineoaltum Brandt***		**Amphibian** Lake frog *Rana terrestris* **Vermigrade** Desert lacerta *Eremias* Wood snake *Coluber* ***Taphometofon lineoaltum Brandt***
Species		**2.The inhabited territory**			
	Insect-eaters Long-eared hedgehog *Hemiechinus auritus Gmelin* **Rodents** Souslik *Citellus* Jerboa *Salpingotus* House mouse *Mus musculus* Hamster *Cricetus cricetus* Gnawer beetles *Rhombomys opimus Licht* Muskrat *Ondatra zibethica*	**Insect-eaters** Long-eared hedgehog *Hemiechinus auritus Gmelin* **Rodents** Souslik *Citellus* Jerboa *Salpingotus* House mouse *Mus musculus* Hamster *Cricetus cricetus* Gnawer beetles *Rhombomys opimus Licht* Muskrat *Ondatra zibethica*	**Insect-eaters** Long-eared hedgehog *Hemiechinus auritus Gmelin* **Rodents** Souslik *Citellus* Jerboa *Salpingotus* House mouse *Mus musculus*	**Insect-eaters** Long-eared hedgehog *Hemiechinus auritus Gmelin* **Rodents** Souslik *Citellus* Jerboa *Salpingotus* House mouse *Mus musculus* Hamster *Cricetus cricetus* Gnawer beetles *Rhombomys opimus Licht* Muskrat *Ondatra zibethica*	

2. Birds	Mole lemming *Ellobius talpinus* Vole *Microtus* **Carnivores** Wolf *Canis lupus* Fox *Vulpes vulpes* Corsac fox *Vulpes corsak* Weasel *Mustela nivalis* Russian polecat *Mustela eversmanni* Marbled polecat *Vormela Peregusna* (included into the red book) Badger *Meles* **Cloven-footed** Wild boar *Sus scrofa* Goitered gazelle *Gazella subgutturosa*(included into the red book)	Mole lemming *Ellobius talpinus* Vole *Microtus* **Carnivores** Wolf *Canis lupus* Fox *Vulpes vulpes* Corsac fox *Vulpes corsak* Weasel *Mustela nivalis* Russian polecat *Mustela eversmanni* Marbled polecat *Vormela Peregusna* (included into the red book) Badger *Meles* ***<u>Felis margarits Loche</u>*** **Cloven-footed** Wild boar *Sus scrofa* Goitered gazelle *Gazella subgutturosa*(included into the red book)	Hamster *Cricetus cricetus* Gnawer beetles *Rhombomys opimus Licht* Muskrat *Ondatra zibethica* Mole lemming *Ellobius talpinus* Vole *Microtus* **Carnivores** Wolf *Canis lupus* Fox *Vulpes vulpes* Corsac fox *Vulpes corsak* Weasel *Mustela nivalis* Russian polecat *Mustela eversmanni* Badger *Meles* **Cloven-footed** Wild boar *Sus scrofa* Goitered gazelle *Gazella subgutturosa*(included into the red book)	Mole lemming *Ellobius talpinus* Vole *Microtus* **Carnivores** Wolf *Canis lupus* Fox *Vulpes vulpes* Corsac fox *Vulpes corsak* Weasel *Mustela nivalis* Russian polecat *Mustela eversmanni* Badger *Meles* **Cloven-footed** Wild boar *Sus scrofa* Goitered gazelle *Gazella subgutturosa*(included into the red book)
	208 species of nesters, the following ones occur in nature more frequently: ***<u>Columbus cristatus</u>*** Heron *Ergetta ichba* Dotterel *Charadrius* Tturtledove *Streptopelia* Quail *Coturnix* Pheasant *Phasianus colchicus* ***<u>Chidonias</u>*** Rock-pigeon *Columba livia* Hoopoe *Upupa epops*	**118 species of nesters, the following ones occur in nature more frequently:** ***<u>Columbus cristatus</u>*** Heron *Ergetta ichba* Shelduck *Tadorna* Gadwall *Anas strepera* Pewit *Vanellus* Turtledove *Streptopelia* ***<u>Alectoris kakelik Falk</u>*** Pheasant *Phasianus colchicus* Lesser kestrel *Falco naumanni*	**105 species of nesters, the following ones occur in nature more frequently:** ***<u>Columbus cristatus</u>*** Heron *Ergetta ichba* Bittern *Botaurus stellaris* Shelduck	**105 species of nesters, the following ones occur in nature more frequently:** ***<u>Columbus cristatus</u>*** Heron *Ergetta ichba* Bittern *Botaurus stellaris* Shelduck *Tadorna* Shoveler *Anas clypeata* Gadwall *Anas strepera* Oyster catcher *Haematopus ostralegus* Pied avocet *Recurvirostra*

	Swift *Apus melba* Swallow *Riparia* Saxaul desert jay *Podoces panderi Fisch* Lark *Melanacorupha* Black kite *Milvus migrans* Long-eared owl *Asio otus* Nighthawk *Caprimulgus* Pipit *Anthus* Beambird *Muscicapa striata* Nightingale *Luscinia* ***Acrocephalus*** Chat *Oenanthe* Starling *Sturnus* Corbie *Corvus corax* Daw *Corvus monedula* Common magpie *Pica pica* Bunting *Emberiza* Warbler *Sylvia* ***Leucosticte*** Sparrow *Passer* **The following are Included into the Kazakhstan Red Book:** Little heron *Egretta garzetta* (rare species) Spoonbill *Platalea Leucordia* Glossy ibis *Plegadis falcinellus* White stork *Ciconia ciconia* Ciconia nigra *black stork* Whooper swan *Cygnus cygnus* Marbled duck *Anas angustirostris Menetr* White-headed duck *Oxyura leucocephala* Houbara *Otus undulate Jacquin* Sandgrouse *Pterocles orientalis* Pin-tailed sand grouse *Pterocles alchata* Pallas sand grouse *Syrrhaptes paradocux Pall* Saker falcon *Falco cherrug Gray* (rare species) Neophron *Neophron percnoperus*	***Chidonias*** Hoopoe *Upupa epops* Swallow *Riparia* Saxaul desert jay *Podoces panderi Fisch* Lark *Melanacorupha* Montagu's harrier *Circus pygargus* Long-legged buzzard *Buteo rufinus Cretzschm* Long-eared owl *Asio otus* Cuckoo *Cuculus canorus* Halcyon *Alcedo* Starling *Sturnus* Corbie *Corvus corax* ***Corvus ruficollis*** ***Corvus Corone*** Daw *Corvus monedula* Common magpie *Pica pica* Sparrow *Passer* **The following are Included into the Kazakhstan Red Book:** Little heron *Egretta garzetta* (rare species) Spoonbill *Platalea Leucordia* Glossy ibis *Plegadis falcinellus* Marbled duck *Anas angustirostris Menetr* White-headed duck *Oxyura leucocephala* Houbara *Otus undulate Jacquin* Sandgrouse *Pterocles orientalis* Pin-tailed sand grouse *Pterocles alchata* Pallas sand grouse *Syrrhaptes paradocux Pall* Saker falcon *Falco cherrug Gray* (rare species) Neophron *Neophron percnoperus* Imperial eagle *Aquila heliaca* Golden eagle *Aquila chrysaetos* Serpent eagle *Circaetus ferox* Eagle-owl *Bubo*(rare species)	*Tadorna* Shoveler *Anas clypeata* Gadwall *Anas strepera* Oyster catcher *Haematopus ostralegus* Pied avocet *Recurvirostra avosetta* Big fish duck *Mergus merganser* Common coot *Fulica atra* ***Columba Palumbus*** Pratincole *Glareola pratincola* ***Chidonias*** Rock-pigeon *Columba livia* Hoopoe *Upupa epops* Swallow *Riparia* Lark *Melanacorupha* Long-eared owl *Asio otus* Cuckoo *Cuculus canorus* Nighthawk *Caprimulgus* Pipit *Anthus* Blue-cheeked bee eater *Merops superciliosuspersicus Pall* Common chat *Oenanthe oenanthe*	*avosetta* Big fish duck *Mergus merganser* Common coot *Fulica atra* ***Columba Palumbus*** Pratincole *Glareola pratincola* ***Chidonias*** Rock-pigeon *Columba livia* Hoopoe *Upupa epops* Swallow *Riparia* Lark *Melanacorupha* Long-eared owl *Asio otus* Cuckoo *Cuculus canorus* Nighthawk *Caprimulgus* Pipit *Anthus* Blue-cheeked bee eater *Merops superciliosuspersicus Pall* Common chat *Oenanthe oenanthe* Starling *Sturnus vulgaris* My-lady's-belt Corbie *Corvus corax* Daw *Corvus monedula* Common magpie *Pica pica* Bunting *Emberiza* Sparrow *Passer* **The following are Included into the Kazakhstan Red Book:** White stork *Ciconia ciconia* Ciconia nigra *black stork* White-headed duck *Oxyura leucocephala* Houbara *Otus undulate Jacquin* Sandgrouse *Pterocles orientalis* Pallas sand grouse *Syrrhaptes paradocux Pall* Saker falcon *Falco cherrug Gray* (rare species) Golden eagle *Aquila chrysaetos* Steppe eagle *Aquila rapax Hodgs* Booted eagle *Hieraaetus pennatus* Pallas' sea eagle *Haliaeetus leucophrys* (rare species)

	Golden eagle *Aquila chrysaetos* Steppe eagle *Aquila rapax Hodgs* Serpent eagle *Circaetus ferox* Eagle-owl *Bubo*(rare species)		Starling *Sturnus vulgaris* My-lady's-belt Corbie *Corvus corax* Daw *Corvus monedula* Common magpie *Pica pica* Bunting *Emberiza* Sparrow *Passer* **The following are Included into the Kazakhstan Red Book:** White stork *Ciconia ciconia* Ciconia nigra *black stork* White-headed duck *Oxyura leucocephala* Houbara *Otus undulate Jacquin* Sandgrouse *Pterocles orientalis* Pallas sand grouse *Syrrhaptes paradocux Pall* Saker falcon *Falco cherrug Gray* (rare species) Golden eagle *Aquila chrysaetos* Steppe eagle *Aquila rapax Hodgs* Booted eagle	Little bustard *Otis tetrax* Great black-headed gull *Larus ichthyaetus* Serpent eagle *Circaetus ferox* Eagle-owl *Bubo*(rare species)

			Hieraaetus pennatus Pallas' sea eagle *Haliaeetus leucophrys* (rare species) Little bustard *Otis tetrax* Great black-headed gull *Larus ichthyaetus* Serpent eagle *Circaetus ferox* Eagle-owl *Bubo*(rare species)	
3. Reptiles	**Amphibian** Green toad *Bufo viridis* **Vermigrade** Glass-lizard *Pseudopus apodus* (endangered species included into the Red Book) Lizard *Lacertilia* ***Eryx*** ***Tahprometofon lineolatum Bradt*** Orsini's viper *Vipera ursine Bon* Mocassin *Agkistrodon Halis Pall*	**Amphibian** Green toad *Bufo viridis* **Vermigrade** Glass-lizard *Pseudopus apodus* (endangered species included into the Red Book) Lizard *Lacertilia* ***Eryx*** ***Tahprometofon lineolatum Bradt*** Orsini's viper *Vipera ursine Bon* Mocassin *Agkistrodon Halis Pall*	**Amphibian** Green toad *Bufo viridis* **Vermigrade** Lizard *Lacertilia* ***Eryx*** ***Tahprometofon lineolatum Bradt*** Orsini's viper *Vipera ursine Bon* Mocassin *Agkistrodon Halis Pall*	**Amphibian** Green toad *Bufo viridis* **Vermigrade** Lizard *Lacertilia* ***Eryx*** ***Tahprometofon lineolatum Bradt*** Orsini's viper *Vipera ursine Bon* Mocassin *Agkistrodon Halis Pal*

Sources: 1.A.F.Kovshal', V.A. Kovshal, Kazakhstan fauna.Almatykitap.2003
2. Aliev.K.A. Nature and Fauna of South-Kazakhstan oblast, Almaty, 2002
3. The Kazakhstan Red Book. The Vertebrates. Volume. Almaty, 1996
4. A.F.Kovshal', A.B. Bekenov. In the Rare Species Animals World, Almaty, Kainar, 1996
5. A.F.Kovshal', The Kazakhstan Birds' World. Almaty, 1983

Table 18: Flora for South Kazakhstan and other IDIP-II Area, including rare and endangered species

South Kazakhstan	Kyzyl-Orda	Dzhambyl	Almaty
1.Natural area (floodplains/not agricultural area)			
Common reed grass *Phragmites communis* Poplar *Populus* Willow *Salix* Sedge *Cares* Bulrush *Scirpus* Sallow thorn *Hippophae rhamnoides* Alhagi *Alhagi* French tamarisk *Tamarix ramosissima* Sea blite *Suaeda* Bean caper *Zygophyllum* Plantain *Plantago* <u>*Myricaria bracteata Royale*</u> **Included into the Red Book:** Asiatic poplar *Populus diversifolia Schrenk*	Common reed grass *Phragmites communis* Willow *Salix* Oleaster *Elaeagnus* French tamarisk *Tamarix ramosissima* Bulrush *Scirpus* Sea blite *Suaeda* Elm *Ulmus* Devil's-milk *Euphorbia* Sow thistle *Sonchus* Milfoil *Achillea* <u>*Bromopsis intermis Holub*</u> <u>*Myricaria bracteata Royale Agropurum cristatum*</u> **Included into the Red Book:** Asiatic poplar *Populus diversifolia Schrenk*	Common reed grass *Phragmites communis* Narrow-leaved cat's-tail *Typha angustifolia* Oleaster sharp-fruited *Elaeagnus oxycarpa* Poplar *Populus* Willow *Salix* French tamarisk *Tamarix ramosissima* <u>*Halimodendron halodendron*</u> <u>*Nitraria Schberi*</u> <u>*Myricaria bracteata Royale*</u> **Included into the Red Book:** Asiatic poplar *Populus diversifolia Schrenk*	Common reed grass *Phragmites communis* Bulrush *Scirpus* Codlin(g)*Malus sylvestris* Poplar *Populus* Willow *Salix* French tamarisk *Tamarix ramosissima* Sallow thorn *Hippophae rhamnoides* Barberry *Berberis* Long-leaved germander *Veronica longifolia* Asparagus short-leave *Asparagus brachyphyllus* Bluejoint *Calamagrostis* <u>*Myricaria bracteata Royale*</u> **Included into the Red Book:** Asiatic poplar *Populus diversifolia Schrenk*
2. Irrigated areas			
Fleabane *Artemisia* Saxaul *Haloxylon* <u>*Anabasis salsa*</u> Marsh-beet *Limonium*	Reed *Phragmites* Smartweed *Acroptilon* Sharp-fruited Oleaster *Elaeagnus oxycarpa*	Black saxaul *Haloxylon aphyllum* Corneous eurotia *Eurotia ceretoides*	Saxaul *Haloxylon* Fescue *Festura ovina* Eurotia *Eurotia* Glasswort *Salsola*

Licorice *Glycyrrhiza* Bulrush *Scirpus* Locoweed *Astragalus* Cypress prostrate *Kochia prostrate* Narrow-leaved sedge *Carex pachystylis* Giant fennel *Ferula assa-foetida* Prostrate Devil's-milk *Euphorbia canescens* *Ceratocarpus arenarius* *Calligonum* *Salsola abuscula Pall* *Achnatherum* *Cagea Olgae* *Agropurum cristatum* *Acanthophyllum* *Cousinia decurrens* *Halocharis hispida* *Artemisia maritime* **Included into the Red Book:** Incarvillea semiretschenskia *Incarvillea semiretschenskia* Rare endemic species Bryony melanocarpous *Bryonia melanocarpa Nabiev*	French tamarisk *Tamarix ramosissima* Fleabane *Artemisia* Bulrush *Scirpus* Meadowsweet *Spiraea* Locoweed *Astragalus* Pea shrub *Caragana* Narrow-leaved sedge *Carex pachystylis* Prostrate Devil's-milk *Euphorbia canescens* *Acanthophyllum* *Elymus* *Agropurum cristatum* *Calligonum* *Halimodendron* *Cousinia decurrens* *Halocharis hispida* *Artemisia maritime*	Glasswort *Salsola* Fleabane *Artemisia* Sea blite *Suaeda* Sedge *Carex* Marsh-beet *Limonium* Ural licorice *Glycyrrhiza uaralensis* Reed *Phragmites* Bulrush *Scirpus* Nasturtium *Nasturtium* *Halostachus caspica* *Anabasis salsa* *Salsola rigida* *Homocnemum strobilaceum* *Calligonum* *Agropurum cristatum* **Included into the Red Book:** Incarvillea semiretschenskia *Incarvillea semiretschenskia* Rare endemic species *Spiraeanthus screnkianus Maxim* reduced species	Sea blite *Suaeda* Fleabane *Artemisia* Meadowsweet *Spiraea* Stipa *Stipa* Fescue *Festuca* Devil's-milk *Euphorbia* Sea buckthorn *Hippophae rhamnoides* Bulrush *Scirpus* Pea shrub *Caragana* Sedge narrow-leaved *Carex pachystylis* Giant fennel *Ferula assa-foetida* Prostrate Devil's-milk *Euphorbia canescens* *Achnatherum* *Cousinia decurrens* *Halocharis hispida* **Included into the Red Book:** Incarvillea semiretschenskia *Incarvillea semiretschenskia* Rare endemic species

Rare species Aktau atipa *Stipa Aktauensis Roshev*			

Source: 1. Popov M.G. Kazakhstan cover. – M. USSR Academy of Sciences publishing house, 1990

2. Korovin E.P. Asia Mean and South Kazakhstan vegetation. Uzbek SSR Academy of Sciences. – Tashkent, 1962

3. Rare and endangered flora species in USSR need in conservation.
Edited by academician Tahtadzhiana A. L. – Leningrad, “Nauka”, 1981

4. The Red Book. The wild flora species in USSR need in conservation.
Edited by academician Tahtadzhiana A. L. Leningrad, 1975.

Table 19: Indicators and Parameters for Monitoring

The following are the indicators and parameters to be used in monitoring system

Component: Water Quality
Sub Component: Surface Water Quality
Ground Water Quality

Component: Soil

Indicators	**Parameters**
Physical Properties:	Temperature Odour Taste Turbidity TSS TDS Electrical Conductivity
Chemical Properties:	pH Hardness Iron Mangenese Calcium Carbonate Bicarbonate Ammonia Nitrate Nitrite Sulphate Phospate Organic Matter Salinity DO COD BOD Other Pollutants

Source : Prepared by SMEC Environmental Specialist.

ECOLOGICAL & ENVIRONMENTAL STUDIES OF IDIP-II PROJECT
ENVIRONMENTAL ASSESSMENT (EA)
MAKHTAARAL SUB-REGIONS

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Makhtaaral Sub-Regions

Summary of Makhtaaral Environmental Assessment (EA)

The Environmental Assessment (EA) describes potential impacts of irrigation and drainage improvement and rehabilitation of 40,000 ha including a pilot design area of 8,000 ha in Mahtaaral raion, just north of the Kazakhstan – Uzbekistan border.

Makhtaaral has total population of 82716 of which 40761 are male and 41131 are female. The potential for water logging and secondary salinization will be managed by vertical drainage , and with cleaned and deepened interfarm and on-farm collectors drains. Total number of in-farm canals in the project area is about 400. Command area of canals varies from 0.02 ha to 100ha, but the average is about 100 ha. Length of canal varies from 0.1 to 11.0 km, and the average is 1.7 km.

The project is located in the alluvial valley of the Syr Darya river. This area is closed depression with an absolute elevation of 255-260 m. The soils are mainly meadow gray and meadow with average light loamy and sandy loamy texture. The organic matter content is about 0.56-0.91 %.
All land in the project area, except settlement is used for agriculture or cattle breeding.

The water salinity is 0.6- 1.5 gm/l (annual average 1.17 gm/l) and is polluted with pesticide and herbicides. The project collectors-drainage system discharges into Dostyk Canal. The water salinity there 4.2 to 6.4 gm /l..

Impact Assessment:
The effect of IDIP-II on natural and social resources can be described as follows. Under the IDIP-II an area of 40,000 ha has been outlined for feasibility study. As proposed, after leaching the lands will be returned to intensive farming. With drainage rehabilitation ,changes in land use are expected. The impact assessment has been simplified into three main components: (1) Project design (2) Project construction and (3)Project Operation. Out of 7 project related activities, no adverse environmental impacts are expected.

If irrigation and drainage systems are not rehabilitated , the existing infrastructure will become further degraded, and agricultural will become more waterlogged and saline. The land would turn into more desert condition.

Most of the potential impacts are effectively mitigated. The environmental impacts related to project design, construction and operation will not affect the environment. Project documentation will be prepared on :

1. Regulation for closed vertical bore holes and destroyed horizontal canals to avoid contamination of ground water for village water use.
2. Regulation forbidding persistent chemical weed and pest killers.
3. Environmental sustainability and bio-diversity preservation for the IDIP

The consultant proposes that the Committee of Water Resources (CWR) and Ministry of Environment and Biological Resources (MOEB) will be responsible for project development and will manage environmental programs. To do so , a small amount of Rayon and WUA will be trained in water and soil salinity monitoring with equipments and procedures. One or more short courses for professional development will be organized in project institutions.

A monitoring program will be formulated to avoid any unforeseen negative environmental effects when implementing the Makhtaaral IDIP –II project. This is required to guarantee efficiency of the mitigation measures and amonitoring program is very much required. Please refer to "Monitoring Plan " of Makhtaaral (Table 5.) and main object of the monitoring plan are as follows:

- Regular soil sampling for chemical analysis, weed and pest , and for fertilizers.
- Regular surface, ground and drainage water sampling inside the irrigation and drainage project (IDIP-II) for chemical analysis, weed and pests , and fertilizers. Depending on the initial results of the monitoring the space and intensity of analysis could be increased or decreased..
- The fodder crops, animal tissues and milk should be analyzed for pesticides. Depending on the results , the analysis could be continued or discontinued.

The total monitoring cost for 75,000 ha of Makhtaaral is about $ 308, 850 US. (Table 1). If we spread the cost to the whole area it comes to about $4.12 per hectors. It is worth to spend that money on monitoring

The findings and recommendations for an Environmental Impact Assessment (EIA).
As we have seen from the document there are no negative environmental impacts due to IDIP-II project formulation, design , implementation , and operation . The only negative impacts identified are transitory ones and can be mitigated during construction and operation. All other impacts for Makhtaaral are positive.

IDIP-II South Kazakhstan Oblasts has three sub- projects:

A detailed project description has been given in mid term report. A general environmental description is also presented in section 3 and 4 of this Environmental Assessment (EA) report.
Further information on agriculture, soil , agro-economy, sociology, design and other engineering details will be available from mid term engineering report.

Makhtaaral IDS .

2. Brief Sub Project Location-Description

The Makhtaaral Irrigation System is located in Makhtaaral Rayon with administrative centre in Zhetisay in South Kazakhstan Oblast. The irrigation system spread along the left bank of the Syr Darya River, at the middle stage of its course at the Southern border of the Oblast. The territory of the region is very compact. On three sides – the East , West and South , it is bordered by Uzbekistan , and on the North –by Shardara Reservoir. The location of Makhtaaral Sub Project area are presented in Figure 1 or Map M-1.

The transport connections between the Rayon Centre Zhetisay and the Oblasyt Centre Shymkent are as follows: the Shymkent – Zhetisay road (340 km), crosses Shardara dam and the Tashkent –Djizak road traverses the region from the north east to south- west.

The Sub Project Mahtaaral is in the Southern most I&D in IDIP-II project with 40,000 ha including pilot design area of about 8000 ha has been outlined for feasibility study. The area encloses the eastern part of the Rayon territory and constitutes a strip of irrigated land with an average width of 12.5 km , and extends from south to north to a length of 41 km. The southern border of the Sub project runs along the Sardabin overflow disposal system ; the Western border along the VS-18 collector , the main canal "Dostyk", the Northern collector , and the canal k-28; the Northern border along the Southern shore of the Shardara reservoir; and the eastern border along the border with Uzbekistan (Figure …..).
The population of the Makhtaaral IDS is 82716, of which 40761 are male and 41131 are female. Total number of labor resources of the area makes up 43405 people or 45.3% of the total population. Of this, the number of economical active population comprising people involved in all shades of household activities, independent employment or occupation and unemployed people make up 30384 persons or 70% and economical non active population belonging to the groups of housewives , students and person not searching jobs make up 13021 persons or 30% of the labour force. Makhtaaral with a population density of 143 person per km2. Within the Makhtaaral subproject area , there are 52 villages under seven rural districts and two settlement districts. There is an increase in Makhtaaral population of 9.3% from 1998 to 2004.

The description of the project and description of environment are in chapter 3 and 4 of the Environmental Assessment (EA) report. Further description for the project are available in the Mid Term Engineering Report.

The Mahtaaral I&D System off-takes from Dostyk canal, which originates at Farhad Dam in Uzbekistan on Syr Daria River. The total length of the canal is 113 km, of which 40 km falls in Kazakhstan territory.

Climate of the Makhtaaral is sharp continental with high daily and annual fluctuation in temperature. It lies in dry and hot desert and semi-desert area. Summer is long , dry and hot and autumn is dry and warm.
Annual average temperature of the area is about 14.6 ^{0}C. Absolute maximum temperature is 46^{0} C, occurring in July and absolute minimum temperature is -35 ^{0}C occurring in December. The sum of annual temperature above 10^{0} C is 4000 ^{0} C and above 15 ^{0} C is 3500 ^{0} C. Number of days above 10 ^{0}C and 15 ^{0} C are 193 and 154 respectively.

Average annual precipitation is about 380 mm including winter rainfall of about 270 mm during November through March, and summer rainfall of about 110 mm from April through October. average monthly wind velocity fluctuates from 0.5 to 1.2 m/sec in summer and 1.7 m/sec in winter. Highest wind velocity recorded is 14- 18 m /sec. Humidity ranges between 30-60 %.

The present land use pattern of the sub project area is determined from the land use map prepared by the Oblast Committee. The present land use pattern is given in Table 1:

Table 1: Land Use of Makhtaaral

Massive	Gross Sub Project area	Total Irrigated area	Net Irrigated area	Unused land	Pasture	Total Agricultural land	Settlement Area		Other Area
							Total	Housing	
Subproject area	52300	40992	39757	0	2590	42347	2738	1235	7215
Pilot Area	12447	8579	8039	0	1026	9065	699	540	2683

Source: SMEC Mid Term Report, June 2006.

Statistical Department of South Kazakhstan cropping pattern analysis showed that over the last 5 years, 2001-2005, that cotton is the predominant crop with a coverage of 82 -83 % of the total cultivated area. Vegetables are grown in 4.88 % area, grain 5.38 % and grass 4.48%. A study of cropping practices from 2003-2005 in sub project and pilot area that showed cotton 86.4 % , grass 3.0 % , grains 6.50 % , vegetables 3.2 % ,and other crops 0.9%.

Irrigation system consists of inter-farm, on farm and in-field canals. Canals serving two or more farms are termed as inter-farm canals and those inside one farm are called on farm canals; others small canal network within a farm are named as in-field canals. All inter-farm canals off takes from main canal; on farm canals may off-takes either directly from main canals or often from inter-farm canals; in turn, the field canals may off takes from inter-farm canals or from farm canals.

Present condition of the canal is extremely poor due to lack of proper maintenance for long time. The earth canals were built in trapezoidal section. But during operation and subsequent several times cleaning , many canals are flat and lost their shape and water carrying capacity, with cross section often larger than necessary. In some cases, bed level has become lower than the original design, making it difficult to distribute water correctly. The earth canals are also filled with weeds and grasses.

It is evident that the availability of irrigation water supply for Maahtaaral I&DS will become acute, even when Dostyk canal receives normal water (120m3/sec), there will be slight shortage of irrigation water for IDIP-II development (see Mid Term Engineering report).

For further details, read detailed engineering plan of the Mid Term Feasibility Report. The project description and description of the environment please consult chapters 3 and 4 of the Environmental Assessment Main Report.

3. Potential Environmental Impacts

This will determine & distinguish between significant positive and negative impacts, direct and indirect impacts, immediate and long term impacts .
The consultants will also identify impacts which are unavoidable or irreversible. Wherever possible , the consultants will describe impacts quantitatively , in terms of environmental costs and benefits.
Environmental Impacts by sub project related activities are presented for Makhtaaral Sub Regions in Table 2. Seven sub project related activities are effected by potential environmental impacts such as project design, project construction and project operation activities . They are all presented in Table 2.

Table 2 : Environmental Impacts by Sub-Project Related Activities

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project Makhtaaral I&D System			
1.Rehabilitation & Construction of Irrigation & drainage network and associated infrastructure	No (+)	Yes (-)	No (+)
	No (+)	No (+)	No (+)
2. Improved Agronomic Practices	No (+)	No (+)	No (+)
3. Improved Soil and Land Improvement / Reclamation	No (+)	No (+)	No (+)
4. Agricultural Extension Activities	No (+)	No (+)	No (+)
5. Integrated Pest Management 6.Bio-drainage & Reforestation	No (+)	No (+)	No (+)
7. Improved WUA Management	No (+)	No (+)	No (+)

D = Project design ; C= Project construction and O= Project Operation
No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures)

Most project activities will provide improved agricultural, land and organizational management practices.

4. Environmental Management

4.1 Impacts Related to Design

The design of Irrigation and drainage system for Makhtaaral is not expected to produce negative impacts on the South Kazakhstan Oblast irrigation and drainage rehabilitation part. The design/ construction of new drains and rehabilitation of existing drains will not increase the amount of salt and agricultural chemicals entering natural waterways.
According to Table 4 (EA Main Report) salinity within Makhtaaral 94% of the area are moderately to highly saline (1-<10gm/l), For the whole area(100%) , depth of ground water (Table 5 EA Main Report) are beyond 2 to 5 meters.
This is for the reason:

- The salinity content of the 94% of the project drains are between 1-<10 gm/l (Table 1).
- The quantity of water carried by the drains are low when compared to the discharge of the Syr Daria River.

Downstream Water Use and Drainage flow discharge issue:

Mahtaaral area is supplied with irrigation water by main canal known as Dostyk canal, which off takes from Syr-Darya river at the Farhadskaya Hydroelectric Complex in Uzbekistan. The capacity of Dostyk at the head intake , in Uzbekistan, are 260 m3/sec (maximum) and Kazakh territory are about 130 km3/sec (maximum) and 30 m3 /sec (minimum). The sub project is served by number of secondary and tertiary canal system.

Table 3 : Project Area Soil and Water Condition

Project Name		Area (ha)	Water Table Depth (ha)		Ground Water Salinity (ha)		Irrigation Water (ha)		Saline Soil (ha)		
			<1 m	<2 m	<1g/L	>3g/L	<1g/L	>1g/L	None	Weak	High
Maktaral District		7777		1944		4666					7777
Kyzyl-Orda		1069	703	366		1069		1069	914	155	
Zhambul		1144	266	874	323	266	1144		661	483	

Source: Staff Appraisal Report, GOK, IDIP Project , The World Bank, May 1996

Land Resources
As proposed in the plan , 40,000 ha has been selected for feasibility study. The objective is to rehabilitate reliable irrigation supplies, for moderate to high saline soils, where substantial improvement of land productivity can be achieved with relatively low investment. As a result of drainage improvement, minor changes in land use are expected. There is a high concentration of saline soil in

Makhtaaral area (Table 3), water table depth is within < 2m . The ground water salinity (>3 gm/l)is more than irrigation water(>1gm / l) salinity (Table 3). Further description of soils is provided by Soil Expert in the Mid Term Report.

Water Resources

Some canal will be lined and there will be improvement in water supply to irrigated lands. Salt content (mineralization) in the drainage water will be kept within limits of 4.48 to 4.93 g/l. After mixing the drainage water with irrigated surface water (1.5 -2.0 g/l), the salt content of Central Goldnostepsky Collector will be decreased to 4.2 to 6.4 g /l (Environmental Impact Assessment Report, Hazra Engineering International Company , 1996). For further details please consult engineering report.

Table 4 : Extent Of Salinity Within Sub-projects

Target oblasts	Target Sub-projects	Total Area, thousands of km^2	Non Saline, <1gm/l % of Total Area	Moderate salinity, 1-3 gm /l, % of Total Area	High salinity, 3-10 gm / l, % of Total Area	Very High salinity, >10 gm /l, % of Total Area
1. South Kazakhstan	1. Maktaaral	48000	0	44,67	49,44	5,89
	2. Kyzylkum(Shardara)	74900	1,3	97,3	1,4	0
	3. Turkestan	26000	41.0	55.0	1.0	3.0
2. Kyzylorda	1. Kyzylorda	42638	0	24,5	47,2	28,3
3. Zhambul	1. Bauzak raion, Utemis	5200	0	64.7	35.3	0
4. Almatynsky	1. Karatalsky Irrigation system	5000	85.39	12.68	1.93	0
	2. Akdalinsky Irrigation system	5000	89.0	11.0	0	0
	3. Malaisarinsky Irrigation system	2500	45.1	36.0	18.9	0
	4.Enbekshi-Kazakhsky raion	12500	62.0	25.0	13.0	0

Source: State Institute of South Kazakhstan Hydro-geological and Land Reclamation Survey, Committee of Water Resources , Ministry of Agriculture, Govt. of Kazakhstan , 2005

4.1.1 Bio-drainage and Salinity Control

Many drainage system are dysfunctional and another option particularly on moderate to high saline land (Table…4) would be to introduce bio-drainage techniques to control soil salinity and water table levels by using especially established plantation of trees, bushes, grasses and crops. This moderately to high salinity (1-10 gm salt / l) is not good for agricultural development unless good measures are taken for salinity control (Table 4). Following Bio-Drainage and Salinity control is very appropriate for mitigation.

Tree Belts

The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage , decreasing ground water levels and helping to tackle the problem of secondary salinity and waterlogging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent % . As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions. Table 5 gives you list of indigenous trees and bushes for tree belt formation.

a) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt , high saline soil may be leached with fresh water before planting 1-2 year old sapling.

b) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant , has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

c) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

d) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

- Alkali grass (*Puccinellia airoides)*
- Desert Saltgrass (*Distichlis stricta)*
- Wildrye (*Elymus spp)*
- Bermuda grass (*Cynodon dactylon)*
- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main, on farm and inter-farm canals.

- Establish Compost / Bio-gas sites

In design phase, establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.
Table 5 gives a list of indigenous trees and bushes that can be used in planning tree lines and fence lines around farms, pump houses and irrigation canals. They should be chosen with experience and knowledge.

Table 5 : **List of Indigenous Trees and Bushes for IDIP-II**

Trees	Bushes
1. Apricot - Armenica vulgaris Lam	24. Siberian pea shrub - Caragana arborescens Lam.
2. Cherry-plum - Prunus divaricata Ledeb	25. Redhaw hawthorn - Crataegus sanguinea Pall.
3. Asian sumac - Ailanthus altissima	**26. – Calligonum aphyllum Gurke.**
4. Birch - Bertula pendula Roth	**27. – Calligonum microcurpum Borszcz**
5. Siberian elm - Ulmus pumila L.	**28. – Calligonum caput-medusae Schrenk.**
6. Elm - Ulmus laevis Pall.	**29. – Calligonum serosum (Litv.) Litv.**
7. Common Pear - Pyrus communis	30. Tatar honeysuckle - Lonicera tatarica L.
8. Tatarian maple -Acer tataricum	31. Violet willow - Salix daphnoides Vill.
9. Ash-leaved maple - Acer negundo	32. Caspian willow - Salix caspica Pall
10. Larch Siberian - Larix sibirica Ledeb.	**33. – Salix rubra Huds**
11. Bastard acacia - Robinia pseudoacacia L.	34. Mespilus rotundifolious - Amelanchier rotundifolia (Lat.) Dum./Cours.
12. White saxaul - Haloxylon persicum Bunge	35. Russian olive - Elaeagnus angustifolia
13. Black saxaul - Haloxylon aphyllum (Minkw.) Iljin	36. Rotundifolious Juneberry - Amelanchier rotundifolia (lat.) Dum./Cours
14. Pine Crimean -Pinus pallasiana D.Don.	37. Wig-tree - Cotinus coggygria Scop.
15. Archangel fir -Pinus sylvestris L.	38. Golden currant - Ribes aureum Pursh.
16. White poplar - Populus alba L.	39. French tamarisk -Tamarix ramosissima Ledeb.
17. Poplar balsamic - Populus balsamifera	40. Loose tamarisk -Tamarix lara Willd
18. Bay leaf poplar - Populus laurifolia Ledeb.	41. Coniferous ephedra - Ephedra distachy L.
19.Poplar diversifolious- Populus diversifolia Schrenk	42. Paletskiy Saltwort - Salsola paletskiana litv.
20. Poplar Siberian - Populus barsamifera L. (var. sibirica)	43. Rihter Saltwort - Salsola richteri (Moq.) Kar. Ex. Litv.
21. Black poplar - Populus nigra L.	44. Glasswort - Aellenia subaphylla (C. A. Mey) Aell.
22. White mulberry - Morus alba L.	
23. Siberian apple - Malus pallasiana Jus.	

4.1.2 Soil Salinity Management

The major constraint to crop production is the soil salinity if sufficient water is available for crop production. The steady decline in cotton production over the three decades from 4 ton / ha to about 2 ton / ha (See Agro-Economic Report) can be attributed to increasing salinity over that period in Makhtaaral. Increasing levels of salinity not only reduce yields and quality of produce of individual crops but also restrict crop choice. The relative salt tolerance of crops or which could be grown in Makhtaaral is given in Table 6 (Soil Report), expressed in terms of electrical conductivityof the saturated soil extract (ECe, in mS/cm). Salinity is locally expressed as total water extractable salt per unit of soil (% or gm / 100 gm soil). This also includes gypsum, which does not contribute to toxicity effects until high gypsum concentration are leached. For Makhtaaral soils, the relationship between ECe and % salt in soil has been determined as $y=16.4x+0.0425$, with an $R2= 0.8252$ (Mott Macdonald 2003, working paper no.27).

Management of Soil Salinity:

The principal of soil management is to address their main cause- the High Ground Water Tables. There are number of ways to lower water table for Makhtaaral Subproject area:

- Improve horizontal and vertical drainage systems, as discussed in the I&D Rehabilitation Report.
- Match Irrigation application with actual crop water requirement , as described above , and avoid excessive accumulation of irrigation water in the soil profile.
- Establishment of bio-drainage, such as planting of trees along field boundaries (Ref to section 11.2.2.1) which would extract water from the soil , by lowering the water table, , and also reduce crop water demand by providing wind breaks which would reduce crop evapo-transpiration.

The current recommended method of decreasing soil salinity level is leaching of the soil with large quantities of irrigation water. The amount of irrigation water to be applied for leaching depends on the degree of salinization. For weakly saline lands (0.3-0.4 %), it is recommended that 2-2.5 thousand m3 /ha to be applied in autumn or early winter. For moderately saline soils (0.4-0.8 %) 6 thousand m 3 /ha in two applications is recommended and for strongly saline soils (>0.8%) 13-15 thousand m3 /ha 4-5 applications is recommended.

But , prerequisite for successful use of this technique are leveled land , unimpaired soil infiltration and effective drainage. In the absence of these conditions, leaching runs the risk of further raising the water table and increasing salinization in the soil surface. It has been suggested that leaching is not necessary if deep ripping and leveling have been done and drainage is adequate (ULG- Mott MacDonald,2005). Further, the large quantities of water required for leaching would substantially reduce the WUE (water use efficiency)of the cropping system. It is suggested that the requirement for leaching to reduce soil salinity should be re-examined.

Emphasis should be given to lowering the water table, such that salts are flushed out of the rooting zone in the process of normal irrigation. For a viable crop rotation, it is necessary to grow some crops in the system which are salt sensitive. Lucerne appears to be an integral component of a sustainable cropping system in this environment. But the crop is relatively salt sensitive. Several potentially high value vegetable crops are also salt sensitive. Table 6 gives you list of salt tolerant major crops that can be grown in project area.

Table 6: Relative salt tolerance of major crops grown in the Makhtaaral Subproject area.

Category:	**Sensitive**	**Moderately sensitive**	**Moderately tolerant**	**Tolerant**
ECe[1] at which yield loss begins:	<1.3	1.3-3.0	3-6	6-10
Crop:	Lucerne Beans Carrot Onion	Maize Rice Brassicas Cucurbits Melons Potato Tomato	Wheat Red beet	Cotton Barley Sugar beet

1. Electrical conductivity of the saturated soil extract, in mS/cm
Source: ULG & Mott MacDonald Ltd, IEE Report , Uzbekistan ,2005

7.3.1 Other Impacts
Other possible environmental impacts would include:

(1) Dust generation caused by certain construction operation such as excavation, which ca be mitigated by wetting excavation sites and other sources of dust to control its emission , and public information.
(2) Noise generation which can be mitigated by use of properly maintained equipment and public information, and
(3) Land use conflicts caused by temporary use of land for temporary facilities for construction contractors (accommodation, camp canteen, camp facilities , medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction.

Projects may face other possible impacts such as (1) dust generation caused by certain construction operation , such as excavation, which can be mitigated by wetting excavation sites and other sources of dust control its emission, and public information. (2) noise generation which can be mitigated by use of properly maintained equipment and public information; and (3) land use conflict caused by temporary use of land for temporary facilities for construction contractors (accommodation , camp canteen, camp facilities, medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction. Planning "Buffer Zones" in irrigation Canals and drains, specified Government Regulation has to be followed as follows (Table 7) :

Table 7 : Government Regulations- Buffer Zones (Irrigation Canals and Drains)

Capacity of Irrigation Canals (m^3 / sec)	Width of the Inner Buffer Zones for inspection Roads and Deposit Sediment from Canal (m)	Width of the Outer Buffer Zone for Vegetation and limited Agriculture (m)
1	6	
5	10	
25	20	
50	75	
100 or more	100	

Collector Drains Buffer Zones- Provided by CWR and MOA- (both sides of the Collector Drain)

10	5m for inspection road and 10-20 m for spoil 10-20 m for agricultural traffic & field drains
10-20	100 meters (either side of the collector)
21-50	200 meters (either siude of the collector)
.50	300 meters (either side of the collector)

Source: MOA, Republic of Uzbekistan

This regulation should be strictly enforced on IDIP-II Projects.

4.2 Environmental Impacts Related to Construction

Reconstruction of the Mahtaaral , sections of the project , joining collector with discharging drainage water into primary , secondary and tertiary canals. All open collector and drains will be cleaned and deepened. After the proper design , the project will be open for construction and operation. This will result in the following conditions:

1)Temporary increase in silt

To mitigate this, provisions are there in the standard contract document supplied to contractor for adequate supervision of operations and adherence to the contract. Confining operation to dry to the dry season only, use of silt traps and careful deposition of spoils.

The incorporation of the above measures will have to be placed into BOQ for sub project contract documentations and supervision of contractors.

2)Temporary closure of irrigation system

Participation by Water User Association (WUA) and Farmers. The information are to be given through dialogue and community awareness campaign. Ask WUA and villagers for permission to close the irrigation system temporarily. They are very important that WUA and farmers involved in all aspect of civil works.

3) Disposal of Excavated spoil from main and inter-farm drains.

Excavated soil (spoil) will be deposited alongside the drain in accordance with the guideline laid down by GOK/ MOEB with respect to easement dimension. either side of drain and /or canal. Spoil will be deposited and formed using bulldozer into trapezoidal formation.

4)Disposal of Excavated soil (spoil) from on- farm Drains and Canals.

Spoil will be deposited alongside canals and drains in accordance with WUA and farmer instructions. If required and instructed, the contractors may deposit spoil on farm fields at the expense of farmers.

5) Dust generation

The mitigation measures recommended is the appropriate timing of operations wetting of surfaces and notice to /involvement of public. The workers on construction sites should have international personal safety / protection equipment supplied by the contractor.

6. Noise Generation:

Mitigation measures:

Appropriate timing and operation of machine are to be discussed with the farmers and WUA. Notice will be given to public and WUA- farmers will be involved in timing and reduction of noise level in the project areas.

7. Waste Material :

Replacement and repair of the irrigation and drainage structure will result in waste material (concrete and steel). These are to be disposed of by the civil works contractor as per CWR / MOEB guidelnes.

8. Land Use Conflict for Construction
The CWR , MOA and GOK assessed that there will be no land use conflict for construction. This also confirmed by the client, the CWR, and guarantee given by them to the World Bank. On farm negotiations would be made with WUA and the landowners. However, civil works only will be done by participation agreement of land owners and WUA. The PMO / CWR should have the responsibility for dispute settlement.

9.Construction of Camp Sites and Living Facilities
Establishment and construction of camp sites, and Living facilities for the construction workers have to be established prior to construction work. An acceptable sanitary facility has to be established for the workers. This must satisfy environmental regulation and MOEB code.
The camp site has to be cleaned and returned to the original state before the construction.
Refuge should be properly collected and disposed off.

Mitigation measures are to be:
1)CWR & MOA agrees to allocate free sites for the construction of camp sites and living facilities. This has to be negotiated with the client and the local authorities. Construction of camp sites and living facilities will be funded by the contractor. Clean up costs for these facilities will be borne by the contractor

10. Biodiversity Conservation / Sustainability
Environmental Sustainability of the project area is very low. To improve this situation following steps will be taken:

(1) Organize nursery at every sub-regions and WUA. Provide free extension service ,input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pump location, main , on farm and inter-farm canals.

(2) Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation are to be considered.

4.3 Environmental Impacts related to Operation

1) Soil modification as a result of intensified agriculture
The mitigation required
a) Encouragement of continued use of traditional management of water flows
b)The use of deep rooting grasses and shrubs to further strengthen the bunds
c) Minimum / zero tillage practices

2)Soil and water contamination due to increased use of agrochemicals including fertilizer and pesticides.
The mitigation required
a)Mitigation required are agricultural extension services and Integrated pest management (IPM).
The agricultural extension service would include:

a)Optimum , informed use of mineral fertilizer
b)Promotion of integrated pest management (IPM)
c) Discouragement on the use of persistent pesticide and herbicide.
d) Training on composting, reforestation, minimum or zero-tillage.
e) Biodiversity associated with introduced new plant species and varieties .
Promote Biodiversity for introduced crops and land use changes from protecting soil from wind by tree fencing and other environmental management practices.

(3) Environmental Sustainability & Bio-diversity Concerns.

Biological diversity refers to the variety of South Kazakhstan living biological resources. It is a function not simply of the number of ecosystem and distinct plants and animal species in existence at any given time , but also genetic differences within individual species.
Conservation of biological diversity is a form of natural resources management and should be practiced in Mahtaaral area. This can be done by reforestation activities by indigenous plants on vertical drainage sites, main and secondary canals, and other inter farm canals. A reforestation site plan will have to be prepared in IDIP-II (Phase B) design level.

5. Environmental Monitoring

Monitoring is necessary with respect to (i) water resources quality and quantity ; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance management, including inspection and proper repair of irrigation & drainage canals and structures.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources(CWR) , MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate to evaluate the success or failure of IDIP-II proposed project intervention in the Makhtaaral.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information . Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project , the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as :

1. Soil salinity and high ground water tables;
2. Water Quality & Salinity .
3. Reforestation, Bio-Diversity and Desertification.

The variables to be analyzed are described in Annex……. It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15…...and for one water samples is about USD 10. Most of the project farmers interviewed that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient . Such sampling density for 220,000 ha over 2 year life of the project would be extremely expensive.

The other alternative is to sample the pilot area (6,907 ha in Mahtaaral area) fully and for other project areas , sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project.
During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

Table 8 : Mahtaaral Monitoring Plan
Total 140,000 (Mahtaaral 75,000+ Kyzylkum 90,000+Turkestan 30,000)
CALCULATION IS DONE FOR 75,000 Ha (Makhtaaral, about $4.12 / ha.)

Parameters to be Monitored	**Periodicity**	**Number of Samples**				Cost **of 1 analysis in $US**	**Total Cost in $US**
		Total Number of Samples	**Number of Indicators**	**Sum of Determination**	**Total/ yr**		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 750	3	2250	2250	15	33750 **67,500**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 1000	5	5000	5000	10	50,000 **100,000**
4. Water Quality							
4.a Ground Water Quality							
4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 75	1	75	225	10	2,250 **4500**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 75	15	1125	1125	20	22,500 **45,000**
4.a.c Fertilizer	Annually	(1sample /1000 ha)	1	75	75	15	1,125 **2,250**

		75					
5.Pesticide residues in fish & fodder crops	Annually	2	20	40	40	20	800 **1600**
6.Reforestation , composting and Tree Belts(Bio-drainage & Salinity Control)	Annually	1 $ Per /ha		$75,0000.0	$75,000.0	$1 Per Ha	**$75,000.0 (including yearly Maintenance)**
7. Equipments for Rayons &WUAs	Annually 16 hand held GPS units, computer download, 16 Electrical Conductivity meters	4 Oblasts and 13 Rayons			4,000.0 US$ 1 unit (GPS & Electrical Conductivity meters $250.0 X52	$250.0 for one unit	**$13,000** (one time purchase)
						Grand Total	**$308,850**

Source: The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1999.

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M , it will be easier for them to take this additional responsibility . This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that Total US$473,408..(based on 10 years of inflation ,Table 9).. will be required to implement and maintain the Environmental Management and Monitoring Plan (EM & MP). There are three categories of inputs to the EMP . They are as follows in the Table 9. However , they are calculated from items mentioned in Makhtaaral Monitoring Plan (Table 8).

1. Planning and Surveys and consultant assistance$ 62,158(13.13%)
2. Mitigation Management $384,597(81.24%)
3. Equipment & Training $ 26,653(5.63 %)

Table 9: Estimated Budget for Environmental Management Plan (EMP - Makhtaaral)

Item	Qty	Unit Cost	Total Cost US$
Capital Cost-Equipments for Rayons			
GPS units (handheld), Computer download	24	250	6000.0
Electrical Conductivity Meters(24 Rural Districts)	24	250	6000.0
Capital Cost- Equipment for WUA			
GPS units (Hand Held),computer download	17	250	4250.0
Electrical Conductivity Meters(17 Rural Consumer Cooperatives of Water User RCCWU)	17	250	4250.0
Recurrent Costs			
Support to PMO for Baseline Survey	1 each	17,810	17,810
Support to PMO for M&E activities over 2 years	Lumpsum	30,000	30,000
Analysis for soil and water samples for 2 years by CWR &MOG	2 Yearly	220,850	220,850
Support for reforestation & biodiversity by CF	Lumpsum	75,000	75,000
Total			364,160

Note : Total $ 364,160 is based on 1996 values. and adjusted to 2007 inflation figures (X30%), which makes it (364,160X30%) $109,248 +364,160= **$473,408**

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out. The suggested report systems for environmental monitoring programs are made on the following consideration:

1 Monthly report from the Contractor

Contractors should regularly monitor the environmental –related issues and Environmental parameters based on the guidance from Environmental Management Specialist and requirements from Ryon Inspector. They should provide a monthly Report covering performance of environmental monitoring and progress of environmental related activities.

1. Monthly Environmental Management Report

   The requirement of Environmental Management Specialist is to produce a monthly performance report of environmental monitoring , summarizing the environmental monitoring of sub-projects and other related environmental problems.

2. Environmental Monitoring Report

   The Rayon office laboratories of IDIP-II need to submit PMO thematic monitoring report on the changes in salinity, changes in water use, changes in soil productivity, including baseline soil surveys and subsequent periodic surveys, as well as proposed suggestions for actions to solve key environmental problems if any (semi-annual monitoring and annual monitoring report).

3. Semi-Annual PMO Report

   Every half year, PMO needs to compile a quarterly environmental working report, summarizing the progress of EMP implementation , and monitoring status. The report from IDIP-II project and the Environmental Management Specialist should be attached to PMO report. This report may be integrated into “The Progress Report” and sent to WB for review. The copies may be sent to Oblast Office for reference.

6. FINDINGS AND RECOMMENDATIONS

6.1 The Need for an Environmental Impact Assessment (EIA)

This section evaluates the need for an Environmental Impact Studies (EIA). This should be based on the fact whether significant environmental impacts exist and that need a further detailed study or EIA.

As per as we have seen there are no negative environmental impacts due to IDIP-I proposed project formulation , design, implementation , and operation. The only negative impacts identified are transitory ones (can be mitigated) associated with construction operations. All other impacts for Makhtaaral are positive.

The recommendation from the findings of this Environmental Assessment (EA) are that a follow up EIA or further detailed environmental impact study (EIA) study is not needed.

6.2 Potential Environmental Impacts, Possible Mitigation Measures and Responsible Agencies

The environmental monitoring program will be part of an integrated project monitoring program which will be established by the PMO. The PMO and the "Project Implementation Unit" (PIU) offices at Project area oblast will be responsible for implementing all environmental mitigation measures. Table …… presents all relevant issues with respect to the potential environmental impacts and the possible monitoring and mitigation enhancement measures. The table also lists those agencies who are responsible and also lists agencies which should have an involvement in the monitoring program and an input to the development and planning of the mitigation measures.

6.3 Environmental Assessment Requirement of MOEB

The Government of Kazakhstan (GOK) requirement is to present this Environmental Assessment (EA) report to MOEB. The instruction by MOEB call for report in which available data on the resources likely to be affected by IDIP-II are to be analyzed in terms of scope and intensity. An Environmental Assessment (EA) report are to be prepared by proponent (CWR) and should be included with the feasibility report and submitted for approval. This report provides a brief description of ecological and social sources , and trends in agriculture. Natural resources that are sensitive to change should be identified along with potential environmental problems. This report should be given a public review and then presented to the Ministry of Ecological and Biological Resources (MOEB). The MOEB reviews the EA and its comments (State Ecological Expertise) and forwarded to the concerned sections for approval.

The World Bank 4.01 "Environmental Assessment" has screened the IDIP-II Project and placed it in EA category "B", which means the preparation of an environmental analysis to define environmental management , monitoring and mitigation measures as necessary. The recommended mitigation measures in the State Ecological Expertise (SEE) review would become an integral part of integral part of project design and implementation. The archeological sites would be protected with the guideline and requirement of Kazakhstan law and acceptable to the World Bank. The assurance was also obtained from Kazakh Government about the use of agrochemicals for IDIP-II would be approved ,stored and distributed and used in accordance with the guidelines and requirements of Kazakhstan Government acceptable to the World Bank (WB).

6.4 CONCLUSION

For Makhtaaral sub project an Environmental Impact Assessment (EIA) is not necessary. However, the appointment of a local / domestic Environmental Management Specialist to assist with the implementation of the Environmental Management / Monitoring Program and train WUA staff is considered very important task for the success of the Environmental Management and Monitoring Plan (EMP). A term of reference (TOR) for the Environmental Management Specialist (EMP) is prepared in the Annex….

6. FUTURE DEVELOPMENT PLAN

The future environmental management and monitoring plan will mitigate the following:

1. Monitoring of Soil salinity and pesticide for 2 years
2. Monitoring of surface and Ground Water for water quality (salinity & pesticide).
3. Water table depth
4. Drainage water for salinity , pesticide & fertilizers
5. Pesticide residues in fish , animal tissue and fodder crops
6. Reforestation of indigenous plant for biodiversity & desertification
7. Reclaim saline soil , saline surface and ground water.

For further details, please go through the Environmental Management and Mitigation Plan.
The Environmental Management & Monitoring Plan is also part of future development plan.

ANNEX-B

Kyzylkum Sub-Project Area

Executive Summary of Kyzylkum Environmental Assessment (EA)

The Environmental Assessment (EA)describes potential impacts of irrigation and drainage improvement and rehabilitation of 73,998 ha , developed in two phases . Construction of the first phase was completed 1983 with an area 48,000 ha developed for rice cultivation. The construction of second phase was completed in 1992 with an area of 25,588 ha , developed mainly for cotton cultivation.

The Kyzylkum has total population of 70.9 thousand with a with a density of 5.5 per km ^{2} . Within the Kyzylkum sub project area , there are 11 villages under the nine rural districts. The potential for water logging and secondary salinization will be managed by vertical drainage, and with cleaned and deepened inter farm and on farm collectors drains.

The project is located in the alluvial valley of the Syr Darya river. This area is closed depression with an absolute elevation of 255-260 m . The soils are mainly meadow gray and meadow with average light loamy and sandy loamy texture. The organic matter content is about 0.56-0.91 %.
All land in the project area, except settlement, is used for agriculture or cattle breeding.

About 97.3 % are moderately saline (about 1-3 gm/l , Table 4 &5 of EA Main Report) and is polluted with herbicide and pesticide. About 90 % of the area, the depth of ground water table is between 2-5 meters. All drainage water of the Kyzylkum IDS is disposed into Syr Darya river through a number of main collectors.

Impact Assessment:
The effect of IDIP-II on Kyzylkum natural and social resources can be described as follows. Under the IDIP-II an area of 73,998 ha has been outlined for feasibility study. As proposed , after leaching the lands will be returned to intensive farming. With drainage and reclaimed saline soil , changes in land use are expected. The impact assessment has been simplified into three main components : (1) Project design , (2) Project Construction , and (3) project operation . Out of 7 project related activities , only in the construction phase ,rehabilitation
Of irrigation and drainage network (Table 1) potential adverse environmental impacts are expected.

If irrigation and drainage are not rehabilitated , the existing infrastructure will become further degraded , and agricultural lands will become unfertile and waterlogged with more pronounced saline condition. The land would turn into more desert condition.

Most of the potential impacts will be effectively mitigated. The environmental impacts related to project design , construction and operation will not effect the environment. Project documentation will be prepared on :

1. Regulation for closed vertical bore holes and destroyed horizontal canals to avoid contamination of ground water for village water use.

2. Regulation forbidding persistent chemical weed and pest killers
3. Environmental sustainability and bio-diversity preservation for the IDIP-II

The consultant proposes that the Committee of Water Resources (CWR)and Ministry of Environment and Biological Resources (MOEB) will be responsible for project development and will manage environmental program under Project Implementation Unit (PIU). To do so, there is a urgent need of a local Environmental Specialist , who will train Rayon Committee and WUA in water and soil salinity monitoring with equipments and procedures. One or more short courses for professional development will be organized in project institutions.

A monitoring program will be formulated to avoid any unforeseen negative environmental effects when implementing the Kyzylkum IDIP-II Project. This is required to guarantee efficiency of the mitigation measures and a specific monitoring program is very much required.
Please refer to “Monitoring Program “ of Kyzylkum (Table …) and the main object of the monitoring program are as follows:

- Regular soil sampling for chemical analysis , weed and pest , and for fertilizers.

- Regular surface , ground and drainage water sampling inside the irrigation and drainage project (IDIP-II) for chemical analysis, weed and pest, and fertilizers .
  Depending on the initial results of the monitoring the space and intensity of analysis could be increased or decreased .

- The fodder crops , animal tissue and milk should be analyzed for pesticides. Depending on the results , the analysis could be continued or discontinued.

The total monitoring cost for 74,000 ha of Kyzylkum is about $ 364.160 USD (Table …).
If we spread the cost for the whole area it comes to about $ 4.83 per hectors. It very well spent money for monitoring.

Findings and recommendations for an Environmental Impact Assessment (EIA).
As we have seen from the document there are no negative environmental impacts due to IDIP-II project formulation, design, implementation and operation. The only negative impacts identified in irrigation and drainage rehabilitation work are transitory ones and can be mitigated during construction and operation . All other impacts for Kyzylkum are poisitive.

The Sub Project Kyzylkum is north of Makhtaaral and on the left bank of Syr Daria River with 73,988 ha for I&D development.

Detailed description on the proposed project and environment are given in the "Environmental Assessment (EA)" report in section 3 and 4.
Further project description is available from the Mid Term Engineering Report .
Project description and environmental description can be obtained from Environmental Assessment (EA) Main report and engineering part can be seen in the Mid Term Engineering Report.

Kyzylkum Sub Project

1. Location & General Description

In Kyzylkum I&D System the main canal off-takes from Shardara Reservoir, close to Rayon Head Quarter of Shardara. Location of Kyzylkum Sub Project is presented on Figure 1 or Map No KK -1.

The Kyzylkum I&D system is located on the left bank of the river Syr Daria. The irrigation and drainage development constructed in two phases. The irrigation & drainage project was completed in 1983 with an area of 48,400 ha developed for rice cultivation. The second phase was completed in 1992 with an area 25, 588 ha and developed mainly for cotton cultivation. The first and second phase were from areas of Shardara and two rural districts of Arys region.

There are 25 rural settlements under 10 rural districts. Population is 70.9 thousand with density of 5.5 persons per km2. In Kyzylkum sub project area , there are 11 villages under nine rural districts.
Demographic analysis for the last seven years from 1998 to 2004 showed that there was an increase in Kyzylkum population in Shardara Rayon by 11 %. According to 2005 statistics, total population of Kyzylkum IDS is 47195, of which 22677 are male and 22863 are female.
The Total number of household is 7442.

The annual average annual precipitation is 225 mm with more than 75% of precipitation occurs in winter spring period. Climatic condition is characterized by hot and dry summer , warm and dry autumn, short unstable winter with sharp fluctuation of temperature, and short and usually warm spring.

The Syr Daria is the source of water in the sub project area. Average annual natural flow is estimated as 37.60 km3.The total average annual inflow into Shardara reservoir makes upto 15.025 billion m3. Analysis of the last 5 years average monthly discharge shows that inflow into the reservoir during the winter months (November-February) reaches close to or higher than 1000 m3/sec, a situation which creates a serious condition for waterlogging in Kyzyl-Orda city areas. To avoid this situation , it is recommended that a higher rate of flow should be discharged out downstream of the reservoir.

The total length of Kyzylkum main canal is 106.2 km The Kyzylkum main canal and the structures are in poor condition and need rehabilitation
There are 80 structures on the main canal. These are : fish stopper-1,supporting structures-14, outlets -44, siphons 3, motor way bridges -7, railway bridge-1, escape 2, differential swing-1, pump stations-2 and hydroposts -5 nos. Most of the structure on the canal require repair and rehabilitation.
Shardara Canal off-takes from the Kyzylkum main canal and provide water supply to rural districts-Shardara and Kosseit.

Extensive reconstruction and rehabilitation works will be involved in the irrigation canals. In the rice crop rotation fields, all canals will have to be resized to smaller capacities. In the cotton rotation fields, major repair works will be involved in some of the on farm canals.

The Kyzylkum IDS will require a massive rehabilitation works. As rice cultivation has practically disappeared and replaced by cotton cultivation. This conversion of the rice field to cotton fields will demand a major rehabilitation works as follows:

Reconstruction of irrigation systems and fields and land use change from rice to cotton cultivation

- Rehabilitation of collector-drainage and off take networks,
- Reconstruction of collectors so as to make them working without pumping stations.
- Construction of open drains on the III –agro-area.
- Construction of vertical drainage boreholes.
- Construction of electric power transmission lines..
- Reconstruction of access road network.
- Land leveling.
- Reclamation of saline land.
- Reconstruction of collector Zapadny
- Construction of observation boreholes

Further engineering details can be obtained from Mid Term Report. More information on project and environmental description can be obtained from Environmental Assessment (EA) Main Report.
The Environmental Assessment (EA) Main Report describes the EA report format as mentioned by the World Bank format OD 4.0 , Annex A-1, as follows:

1. Policy ,legal and Administrative Framework
2. Description of the Proposed Project
3. Description of the Environment
4. Significant Environmental Impacts
5. Analysis of Alternatives
6. Mitigation and Management Plan
7. Environmental Management and Training
8. Monitoring plan
9. Inter-Agency and Public /NGO Involvement
10. List of references
11. Appendices

Because of the repetitive nature of the topics, the above subject matters are only described once in EA Main Report.

2. Potential Environmental Impacts

Table 1 : Environmental Impacts by Sub-Project Related Activities

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project Kyzylkuml I&D System			
1.Rehabilitation & Construction of Irrigation & drainage network and associated infrastructure	No (+)	Yes (-)	No (+)
2. Improved Agronomic Practices	No (+)	No (+)	No (+)
3. Improved Soil and Land Improvement / Reclamation	No (+)	No (+)	No (+)
4. Agricultural Extension Activities	No (+)	No (+)	No (+)
5. Integrated Pest Management	No (+)	No (+)	No (+)
6.Bio-drainage & Reforestation	No (+)	No (+)	No (+)
7. Improved WUA Management	No (+)	No (+)	No (+)

D = Project design ; C= Project construction and O= Project Operation
No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures), (+) Positive effect (No Adverse Impact) and (-) negative effect and to be addressed by mitigation.

Most project activities will provide improved agricultural practices, land and organizational support and management practices.

3. Environmental Management

3.1 Impacts Related to Design

The design of Irrigation and drainage system for Kyzylkum are not expected to produce negative impacts on the South Kazakhstan Oblast irrigation and drainage rehabilitation part. The design/ construction of new drains and rehabilitation of existing drains will not increase the amount of salt and agricultural chemicals entering natural waterways.

According to Table 4 (EA Report), the extent of salinity within Kyzylkum area, about 97% of the area are moderately saline (1- 3 gm/l), The depth of ground water , Table 5 (EA Report) , are beyond 2- 5 meters.

For this reason:

- The salinity content of the Kyzyllkum Sub regions drains are between 1-3 gm/l (Table 5).
- The quantity of water carried by the drains are low when compared to the discharge of the Syr Daria River.

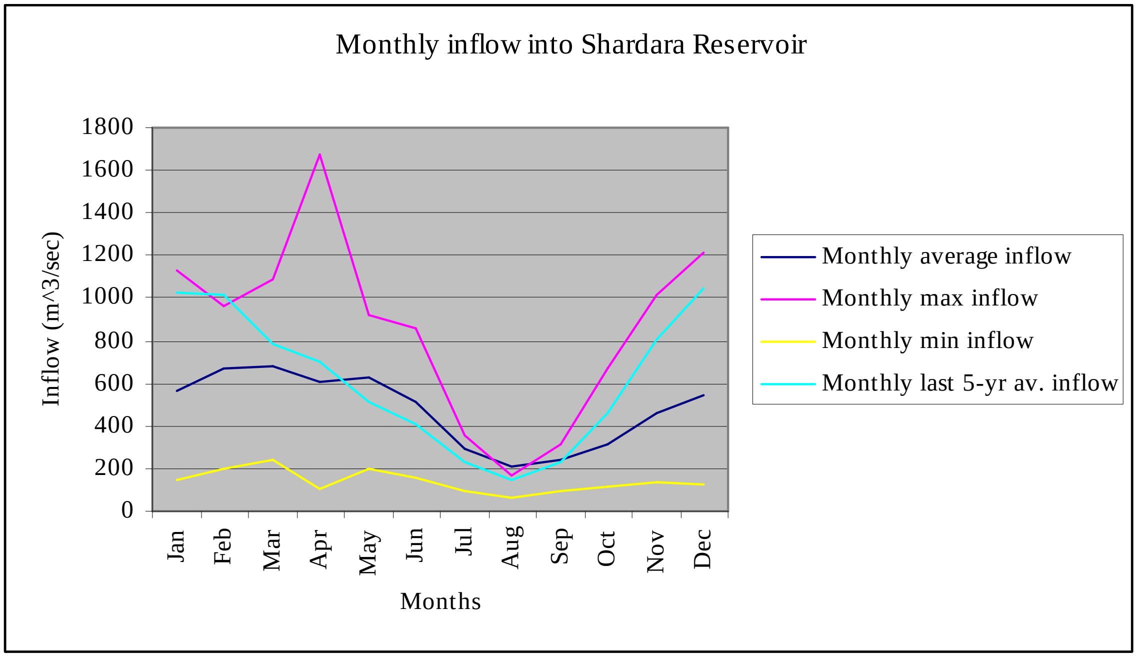
Downstream Water Use and Drainage flow discharge issue:

At present , the water regime of Syr Darya is highly influenced by the human activities such as development of irrigation, and drainage systems in the river basin. There are number of reservoir built along the Syr Darya.
The average , maximum and minimum monthly inflow of SyrDarya into Shardara reservoir based on data for period 1970-2004 is given below.

It is evident that total average annual inflow into Shardara reservoir makes upto 15.025 billion m3. Analysis of the of the last 5 years average monthly discharge show that the average inflow into the reservoir during the winter months (November to February) reaches closer to or higher than 1000 m3 / sec, a situation which creates a condition for water logging in the down stream (Kyzyl-Orda) city areas. To avoid this situation, it is recommended that a higher rate flow should be discharged down stream of the reservoir towards the Aral Sea.

Salinization and harsh chemicals of Syr Darya river water have endured significant changes. The period earlier to 1938, when intensive irrigation did not yet begin, salinization was recorded as low as 400 mg /l, and by composition it was hydr carbonate with Ca++ ion predominate, but at present, the salinization makes up about 1000 mg / l and in anion composition , So4 dominates, and in cation composition , there is predominance of Na + K.

Figure 1 : Monthly Syr Darya River water inflow into Shardara Reservoir



In Kyzylkum I&D system, the left main canal has a design discharge capacity of 228 m3/sec. The left branch canal has a discharge capacity of 41.0 km3/sec.

Land Resources

As proposed in the plan , 140,000 ha , has been selected for feasibility study. The objective is to rehabilitate reliable irrigation supplies, for moderate to high saline soils , where substantial improvement of land productivity can be achieved with relatively low investment. As a result of drainage improvement, minor changes in land use are expected.

Water Resources

Some canal will be lined and there will be improvement in water supply to irrigated lands. Salt content (mineralization) in the drainage water will be kept within limits of 4.48 to 4.93 g/l. After mixing the drainage water with irrigated surface water (1.5 -2.0 g/l), the salt content of Central Goldnostepsky Collector will be decreased to 4.2 to 6.4 g /l (Environmental Impact Assessment Report, Hazra Engineering International Company , 1996). For further details please consult engineering report.

3.1.1 Bio-drainage and Salinity Control

Many drainage system are dysfunctional and another option particularly on moderate to high saline land (Table….) would be to introduce bio-drainage techniques to control soil salinity and water table levels by using especially established plantation of trees , bushes, grasses and crops.

Tree Belts

The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage , decreasing ground water levels and helping to tackle the problem of secondary salinity and waterlogging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent % . As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions.

a) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt , high saline soil may be leached with fresh water before planting 1-2 year old sapling.

b) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant , has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

c) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

e) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

- Alkali grass (*Puccinellia airoides)*
- Desert Saltgrass (*Distichlis stricta)*
- Wildrye (*Elymus spp)*
- Bermuda grass (*Cynodon dactylon)*
- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main , on farm and inter-farm canals.
- Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.

3.1.2 Soil Salinity and Management

The major constraint to crop production is the soil salinity if sufficient water is available for crop production. The steady decline in cotton production over the three decades from 4 ton / ha to about 2 ton / ha (See Agro-Economic Report) can be attributed to increasing salinity over that period in Makhtaaral. Increasing levels of salinity not only reduce yields and quality of produce of individual crops but also restrict crop choice. The relative salt tolerance of crops or which could be grown in Makhtaaral is given in Table 6 (Soil Report), expressed in terms of electrical conductivityof the saturated soil extract (ECe, in mS/cm). Salinity is locally expressed as total water extractable salt per unit of soil (% or gm / 100 gm soil). This also includes gypsum, which does not contribute to toxicity effects until high gypsum concentration are leached. For Makhtaaral soils, the relationship between ECe and % salt in soil has been determined as $y=16.4x+ 0.0425$, with an $R2= 0.8252$ (Mott Macdonald 2003, working paper no.27).

Management of Soil Salinity:
The principal of soil management is to address their main cause- the High Ground Water Tables. There are number of ways to lower water table for Kyzylkum Subproject area:

- Improve horizontal and vertical drainage systems, as discussed in the I&D Rehabilitation Report.
- Match Irrigation application with actual crop water requirement , as described above , and avoid excessive accumulation of irrigation water in the soil profile.
- Establishment of bio-drainage, such as planting of trees along field boundaries (Ref to section 11.2.2.1) which would extract water from the soil , by lowering the water table, , and also reduce crop water demand by providing wind breaks which would reduce crop evapo-transpiration.

The current recommended method of decreasing soil salinity level is leaching of the soil with large quantities of irrigation water. The amount of irrigation water to be applied for leaching depends on the degree of salinization. For weakly saline lands (0.3-0.4 %), it is recommended that 2-2.5 thousand m3 /ha to be applied in autumn or early winter. For moderately saline soils (0.4-0.8 %) 6 thousand m 3 /ha in two applications is recommended and for strongly saline soils (>0.8%) 13-15 thousand m3 /ha 4-5 applications is recommended.
But , prerequisite for successful use of this technique are leveled land , unimpaired soil infiltration and effective drainage. In the absence of these conditions, leaching runs the risk of further raising the water table and increasing salinization in the soil surface. It has been suggested that leaching is not necessary if deep ripping and leveling have been done and drainage is adequate (ULG- Mott MacDonald,2005). Further, the large quantities of water required for leaching would substantially reduce the WUE (water use efficiency)of the cropping system. It is suggested that the requirement for leaching to reduce soil salinity should be re-examined.

Emphasis should be given to lowering the water table, such that salts are flushed out of the rooting zone in the process of normal irrigation. For a viable crop rotation, it is necessary to grow some crops in the system which are salt sensitive. Lucerne appears to be an integral component of a sustainable cropping system in this environment. But the crop is relatively salt sensitive. Several potentially high value vegetable crops are also salt sensitive.

3.1.3. Other impacts
Projects may face other possible impacts such as (1) dust generation caused by certain construction operation , such as excavation, which can be mitigated by wetting excavation sites and other sources of dust control its emission, and public information. (2) noise generation which can be mitigated by use of properly maintained equipment and public information; and (3) land use conflict caused by temporary use of land for temporary facilities for construction contractors (accommodation ,

camp canteen, camp facilities, medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction. Planning "Buffer Zones" in irrigation Canals and drains, specified Government Regulation has to be followed as follows:

Table 5 : Government Regulations- Buffer Zones (Irrigation Canals and Drains)

Capacity of Irrigation Canals (m^3 / sec)	Width of the Inner Buffer Zones for inspection Roads and Deposit Sediment from Canal (m)	Width of the Outer Buffer Zone for Vegetation and limited Agriculture (m)
1	6	
5	10	
25	20	
50	75	
100 or more	100	

Collector Drains Buffer Zones- Provided by CWR and MOA- (both sides of the Collector Drain)

10	5m for inspection road and 10-20 m for spoil 10-20 m for agricultural traffic & field drains
10-20	100 meters (either side of the collector)
21-50	200 meters (either siude of the collector)
.50	300 meters (either side of the collector)

Source: MOA, Republic of Uzbekistan

This type of regulation should be strictly enforced on IDIP-II Projects especially for Kyzylkum Sub regions. It has been seen from field visit that Buffer Zone was not kept in Kalgansyr Outlet area between inspection road and Syr Darya River.

3.2 Impacts Related to Construction

Reconstruction of the Kyzylkum, sections of the project , joining collector with discharging drainage water into primary , secondary and tertiary canals. All open collector and drains will be cleaned and deepened. After the proper design , the project will be open for construction and operation. This will result in the following conditions:

1)Temporary increase in silt

To mitigate this, provisions are there in the standard contract document supplied to contractor for adequate supervision of operations and adherence to the contract. Confining operation to dry to the dry season only, use of silt traps and careful deposition of spoils.

The incorporation of the above measures will have to be placed into BOQ for sub project contract documentations and supervision of contractors.

2)Temporary closure of irrigation system

Participation by Water User Association (WUA) and Farmers. The information are to be given through dialogue and community awareness campaign. Ask WUA and villagers for permission to close the irrigation system temporarily. They are very important that WUA and farmers involved in all aspect of civil works.

3) Disposal of Excavated spoil from main and inter-farm drains.
Excavated soil (spoil) will be deposited alongside the drain in accordance with the guideline laid down by GOK/ MOEB with respect to easement dimension.- either side of drain and /or canal. Spoil will be deposited and formed using bulldozer into trapezoidal formation.

4)Disposal of Excavated soil (spoil) from on- farm Drains and Canals.
Spoil will be deposited alongside canals and drains in accordance with WUA and farmer Instructions. If required and instructed, the contractors may deposit spoil on farm fields at the expense of farmers.

5) Dust generation
The mitigation measures recommended is the appropriate timing of operations wetting of Surfaces and notice to /involvement of public. The workers on construction sites should Have international personal safety / protection equipment supplied by the contractor.

6. Noise Generation:
Mitigation measures:
Appropriate timing and operation of machine are to be discussed with the farmers and WUA. Notice will be given to public and WUA- farmers will be involved in timing and reduction of noise level in the project areas.

7. Waste Material :
Replacement and repair of the irrigation and drainage structure will result in waste material (concrete and steel). These are to be disposed of by the civil works contractor as per CWR / MOEB guidelines.

8. Land Use Conflict for Construction
The CWR , MOA and GOK assessed that there will be no land use conflict for construction. This also confirmed by the client, the CWR, and guarantee given by them to the World Bank. On farm negotiations would be made with WUA and the landowners. However, civil works only will be done by participation agreement of land owners and WUA. The PMO / CWR should have the responsibility for dispute settlement.

9.Construction of Camp Sites and Living Facilities
Establishment and construction of camp sites, and Living facilities for the construction workers have to be established prior to construction work. An acceptable sanitary facility has to be established for the workers. This must satisfy environmental regulation and MOEB code.
The camp site has to be cleaned and returned to the original state before the construction.
Refuge should be properly collected and disposed off.

Mitigation measures are to be:
1)CWR & MOA agrees to allocate free sites for the construction of camp sites and living facilities. This has to be negotiated with the client and the local authorities. Construction of camp sites and

living facilities will be funded by the contractor. Clean up costs for these facilities will be borne by the contractor

10. Biodiversity Conservation / Sustainability
Environmental Sustainability of the project area is very low. To improve this situation following steps will be taken:
(1) Organize nursery at every sub-regions and WUA. Provide free extension service ,input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pump location, main , on farm and inter-farm canals.
(2) Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to be considered.

3.3 Environmental Impacts related to Operation

1) Soil modification as a result of intensified agriculture
The mitigation required
a) Encouragement of continued use of traditional management of water flows
b)The use of deep rooting grasses and shrubs to further strengthen the bunds
c) Minimum / zero tillage practices

2)Soil and water contamination due to increased use of agrochemicals including fertilizer and pesticides.
The mitigation required
a)Mitigation required are agricultural extension services and Integrated pest management (IPM).
The agricultural extension service would include

a)Optimum , informed use of mineral fertilizer
b)Promotion of integrated pest management (IPM)
c) Discouragement on the use of persistent pesticide and herbicide.
d) Training on composting, reforestation, minimum or zero-tillage.
e) Biodiversity associated with introduced new plant species and varieties .
Promote Biodiversity for introduced crops and land use changes from protecting soil from wind by tree fencing and other environmental management practices.

(3) Environmental Sustainability & Bio-diversity Concerns.

Biological diversity refers to the variety of South Kazakhstan living biological resources. It is a function not simply of the number of ecosystem and distinct plants and animal species in existence at any given time , but also genetic differences within individual species.
Conservation of biological diversity is a form of natural resources management and should be practiced in Mahtaaral area. This can be done by reforestation activities by indigenous plants on vertical drainage sites, main and secondary canals, and other inter farm canals. A reforestation site plan will have to be prepared in IDIP-II (Phase B) design level.

4. Environmental Monitoring

Monitoring is necessary with respect to (i) water resources quality and quantity ; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance management, including inspection and proper repair of irrigation & drainage canals and structures.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources(CWR) , MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate to evaluate the success or failure of IDIP-II proposed project intervention in the Kyzylkum.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information . Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project , the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as :

1. Soil salinity and high ground water tables;
2. Water Quality & Salinity .
3. Reforestation, Bio-Diversity and Desertification.

The variables to be analyzed are described in Annex……. It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15…...and for one water samples is about USD 10. Most of the project farmers interviewed that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient . Such sampling density for 220,000 ha over 2 year life of the project would be extremely expensive.

The other alternative is to sample the pilot area (6,907 ha in Kyzylkum area) fully and for other project areas , sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project.
During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M , it will be easier for them to take this additional responsibility . This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that US$...565 ,383. will be required to implement and maintain the Environmental Management and Monitoring Plan (EM & MP). There are three categories of inputs to the EMP. They are as follows:

1. Planning and Surveys and consultant assistance$ 74,165 (13.13%)
2. . Mitigation Management $ 459,095(81.24%)
3. Equipment & Training $ 31,764(5.63 %)

This is detailed in Table…6 and calculated from Table 7 of Kyzylkum Sub Region Monitoring Pan .

Table 6 : Estimated Budget for Environmental Management Plan (Kyzylkum EMP)
74,000 ha   (Cost $7.64 /ha)

Item	**Q-ty**	**Unit Cost**	**Total Cost US$**
Capital Cost-Equipments for Rayons			
GPS units (handheld), Computer download	26	250	6500.0
Electrical Conductivity Meters(24 Rural Districts)	26	250	6500.0
Capital Cost- Equipment for WUA			
GPS units (Hand Held),computer download	26	250	6500.0
Electrical Conductivity Meters(17 Rural Consumer Cooperatives of Water User RCCWU)	26	250	6500.0
Recurrent Costs			
Support to PMO for Baseline Survey	1 each	17,810	17,810
Support to PMO for M&E activities over 2 years	Lumpsum	40,000	40,000

Analysis for soil and water samples for 2 years by CWR &MOG	2 Yearly	220,850	261,100
Support for reforestation & biodiversity by CF	Lumpsum	75,000	90,000
Total			434,910

Note: This $434,910 is based on figure of 1996. For 2007 condition ,this $434,910 has to be updated by 30% (cost of inflation) , which comes to ($ 434,910 + 130,473) **USD$ 565,383 (TOTAL COST FOR MONITORING).**

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out. The suggested report systems for environmental monitoring programs are made on the following consideration:

1. Monthly report from the Contractor

   Contractors should regularly monitor the environmental –related issues and environmental parameters based on the guidance from Environmental Management Specialist and requirements from Ryon Inspector. They should provide a monthly report covering performance of environmental monitoring and progress of environmental related activities.
2. Monthly Environmental Management Report

   The requirement of Environmental Management Specialist is to produce a monthly performance report of environmental monitoring , summarizing the environmental monitoring of sub-projects and other related environmental problems.
3. Environmental Monitoring Report

   The Rayon office laboratories of IDIP-II need to submit PMO thematic monitoring report on the changes in salinity, changes in water use, changes in soil productivity, including baseline soil surveys and subsequent periodic surveys, as well as proposed suggestions for actions to solve key environmental problems if any (semi-annual monitoring and annual monitoring report).

4. Semi-Annual PMO Report

   Every half year, PMO needs to compile a quarterly environmental working report, summarizing the progress of EMP implementation , and monitoring status. The report from IDIP-II project and the Environmental Management Specialist should be attached to PMO report. This report may be integrated into "The Progress Report" and sent to WB for review. The copies may be sent to Oblast Office for reference.

Table 7: Kyzylkum Subregion Monitoring Plan
CALCULATION IS DONE FOR 74,000 Ha (Kyzylkum Subregions)

Parameters to be Monitored	Periodicity	Number of Samples				Cost of 1 analysis in $US	Total Cost in $US
		Total Number of Samples	Number of Indicators	Sum of Determination	Total/ yr		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 900	3	2700	2700	15	40,500 **81,000**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 1000	5	6000	6000	10	60,000 **120,000**
4. Water Quality							
4.a Ground Water Quality							
4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 90	1	90	90	10	900 **1800**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 90	15	1350	1350	20	27,000 **54,000**
4.a.c Fertilizer	Annually	(1sample /1000 ha) 90	1	90	90	15	1350 **2,700**
5.Pesticide residues in fish & fodder crops	Annually	2	20	40	40	20	800 **1600**
6.Reforestation , composting and Tree Belts(Bio-drainage & Salinity Control)	Annually	1 $ Per /ha		$90,0000.0	$90,000.0	$1 Per Ha	**$90,000.0 (including yearly Maintenance)**

7. Equipments for Rayons &WUAs	Annually 21 hand held GPS units, computer download, 21 Electrical Conductivity meters	2 Rayons Shardara & Arys Only 21 (Rural Consumer Cooperatives, RCC) in Shardara			10,500 US$ 1 unit (GPS & Electrical Conductivity meters $250.0 X42	$250.0 for one unit	**$13,000.0** (one time purchase)
						Grand Total	**$364,100**

Source: The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1999.

5. FINDINGS AND RECOMMENDATIONS

5.1 The Need for an Environmental Impact Assessment (EIA)

This section evaluates the need for an Environmental Impact Studies (EIA). This should be based on the fact whether significant environmental impact exist and that need a further detailed study or EIA.

As per as we have seen there are no negative environmental impacts due to IDIP-I proposed project formulation , design, implementation , and operation. The only negative impacts identified are transitory ones (can be mitigated) associated with construction operations. All other impacts for Mahtaaral are positive. The required mitigation are presented in sections and 7.4.

The recommendation from the findings of this Environmental Assessment (EA) are that a follow up EIA or further detailed environmental impact study (EIA) study is not needed.

5.2 Potential Environmental Impacts, Possible Mitigation Measures and Responsible Agencies

The environmental monitoring program will be part of an integrated project monitoring program which will be established by the PMO. The PMO and the "Project Implementation Unit" (PIU) offices at Project area oblast will be responsible for implementing all environmental mitigation measures. Table …… presents all relevant issues with respect to the potential environmental impacts and the possible monitoring and mitigation enhancement measures. The table also lists those agencies who are responsible and also lists agencies which should have an involvement in the monitoring program and an input to the development and planning of the mitigation measures.

5.3 Environmental Assessment Requirement of MOEB

The Government of Kazakhstan (GOK) requirement is to present this Environmental Assessment (EA) report to MOEB. The instruction by MOEB call for report in which available data on the resources likely to be affected by IDIP-II are to be analyzed in terms of scope and intensity. An Environmental Assessment (EA) report are to be prepared by proponent (CWR) and should be included with the feasibility report and submitted for approval. This report provides a brief description of ecological and social sources, and trends in agriculture. Natural resources that are sensitive to change should be identified along with potential environmental problems. This report should be given a public review and then presented to the Ministry of Ecological and Biological Resources (MOEB). The MOEB reviews the EA and its comments (State Ecological Expertise) and forwarded to the concerned sections for approval.

The World Bank 4.01 "Environmental Assessment" has screened the IDIP-II Project and placed it in EA category "B", which means the preparation of an environmental analysis to define environmental management , monitoring and mitigation measures as necessary. The recommended mitigation measures in the State Ecological Expertise (SEE) review would become an integral part of integral part of project design and implementation. The archeological sites would be protected with the guideline and requirement of Kazakhstan law and acceptable to the World Bank. The assurance was also obtained from Kazakh Government about the use of agrochemicals for IDIP-II would be approved ,stored and distributed and used in accordance with the guidelines and requirements of Kazakhstan Government acceptable to the World Bank (WB).

6. CONCLUSION

For Kyzylkum sub project an Environmental Impact Assessment (EIA) is not necessary. However , the appointment of a local / domestic Environmental Management Specialist to assist with the implementation of the Environmental Management / Monitoring Program and train WUA staff is considered very important for the success of the Environmental Management and Monitoring Plan (EMP). A term of reference (TOR) for the Environmental Management Specialist (EMP) is prepared in the Annex …T.

7. FUTURE DEVELOPMENT PLAN

In addition to engineering development plan , the environment section has the following environmental management and monitoring plan:

1. Monitoring of Soil salinity and pesticide for 2 years
2. Monitoring of surface and Ground Water for water quality (salinity & pesticide).
3. Water table depth
4. Drainage water for salinity , pesticide & fertilizers
5. Pesticide residues in fish , animal tissue and fodder crops
6. Reforestation of indigenous plant for biodiversity & desertification
7. Reclaim saline soil , saline surface and ground water.

This are all explained in Environmental Management and Monitoring Plan.

ECOLOGICAL & ENVIRONMENTAL STUDIES OF IDIP-II PROJECT
ENVIRONMENTAL ASSESSMENT (EA)
ARYS-TURKESTAN SUB-REGIONS

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A. Report

B. Tables

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1. Summary of Arys-Turkestan Environmental Assessment (EA)

The Environmental Assessment (EA) describes potential impacts of irrigation and drainage improvement and rehabilitation of 26,000 ha excluding pilot area. In fact there is no pilot area in Arys-Turkestan, one of the ancient towns in Kazakhstan.

Arys-Turkestan has a total population of 62,000 with a density of population of 9.9 person per km^2. The potential for waterlogging and secondary salinization will be managed by vertical drainage, and a cleaned and deepened interfarm and on-farm collectors drains.

The project is located in the alluvial valley of the Syr Darya and Karachik River. All the land in the project area , except settlement , is used for agriculture or cattle breeding.

About 96 % of the total area , the extent of salinity is non saline to moderately saline (1 -3 gm of salt /litre) and is slightly polluted by pesticide and herbicide (Table 4 of EA Main Report).

Drainage water from Turkestan main canal is disposed into Shoshka-Kulskaya depression and vertical drainage boreholes is discharged into irrigation canals. Drainage water from Syr Darya command area is discharged into old river bed of Tamdiozek and Shoskka –Kulsky collector, which flows into Syr Darya river.

The depth of ground water table , for about 96 % of the total area (Table 5 of EA Main Report) are more than 2 -5 m . About 46 % of the total area , the ground water are more than 5 m depth.
Impact Assessment :
The effect of IDIP –II on natural and social resources can be described as follows. Under the IDIP-II an area of 26,000 ha has been outlined for feasibility study. As proposed , after leaching and draining , the lands will be retuned to intensive farming . With drainage and better farming practices, changes in land use are expected. The impact assessment has been simplified into three main components: (1) Project design , (2) Project construction, and (3) Project Operation. Out of 6 project related activities, no adverse environmental impacts are expected.

If irrigation and drainage systems are not rehabilitated, the existing infrastructure will become further degraded, and agriculture will become difficult, the soils will become more saline and waterlogged. The land will turn into more un- productive and more desert condition.

Most of the potential impacts are effectively mitigated. The environmental impacts related to project design, construction, and operation will not effect the environment. Project documentation will be prepared on:

1. Regulation for closed vertical bore holes and destroyed horizontal canals to avoid contamination of ground water for village water use.
2. Regulation forbidding persistent chemical weed and pest killers.
3. Environmental sustainability and bio-diversity preservation for the IDIP-II

The Environmental Assessment , the main EA report, proposes that the Committee of Water Resources (CWR) and Ministry of Environment and Biological Resources (MOEB) will be responsible for project development and big role for IDIP-II EMP. For environmental monitoring , all the Rayons and WUA /equivalents will be trained in water and soil salinity monitoring procedures and equipments. One or more short courses for professional developments will be organized in project institutions.

A monitoring program will be formulated to avoid any unforeseen negative environmental effects when implementing Arys –Turkestan IDIP-II project. This is required to guarantee efficiency of the mitigation measures and a monitoring program is very much required. In this connection the “Monitoring Plan” is referred (Table 5) for discussion. The main objective of the monitoring plan are as follows:

- Regular soil sampling for chemical analysis, weed and pest , and for fertilizer.
- Regular surface , ground and drainage water sampling inside irrigation and drainage project (IDIP-II) for chemical analysis, weed and pests, and fertilizers. Depending on the initial results of the monitoring , the space and intensity of analysis could be increased or decreased.
- The fodder crops, animal tissues and milk should be analyzed for pesticides. Depending on the results, the analysis could be continued or discontinued.

The total monitoring cost for 26,000 ha of Arys –Turkestan is about $ 217,503 (Table 5). If we spread the cost for the whole area it comes to about $8.43 per hectors. It is worth to spend that money on monitoring.

The findings and recommendations for an Environmental Impact Assessment (EIA).

As we have seen from the EA document , there are no negative environmental impacts due to ATK (Arys-Turkestan) project formulation, design , implementation, and operation. Some of the impacts identified are transitory ones and can be mitigated during construction and operation. All impacts for Arys-Turkestan are positive. There are no need for further EIA study.

Arys- Turkestan Sub Regions
2. Arys-Turkestan I & D System-General Description

A detailed project description has been given in mid term report. A general environmental description is also presented in section 3 and 4 the Main Environmental Assessment (EA) report.
Further information on agriculture, soil , agro-economy, sociology, design and other engineering details will be available from Mid Term Engineering report.

Arys Administration, which is located in the close vicinity of the Arys-Turkestan IDS occupies an area of 6.3 thousand km^2.The Administration consists of 25 settlements under 6 rural districts. Total population of the Administration is 62.2 thousand with density of population of 9.9 per km^2.
Location of Arys-Turkestan is presented in Map AT-1 or Figure 1 of this report.

Turkestan Administration , one of the ancient towns of Kazalkhstan, is considered as spiritual center of the country. The World Mausoleum of Hodza Akhmet Yassavy is located in this town. The Administration occupies an area 7.4 thousand km^2 with a total population of more than 183 thousand. The density of population is 25 persons per km^2. The area consists of 39 settlements in 11 rural districts.
Demographic analysis for seven years, from 1998 to 2004, indicated that there has been increase in population both in Arys and Turkestan Administration by 5.8 % and 6.6 % respectively. Total number of labour resources of the area.makes up 39.2% of the total population.
The total population in the Makhtaaral IDS is 82716, of which 40761 are male and 41131 are female. Total number of households is 15055. The following table shows the population and number of households is 15055. The following table shows the population number of house holds of the rural and settlement districts of the Arys-Turkestan Subproject area.

Climatic condition is characterized by hot and dry summer, warm and dry autumn, short unstable winter with sharp fluctuation of temperature, short and usually warm spring. Average annual temperature is 11^0C. Average monthly temperature of the hottest monthmonth July is 28.3 ^{0} C, mean maximum temperature is 36.2 ^{0} C and mean minimum temperature is 19.4 ^{0} C. Absolute maximum temperature is 46^0 C.

Hydrology:
The sources of water supply to the Arys-Turkistansky IDS is Burgunsky reservoir, having annual storage capacity 360 million m^3 being predominantly recharged by Arys river with some flow Bugun river. The Arys flow is diverted to the reservoir through Arys canal, which offtakes at up stream of Karaspansky dam. The

capacity of Arys canal is 22.0 m^3/sec. The annual average discharge of Arys river, upstream of Karaspansky dam, based on data over a long-term period is evaluated as 41.6 m^3/s, and discharges with probability of 50%, 75% and 95% are 39.90 m^3/s, 35.5 m^3/s and 31.50 m^3/s respectively. The flow hydrograph of Arys river is given below:

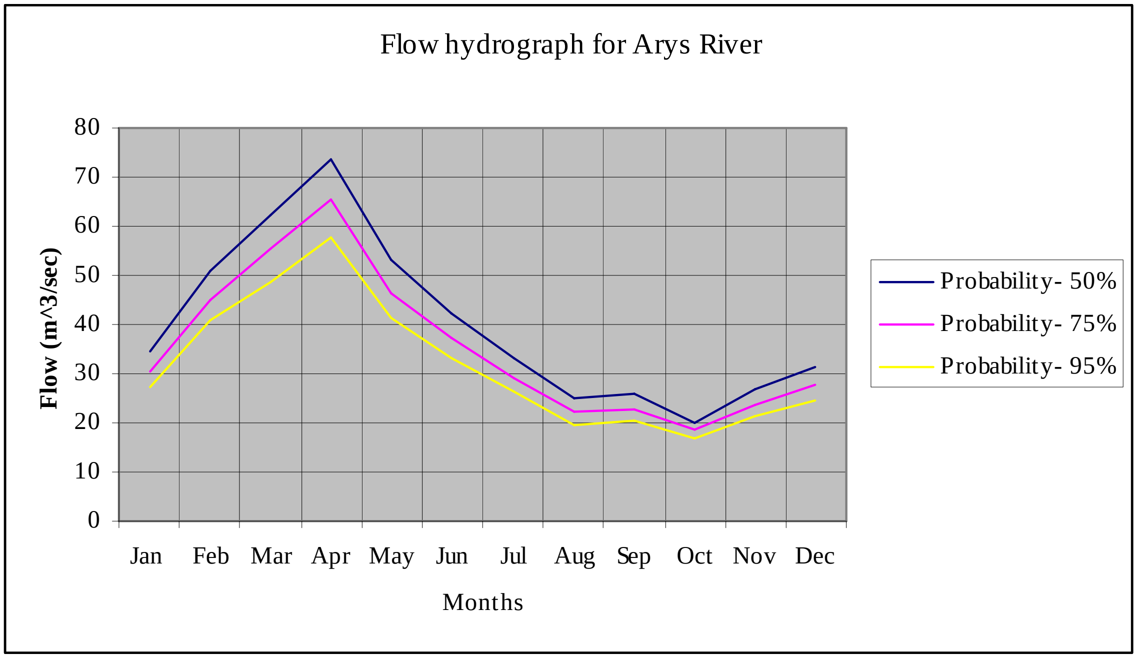

Figure: 2 Flow Hydrograph for Arys River

The annual average discharge of Bugun river, upstream of Karaspansky dam, based on data over a long-term period is evaluated as 4.43 m^3/s, and the discharges with probability of 50%, 75% and 95% are 3.54 m^3/s, 1.84 m^3/s and 0.53 m^3/s respectively. The flow hydrograph of Bugun river is given below:

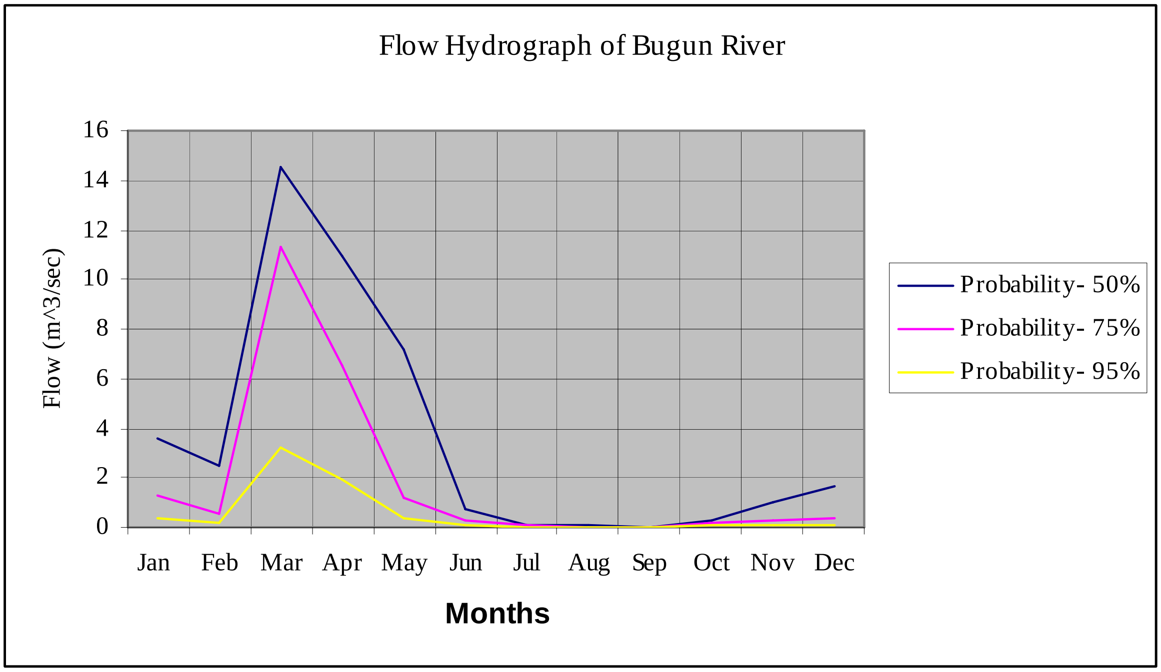

Figure :3 Flow Hydrograph of Bugun River

It is evident that during the period 2000-2005, the annual average inflow of Arys river amounts to 39.0 m^3 / sec, of which the actual diversion to Aryssky main canal makes up to 22.6 m^3/ sec or 58 % of the total annual inflow .

Further description for project description is available in the Mid Term Engineering Report .

The total subproject area is 26,000 ha and distributed in 10 subdivisions, mostly along Turkestan main canal. There are three different sources of water for the Arys-Turkestan IDS: Bugun reservoir, the Rivers Syr Darya and Karachik. The Turkestan Main Canal (TMC) , which forms the main conveyance system, offtakes from Bugun reservoir . Of the three sources , the Turkestan Main Canal and Karachik work under gravity and Syr Darya by pumps.

Drainage water from Turkestan main canal command area is deposited to Shoshka-Kulskaya depression, and vertical drainage boreholes are discharged into irrigation canals. Drainage water of Syr Darya command area is discharged into old river bed Tamdiozek and Shoskka-Kulsky collector, which flows into Syr Darya river.

It is evident that the availability of irrigation water for Arys-Turkestan I&DS is in short supply , even when canal receives normal water (120m3/sec), there will be slight shortage of irrigation water for IDIP-II development (see Mid Term Engineering report).

Details of the sources of irrigation water supply and type of drainage for different subdivision are described in Mid Term Report

Project description and environmental description can be obtained from Environmental Assessment (EA) Main report and engineering part can be seen in the Mid Term Engineering Report.
The Environmental Assessment (EA) Main Report describes the issues as mentioned by the World Bank suggested format OD 4.0 , Annex A-1, as follows:

1. Policy ,legal and Administrative Framework
2. Description of the Proposed Project
3. Description of the Environment
4. Significant Environmental Impacts
5. Analysis of Alternatoives
6. Mitigation and Management Plan
7. Environmental Management and Training
8. Monitoring plan
9. Inter-Agency and Public /NGO Involvement
10. List of references
11. Appendices

Because of the repetitive nature of the topics , the above subject matters are only described once in EA Main Report.

For further engineering details, read detailed engineering plan of the Feasibility Report.

3. Potential Environmental Impacts

This will determine & distinguish between significant positive and negative impacts, direct and indirect impacts, immediate and long term impacts .
The consultants will also identify impacts which are unavoidable or irreversible. Wherever possible , the consultants will describe impacts quantitatively , in terms of environmental costs and benefits.
Environmental Impacts by sub project related activities are presented for Makhtaaral Sub Regions in Table 1. Seven sub project related activities are effected by potential environmental impacts such as project design, project construction and project operation activities . They are all presented in Table 1. Further explanation on “Potential Environmental Impacts” can be obtained from Environmental Assessment (EA) Main Report , Section 5.

Table 1: Environmental Impacts by Sub-Project Related Activities

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project Arys-Turkestan Oblast I&D System			
1.Rehabilitation & Construction of Irrigation & drainage network and associated infrastructure	NO (+)	NO (+)	NO (+)
2. Improved Irrigation & Drainage Management.	NO (+)	NO (+)	NO (+)
3. Improved soil and land improvement / reclamation.	NO (+)	NO (+)	NO (+)
4. Agricultural extension activities	NO (+)	NO (+)	NO (+)
5. Biodiversity & Reforestation	NO (+)	NO (+)	NO (+)
6.Improved WUA Water & Drainage Management.	NO (+)	NO (+)	NO (+)

D = Project design ; C= Project construction and O= Project Operation
No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures)
(+) Positive Impact
(-) Negative Impact

Most project activities will provide improved agricultural practices, land and organizational management practices.

4. Environmental Management

4.1 Environmental Impacts Related to Design

The design of Irrigation and drainage system for Arys-Turkestan is not expected to produce negative impacts on the South Kazakhstan Oblast irrigation and drainage rehabilitation part. The design/ construction of new drains and rehabilitation of existing drains will not increase the amount of salt and agricultural chemicals entering natural waterways.
According to Table 2 salinity within Arys-Turkestan about 96% of the area are non saline to moderately saline (1-3 gm/l). For the same area (96%) , the depth of ground water (Table 3) are beyond 2 to 5 meters or more.
For this reason:

- The salinity content of the 96% of the project drains are between 1-3 gm/l (Table 2).
- The quantity of water carried by the drains are low when compared to the discharge of the Syr Daria River.

Land Resources
As proposed in the plan , 26,000 ha has been selected for feasibility study. The objective is to rehabilitate reliable irrigation supplies, for moderate to high saline soils, where substantial improvement of land productivity can be achieved with relatively low investment. As a result of drainage improvement, minor changes in land use are expected. There is a non to moderately saline soil in Ays-Turkestan (Table 2), water table depth is within 2 to 5 m or more. The ground water salinity (>3 gm/l)is more than surface irrigation water(>1gm / l) salinity (Table 2).
Further description of soils is provided by Soil Expert in the Mid Term Report.

Water Resources
Some canal will be lined and there will be improvement in water supply to irrigated lands. Salt content (mineralization) in the drainage water will be kept within limits of 4.48 to 4.93 g/l. After mixing the drainage water with irrigated surface water (1.5 -2.0 g/l), the salt content of Collector will be decreased to 4.2 to 6.4 g /l (Environmental Impact Assessment Report, Hazra Engineering International Company , 1996). For further details please consult engineering report.

Table 2 : Extent Of Salinity Within Sub-projects

Target oblasts	Target Sub-projects	Total Area, thousands of km^2	Non Saline, <1gm/l % of Total Area	Moderate salinity, 1-3 gm /l, % of Total Area	High salinity, 3-10 gm / l, % of Total Area	Very High salinity, >10 gm /l, % of Total Area
1. South Kazakhstan	1. Maktaaral	48000	0	44,67	49,44	5,89
	2. Kyzylkum(Shardara)	74900	1,3	97,3	1,4	0
	3. Turkestan	26000	41.0	55.0	1.0	3.0
2. Kyzylorda	1. Kyzylorda	42638	0	24,5	47,2	28,3
3. Zhambul	1. Bauzak raion, Utemis	5200	0	64.7	35.3	0
4. Almatynsky	1. Karatalsky Irrigation system	5000	85.39	12.68	1.93	0
	2. Akdalinsky Irrigation system	5000	89.0	11.0	0	0
	3. Malaisarinsky Irrigation system	2500	45.1	36.0	18.9	0
	4.Enbekshi-Kazakhsky raion	12500	62.0	25.0	13.0	0

Source: State Institute of South Kazakhstan Hydro-geological and Land Reclamation Survey, Committee of Water Resources , Ministry of Agriculture, Govt. of Kazakhstan , 2005

4.1.1 Bio-drainage and Salinity Control

Many drainage system are dysfunctional and another option particularly on moderate to high saline land (Table…2) would be to introduce bio-drainage techniques to control soil salinity and water table levels by using especially established plantation of trees, bushes, grasses and crops. This moderately to high salinity (1-10 gm salt / l) is not good for agricultural development unless good measures are taken for salinity control (Tables 2 &3). Following Bio-Drainage and Salinity control is very appropriate for mitigation.

Table 3 : Extent of Water Table Depth Within Sub-projects

Sub-project Area	Water Salinity, gr/l	Oblast	Rayon	Total Area (ha)	The Depth of Ground Water Table < 2 m, as % of Total Area	The Depth of Ground Water Table from 2 m to 5 m, as % of Total Area	The Depth of Ground Water Table > 5 m, as % of Total Area
1	1,15	South-Kazakhstan	Maktaaral (Syrdarya river)	48000	28,8	71,2	0
2	1,2	South-Kazakhstan	Kyzylkum (Shardara) (Syrdarya river)	74900	10,5	89,5	0
3	0,42	South-Kazakhstan	Turkistan raion ATK	26000	4,0	50,0	46,0
4	1,8	Kyzylorda	Kyzylorda (Syrdarya river)	42638	12,6	87,4	0
5	0,46	Zhambul	Bayzak (Talas river)	5200	82,5	17,5	0
	0,76		Shu (PMC, Shu river)				
6	0,28	Almatinsky	1. Karatalsky Irrigation system	5000	21,94	78,06	0
7	0,41	Almatinsky	2. Akdalinsky Irrigation system	5000	44,0	56,0	0
8	0,58	Almatinsky	3. Malaisarinsky Irrigation system	2500	33,0	67,0	0
9	0,75	Almatinsky	4.Enbekshi-Kazakhsky raion	12500	45,91	54,09	0

Source: State Institute of South Kazakhstan Hydrogeological- Land reclamation Survey carried by the Committee of Water Resources, Ministry of Agriculture, Government of Peoples Republic of Kazakhstan,2005

Tree Belts

The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage , decreasing ground water levels and helping to tackle the problem of secondary salinity and waterlogging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent % . As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions. Table 5 gives you list of indigenous trees and bushes for tree belt formation. Table 4 gives a “List of Indigenous Trees and Bushes” that can be grown in the project area.

a) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt , high saline soil may be leached with fresh water before planting 1-2 year old sapling.

b) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant , has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

c) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

d) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

- Alkali grass (*Puccinellia airoides)*
- Desert Saltgrass (*Distichlis stricta)*
- Wildrye (*Elymus spp)*

- Bermuda grass (*Cynodon dactylon)*
- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main, on farm and inter-farm canals.

- Establish Compost / Bio-gas sites

In design phase, establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.
Table 5 gives a list of indigenous trees and bushes that can be used in planning tree lines and fence lines around farms, pump houses and irrigation canals. They should be chosen with experience and knowledge.

Table 4 : **List of Indigenous Trees and Bushes for IDIP-II**

Trees	Bushes
1. Apricot - Armenica vulgaris Lam	24. Siberian pea shrub - Caragana arborescens Lam.
2. Cherry-plum - Prunus divaricata Ledeb	25. Redhaw hawthorn - Crataegus sanguinea Pall.
3. Asian sumac - Ailanthus altissima	**26. – Calligonum aphyllum Gurke.**
4. Birch - Bertula pendula Roth	**27. – Calligonum microcurpum Borszcz**
5. Siberian elm - Ulmus pumila L.	**28. – Calligonum caput-medusae Schrenk.**
6. Elm - Ulmus laevis Pall.	**29. – Calligonum serosum (Litv.) Litv.**
7. Common Pear - Pyrus communis	30. Tatar honeysuckle - Lonicera tatarica L.
8. Tatarian maple -Acer tataricum	31. Violet willow - Salix daphnoides Vill.
9. Ash-leaved maple - Acer negundo	32. Caspian willow - Salix caspica Pall
10. Larch Siberian - Larix sibirica Ledeb.	**33. – Salix rubra Huds**
11. Bastard acacia - Robinia pseudoacacia L.	34. Mespilus rotundifolious - Amelanchier rotundifolia (Lat.) Dum./Cours.
12. White saxaul - Haloxylon persicum Bunge	35. Russian olive - Elaeagnus angustifolia
13. Black saxaul - Haloxylon aphyllum (Minkw.) Iljin	36. Rotundifolious Juneberry - Amelanchier rotundifolia (lat.) Dum./Cours
14. Pine Crimean -Pinus pallasiana D.Don.	37. Wig-tree - Cotinus coggygria Scop.
15. Archangel fir -Pinus sylvestris L.	38. Golden currant - Ribes aureum Pursh.
16. White poplar - Populus alba L.	39. French tamarisk -Tamarix ramosissima Ledeb.
17. Poplar balsamic - Populus balsamifera	40. Loose tamarisk -Tamarix lara Willd
18. Bay leaf poplar - Populus laurifolia Ledeb.	41. Coniferous ephedra - Ephedra distachy L.
19.Poplar diversifolious- Populus diversifolia Schrenk	42. Paletskiy Saltwort - Salsola paletskiana litv.
20. Poplar Siberian - Populus barsamifera L. (var. sibirica)	43. Rihter Saltwort - Salsola richteri (Moq.) Kar. Ex. Litv.
21. Black poplar - Populus nigra L.	44. Glasswort - Aellenia
22. White mulberry - Morus alba L.	
23. Siberian apple - Malus pallasiana Jus.	

	subaphylla (C. A. Mey) Aell.

4.1.2 Soil Salinity Management

The major constraint to crop production is the soil salinity if sufficient water is available for crop production. The steady decline in cotton production over the three decades from 4 ton / ha to about 2 ton / ha (See Agro-Economic Report) can be attributed to increasing salinity over that period in Makhtaaral. Increasing levels of salinity not only reduce yields and quality of produce of individual crops but also restrict crop choice. The relative salt tolerance of crops or which could be grown in Makhtaaral is given in Table 6 (Soil Report), expressed in terms of electrical conductivityof the saturated soil extract (ECe, in mS/cm). Salinity is locally expressed as total water extractable salt per unit of soil (% or gm / 100 gm soil). This also includes gypsum, which does not contribute to toxicity effects until high gypsum concentration are leached. For Makhtaaral soils, the relationship between ECe and % salt in soil has been determined as $y=16.4x+0.0425$, with an $R2= 0.8252$ (Mott Macdonald 2003, working paper no.27).
The above relationship for salinity management has been worked out for Makhtaaral but this can also be applied to Arys-Turkestan.

Management of Soil Salinity:

The principal of soil management is to address their main cause- the High Ground Water Tables. There are number of ways to lower water table for Arys-Turkestanl Subproject area:

- Improve horizontal and vertical drainage systems, as discussed in the I&D Rehabilitation Report.
- Match Irrigation application with actual crop water requirement , as described above , and avoid excessive accumulation of irrigation water in the soil profile.
- Establishment of bio-drainage, such as planting of trees along field boundaries (Ref to section 11.2.2.1) which would extract water from the soil , by lowering the water table, , and also reduce crop water demand by providing wind breaks which would reduce crop evapo-transpiration.

The current recommended method of decreasing soil salinity level is leaching of the soil with large quantities of irrigation water. The amount of irrigation water to be applied for leaching depends on the degree of salinization. For weakly saline lands (0.3-0.4 %), it is recommended that 2-2.5 thousand m3 /ha to be applied in autumn or early winter. For moderately saline soils (0.4-0.8 %) 6 thousand m 3 /ha in two applications is recommended and for strongly saline soils (>0.8%) 13-15 thousand m3 /ha 4-5 applications is recommended.
But , prerequisite for successful use of this technique are leveled land , unimpaired soil infiltration and effective drainage. In the absence of these conditions, leaching runs the risk of further raising the water table and increasing

salinization in the soil surface. It has been suggested that leaching is not necessary if deep ripping and leveling have been done and drainage is adequate (ULG- Mott MacDonald,2005). Further, the large quantities of water required for leaching would substantially reduce the WUE (water use efficiency)of the cropping system. It is suggested that the requirement for leaching to reduce soil salinity should be re-examined.

Emphasis should be given to lowering the water table, such that salts are flushed out of the rooting zone in the process of normal irrigation. For a viable crop rotation, it is necessary to grow some crops in the system which are salt sensitive. Lucerne appears to be an integral component of a sustainable cropping system in this environment. But the crop is relatively salt sensitive. Several potentially high value vegetable crops are also salt sensitive. Table 5 gives you list of salt tolerant major crops that can be grown in project area.

Table 5: Relative salt tolerance of major crops grown in the Arys-Turkestan Subproject area.

Category:	Sensitive	Moderately sensitive	Moderately tolerant	Tolerant
ECe[1] at which yield loss begins:	<1.3	1.3-3.0	3-6	6-10
Crop:	Lucerne Beans Carrot Onion	Maize Rice Brassicas Cucurbits Melons Potato Tomato	Wheat Red beet	Cotton Barley Sugar beet

1. Electrical conductivity of the saturated soil extract, in mS/cm
Source: ULG & Mott MacDonald Ltd, IEE Report , Uzbekistan ,2005

4.2 Environmental Impacts Related to Construction

Reconstruction of the Arys-Turkestan sections of the project involves joining collector with discharging drainage water into primary , secondary and tertiary canals. All open collector and drains will be cleaned and deepened. After the proper design, the project will be open for construction and operation. This will result in the following conditions:

1)Temporary increase in silt

To mitigate this, provisions are there in the standard contract document supplied to contractor for adequate supervision of operations and adherence to the contract. Confining operation to dry and to the dry season only, use of silt traps and careful deposition of spoils.

The incorporation of the above measures will have to be placed into BOQ for sub project contract documentations and supervision of contractors.

2)Temporary closure of irrigation system
Participation by Water User Association (WUA) and Farmers. The information are to be given through dialogue and community awareness campaign. Ask WUA and villagers for permission to close the irrigation system temporarily. They are very important that WUA and farmers involved in all aspect of civil works.

3) Disposal of Excavated spoil from main and inter-farm drains.
Excavated soil (spoil) will be deposited alongside the drain in accordance with the guideline laid down by GOK/ MOEB with respect to easement dimension.- either side of drain and /or canal. Spoil will be deposited and formed using bulldozer into trapezoidal formation.

4)Disposal of Excavated soil (spoil) from on- farm Drains and Canals.
Spoil will be deposited alongside canals and drains in accordance with WUA and farmer instructions. If required and instructed, the contractors may deposit spoil on farm fields at the expense of farmers.

5) Dust generation
The mitigation measures recommended is the appropriate timing of operations wetting of surfaces and notice to /involvement of public. The workers on construction sites should have international personal safety / protection equipment supplied by the contractor.

6. Noise Generation:
Mitigation measures:
Appropriate timing and operation of machine are to be discussed with the farmers and WUA. Notice will be given to public and WUA- farmers will be involved in timing and reduction of noise level in the project areas.

7. Waste Material :
Replacement and repair of the irrigation and drainage structure will result in waste material (concrete and steel). These are to be disposed of by the civil works contractor as per CWR / MOEB guidelines.

8. Land Use Conflict for Construction
The CWR , MOA and GOK assessed that there will be no land use conflict for construction. This also confirmed by the client, the CWR, and guarantee given by them to the World Bank. On farm negotiations would be made with WUA and the landowners. However, civil works only will be done by participation agreement of land owners and WUA. The PMO / CWR should have the responsibility for dispute settlement.

9.Construction of Camp Sites and Living Facilities
Establishment and construction of camp sites, and Living facilities for the construction workers have to be established prior to construction work. An acceptable sanitary facility has to be established for the workers. This must satisfy environmental regulation and MOEB code.
The camp site has to be cleaned and returned to the original state before the construction.
Refuge should be properly collected and disposed off.

Mitigation measures are to be:
1)CWR & MOA agrees to allocate free sites for the construction of camp sites and living facilities. This has to be negotiated with the client and the local authorities. Construction of camp sites and living facilities will be funded by the contractor. Clean up costs for these facilities will be borne by the contractor.

10. Biodiversity Conservation / Sustainability
Environmental Sustainability of the project area is very low. To improve this situation following steps will be taken:

(1) Organize nursery at every sub-regions and WUA. Provide free extension service ,input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pump location, main , on farm and inter-farm canals.

(2) Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation should be considered.

4.3 Environmental Impacts related to Operation

1) Soil modification as a result of intensified agriculture
The mitigation required
a) Encouragement of continued use of traditional management of water flows
b)The use of deep rooting grasses and shrubs to further strengthen the bunds
c) Minimum / zero tillage practices

2)Soil and water contamination due to increased use of agrochemicals including fertilizer and pesticides.
The mitigation required
Mitigation required are agricultural extension services and Integrated pest management (IPM).
The agricultural extension service would include

a)Optimum , informed use of mineral fertilizer
b)Promotion of integrated pest management (IPM)
c) Discouragement on the use of persistent pesticide and herbicide.
d) Training on composting, reforestation, minimum or zero-tillage.
e) Biodiversity associated with introduced new plant species and varieties .
Promote Biodiversity for new introduced crops and land use changes . Protect soil from wind erosion by tree fencing along pump sites, collectors and other environmental management practices.

(3) Environmental Sustainability & Bio-diversity Concerns.

Biological diversity refers to the variety of South Kazakhstan living biological resources. It is a function not simply of the number of ecosystem and distinct plants and animal species in existence at any given time , but also genetic differences within individual species.
Conservation of biological diversity is a form of natural resources management and should be practiced in Arys-Turkestan area. This can be done by reforestation activities by indigenous plants on vertical drainage sites, main and secondary canals, and other inter farm canals. A reforestation site plan will have to be prepared in IDIP-II (Phase B) design level.

5. Environmental Monitoring

Monitoring is necessary with respect to (i) water resources quality and quantity ; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance management, including inspection and proper repair of irrigation & drainage canals and structures.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources(CWR) , MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate to evaluate the success or failure of IDIP-II proposed project intervention in the Arys-Turkestan.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information . Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project , the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as :

1. Soil salinity and high ground water tables;
2. Water Quality & Salinity .
3. Reforestation, Bio-Diversity and Desertification.

The variables to be analyzed are described in Annex……. It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15…...and for one water samples is about USD 10. Most of the project farmers interviewed that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient . Such sampling density for 220,000 ha over 2 year life of the project would be extremely expensive.

Table 6 : Monitoring Plan for Arys -Turkestan
CALCULATION IS DONE FOR 26,000 Ha (Arys-Turkestan, about $4.52 / ha.)

Parameters to be Monitored	Periodicity	Number of Samples				Cost of 1 analysis in $US	Total Cost in $US
		Total Number of Samples	Number of Indicators	Sum of Determination	Total/ yr		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 260	3	780	11,700	15	11,700 **23,400**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 346	5	1730	17,300	10	17,300,000 **34,600.0**
4. Water Quality							
4.a Ground Water Quality							
4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 26	1	26	260	10	260 **520**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 26	15	390	7,800	20	7,800 **15,600**
4.a.c Fertilizer	Annually	(1sample /1000	1	26	390	15	390

		ha) 26					**780**
5.Pesticide residues in fish & fodder crops	Annually	2	20	40	40	20	800 **1600**
6.Reforestation , composting and Tree Belts(Bio-drainage & Salinity Control)	Annually	1 $ Per /ha		$26,0000.0	$30,000.0	$1 Per Ha	**$26,000.0 (including yearly Maintenance)**
7. Equipments for Rayons &WUAs	Annually 7 hand held GPS units, computer download, 7 Electrical Conductivity meters				4,000.0 US$ 1 unit (GPS & Electrical Conductivity meters $250.0 X14	$250.0 for one unit	**$3,500.0** (one time purchase)
						Grand Total	**$117,700**

Source: The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1996.

The other alternative is to sample the pilot area (6,907 ha in Mahtaaral area) fully and for other project areas , sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project.
During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M , it will be easier for them to take this additional responsibility . This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that US$.217,503 (2007 figures).. will be required to implement and train the Environmental Management and Monitoring Plan (EM & MP). For the Arys –Turkestan Sub Regions, the cost of environmental monitoring is about $ 8.4 per hectors. There are three categories of inputs to the EMP as follows:

1. Planning and Surveys and consultant assistance $ 75,038(34.55 %)
2. Mitigation Management $ 133,329 (61.26%)
1. Equipment & Training $ 9,136 (4.18%)

The above information is detailed in Table 7. This table is based on Table 6 ,: Monitoring Plan for Arys-Turkestan presented in the report.

Table 7 : Estimated Budget for Environmental Management Plan (Arys-Turkestan, EMP Cost $ 8.4 /ha) Total Area 26,000 ha

Item	**Qty**	**Unit Cost**	**Total Cost US$**
Capital Cost-Equipments for Rayons			
GPS units (handheld), Computer download	7	250	1750.0
Electrical Conductivity Meters(24 Rural Districts)	7	250	1750.0
Capital Cost- Equipment for WUA			
GPS units (Hand Held),computer download	7	250	1750.0
Electrical Conductivity Meters(17 Rural Consumer Cooperatives of Water User RCCWU)	7	250	1750.0
Recurrent Costs			
Support to PMO for Baseline Survey	1 each	8,905 Year	17,810
Support to PMO for M&E activities over 2 years	Lumpsum	20,000 Year	40,000
Analysis for soil and water samples for 2 years by CWR &MOG	2 Yearly	38,250 Year	76,500
Support for reforestation & biodiversity by CF	Lumpsum	$1 / ha	26,000
Total			167,310

Note: The $167,310 is based on 1996 values. Taking the cost of inflation for 10 years, the total figures comes to ($167,310x 30%) **$ 217,503** .

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out. The suggested report systems for environmental monitoring programs are made on the following consideration:

6. FINDINGS AND RECOMMENDATIONS

6.1 The Need for an Environmental Impact Assessment (EIA)

This section evaluates the need for an Environmental Impact Studies (EIA). This should be based on the fact whether significant environmental impact exist and that need a further detailed study or EIA.

As per as we have seen there are no negative environmental impacts due to IDIP-I proposed project formulation , design, implementation , and operation. The only negative impacts identified are transitory ones (can be mitigated) associated with construction operations. All other impacts for Arys-Turkestan are positive . The required mitigation are presented in sections 11.1.1.3 and 7.4.

The recommendation from the findings of this Environmental Assessment (EA) are that a follow up EIA or further detailed environmental impact study (EIA) study is not needed.

6.2 Potential Environmental Impacts, Possible Mitigation Measures and Responsible Agencies

The environmental monitoring program will be part of an integrated project monitoring program which will be established by the PMO. The PMO and the "Project Implementation Unit" (PIU) offices at Project area oblast will be responsible for implementing all environmental mitigation measures. Table …… presents all relevant issues with respect to the potential environmental impacts and the possible monitoring and mitigation enhancement measures. The table also lists those agencies who are responsible and also lists agencies which should have an involvement in the monitoring program and an input to the development and planning of the mitigation measures.

6.3 Environmental Assessment Requirement of MOEB

The Government of Kazakhstan (GOK) requirement is to present this Environmental Assessment (EA) report to MOEB. The instruction by MOEB call for report in which available data on the resources likely to be affected by IDIP-II are to be analyzed in terms of scope and intensity. An Environmental Assessment (EA) report are to be prepared by proponent (CWR) and should be included with the feasibility report and submitted for approval. This report provides a brief description of ecological and social sources , and trends in agriculture. Natural resources that are sensitive to change should be identified along with potential environmental problems. This report should be given a public review and then presented to the Ministry of Ecological and Biological Resources

(MOEB). The MOEB reviews the EA and its comments (State Ecological Expertise) and forwarded to the concerned sections for approval.

The World Bank 4.01 “Environmental Assessment” has screened the IDIP-II Project and placed it in EA category “B”, which means the preparation of an environmental analysis to define environmental management , monitoring and mitigation measures as necessary. The recommended mitigation measures in the State Ecological Expertise (SEE) review would become an integral part of integral part of project design and implementation. The archeological sites would be protected with the guideline and requirement of Kazakhstan law and acceptable to the World Bank. The assurance was also obtained from Kazakh Government about the use of agrochemicals for IDIP-II would be approved ,stored and distributed and used in accordance with the guidelines and requirements of Kazakhstan Government acceptable to the World Bank (WB).

6.4 CONCLUSION

For Arys- Turkestan sub project an Environmental Impact Assessment (EIA) is not necessary. However, the appointment of a local / domestic Environmental Management Specialist to assist with the implementation of the Environmental Management / Monitoring Program and train WUA staff is considered very important for the success of the Environmental Management and Monitoring Plan (EMP). A term of reference (TOR) for the Environmental Management Specialist (EMP) is prepared in the Annex…T**..**

7. FUTURE DEVELOPMENT PLAN

In addition to engineering development plan , the environment section has the following environmental management and monitoring plan:

1. Monitoring of Soil salinity and pesticide for 2 years
2. Monitoring of surface and Ground Water for water quality (salinity & pesticide).
3. Water table depth
4. Drainage water for salinity , pesticide & fertilizers
5. Pesticide residues in fish , animal tissue and fodder crops
6. Reforestation of indigenous plant for biodiversity & desertification
7. Reclaim saline soil , saline surface and ground water.

This are all explained in Environmental Management and Monitoring Plan in the EA Main Report.

ECOLOGICAL & ENVIRONMENTAL STUDIES OF IDIP-II PROJECT
ENVIRONMENTAL ASSESSMENT (EA)
KYZYL-ORDA SUB-REGION

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ANNEX-D

KYZYL-ORDA

1. Summary of Kyzyl-Orda Oblast Environmental Assessment (EA)

The Environmental Assessment (EA) describes potential impacts of irrigation and drainage improvement and rehabilitation of 30,000 ha excluding a pilot area of 5451 ha on the left bank of Syr Darya River in the Kyzyl-Orda area. The Sub project area includes lands in two Rayons of Djalagash and Syr Darya.

Kyzyl-Orda has total population of 21,674 with total number of families of 3,771. The Pilot Area has a total population of 2235 with total number of families of 387. The meadow marsh soil , which is used for rice cultivation are developed in anaerobic condition due to periods of prolonged flooding. The land use choice of rice cultivation under prolonged flooded rice cultivation has made the Kyzyl-Orda project area very poorly drained and waterlogged. However, this very poorly drained & waterlogged condition will be managed by vertical drainage, with cleaned and deepened north and south collectors, and with cleaned and deepened interfarm and on –farm collectors drains.
The Kyzyl-Orda left bank drainage system consist of surface drainage networks with main collectors, inter-farm and on farm collectors , field collectors and field drains. All drainage channels are unlined and have trapezoidal sections. The condition of the drainage network is extremely poor, Most of the channels are silted up (not cleaned for the last 20 years) and need cleaning.

The project is located in the meadow marsh soil area, which is extensively used for rice, and as a result of prolonged flooding under anaerobic condition , the project area has turned into waterlogged area. The soils are also formed from quaternary deposits on delta alluvium of the Syr Darya River. They are grey clay loam soilwith iron oxide mottling in the plough layer. The organic matter content in the surface layer is 0.6 to 1.6 %.
Many of the low lying areas due to prolonged flooding has turned into wetlands. These wetlands should be preserved as “Wetlands” and considered in the EMP plan.

The extent of salinity for 47% of the area (total area 42,638 km^2) are highly saline (3-10 gm salt / litre). Other 28 % of the total area are very highly saline (>10gm salt / litre). The drainage water taken from North Collector to the South Collector and then to Kuvan Darya, which ultimately outfalls into Syr Darya River.

Impact Assessment:
The effect of IDIP-II on natural and social resources can be described as follws.

Under the project an area of 30,000 ha has to be outlined for feasibility study. The present practice of flooding the area for rice cultivation is ecologically unsustainable. The optimum amount of water to be used for rice and amount of rice cultivation to be reduced for more efficient production should be planned. A land use plan has to be worked out to reflect this situation. As proposed , after cleaning and deepening of collectors , and leaching of soils, the project land will be returned to intensive farming. With reclamation and drainage improvement , changes in land use are expected and more sustainable irrigation system is proposed. The impact assessment has been simplified into three main components: (1) Project design , (2) Project Construction and (3) project operation. Out of 6 project related activities adverse environmental impacts are expected to happen in (Table : 6).

(1) Rehabilitation & improvement of irrigation and drainage network in operation stage.

(5)Bio-drainage, wetland conservation & Salinity Control in the design stage

If irrigation and drainage systems are not rehabilitated, environmental sustainability are not built into the land use pattern, the existing infrastructure will become further degraded, agriculture and environment will become more waterlogged and unsustainable. The land will turn into more wetlands and unproductive wasteland.

Most of the potential impacts will be effectively mitigated. The potential environmental impacts that are created by project design, construction and operation will be mitigated. The project documentation will be prepared on :

1. Land use planning to reflect the environmental sustainability of Kyzyl-Orda. Flooding of the area for rice cultivation is environmentally unsustainable.
2. Regulation for closed vertical bore holes and destroyed horizontal Canals to avoid contamination of ground waterfor village water use.
3. Regulation forbidding persistent chemical weed and pest killers.
4. Bio-diversity and Wet land preservation

The consultant proposes that the committee of Water Resources (CWR) and Ministry of Environment and Biological Resources (MOEB) will be responsible for environmental management and monitoring programs. Part of that responsibility will include training of Rayon and WUA in water and soil monitoring and equipment use . One or more short courses on soil and water salinity monitoring, sampling and data base management will be organized in project institution.

A monitoring program will be formulated to avoid any unforeseen negative environmental effects when implementing Kyzyl-Orda IDIP-II project. This is required to guarantee efficiency of the mitigation measures . A proper monitoring program is very much required. Please refer to “Monitoring Plan” of Kyzyl-Orda (Table…8) and the main object of the monitoring plan are as follows:

- Regular soil and water sampling for chemical analysis, weed and pest and for fertilizers.
- Regular surface , ground and drainage water sampling inside the irrigation and drainage project (IDIP-II) for chemical analysis, weed and pest , and fertilizers. Depending on the initial result of the monitoring the space and intensity of number of analysis could be increased or decreased.
- The fodder crops, animal tissue and milk should be analyzed for pesticides. Depending on the results , the analyses could be continued or discontinued.

The total monitoring cost for 30,000 ha of Kyzyl-Orda is about $447,957 (Table…9.). If we spread the cost for whole Kyzyl-Orda it comes to about $15 per hectors. It is worth to spend that money on monitoring.

The findings and recommendations for an Environmental Impact Assessment (EIA).
As we have seen from the EIA document, there are no negative environmental impacts due to IDIP-II project formulation, design, implementation and operation. The only negative impacts identified are transitory ones and can be mitigated during operation and design. All other impacts for Kyzyl-Orda are positive.

Kyzyl- Orda Oblast (including Zhalagash and Syrdarya Rayons)
2.General Description
A detailed project description has been given in mid term report. A general description of the proposed project and environmental description are also presented at the beginning of section 3 and 4 of the Environmental Assessment (EA) report.
The location of Kyzyl-Orda is presented on Figure 1 or Map KD-1 of this report
A very short "Baseline Condition " are described in the following chapter.

Water Resources:
1.River and Irrigation Canal Water
The Tables 1 and 2 describes the water quality class for irrigation. Further , Table 2 describes irrigation water quality for Syr Daraya River Basin.

The yearly & monthly water quality data on the Syr Darya River collected by Ministry of Agriculture, The State Republic Enterprise "Kazhydromet" and South Kazakhstan Hydrometeorology Centre available for Kyzyl-Orda, Kazalinsk and Karateren, ie. Downstream of Shardara Reservoir, Kyzyl-Orda and Kazalinsk as shown in Tables 3,4, 5 ,6 and 7.
According to the above guideline , the quality of river water at Kyzyl-Orda is classified as class II in terms of salinity during the irrigation period of the project area from May to August., except in June when the water quality is in Class III.

The Water Quality Class II states that " Irrigation water does not have an adverse impact on agricultural products, surface and underground water. Soil salinity , reduction of crops (of weak salt resistance) up to 10% can occur with insufficient drainage . To leach excess salt from soil the leaching irrigation mode is required with drainage and reclamation measures (application of calcium into soil and water, introduction of organic fertilizers and so on.

The above information shows that the regular monitoring of water quality should be done along the Syr Darya river in order to check the deterioration of water quality.
As shown in Tables 5,6 & 7, concentration of heavy metals such as copper, zinc, lead , cadmium, arsenic , mercury and chrome is much lower than the standard (norms) referred in the guidelines. The organic chemicals such as phenols , HCCH,DDE and DDT were not found in the samples.
It is therefore predicted that surface Syr Darya river water at Kyzyl-Orda Headworks and left main canal can be used as irrigation water for most crops except some salt sensitive crops.

The above water quality indicators (salinity, BOD, nitrates, ammonium ,total phosphorus T-P and organic substances) show higher contamination in the downstream reach of Syr Darya river. According to the information from Oblast office of MOEB , the following pollution are observed:

- Syr Darya river receives waste water from urban and industrial areas in Shymkent, KyZyl-Orda and other small towns located along the river. Heavy pollution from chemical factories , mining , oil refinery and food processing factories polluting the Badam river, which is a tributary of the Syr Darya river.
- The return flow from irrigated agricultural land to Syr Darya river reported to spread in the whole basin , except in the study area where the return flow from irrigated area is limited to the existing area of drainage canal system. The high water level in the Syr Darya river is also responsible for high surface water in the project (IDIP) paddy fields.

3.Drainage Water

Two samples collected from existing drainage canals (Table 8) in July 1997 and analyzed (JICA report-1998). According to these tables, salt content in drainage canal is 2100 mg /lit in the upper reaches of North Collector to 2,500 mg /lit in the middle reaches , which shows that the average salt content is around 2.0 times compared to the irrigation water from Syr Darya river. According to irrigation water quality standard of Kazakhstan , the drainage water is classified as Class IV, which is not suitable for irrigation use.
The ground water depth (Tables 9 and 10) of Syr Darya Rayon farms are between 2-1.5 meters

4.Ground Water

Most of the ground water sampled contained (JICA –report , 1998) more than 2,000 mg / lit of salt , which is classified as class IV, based on the irrigation water Quality Standard. The ground water is judged to be not suitable for irrigation use. The Tables 9 and 10 also shows that cations like Na are quite high in both north and south collector and so is the anion sulphate.

Biological Resources

(1) Vegetation and Flora

The vegetation cover in the project area is divided into two categories:

a. Planted Vegetation
b. Natural Vegetation

The “Planted Vegetation” includes mainly rice, wheat, Lucerne and vegetables in the original rice rotation area (original irrigation area). The trees are planted in around the settlement and roads in the project area.

The natural vegetation includes dumetosous vegetation, reeds , mixed grass, and saltworts vegetation.

(2)Fauna

sed on JICA report (1998), the species of fauna in and around the IDIP-II project are listed in “Red Data Book” (RDB) of Kazakhstan and listed in Table 1.

Table : 1 List of Fauna in Kyzyl- Orda

Mammals 1. Grey Putorak (Diplamesodon pulchellum) 2. Pale Pigmy Jerboa (Salpingotus pallidus) 3. Hepter's Pigmy Jerboa (Salpingotus heptner) 4.Bobrinski Jerboa (Alactodipus bobrinski) 5. Sand Cat (Felismargarita thinobius) 6. Pallas cat (Felis manul) 7. Marbled Polecat (Vormela peregusna) 8. Goitered Gazelle (Gazella Subguttorosa) 9. Oriental Moufflon (Ovisorieentalis Severtzovi) 10.White –bellied Long-eared Bat (Otonycteris hremprichi) 11. Wide –eared Free-tailed Bat (Tadarida teniotis)	**Birds** 1.Dalmatin Pelican (Pelecanas Crispus) 2. European (white) Pelican (Pelecanus onocratalus) 3.Glossy Ibis (Plegadis falcinellus) L 4. Common (gray) Heron (Ardea cinerea) L 5. Little Heron (Egreta alba) L 6. Pond Heron (Ardeola ralloides Scop) 7. Marbled Duck (Anas angustirostris) Men 8. Stif –Tailed Duck (Oxyuraleucocephala Scop) 9.Houbara Bustard (Otis undulate Jacg) 10. White –Tailed Plover(Vanellochettusia Leucura Licht) 11. Black-Bellied Grouse (Pterocles orientalis) 12. Pin-Tailed Grouse (Pterocles alchata) L 13. Pallas Sand Grouse (Syrrhaptes paradoxus) Pall 14. Golden Eagle (Aguila chrysaetus) L 15. Imperial Eagle (Aguila heliaca) Sav. 16. Booted Eagle (Aguila pennata)Gm. 17.Serpent Hawk (Circaetus ferox) GM. 18. Fish Hawk (Pandion haliaetus) 19. Eagle Owl (Bubo bubo)
Reptiles: 1. Grey Monitor Lizard (Varanus griseus)	Amphibia: None
Fish: 1.Nosed Sturgeon (Pseudoscaphip Kunchu fedcnhenkor)	

2.Pickerel Zherekhsalmon (Aspiotocius esocinus) 3. Aral Slmon (Slmotrutta)	

Source: JICA Report (section2.2) , 1998

The preliminary estimate by the Scientific Research Institute of Fish shows that about 200-300 tons of fish annually flow in the left main canal through the intake facilities of the Kyzyl-Orda Headworks from Syr Darya river. This is the important protein source for the people and the fish die in the canal during the non irrigation period. Due to shortage of funds no counter measures was taken to protect the fish stock.

Reforestation:
The Oblast office of Committee of Forest and Hunting is planting the seedling of sexual tree in the area in order to protect the desertification caused by strong wind. Due to shortage of budget the reforestation activity was limited to settlement area. It is also difficult to grow seedling without irrigation, because the tree need irrigation water for 4 years after the planting. From the above reasons , it is difficult to provide reforestation around the farm lands . IDIP-II must provide financial and technical assistance to overcome these difficulties.

Downstream Reaches of Syr Darya River:
According to IBRD (1996) report on "Syr Darya Control and Delta Development Project ", the discharge of Syr Darya River has decreased from 13,000 MCM in 1995 -1970 to 1,200 MCM in 1981- 1987; and 37,000 MCM to 5,600 MCM for Amu Darya River in the same period. As a result , the reduction of the discharge has caused the retreat of the Aral Sea ; reduction of the surface area by 45% , the storage volume by 70 % and average water depth by 43%.

Due to retreat of the Aral Sea, the following changes of land use has happened in about 21.1 million hectares from Kazalinsk to Aral Sea (1960- 1990).

Table : 2 Land Use in the Kyzyl-Orda (Delta) Area of Syr Darya

Land use	Year 1960		Year 1990	
	Ha	%	Ha	%
1. Delta Small Lakes	76,000	10%	33,600	3 %
2. Syr Darya River Bed	5,600	1 %	8,000	1 %
3. Marsh Land	51,900	7 %	56,700	5 %
4. Forest	21,000	3 %	6,500	1 %
5. Agricultural Land	273, 000	36 %	253,000	23 %
6. Settlements	8,000	1 %	11,000	1 %
7. Pasture Land	313,900	42 %	381,200	35 %
8. Bottom of Aral Sea (New Area)	0	0	350,000	32 %

Source: JICA Kyzyl-Orda Irrigation , Drainage and Water Management Project , 1998

About 350,000 hectares of new area is mainly wasteland of Saline Soil. In addition to above land use change , the area with slight to strong saline soil had increased from 150,000 hectares in 1955 to 311,000 hectares in 1986 excluding bottom area of Aral Sea . The salinity level in Aral Sea has also increased from fresh water level in 1950 to around 25 gm/ lit in 1980.

The Table 13 also explains land use in Kyzyl-Orda Oblast. This shows that 58% is occupied by rice, total forage crops is about 25.5 and the rest is grown by early grain crops.

The above mentioned environmental condition has caused the change of flora and fauna in the Delta area. The number and biodiversity of plant species has reduced , while salt and arid resistant plant species have increased.

Soil

Soils are formed from quarternary deposits of delta alluvium of the Syr Darya River. In the sub project area there are 2,690 ha of Alluvial –meadow (tugai) soils, 18,040 ha of Alluvial meadow and Meadow Marsh soils . There is small area of Solonchal soils but these are not used for irrigated agriculture.

Rice - marsh soils are developed from meadow –marsh soils as result of prolonged periods of flooding and anaerobic conditions. During flooding , salts especially chloride, are washed into the soil but they return towards the surface when the soil is drained. Salinization type is mainly sulphate, Organic matter (OM) develops from abundant accretion of vegetation at the soil surfaceand is leached into the deeper horizons. The plogh layer has high bulk density and lower permeability and forms large clods when dry. The organic matter in the surface is about 0.8 – 1.8 %,

carbonates are high and CEC is low, at 4-11 mequiv / 100g soil. Under regular flooding condition for rice , the B horizon become compact, cycles of salting and desalting occurs and alkalinity increases. The water table can be at depths of 0-2 m , and contains salt level up to 5 g/ l. These soils have high demands for N and P fertilizers.
In the Kyzyl-Orda Sub- projects , 35 % of soils are non saline, 28 % weakly saline, 32 % moderately saline and 5% strongly saline.

Soil Salinization :
Of the 30,000 hectares of project area , the area with 250,420 ha are slight to medium salinity (Table 4) with Solonchaks or 59 % of the total area. The other 51 % or 179, 580 ha are very strong to strong saline. The Saline soil closely correspond to the salt content in ground water. The strongly saline soil are found around the observation wells with ground water containing salt more than 10,000 mg / lit. The original rice rotation area is outside the area of strong to very strong saline soil (Table 4.)

Further information on agriculture, soil, agro-economy, sociology, engineering design and other engineering details that are available from mid term engineering report.

Kyzyl-Orda I & D System includes Zhalagash and Syrdarya raions. Together they have 30,000 ha to be included in Irrigation and Drainage Improvement, phase 2, project.

a)Sub Project Location-Description

Table : 3 Mean monthly climatic data for the Kyzylorda Subproject Area; from Kyzylorda Weather Station

Parameter	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual mean[1]
Maximum temperature	^{0}C	-4.8	-2.1	6.8	18.6	26.5	31.2	32.4	30.8	24.7	16.0	6.1	-2.5	15.3
Minimum temperature	^{0}C	-14.0	-12.0	-4.7	4.2	10.6	15.0	16.9	14.2	7.8	1.2	-5.7	-12.0	1.8
Sunshine	hrs	3.6	5.1	6.6	8.4	11.2	12.5	13.7	12.1	10.9	7.7	5.0	3.6	8.3
Solar radiation	MJ/m^2/d	5.5	8.7	13.3	18.8	24.9	27.5	28.6	24.4	19.4	12.1	6.9	4.8	16.2
Wind speed	m/s	5.5	5.7	5.7	6.1	5.5	4.8	4.1	4.1	4.1	4.2	4.5	5.0	4.9
Precipitation	mm	13	15	14	14	11	5	4	3	4	7	10	14	114[1]
Relative humidity	%	80	78	70	49	39	38	38	39	44	54	69	78	56

1. Annual total for precipitation

From the above Table 3, it is evident that the climate is sharp continental with ery dry and hot summer and cold windy winter. Total average annual precipitation amounts to 114 mm , of which 40-67 mm occurs in summer. Rainy season lasts from November till May and about 80% of precipitation occurs during this time. Average precipitation during the vegetation period (April to September) equals to 40 mm or 25% of the annual precipitation. Therefore , agriculture without irrigation in this area is not possible.

The left bank Massive Irrigation System (Left Main Canal), which commands the sub-project area, originates from Kyzylorda Headworks built on the Syr Darya river in 1957. The Left Main Canal System was completed in 1969 and was planned to irrigate farm land of 142,400 ha but actually some 87,000 ha has been opened for farming . The irrigation system consist of Left Main Canal, Right and Left Branch Canals, and Inter-farm and on –farm Canals. At the end the Left Main Canal is bifurcated into Left and Right Branch Canals. The total length of the Left Main Canals is 86.40 Km and design discharge 228.0 m3/sec.

The project of Kyzyl-Orda left Bank massive is situated on the land of two regions in agricultural zone in the West from the Kyzyl-Orda Oblastin the central and eastern regions. The transportation network in Kyzyl-Orda Oblast is well connected by railway and roads. A railway connects Kyzyl-Orda and Aktobe Oblast in the north western direction and in eastern direction. The railroad pass through Northern and Central Kazakhstan, places like Kirghizstan, Uzbekstan, Turkmenistan and China (Peking).

The total population of Kyzyl-Orda is 21674 peoples with 3771 families. Together with pilot project the total population is 2235 persons. The climate is sharp continental with very dry and hot summers and cold winter months. The Kyzyl-Orda left bank is Syr Darya Alluvium plain. The alluvium plain stretches 130 km from East to West and has the middle width of 33 km. The area is situated into huge cavity with flat bottom. Such a flat relief led to the formation of very poorly drained agricultural plots and swamps.

Cultural and Historical Sites:

According to the information from field visit and other historical and cultural documents, there are no cultural and historical sites protected by Kazakhstan law in the project area. However, there some ancient tombs and monuments exist in the area but outside the project.

Table : 4 Salinity Hazard of Kyzyl –Orda Left Bank Area

Salinity Hazard	Area (ha)	% Area
Slight	168,550	39.20
Medium	81,870	19.00
Strong	86, 270	20.10
Very Strong	93,310	21.70

Source: Inception Report, IDIP-II, SMEC. February 2006

The Subproject area is located in the transition of semi-desert and desert agro climate zone.
The salinity concentration of ground water ranges from 700 to 36,000 mg/l , and the concentration exceeds 2,000 mg / l in the 70% of the existing observation wells. Results of salinity concentration of the observed wells are given in the following Table 5.

Table : 5 Salinity Concentration of Ground Water in Kyzylorda Left Bank Area

Salinity Concentration (mg/l)	March	June	October
S< 1,200	30 (7)	10 (4)	18 (6)
1,200 <S <2,000	77(19)	56 (20)	43 (13)
2000 <S, 3,500	128 (32)	82 (30)	116 (37)
3,500 <S , 6,500	121 (30)	74 (27)	78 (25)
6,500 < S < 8,000	19 (5)	12 (4)	20 (6)
8,000 <			

Source: IDIP-II Inception Report, Feb.2006

3. Potential Environmental Impacts

In order to simplify the impact assessment, the project is divided into its main components. Only activities likely to interfere with the environment of are considered. The components that considered are design, project construction and project operation as follows:

Table: 6 Environmental Impact by Sub Project Related Activities)

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project Kyzyl-Orda Oblast I&D System			
1.Rehabilitation & Improvement of Irrigation & drainage network and associated infrastructure	NO	NO	YES
2. Improved Irrigation & Drainage Management.	NO	NO	NO
3. Improved soil and land improvement / reclamation.	NO	NO	NO
4. Agricultural extension activities	NO	NO	NO
5. Bio-drainage , Wetland Conservation & Salinity Control	YES	NO	NO
6.Improved WUA Water & Drainage Management.	NO	NO	NO

D = Project design ; C= Project construction and O= Project Operation

No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures)

4. Environmental Management

4.1.1 Environmental Impacts Related to Design

The design of Irrigation and drainage system for Kyzyl-Orda are expected to produce some negative impacts on the Kyzyl-Orda Oblast irrigation and drainage design and operation. The rehabilitation of existing drains will not increase the amount of salt and agricultural chemicals entering natural waterways. This is for the reason:

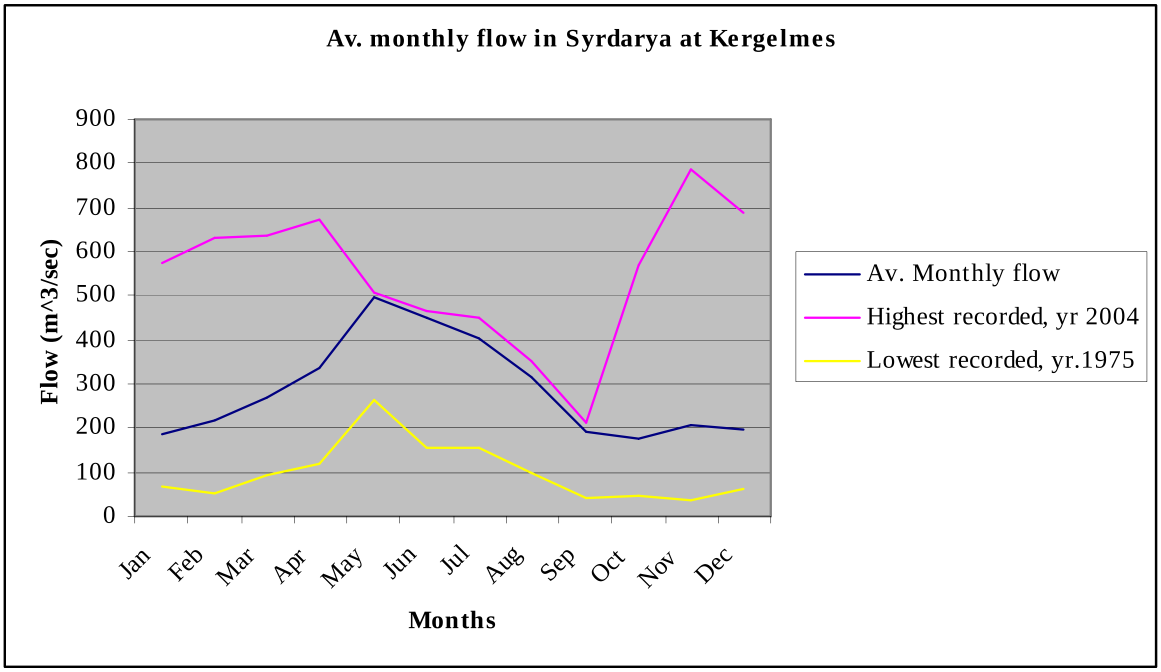
- The salinity content of the Kyzyl-Orda oblast project drains are between 24.5 to 47.2 gm/l (Moderate to high salinity)
- The quantity of surface water carried by the drains are low when compared to the discharge of the Syr Daria River.

But flooding the whole area for growing 16579 ha (about 58%) of rice is turning the whole area into shallow grand water area (waterlogged) with profound impact on human and animal health. The amount of rice will have to be phased out to about 50% for the whole area , remainder area to be planned for grain and forage crops (Table 16). The whole area to be designed for better subsurface drainage and the amount of water needed for flooding should be properly calculated and managed. The vertical drainage should be planned to work effectively. A wetland conservation strategy has to be worked out during design stage.

Downstream Water Use and Drainage flow discharge issue:

In Kyzyl-Orda I&D system, the left main canal has a design discharge capacity of 228 m3/sec. The left branch canal has a discharge capacity of 41.0 km3/sec.

Figure 2 : Average Monthly Flow in SyrDarya at Kergelmes



This waterlogging problem for the total average annual inflow into Shardara reservoir which is about 15.025 billion m3 (Figure :2). Analysis of the last 5 years average monthly discharge show that the average inflow into the reservoir during winter months (November to February) reaches close to or higher than 1000 m3/ sec, a situation which creates a serious condition for water logging in the Kyzyl-Orda project area. It is advised that during the design phase , a higher rate of flow should be planned to discharged down the Shardara reservoir.

Land Resources

The sub project, the Kyzyl-Orda Left Bank area occupies a total of 430,000 ha of land area. Of which 324,300 ha or 76% is used for agriculture including livestock grazing and fodder production. The non agricultural land includes marsh and swamp, bushes, villages ,roads and desert. The present land use pattern given in following Table.

Total irrigated lands in the Kyzyl-Orda left bank area under IDIP-II amounts to 30,000 hectares. They are distributed in 4 rural districts of Djalagash Raion and 4 rural districts in Syrdarya Raion. Recent survey indicates that 24,640 ha or 82% of the irrigated area are used for cultivation and 5630 ha are left unused. Rice is the main crop occupies 61-64 % of the cultivated land. Other crops are perennial grass 25 to 27 % and wheat 6.0 to 7.7 %.

Water Resources
Some canal will be lined and there will be improvement in water supply to irrigated lands. Salt content (mineralization) in the drainage water will be kept within limits of 4.48 to 4.93 g/l. It is demonstrated from Table …that about 80 % of the Kyzyl-Orda area has moderate to high salinity level (1-<10 gm/l) After mixing the drainage water with irrigated surface water (1.5 -2.0 g/l), the salt content of r will be decreased to 4.2 to 6.4 g /l (Environmental Impact Assessment Report, JICA , 1998). For further details please consult the engineering report.

Reuse of drainage and collector water after treatment in settling pond has to be discussed and assessed properly. Treated and safer waste water can be used for further irrigation for field crops. This concept of using treated waste water was proposed by an engineering firm in Almaty.

4.1.1 Bio-drainage and Salinity Control

Many drainage system are dysfunctional and another option particularly on moderate to high saline land (Table….) would be to introduce bio-drainage techniques to control soil salinity and water table levels by using especially established plantation of trees , bushes, grasses and crops.

Tree Belts
The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage , decreasing ground water levels and helping to tackle the problem of secondary salinity and waterlogging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent % . As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions.

b) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt , high saline soil may be leached with fresh water before planting 1-2 year old sapling.

c) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant , has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

d) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops
to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

e) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

- Alkali grass (*Puccinellia airoides)*
- Desert Saltgrass (*Distichlis stricta)*
- Wildrye (*Elymus spp)*
- Bermuda grass (*Cynodon dactylon)*
- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main , on farm and inter-farm canals.

- Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.

Soil Salinity

The major constraint to crop production is the soil salinity if sufficient water is available for crop production. The steady decline in cotton production over the three decades from 4 ton / ha to about 2 ton / ha (See Agro-Economic Report) can be attributed to increasing salinity over that period in Makhtaaral. Increasing levels of salinity not only reduce yields and quality of produce of individual crops but also restrict crop choice. The relative salt tolerance of crops or which could be grown in Makhtaaral is given in Table 6 (Soil Report), expressed in terms of electrical conductivityof the saturated soil extract (ECe, in mS/cm). Salinity is locally expressed as total water extractable salt per unit of soil (% or gm / 100 gm soil). This also includes gypsum, which does not contribute to toxicity effects until high gypsum concentration are leached. For Makhtaaral soils, the relationship between ECe and % salt in soil has been determined as y=16.4x+ 0.0425, with an $R2= 0.8252$ (Mott Macdonald 2003, working paper no.27). The application of this research can be applied to Kyzyl-Orda area. Application of this research can be applied to Kyzyl-Orda.

Management of Soil Salinity:
The principal of soil management is to address their main cause- the High Ground Water Tables. There are number of ways to lower water table for Makhtaaral Subproject area:

- Improve horizontal and vertical drainage systems, as discussed in the I&D Rehabilitation Report.
- Match Irrigation application with actual crop water requirement , as described above , and avoid excessive accumulation of irrigation water in the soil profile.
- Establishment of bio-drainage, such as planting of trees along field boundaries (Ref to section 11.2.2.1) which would extract water from the soil , by lowering the water table, , and also reduce crop water demand by providing wind breaks which would reduce crop evapo-transpiration.

The current recommended method of decreasing soil salinity level is leaching of the soil with large quantities of irrigation water. The amount of irrigation water to be applied for leaching depends on the degree of salinization. For weakly saline lands (0.3-0.4 %), it is recommended that 2-2.5 thousand m3 /ha to be applied in autumn or early winter. For moderately saline soils (0.4-0.8 %) 6 thousand m 3 /ha in two applications is recommended and for strongly saline soils (>0.8%) 13-15 thousand m3 /ha 4-5 applications is recommended.
But , prerequisite for successful use of this technique are leveled land , unimpaired soil infiltration and effective drainage. In the absence of these conditions, leaching runs the risk of further raising the water table and increasing salinization in the soil surface. It has been suggested that leaching is not necessary if deep ripping and leveling have been done and drainage is adequate (ULG- Mott MacDonald,2005). Further, the large quantities of water required for leaching would substantially reduce the WUE (water use efficiency)of the cropping system. It is suggested that the requirement for leaching to reduce soil salinity should be re-examined.

Emphasis should be given to lowering the water table, such that salts are flushed out of the rooting zone in the process of normal irrigation. For a viable crop rotation, it is necessary to grow some crops in the system which are salt sensitive. Lucerne appears to be an integral component of a sustainable cropping system in this environment. But the crop is relatively salt sensitive. Several potentially high value vegetable crops are also salt sensitive.

3.1.3. Other impacts

Projects may face other possible impacts such as (1) dust generation caused by certain construction operation , such as excavation, which can be mitigated by wetting excavation sites and other sources of dust control its emission, and public information. (2) noise generation which can be mitigated by use of properly maintained equipment and public information; and (3) land use conflict caused by temporary use of land for temporary facilities for construction contractors (accommodation , camp canteen, camp facilities, medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction. Planning "Buffer Zones" in irrigation Canals and drains, specified Government Regulation has to be followed as Table 7:

Table 7 : Government Regulations- Buffer Zones (Irrigation Canals and Drains)

Capacity of Irrigation Canals (m^3 / sec)	Width of the Inner Buffer Zones for inspection Roads and Deposit Sediment from Canal (m)	Width of the Outer Buffer Zone for Vegetation and limited Agriculture (m)
1	6	
5	10	
25	20	
50	75	
100 or more	100	

Collector Drains Buffer Zones- Provided by CWR and MOA- (both sides of the Collector Drain)

10	5m for inspection road and 10-20 m for spoil 10-20 m for agricultural traffic & field drains
10-20	100 meters (either side of the collector)
21-50	200 meters (either siude of the collector)
.50	300 meters (either side of the collector)

Source: MOA , Republic of Uzbekistan

This regulation should be strictly enforced on IDIP-II Projects in Kyzyl-Orda.

4.2 Environmental Impact Related to Construction

This will result in the following conditions:

1)Temporary increase in silt

To mitigate this, provisions there are standard contract document supplied to contractor for adequate supervision of operations and adherence to the contract. Confining operation to the dry season only, use of silt traps and careful deposition of spoils.

The incorporation of the above measures will have to be placed into BOQ for sub project contract documentations and supervision of contractors.

2)Temporary closure of irrigation system

Participation by Water User Association (WUA) and Farmers. The information are to be given through dialogue and community awareness campaign. Ask WUA and villagers for permission to close the irrigation system temporarily. They are very important that WUA and farmers involved in all aspect of civil works.

3) Disposal of Excavated spoil from main and inter-farm drains.

Excavated soil (spoil) will be deposited alongside the drain in accordance with the guideline laid down by GOK/ CWR/MOEB with respect to easement dimension.- either side of drain and /or canal. Spoil will be deposited and formed using bulldozer into trapezoidal formation.

4)Disposal of Excavated soil (spoil) from on- farm Drains and Canals.

Spoil will be deposited alongside canals and drains in accordance with WUA and farmer instructions. If required and instructed, the contractors may deposit spoil on farm fields at the expense of farmers.

5) Dust generation

The mitigation measures recommended is the appropriate timing of operations wetting of surfaces and notice to /involvement of public. The workers on construction sites should have international personal safety / protection equipment supplied by the contractor.

6. Noise Generation:

Mitigation measures :

Appropriate timing and operation of machine are to be discussed with the farmers and WUA. Notice will be given to public and WUA- farmers will be involved in timing and reduction of noise level in the project areas.

7. Waste Material :

Replacement and repair of the irrigation and drainage structure will result in waste material (concrete and steel). These are to be disposed of by the civil works contractor as per CWR / MOEB guidelines.

8. Land Use Conflict for Construction

The CWR , MOA and GOK assessed that there will be no land use conflict for construction. This also confirmed by the client, the CWR, and guarantee given by them to the World Bank. On farm negotiations would be made with WUA and the landowners. However, civil works only will be done by participation agreement of land owners a

However, civil works only will be done by participation agreement of land owners and WUA. The PMO / CWR should have the responsibility for dispute settlement.

9.Construction of Camp Sites and Living Facilities

Establishment and construction of camp sites, and Living facilities for the construction workers have to be established prior to construction work. An acceptable sanitary facility has to be established for the workers. This must satisfy environmental regulation and MOEB code.

The camp site has to be cleaned and returned to the original state before the construction.

Refuge should be properly collected and disposed off.

Mitigation measures are to be:

1)CWR & MOA agrees to allocate free sites for the construction of camp sites and living facilities. This has to be negotiated with the client and the local authorities. Construction of camp sites and living facilities will be funded by the contractor. Clean up costs for these facilities will be borne by the contractor

10. Bio-drainage and Salinity Control / Sustainability

Table … shows that about 76% of Kyzyl-Orda project area are moderate to highly saline and may need bio-drainage technique to control soil salinity and water table level.

Environmental Sustainability of the project area is very low. To improve this situation following steps would be necessary :

a) Tree Belts

The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage , decreasing ground water levels and helping to tackle the problem of secondary salinity and waterlogging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent % . As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions.

b) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt , high saline soil may be leached with fresh water before planting 1-2 year old sapling.

c) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant , has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

d) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

e) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

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- Bermuda grass (*Cynodon dactylon)*
- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main , on farm and inter-farm canals.

- Establish Compost / Bio-gas sites

Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.

11) Soil Organic matter

To increase soil organic matter into the soil , all crop residues (wheat, cotton and legume stems) must be ploughed back into the soil . This is an attempt to increase the organic matter content of the soil in Kyzyl-Orda.
This is very doubtful whether it will take place on farmers field , all cotton stems , grain stover, and legume residues are likely to used either for fuel , and /or livestock fodder. The agricultural planner should introduce short- term fodder into the cropping pattern of the area. This may reduce the pressure on existing crop residues. It may be possible to introduce short –term or winter crops of kale or broad bean to the cropping pattern.

4.3 Environmental Impacts related to Operation

For Kyzyl-Orda, the North and South collectors needs cleaning. In the last 20 years it has not been cleaned. The north and south collectors needs to be deepened about 1 m . Presently in the month of June –July , most of the rice growing low lying are flooded about 1-2 meters. This creates a waterlogging situation within the project area. Care has to be taken in operation phase to see that this is not happening in project areas in future. After the proper design, the project will be open for construction and operation. In the rehabilitation and improvement of irrigation and drainage network , care must be taken to clean the main collectors within 2-3 years. Un-cleaned collectors will have “Potential Adverse Environmental Impact “ (Refer to Table : Potential Impact by Sub Project).

Following condition needs to be checked during operation.
1) Soil modification as a result of intensified agriculture
The mitigation required

a) Encouragement of continued use of traditional management of water flows
b) The use of deep rooting grasses and shrubs to further strengthen the bunds
c) Minimum / zero tillage practices

2)Soil and water contamination due to increased use of agrochemicals including fertilizer and
pesticides.
The mitigation required
a)Mitigation required are agricultural extension services and Integrated pest management (IPM).
The agricultural extension service would include

a)Optimum , informed use of mineral fertilizer
b)Promotion of integrated pest management (IPM)
c) Discouragement on the use of persistent pesticide and herbicide.

d) Training on composting, reforestation, minimum or zero-tillage.
e) Biodiversity associated with introduced new plant species and varieties .
Promote Biodiversity for introduced crops and land use changes. Protect soil from wind erosion by tree fencing and other environmental management practices. The list of flora mentioned in Table 18 of the EA main report can be useful to readers.

(3) Bio-drainage –Salinity Control / Environmental Sustainability
Please refer to discussion on section 10 of Construction Impact (11.2.3).
Biological diversity refers to the variety of South Kazakhstan living biological resources. It is a function not simply of the number of ecosystem and distinct plants and animal species in existence at any given time , but also genetic differences within individual species.
Conservation of biological diversity is a form of natural resources management and should be practiced in Kyzyl-Orda area. This can be done by reforestation activities by indigenous plants on vertical drainage sites, main and secondary canals, and other inter farm canals. A reforestation site plan will have to be prepared in IDIP-II (Phase B) design level.

5. Environmental Monitoring

Monitoring is necessary with respect to (i) water resources quality and quantity ; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance management, including inspection and proper repair of irrigation & drainage canals and structures.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources(CWR) , MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate to evaluate the success or failure of IDIP-II proposed project intervention in the Kyzyl-Orda.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information . Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project , the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as :

1. Soil salinity and high ground water tables;
2. Water Quality & Salinity .
3. Reforestation, Bio-Diversity, Wetland Conservation and Desertification.

The variables to be analyzed are described in Annex……. It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15…...and for one water samples is about USD 10. Most of the project farmers interviewed that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient . Such sampling density for 220,000 ha over 2 year life of the project would be extremely expensive.

The other alternative is to sample the pilot area (6,907 ha in Mahtaaral area) fully and for other project areas , sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project.
During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

Table 8 : Monitoring Plan for Kyzyl-Orda

CALCULATION IS DONE FOR 30,000 Ha (Kyzyl-Orda, about $15 / ha.)

Parameters to be Monitored	Periodicity	Number of Samples				Cost **of 1 analysis in $US**	Total Cost in $US
		Total Number of Samples	Number of Indicators	Sum of Determination	Total/ yr		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 300	3	900	13,500	15	13,500 **27,000.0**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 400	5	2000	20,000	10	20,000 **40,000.0**
4. Water Quality							
4.a Ground Water Quality							
4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 30	1	30	300	10	300 **600**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 30	15	450	9000	20	9000 **18,000**
4.a.c Fertilizer	Annually	(1sample /1000 ha) 30	1	30	450	15	450 **900**
5.Pesticide	Annually	2	20	40	40	20	800

residues in fish & fodder crops							**1600**
6.Reforestation , composting and Tree Belts(Bio-drainage & Salinity Control)	Annually	1 $ Per /ha		$30,0000.0	$30,000.0	$1 Per Ha	**$30,000.0 (including yearly Maintenance)**
7. Equipments for Rayons &WUAs	Annually 7 hand held GPS units, computer download, 7 Electrical Conductivity meters				4,000.0 US$ 1 unit (GPS & Electrical Conductivity meters $250.0 X14	$250.0 for one unit	**$3,500.0** (one time purchase)
						Grand Total	**$120,000**

Source: The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1996.

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M , it will be easier for them to take this additional responsibility . This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that US$ 447,957. will be required to implement and maintain the Environmental Management and Monitoring Plan for Kyzyl-Orda (EM & MP). There are three categories of inputs to the EMP. They are as follows:

1. Planning , Surveys and Consultant Assistance$ 59,578 (13.3%)
2. Mitigation Management $361,501 (80.73 %)
1. Equipment & Training $ 26,877(6.0)

These are detailed in Table 8 and explained from Table 7, “ Monitoring Plan”. The cost for environmental monitoring is about $ 15 / ha ($ 14.93 exact).. .

Table 9 : Estimated Budget for Environmental Management Plan
(Kyzyl-Orda EMP)
(Cost $15 /ha)

Item	Qty	Unit Cost	Total Cost US$
Capital Cost-Equipments for Rayons			
GPS units (handheld), Computer download	26	250	6500.0
Electrical Conductivity Meters(24 Rural Districts)	26	250	6500.0
Capital Cost- Equipment for WUA			
GPS units (Hand Held),computer download	26	250	6500.0
Electrical Conductivity Meters(17 Rural Consumer Cooperatives of Water User RCCWU)	26	250	6500.0
Recurrent Costs			
Support to PMO for Baseline Survey	1 each	17,810	17,810
Support to PMO for M&E activities over 2 years	Lumpsum	40,000	40,000
Analysis for soil and water samples for 2 years by CWR &MOG	2 Yearly	220,850	261,100
Support for reforestation , Wet land Conservation & biodiversity by CF	Lumpsum	75,000	90,000
Total			434,910

Note : The $434,910 is based on 1996 values. This value is updated for 2007which comes to ($13,047.3+$434910 = 447,957.3) **Total $447,957.** The adjustment is done for inflation from 1996 to 2007, about 30%.

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out. The suggested report systems for environmental monitoring programs are made on the following consideration:

6. FINDINGS AND RECOMMENDATIONS

6.1 The Need for an Environmental Impact Assessment (EIA)

This section evaluates the need for an Environmental Impact Studies (EIA). This should be based on the fact whether significant environmental impact exists and that need a further detailed study or EIA.

As per as we have seen there are negative environmental impacts due to IDIP-I proposed project design and operation. The only negative impacts identified are transitory ones (can be mitigated) associated with design and operations. All other impacts for Kyzyl-Orda are positive. The required mitigation are presented in sections 11.1.1.3 and 7.4 of the main EA Main report.

The recommendation from the findings of this Environmental Assessment (EA) are that a follow up EIA or further detailed environmental impact study (EIA) study is not needed.

6.2 Potential Environmental Impacts, Possible Mitigation Measures and Responsible Agencies

The environmental monitoring program will be part of an integrated project monitoring program which will be established by the PMO. The PMO and the "Project Implementation Unit" (PIU) offices at Project area oblast will be responsible for implementing all environmental mitigation measures. Table …… presents all relevant issues with respect to the potential environmental impacts and the possible monitoring and mitigation enhancement measures. The table also lists those agencies who are responsible and also lists agencies which should have an involvement in the monitoring program and an input to the development and planning of the mitigation measures.

6.3 Environmental Assessment Requirement of MOEB

The Government of Kazakhstan (GOK) requirement is to present this Environmental Assessment (EA) report to MOEB. The instruction by MOEB call for report in which available data on the resources likely to be affected by IDIP-II are to be analyzed in terms of scope and intensity. An Environmental Assessment (EA) report are to be prepared by proponent (CWR) and should be included with the feasibility report and submitted for approval. This report provides a brief description of ecological and social sources , and trends in agriculture. Natural resources that are sensitive to change should be identified along with potential environmental problems. This report should be given a public review and then presented to the Ministry of Ecological and Biological Resources (MOEB). The MOEB reviews the EA and its comments (State Ecological Expertise) and forwarded to the concerned sections for approval.

The World Bank 4.01 “Environmental Assessment” has screened the IDIP-II Project and placed it in EA category “B”, which means the preparation of an environmental analysis to define environmental management , monitoring and mitigation measures as necessary. The recommended mitigation measures in the State Ecological Expertise (SEE) review would become an integral part of integral part of project design and implementation. The archeological sites would be protected with the guideline and requirement of Kazakhstan law and acceptable to the World Bank. The assurance was also obtained from Kazakh Government about the use of agrochemicals for IDIP-II would be approved ,stored and distributed and used in accordance with the guidelines and requirements of Kazakhstan Government acceptable to the World Bank (WB).

6.4 CONCLUSION

For Kyzyl-Orda sub project an Environmental Impact Assessment (EIA) is not necessary. However , the appointment of a local / domestic Environmental Management Specialist to assist with the implementation of the Environmental Management / Monitoring Program and train WUA staff . It is considered very important for the success of the Environmental Management and Monitoring Pan (EMP). A terms of reference (TOR) for the Environmental Management Specialist (EMP) is prepared in the Annex….

7. FUTURE DEVELOPMENT PLAN

In addition to engineering development plan , the environment section has the following environmental management and monitoring plan for future development :

1. Monitoring of Soil salinity and pesticide for 2 years
2. Monitoring of surface and Ground Water for water quality (salinity & pesticide).
3. Lowering of water table depth
4. Drainage water for salinity , pesticide & fertilizers
5. Pesticide residues in fish , animal tissue and fodder crops
6. Reforestation of indigenous plant for biodiversity & desertification
7. Preservation and conservation of wet land.
8. Reclaim saline soil, saline surface and ground water.

These are all explained in Environmental Management and Monitoring Plan.

ECOLOGICAL & ENVIRONMENTAL STUDIES OF IDIP-II PROJECT
ENVIRONMENTAL ASSESSMENT (EA)
MALAI- SARINSKY SUB-REGIONS

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1. Summary of Malai-Sarinsky Environmental Assessment (EA)

The Environmental Assessment (EA) describes potential impacts of irrigation and drainage improvement and rehabilitation of 2,500 ha excluding pilot area. In fact there are no pilot areas in Malai -Sarinsky .

Malai –Sarinsky is a "PULSAR" company town run by 50 families. When required they bring workers outside the project area. The potential for waterlogging and secondary salinization will be managed by vertical drainage, and a cleaned and deepened interfarm and on-farm collectors drains.

The project is located in the Ili River floodplain of the Steppe. The original Sierozem grey soil have been modified by rice –lucerne cultivation..

About 45.1 % of the total area , the area is non saline (<I gm /l) . The rest 56 % of the area is moderately to highly saline (1 -10 gm of salt /litre) . This is slightly polluted by pesticide and herbicide (Table 1).

The depth of ground water table , for about 33 % of the total area (Table 2) are more than 2 -5 m . The rest 67 % of the total area , the ground water are more than 5 m depth.

Impact Assessment :
The effect of IDIP –II on natural and social resources can be described as follows. Under the IDIP-II an area of 2,500 ha has been outlined for feasibility study. As proposed , after leaching and draining , the lands will be retuned to intensive farming . With drainage and better farming practices, changes in land use are expected. The impact assessment has been simplified into three main components (Table 3) : (1) Project design , (2) Project construction, and (3) Project Operation. Out of 6 project related activities, no adverse environmental impacts are expected.

If irrigation and drainage systems are not rehabilitated, the existing infrastructure will become further degraded, and agriculture will become difficult, the soils will become more saline and waterlogged. The land will turn into more un- productive and more desert condition.

Most of the potential impacts are effectively mitigated. The environmental impacts related to project design, construction, and operation will not effect the environment. Project documentation will be prepared on:

1. Regulation for closed vertical bore holes and destroyed horizontal canals to avoid contamination of ground water for village water use.
2. Regulation forbidding persistent chemical weed and pest killers.
3. Environmental sustainability and bio-diversity preservation for the IDIP-II

The Environmental Assessment , the EA report, proposes that the Committee of Water Resources (CWR) and Ministry of Environment and Biological Resources (MOEB) will be responsible for project development and big role for IDIP-II EMP. For environmental monitoring , all the Rayons and WUA /equivalents will be trained in water and soil salinity monitoring procedures and equipments. One or more short courses for professional developments will be organized in project institutions.

A monitoring program will be formulated to avoid any unforeseen negative environmental effects when implementing Malai Sarinsky IDIP-II project. This is required to guarantee efficiency of the mitigation measures and a monitoring program is very much required. In this connection the "Monitoring Plan" is referred (Table 6) for discussion. The main objective of the monitoring plan are as follows:

- Regular soil sampling for chemical analysis, weed and pest , and for fertilizer.
- Regular surface , ground and drainage water sampling inside irrigation and drainage project (IDIP-II) for chemical analysis, weed and pests, and fertilizers. Depending on the initial results of the monitoring , the space and intensity of analysis could be increased or decreased.
- The fodder crops, animal tissues and milk should be analyzed for pesticides. Depending on the results, the analysis could be continued or discontinued.

The total monitoring cost for ha of Malai-Sarinsky is about $ 20,462 (Table 7). If we spread the cost for the whole area it comes to about $8.18 per hectors. It is worth to spend that money on monitoring.

The findings and recommendations for an Environmental Impact Assessment (EIA).

As we have seen from the EA document , there are no negative environmental impacts due to (Malai-Sarinsky) project formulation, design , implementation, and operation. Some of the impacts identified are transitory ones and can be mitigated during construction and operation. All impacts for Malai-Sarinsky are positive. There is no need for further EIA study.

ANNEX- E
Malai- Sarinsky Sub Project
ALMATY OBLAST
Environmental Assessment (EA)

2.Brief General Description and Location

Malai-Sarinsky irrigation and drainage system is located in Talgarsky Rayon of Almaty Oblast, on the right side of Almaty- Bakanas motor Road. . It is situated at the lower part of Ille River, which is the source of irrigation water for Malai- Sarinsky System . The water is pumped by pumping station from Ille River. The location of the Sub Project is presented on Location Map No. A-MS-1 or Figure 1.

The climate of river reservoir Talgar is various and depends on upper level location . The coldest month is January and warmest is July. Absolute maximum air temperature is $+39^{0}$ C and minimum air temperature - 35^{0} C . On average frost free periods lasts 149 days. The first frost observed at the end of September and the last frost on or around 3rd of May.

The Mallai-Sarinsky is run by Joint Stock Company known as “Akzhar Pulsar Company” from Almaty. There are about 50 families lives there permanently. When required “The Pulsar” company brings workers from outside.

For the last 15-17 years the damaged irrigation and drainage system was not rehabilitated. The I & D system is soiling and overgrown with rush and sedge. The Malai- Sarinsky IDS and on farm canals are in bad condition. The collector drainage network is not working , the ground water level has increased , the land is affected by salinity and waterlogging. The system is clogged by aquatic plants and there is decrease in crop production for the project area. It is necessary to rehabilitate the Malai –Sarinsky I & D System

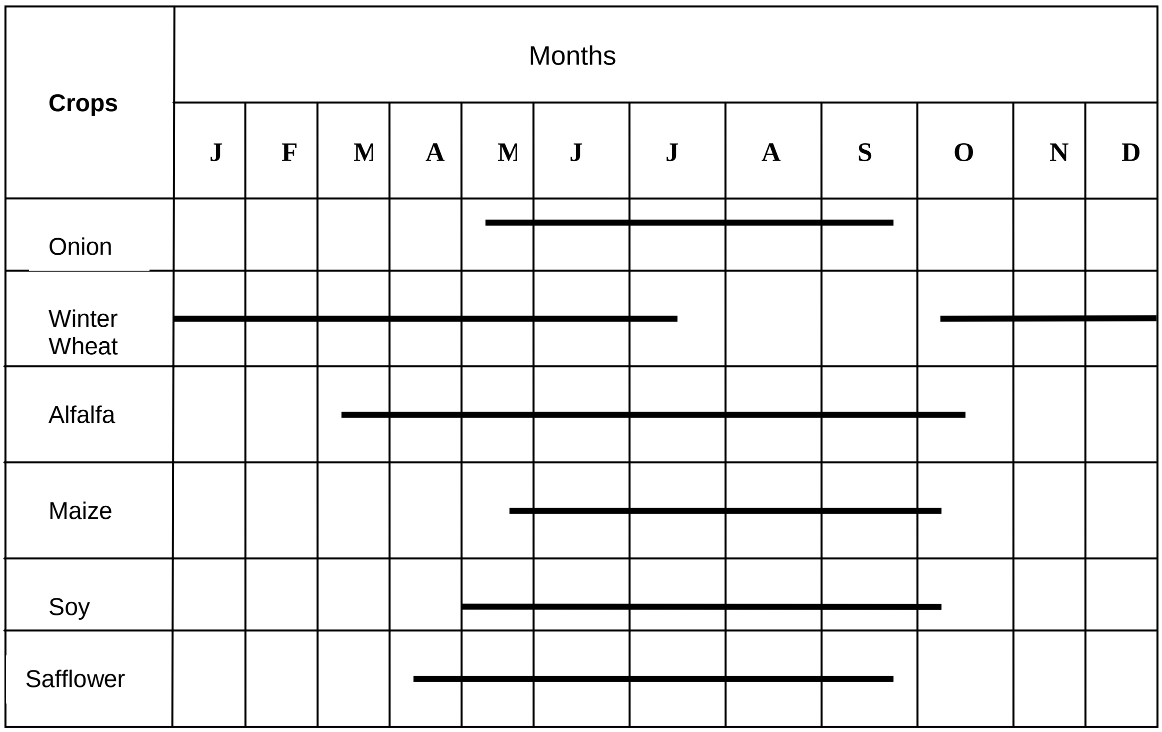
In 2003 and 2004 the irrigated lands were not used for crop production. However, in 2005 , 148 ha was used for onion and winter wheat was grown on 407 ha. With the introduction of vegetable growing for commercial purposes , the onion growing has reached the peak compared to winter wheat production.

Crop rotation and maintenance of agricultural crops for sustainability is very important for the project. Growing same crops year after year is damaging to agricultural lands. Government of Kazakhstan has not worked out a policy towards crop rotatioin. Non observance of scientific recommendations on the maintenance of lands and fertility is great decision to be taken by the government. The land user , the population, must understand their responsibility to wards a sustainable future.

The following Figure 1 shows the period of growing season of crops in Malai-Sarinsky:
Onion from 20th March to 15 th of September

Maize from 2^{nd} of May to 2^{nd} of September
Alfalfa from 20^{th} of March to 15 th of October
Winter wheat from $20^{th.}$ Of October to the end of June-beginning of July
Soy bean from 30 th April to 25 th September , and
Safflower from $20^{th.}$ Of April to 20 th September
Crop capacity for the all above crops is poor now because of the unsatisfactory condition of the irrigation and drainage System.

Figure 2 : Crop Calendar



Out of 5000 ha , about 45 % of the area are non saline (< 1gm /l), and 55 % of the area are moderately to highly saline (Table -1 , 1-10 gm of salt / lit). The Malai-Sarinsky area has no waterlogging and ground water problem. For the 46% of the area , the ground water are less than 2 meter depth and 55% of the area are more than 5 meter depth(Table 2) .

Table 1 : **Extent of Salinity in Almaty and Zhambul**

Target oblast	Target Sub-projects	Total Area, thousands of ha	None Saline1 gm/l, % of Total Area	Moderately Salinity, 1-3 gm/l, % of Total Area	Highly Saline 3-10 gm/l, % Total Area	Very Highly Saline, > 10 gm/l , % of Total Area
Zhambyl oblast	Baizaksky rayon	5000	-	64.7	35.3	-
	Shuysky rayon	5000	32.5	67.5	-	-
	Zhambylsky rayon	5000	70.0	30.0	-	-
	Kordaysky rayon	5000	75.0	25.0	-	-
	Merkensky rayon	5000	67.0	20.0	13.0	-
Alamtynskya oblast						
	Karatalsky irrigation system	5000	85.39	12.68	1	0.93
	Akdalinsky irrigation system	5000	89	11	-	-
	Malaisarynsky irrigation system	2500	45.1	36	18.9	-
	Enbekshy Kazakhsky rayon	12500	62	25	13	-

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

Table 2 : Extent of Water Table Depth within Almaty and Zhambul

Sub-project	Oblast	Rayon	Total Area, ha	The Depth of Ground Water Table <2m, as % of Total Area	The Depth of Ground Water Table from 2 m to 5 m, as % of Total Area	The Depth of Ground Water Table > 5 m, as % of Total Area
1	Zhambul oblast	Baizaksky rayon	5000	82.5	17.5	-
2		Shuysky rayon	5000	18.0	72.0	-
3		Zhambylsky rayon	5000	34.0	37.0	29.0
4		Kordaysky rayon	5000	13.0	70.0	17.0
5		Merkensky rayon	5000	20.0	80.0	-
6	Almaty oblast	Karatalsky irrigation system	5000	21.94	78.06	-
7		Akdalinsky irrigation system	5000	44	56	-
8		Malaisarynsky irrigation system	2500		33	67
9		Enbekshy Kazakhsky rayon	12500		45.91	54.09

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

Project description and environmental description can be obtained from Environmental Assessment (EA) Main report and engineering part can be seen in the Mid Term Engineering Report.

The Environmental Assessment (EA) Main Report describes the issues as mentioned by the World Bank suggested format OD 4.0 , Annex A-1, as follows:

1. Policy ,legal and Administrative Framework
2. Description of the Proposed Project
3. Description of the Environment
4. Significant Environmental Impacts
5. Analysis of Alternatives
6. Mitigation and Management Plan
7. Environmental Management and Training
8. Monitoring plan
9. Inter-Agency and Public /NGO Involvement
10. List of references
11. Appendices

Because of the repetitive nature of the topics , some of the above subject matters are only described once in EA Main Report not in each Sub Regions report. The topics on 3,4,6,8 are only described in this report.

3. Potential Environmental Impact

This section will determine and distinguish between significant positive and negative impacts, direct and indirect impacts , immediate and long term impacts. This will also identify unavoidable or irreversible impacts.

For further information and explanation on this subject , please refer to Environmental Assessment Main Report.

Table 3 : Environmental Impacts by Sub-Project Related Activities

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project Karatal I&D System 1.Rehabilitation & Construction of Irrigation & drainage network and associated infrastructure	No (+)	Yes (-)	No (+)
2. Improved Agronomic Practices	No (+)	No (+)	No (+)

3. Improved Soil and Land Improvement / Reclamation	No (+)	No (+)	No (+)
4. Crop Rotation & Improved Agricultural Practices (IAP)	No (+)	No (+)	No (+)
5. Integrated Pest Management and Fertilizer Application	No (+)	No (+)	No (+)
6.Bio-drainage & Reforestation	No (+)	No (+)	No (+)
7. Improved WUA Management	No (+)	No (+)	No (+)

D = Project design ; C= Project construction and O= Project Operation
No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures), (+) Positive effect (No Adverse Impact) and (-) negative effect and to be addressed by mitigation.

4. Environmental Management

4.1 Impacts Related to Design

The design of Irrigation and drainage system for Malai-Sarinsky of Almaty Oblast is not expected to produce negative impacts on the Oblast irrigation and drainage rehabilitation project. The design/ construction of new drains and rehabilitation of existing drains will not increase the amount of salt and agricultural chemicals entering natural waterways.
According to Table 2 , salinity within Malai- Sarinisky area are moderately to highly saline (1-<10gm/l), For the whole area(100%) , depth of ground water (Table 3) are beyond 2 to 5 meters.
This is for the reason:

- The salinity content of the 94% of the project drains are between 1-<10 gm/l (Table 1).

- The quantity of water carried by the drains are low when compared to the discharge of the Syr Daria River.

Land Resources
As proposed in the plan , 2,500 ha has been selected for feasibility study. The objective is to rehabilitate reliable irrigation supplies, for moderate to high saline soils, where substantial improvement of land productivity can be achieved with relatively low investment. As a result of drainage improvement, minor changes in land use are expected.

Water Resources
Some canal will be lined and there will be improvement in water supply to irrigated lands. Salt content (mineralization) in the drainage water will be kept within limits of 1 to 3 gm /l. After mixing the drainage water with irrigated surface water (1.5 -2.0 g/l), they can be used as irrigation water. For further details please consult engineering report.
Further description of soils is provided by Soil Expert in the Soil Report.

4.1.1 Bio-drainage and Salinity Control

Many drainage system are dysfunctional and another option particularly on moderate to high saline land (Table 2) would be to introduce bio-drainage techniques to control soil salinity and water table levels by using especially established plantation of trees, bushes, grasses and crops.

Tree Belts
The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage, decreasing ground water levels and helping to tackle the problem of secondary salinity and waterlogging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent % . As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions.

a) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt , high saline soil may be leached with fresh water before planting 1-2 year old sapling.

b) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant , has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

c) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

d) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

- Alkali grass (*Puccinellia airoides)*
- Desert Saltgrass (*Distichlis stricta)*
- Wildrye (*Elymus spp)*
- Bermuda grass (*Cynodon dactylon)*
- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main, on farm and inter-farm canals.

Establish Compost / Bio-gas sites

In design phase, establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.

Table 5 gives a list of indigenous trees and bushes that can be used in planning tree lines and fence lines around farms, pump houses and irrigation canals. They should be chosen with experience and knowledge.

Table 4: List of Indigenous Trees and Bushes for IDIP-II

Trees	Bushes
1. Apricot - Armenica vulgaris Lam 2. Cherry-plum - Prunus divaricata Ledeb 3. Asian sumac - Ailanthus altissima 4. Birch - Bertula pendula Roth 5. Siberian elm - Ulmus pumila L. 6. Elm - Ulmus laevis Pall. 7. Common Pear - Pyrus communis 8. Tatarian maple -Acer tataricum 9. Ash-leaved maple - Acer negundo 10. Larch Siberian - Larix sibirica Ledeb. 11. Bastard acacia - Robinia pseudoacacia L. 12. White saxaul - Haloxylon persicum Bunge 13. Black saxaul - Haloxylon aphyllum (Minkw.) Iljin 14. Pine Crimean -Pinus pallasiana D.Don. 15. Archangel fir -Pinus sylvestris L. 16. White poplar - Populus alba L. 17. Poplar balsamic - Populus balsamifera 18. Bay leaf poplar - Populus laurifolia Ledeb. 19.Poplar diversifolious- Populus diversifolia Schrenk 20. Poplar Siberian - Populus barsamifera L. (var. sibirica) 21. Black poplar - Populus nigra L. 22. White mulberry - Morus alba L. 23. Siberian apple - Malus pallasiana Jus.	24. Siberian pea shrub - Caragana arborescens Lam. 25. Redhaw hawthorn - Crataegus sanguinea Pall. **26. – Calligonum aphyllum Gurke.** **27. – Calligonum microcurpum Borszcz** **28. – Calligonum caput-medusae Schrenk.** **29. – Calligonum serosum (Litv.) Litv.** 30. Tatar honeysuckle - Lonicera tatarica L. 31. Violet willow - Salix daphnoides Vill. 32. Caspian willow - Salix caspica Pall **33. – Salix rubra Huds** 34. Mespilus rotundifolious - Amelanchier rotundifolia (Lat.) Dum./Cours. 35. Russian olive - Elaeagnus angustifolia 36. Rotundifolious Juneberry - Amelanchier rotundifolia (lat.) Dum./Cours 37. Wig-tree - Cotinus coggygria Scop. 38. Golden currant - Ribes aureum Pursh. 39. French tamarisk -Tamarix ramosissima Ledeb. 40. Loose tamarisk -Tamarix lara Willd 41. Coniferous ephedra - Ephedra distachy L. 42. Paletskiy Saltwort - Salsola paletskiana litv. 43. Rihter Saltwort - Salsola richteri (Moq.) Kar. Ex. Litv. 44. Glasswort - Aellenia subaphylla (C. A. Mey) Aell.

4.1.2 Crop Rotation

This is a sequence in which crops are grown on the same piece of land over a number of years-
Used to be important for:

- The maintenance of soil fertility
- The prevention of a build up of soil borne diseases, pests and weeds;
- The control of erosion

Nowadays, technical innovations, such as use of fertilizers, pesticide and herbicides, have reduced the necessity of crop rotation. However, there are number of serious soil borne disease and nematode infections the control of which requires a sound rotation program . Thus, alfalfa, rice, wheat and others are planted with a 5-6 year interval.

Some general rules relating to crop rotation are :

- The continuous growing of cereals or pulses should be avoided
- Leguminous crops should not be sown in sequence , even one crop is seed and other for forage;
- Crops with common root diseases should not be sown in succession. For instances , tobacco should not be planted following tomatoes.

4.1.3 Other Impacts

Other possible environmental impacts would include:

(1) Dust generation caused by certain construction operation such as excavation, which ca be mitigated by wetting excavation sites and other sources of dust to control its emission , and public information.
(2) Noise generation which can be mitigated by use of properly maintained equipment and public information, and
(3) Land use conflicts caused by temporary use of land for temporary facilities for construction contractors (accommodation, camp canteen, camp facilities , medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction.

Projects may face other possible impacts such as (1) dust generation caused by certain
construction operation , such as excavation, which can be mitigated by wetting excavation sites and other sources of dust control its emission, and public information. (2) noise generation which can be mitigated by use of properly maintained equipment and public information; and (3) land use conflict caused by temporary use of land for temporary facilities for construction contractors (accommodation , camp canteen, camp facilities, medical centre, sanitation and

other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction. Planning “Buffer Zones” in irrigation Canals and drains, specified Government Regulation has to be followed as follows:

Table 5 : Government Regulations- Buffer Zones (Irrigation Canals and Drains)

Capacity of Irrigation Canals (m^3 / sec)	Width of the Inner Buffer Zones for inspection Roads and Deposit Sediment from Canal (m)	Width of the Outer Buffer Zone for Vegetation and limited Agriculture (m)
1	6	
5	10	
25	20	
50	75	
100 or more	100	

Collector Drains Buffer Zones- Provided by CWR and MOA- (both sides of the Collector Drain)

10	5m for inspection road and 10-20 m for spoil 10-20 m for agricultural traffic & field drains
10-20	100 meters (either side of the collector)
21-50	200 meters (either siude of the collector)
.50	300 meters (either side of the collector)

Source: MOA, Republic of Uzbekistan

This regulation should be strictly enforced on IDIP-II Projects.

4.2 Environmental Impacts Related to Construction

Reconstruction of the Malai- Sarinsky , sections of the project , joining collector with discharging drainage water into primary , secondary and tertiary canals. All open collector and drains will be cleaned and deepened. After the proper design, the project will be open for construction and operation. This will result in the following conditions:

1)Temporary increase in silt

To mitigate this, provisions are there in the standard contract document supplied to contractor for adequate supervision of operations and adherence only, use of silt traps and careful deposition of spoils.

The incorporation of the above measures will have to be placed into BOQ for sub project contract documentations and supervision of contractors.

2)Temporary closure of irrigation system

Participation by Water User Association (WUA) and Farmers. The information are to be given through dialogue and community awareness campaign. Ask WUA and villagers for permission to close the irrigation system temporarily. They are very important that WUA and farmers involved in all aspect of civil works.

3) Disposal of Excavated spoil from main and inter-farm drains.
Excavated soil (spoil) will be deposited alongside the drain in accordance with the guideline laid down by GOK/ MOEB with respect to easement dimension.- either side of drain and /or canal. Spoil will be deposited and formed using bulldozer into trapezoidal formation.

4)Disposal of Excavated soil (spoil) from on- farm Drains and Canals.
Spoil will be deposited alongside canals and drains in accordance with WUA and farmer instructions. If required and instructed, the contractors may deposit spoil on farm fields at the expense of farmers.

5) Dust generation
The mitigation measures recommended is the appropriate timing of operations wetting of surfaces and notice to /involvement of public. The workers on construction sites should have international personal safety / protection equipment supplied by the contractor.

6. Noise Generation:
Mitigation measures:
Appropriate timing and operation of machine are to be discussed with the farmers and WUA. Notice will be given to public and WUA- farmers will be involved in timing and reduction of noise level in the project areas.

7. Waste Material :
Replacement and repair of the irrigation and drainage structure will result in waste material (concrete and steel). These are to be disposed of by the civil works contractor as per CWR / MOEB guidelines.

8. Land Use Conflict for Construction
The CWR , MOA and GOK assessed that there will be no land use conflict for construction. This also confirmed by the client, the CWR, and guarantee given by them to the World Bank. On farm negotiations would be made with WUA and the landowners. However, civil works only will be done by participation agreement of land owners and WUA. The PMO / CWR should have the responsibility for dispute settlement.

9.Construction of Camp Sites and Living Facilities
Establishment and construction of camp sites, and Living facilities for the construction workers have to be established prior to construction work. An acceptable sanitary facility has to be established for the workers. This must satisfy environmental regulation and MOEB code.

The camp site has to be cleaned and returned to the original state before the construction.
Wastes & House Hold Refuge should be properly collected and disposed off.

Mitigation measures are to be:
1)CWR & MOA agrees to allocate free sites for the construction of camp sites and living facilities. This has to be negotiated with the client and the local authorities. Construction of camp sites and living facilities will be funded by the contractor. Clean up costs for these facilities will be borne by the contractor.

10. Biodiversity Conservation / Sustainability
Environmental Sustainability of the project area is very low. To improve this situation following steps will be taken:

(1) Organize nursery at every sub-regions and WUA. Provide free extension service ,input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pump location, main , on farm and inter-farm canals.

(2) Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas production for power generation to be considered.

4.3 Environmental Impacts related to Operation

1) Soil modification as a result of intensified agriculture
The mitigation required
a) Encouragement of continued use of traditional management of water flows
b)The use of deep rooting grasses and shrubs to further strengthen the bunds
c) Minimum / zero tillage practices

2)Soil and water contamination due to increased use of agrochemicals including fertilizer and pesticides.
The mitigation required
a) Mitigation required are agricultural extension services and Integrated pest management (IPM).

The agricultural extension service would include

a)Optimum , informed use of mineral fertilizer
b)Promotion of integrated pest management (IPM)
c) Discouragement on the use of persistent pesticide and herbicide.
d) Training on composting, reforestation, minimum or zero-tillage.
e) Biodiversity associated with introduced new plant species and varieties .

Promote Biodiversity for introduced crops and land use changes from protecting soil from wind by tree fencing and other environmental management practices.

(3) Environmental Sustainability & Bio-diversity Concerns.

Biological diversity refers to the variety of South Kazakhstan living biological resources. It is a function not simply of the number of ecosystem and distinct plants and animal species in existence at any given time, but also genetic differences within individual species.
Conservation of biological diversity is a form of natural resources management and should be practiced in Malai- Sarinsky area. This can be done by reforestation activities of indigenous plants on vertical drainage sites, main and secondary canals, and other inter farm canals. A reforestation site plan will have to be prepared in IDIP-II (Phase B) design level.

5. Environmental Monitoring

Monitoring is necessary with respect to (i) water resources quality and quantity ; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance management, including inspection and proper repair of irrigation & drainage canals and structures.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources(CWR) , MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate to evaluate the success or failure of IDIP-II proposed project intervention in the Malai-Sarinsky.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information . Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project , the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as :

1. Soil salinity and high ground water tables;
2. Water Quality & Salinity .
3. Reforestation, Bio-Diversity and Desertification.

The variables to be analyzed are described in Table 19 (EA Main Report)**.** It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15 and for one water samples is about USD 10. Most of the project farmers interviewed that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient . Such sampling density for 220,000 ha over 2 year life of the project would be extremely expensive.

The other alternative is to sample the pilot area (6,907 ha in Mahtaaral area) fully and for other project areas , sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project.
During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

Table 6 : Monitoring Plan For Malai - Sarinsky
CALCULATION IS DONE FOR 2,500 Ha (Malai-Sarinsky, about $8.18/ ha.)

Parameters to be Monitored	Periodicity	Number of Samples				Cost of 1 analysis in $US	Total Cost in $US
		Total Number of Samples	Number of Indicators	Sum of Determination	Total/ yr		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 25	3	75	1,125	15	1,125 **2,250**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 34	5	170	1,700	10	1,700 **3,400**
4. Water Quality							
4.a Ground Water Quality							
4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 3	1	3	30	10	300 **600**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 3	15	45	900	20	900 **1,800**
4.a.c Fertilizer	Annually	(1sample /1000 ha) 3	1	3	45	15	45 **90**
5.Pesticide residues in fish & fodder crops	Annually	2	20	40	40	20	800 **1600**
6.Reforestation , composting and Tree	Annually	1 $ Per /ha		$2,500.0	$2,500.0	$1 Per Ha	$2,500 **$5,000.0** **(including yearly Maintenance)**

Belts(Bio-drainage & Salinity Control)							
7. Equipments for Rayons &WUAs	Annually 3 hand held GPS units, computer download, 3 Electrical Conductivity meters				1 unit (GPS & Electrical Conductivity meters $250.0 X4	$250.0 for one unit	**$1,000** (one time purchase)
						Grand Total	**$15,740 ***

Source: The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1996.
* this $15,740s based on 1996 figure and upgraded to $20,462 to reflect 2007 values (30% inflation).

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M , it will be easier for them to take this additional responsibility . This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that Total US$20,462.(based on 10 years of inflation). will be required to implement and maintain the Environmental Management and Monitoring Plan (EM & MP). There are three categories of inputs to the EMP. They are as follows in the Table 7.

1. Planning and Surveys and consultant assistance$ 2,681 (13.13%)
2. Mitigation Management $16,635 (81.24%)
3. Equipment & Training $ 1,146 (5.63 %)

Table 7: Estimated Budget for Environmental Management Plan (EMP – Malai-Sarinsky)

Item	Qty	Unit Cost	Total Cost US$
Capital Cost-Equipments for Rayons			
GPS units (handheld), Computer download	1	250	250.0
Electrical Conductivity Meters(24 Rural Districts)	1	250	250.0
Capital Cost- Equipment for WUA			
GPS units (Hand Held),computer download	1	250	250.0
Electrical Conductivity Meters(17 Rural Consumer Cooperatives of Water User RCCWU)	1	250	250.0
Recurrent Costs			
Support to PMO for Baseline Survey	1 each	3,000	2,000
Support to PMO for M&E activities over 2 years	Lumpsum	5,000	2,000
Analysis for soil and water samples for 2 years by CWR &MOG	2 Yearly	19030	9,740
Support for reforestation & biodiversity by CF	Lumpsum		1000
Total			15740

Note : Total $ 15,740 (round figure) is based on 1996 values. and adjusted to 2007 inflation figures (X30%), which makes it (15,740X30%) $15,740 +4,722= **$20,462**

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out. The suggested report systems for environmental monitoring programs are made on the following consideration:

1. Monthly report from the Contractor

Contractors should regularly monitor the environmental –related issues and Environmental parameters based on the guidance from Environmental Management Specialist and requirements from Ryon Inspector. They should provide a monthly

Report covering performance of environmental monitoring and progress of environmental related activities.

2. Monthly Environmental Management Report

   The requirement of Environmental Management Specialist is to produce a monthly performance report of environmental monitoring , summarizing the environmental monitoring of sub-projects and other related environmental problems.

3. Environmental Monitoring Report

   The Rayon office laboratories of IDIP-II need to submit PMO thematic monitoring report on the changes in salinity, changes in water use, changes in soil productivity, including baseline soil surveys and subsequent periodic surveys, as well as proposed suggestions for actions to solve key environmental problems if any (semi-annual monitoring and annual monitoring report).

4. Semi-Annual PMO Report

   Every half year, PMO needs to compile a quarterly environmental working report, summarizing the progress of EMP implementation , and monitoring status. The report from IDIP-II project and the Environmental Management Specialist should be attached to PMO report. This report may be integrated into "The Progress Report" and sent to WB for review. The copies may be sent to Oblast Office for reference.

6. FINDINGS AND RECOMMENDATIONS

6.1 The Need for an Environmental Impact Assessment (EIA)

This section evaluates the need for an Environmental Impact Studies (EIA). This should be based on the fact whether significant environmental impacts exist and that need a further detailed study or EIA.

As per as we have seen there are no negative environmental impacts due to IDIP-I proposed project formulation , design, implementation , and operation. The only negative impacts identified are transitory ones (can be mitigated) associated with construction operations. All other impacts for Malai-Sarinskyl are positive. The required mitigations are presented in sections and 7.4.of the EA Main Report.
The recommendation from the findings of this Environmental Assessment (EA) are that a follow up EIA or further detailed environmental impact study (EIA) study is not needed.

6.2 Potential Environmental Impacts, Possible Mitigation Measures and Responsible Agencies

The environmental monitoring program will be part of an integrated project monitoring program which will be established by the PMO. The PMO and the "Project Implementation Unit" (PIU) offices at Project area oblast will be responsible for implementing all environmental mitigation measures. Table …… presents all relevant issues with respect to the potential environmental impacts and the possible monitoring and mitigation enhancement measures. The table also lists those agencies who are responsible and also lists agencies which should have an involvement in the monitoring program and an input to the development and planning of the mitigation measures.

6.3 Environmental Assessment Requirement of MOEB

The Government of Kazakhstan (GOK) requirement is to present this Environmental Assessment (EA) report to MOEB. The instruction by MOEB call for report in which available data on the resources likely to be affected by IDIP-II are to be analyzed in terms of scope and intensity. An Environmental Assessment (EA) report are to be prepared by proponent (CWR) and should be included with the feasibility report and submitted for approval. This report provides a brief description of ecological and social sources , and trends in agriculture. Natural resources that are sensitive to change should be identified along with potential environmental problems. This report should be given a public review and then presented to the Ministry of Ecological and Biological Resources (MOEB). The MOEB reviews the EA and its comments (State Ecological Expertise) and forwarded to the concerned sections for approval.

The World Bank 4.01 "Environmental Assessment" has screened the IDIP-II Project and placed it in EA category "B", which means the preparation of an environmental analysis to define environmental management , monitoring and mitigation measures as necessary. The recommended mitigation measures in the State Ecological Expertise (SEE) review would become an integral part of integral part of project design and implementation. The archeological sites would be protected with the guideline and requirement of Kazakhstan law and acceptable to the World Bank. The assurance was also obtained from Kazakh Government about the use of agrochemicals for IDIP-II would be approved ,stored and distributed and used in accordance with the guidelines and requirements of Kazakhstan Government acceptable to the World Bank (WB).

6.4 CONCLUSION

For Kapal sub project an Environmental Impact Assessment (EIA) is not necessary. However, the appointment of a local / domestic Environmental Management Specialist to assist with the implementation of the Environmental Management / Monitoring Program and train WUA staff is considered very important task for the success of the

Environmental Management and Monitoring Plan (EMP). A term of reference (TOR) for the Environmental Management Specialist (EMP) is prepared in the Annex…T.

7. FUTURE DEVELOPMENT PLAN

The future environmental management and monitoring plan will mitigate the following:

1. Monitoring crop rotation for 6 years
2. Monitoring of surface and Ground Water for water quality (salinity & pesticide).
3. Water table depth
4. Drainage water for salinity , pesticide & fertilizers
5. Pesticide residues in fish , animal tissue and fodder crops
6. Reforestation of indigenous plant for biodiversity & desertification control.
7. Reclaim saline soil, saline surface and ground water.

For further details, please go through the Environmental Management and Mitigation Plan of the Main Environmental Assessment (EA) report.
The Environmental Management & Monitoring Plan is also part of future development plan.

ECOLOGICAL & ENVIRONMENTAL STUDIES OF IDIP-II PROJECT
ENVIRONMENTAL ASSESSMENT (EA)
BIG ALMATY CANAL SUB-REGIONS

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A. Report

B. Tables

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Big Almaty Canal Sub-Regions

1. Summary of Big Almaty Canal Environmental Assessment (EA)

The Environmental Assessment (EA) describes potential impacts of irrigation and drainage improvement and rehabilitation of 12,500 ha .

Big Almaty Canal has total population of 28,100 of which 13635 are male and 14465 are female. The potential for water logging and secondary salinization will be managed by some vertical drainage , and with cleaned and deepened interfarm and on-farm collectors drains. Total number of in-farm canals in the project area is not known.

The soil types that are present in the regions include *Light Walnut Soils, mid light Sierozems, light Sierozems, middle Marsh, marsh –middle and Marsh soils.* All these soils are alkaline, with ph. 7.5 -9.0.IN the Big Almaty Canal area , 36 % of the soil are non saline, 36 % weakly saline, 27 % are moderately saline and 0.5 % are strongly saline. All the project area, except settlement is used for agriculture or cattle breeding.

The water salinity , the 62 % are non saline(<1gm / l) , 25 % are moderately saline (1-3 gm /l)and 13 % are highly saline (3-10 gm of salt /l). Further they are polluted with pesticide and herbicides. The project collectors-drainage system discharges into Big Almaty Canal.

Impact Assessment:
The effect of IDIP-II on natural and social resources can be described as follows. Under the IDIP-II an area of 12,500 ha has been outlined for feasibility study. As proposed, after leaching the lands will be returned to intensive farming. With drainage rehabilitation ,changes in land use are expected. The impact assessment has been simplified into three main components: (1) Project design (2) Project construction and (3)Project Operation. Out of 7 project related activities, no adverse environmental impacts are expected.

If irrigation and drainage systems are not rehabilitated , the existing infrastructure will become further degraded, and agricultural will become more waterlogged and saline. The land would turn into more desert condition.

Most of the potential impacts are effectively mitigated. The environmental impacts related to project design, construction and operation will not affect the environment. Project documentation will be prepared on :

1. Regulation for closed vertical bore holes and destroyed horizontal canals to avoid contamination of ground water for village water use.
2. Regulation forbidding persistent chemical weed and pest killers.

3. Environmental sustainability and bio-diversity preservation for the IDIP

The consultant proposes that the Committee of Water Resources (CWR) and Ministry of Environment and Biological Resources (MOEB) will be responsible for project development and will manage environmental programs. To do so , a small amount of Rayon and WUA will be trained in water and soil salinity monitoring with equipments and procedures. One or more short courses for professional development will be organized in project institutions.

A monitoring program will be formulated to avoid any unforeseen negative environmental effects when implementing the Big Almaty Canal IDIP –II project. This is required to guarantee efficiency of the mitigation measures and a monitoring program is very much required. Please refer to “Monitoring Plan “ of Big Almaty Canal (Table 6.) and main object of the monitoring plan are as follows:

- Regular soil sampling for chemical analysis, weed and pest , and for fertilizers.
- Regular surface, ground and drainage water sampling inside the irrigation and drainage project (IDIP-II) for chemical analysis, weed and pests , and fertilizers. Depending on the initial results of the monitoring the space and intensity of analysis could be increased or decreased..
- The fodder crops, animal tissues and milk should be analyzed for pesticides. Depending on the results , the analysis could be continued or discontinued.

The total monitoring cost for 12,500 ha of Big Alamaty Canal is about $ US 103,675 (Table 7). If we spread the cost to the whole area it comes to about $8.2 per hectors. It is worth to spend that money on monitoring

The findings and recommendations for an Environmental Impact Assessment (EIA).
As we have seen from the document there are no negative environmental impacts due to IDIP-II project formulation, design , implementation , and operation . The only negative impacts identified are transitory ones and can be mitigated during construction and operation. All other impacts for Big Almaty Canal are positive.

ANNEX –F
BAK "Big Almaty Canal
ALMATY OBLAST

2.Brief General Description and Location

The location of the Big Almaty Canal Sub Projectis is indicated in Figure 1 or Map A-BAK -1 . The climatic data representative of the location are presented in Soils Report and Mid Term Report. The altitude of >1000 m above sea level moderates summer temperature, giving the location the lowest growing season temperature of all Sub project sites. Rainfall is at least double than that of other location , with most rain falling during March –June, but considerable amounts for the remainder of the growing season. Thus at this location if it is possible for rainfall to meet crop water requirement to a considerable extent, thereby reducing the requirement for irrigation. About 12,500 ha are given for Big Almaty Canal Study Area (BAC).

Water supply to the Big Almaty Canalis from Bartogaisky reservoir, located on the Chilik River. Chilik River originates in the central part of Zailisky mountain range and Kuney Alatau, and flows to the Ily Riverand its left inflow. The recharge of Chilik river is the icy snow type. High water are in the July and August and the duration of flood are 119 days. Mean water are from mid September to end of April with minimum flow in are in February and March.

The soil type presents in the region include light walnut soils, mid light sierozems , light sierozems, middle marsh, marsh middle and marsh soils . All of these soils are alkaline , with pH 7.5 to 9.0. In the general region , 36 % of the soil are non saline, 36 % of the soil weakly saline , 27 % moderately saline and 0.5 % strongly saline. Water tables are at 2-3 meter in Walnut soils , 3-5 meter in Sierozems, 0.5 to 1.0 m in Middle Marsh and about 0.5 in Marsh Soils.

The current land use are maize as grain , winter wheat and Lucerne Tobacco, Barley , Sunflower and vegetables are grown in small quantities. (Ag.Eco. Rep. 2005).

This Sub-Project has more rainfall than other Sub Project locations. But this is not enough to support productive rainfed agriculture. As a consequence of secondary salinity induced by poor irrigation and drainage, salinity problem is pronounced in some location. Crop fertilizer requirement need to be established both for individual crop and general crop rotation basis. The farmers also need high yielding varieties of vegetables , Lucerne and maize.

The "Big Almaty Canal " Sub-Project has to establish an effective supplementary irrigation system that maximizes water use efficiency (WUE) of irrigation water.

This requires renovation of the irrigation and drainage system to permit effective delivery of optimum of water with minimum system loss. Leveling of field is required to allow an even distribution of water most economically. Measures to be taken to prevent further salinity encroachment and reclaim salt-affected areas. The major requirement is to ensure proper drainage of irrigation water and keep water tables at >2.5 m depth.

Out of 12,500 ha , about 62 % of the area are non saline (< 1gm /l), and 38 % of the area are moderately to highly saline (1-10 gm of salt / lit). The Big Almaty Canal (BAC) area has almost no waterlogging problem (Table 1).

Table 1: **Extent of Salinity in Almaty and Zhambul**

Target oblast	Target Sub-projects	Total Area, thousands of ha	None Saline 1 gm/l, % of Total Area	Modeterately Salinity, 1-3 gm/l, % of Total Area	Highly Saline 3-10 gm/l, % Total Area	Very Highly Saline, > 10 gm/l , % of Total Area
Zhambyl oblast	Baizaksky rayon	5000	-	64.7	35.3	-
	Shuysky rayon	5000	32.5	67.5	-	-
	Zhambylsky rayon	5000	70.0	30.0	-	-
	Kordaysky rayon	5000	75.0	25.0	-	-
	Merkensky rayon	5000	67.0	20.0	13.0	-
Almatynskya oblast						
	Karatalsky irrigation system	5000	85.39	12.68	1	0.93
	Akdalinsky irrigation system	5000	89	11	-	-
	Malaisarynsky irrigation system	2500	45.1	36	18.9	-
	Enbekshy Kazakhsky rayon	12500	62	25	13	-

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

Table 2: Extent of Water Table Depth within Almaty and Zhambul

Sub-project	Oblast	Rayon	Total Area, ha	The Depth of Ground Water Table <2m, as % of Total Area	The Depth of Ground Water Table from 2 m to 5 m, as % of Total Area	The Depth of Ground Water Table > 5 m, as % of Total Area
1	Zhambul oblast	Baizaksky rayon	5000	82.5	17.5	-
2		Shuysky rayon	5000	18.0	72.0	-
3		Zhambylsky rayon	5000	34.0	37.0	29.0
4		Kordaysky rayon	5000	13.0	70.0	17.0
5		Merkensky rayon	5000	20.0	80.0	-
6	Almaty oblast	Karatalsky irrigation system	5000	21.94	78.06	-
7		Akdalinsky irrigation system	5000	44	56	-
8		Malaisarynsky irrigation system	2500		33	67
9		Enbekshy Kazakhsky rayon	12500		45.91	54.09

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

3. Potential Environmental Impact

This section will determine and distinguish between significant positive and negative impacts, direct and indirect impacts , immediate and long term impacts. This will also identify unavoidable or irreversible impacts.
For further information and explanation on this subject , please refer to Environmental Assessment Main Report.

For further information and explanation on this subject , please refer to Environmental Assessment Main Report.

Table 3: Environmental Impacts by Sub-Project Related Activities

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project Karatal I&D System			
1.Rehabilitation & Construction of Irrigation & drainage network and associated infrastructure	No (+)	Yes (-)	No (+)
2. Improved Agronomic Practices	No (+)	No (+)	No (+)
3. Improved Soil and Land Improvement / Reclamation		No (+)	No (+)
4. Crop Rotation & Improved Agricultural Practices (IAP)	No (+)	No (+)	No (+)
5. Integrated Pest Management and Fertilizer Application	No (+)	No (+)	No (+)
6.Bio-drainage & Reforestation	No (+)	No (+)	No (+)
7. Improved WUA Management	No (+)	No (+)	No (+)
		No (+)	No (+)

D = Project design ; C= Project construction and O= Project Operation

No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures), (+) Positive effect (No Adverse Impact) and (-) negative effect and to be addressed by mitigation.

4. Environmental Management

4.1 Impacts Related to Design

The design of Irrigation and drainage system for Big Almaty Canal is not expected to produce negative impacts on the South Kazakhstan Oblast irrigation and drainage rehabilitation project. The design/ construction of new drains and rehabilitation of existing drains will not increase the amount of salt and agricultural chemicals entering natural waterways.
According to Table 2 , salinity within 87 % of the area are non to moderately saline (1- 3 gm/l), For the whole area(100%) , depth of ground water (Table 3) are beyond 2 to 5 meters.
This is for the reason:

- The salinity content of the 38% of the project drains are between 1-<10 gm/l (Table 1). The rest 62 % are non saline with less than 1 gm / litre.
- The quantity of water carried by the drains are low when compared to the discharge of the Big Almaty River.

Land Resources
As proposed in the plan , 12,500 ha has been selected for feasibility study. The objective is to rehabilitate reliable irrigation supplies, for moderate to high saline soils, where substantial improvement of land productivity can be achieved with relatively low investment. As a result of drainage improvement, minor changes in land use are expected.
Further description of soils is provided by Soil Expert in the Mid Term Report.

Water Resources
Some canal will be lined and there will be improvement in water supply to irrigated lands. Salt content (mineralization) in the drainage water will be kept within limits of 1 to 3 gm /l. After mixing the drainage water with irrigated surface water (1.5 -2.0 g/l), they can be used as irrigation water. For further details please consult engineering report.

4.1.1 Bio-drainage and Salinity Control

Many drainage system are dysfunctional and another option particularly on moderate to high saline land (Table 1) would be to introduce bio-drainage techniques to control soil salinity and water table levels by using especially established plantation of trees, bushes, grasses and crops.

Tree Belts

The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage, decreasing ground water levels and helping to tackle the problem of secondary salinity and waterlogging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent %. As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions.

a) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt , high saline soil may be leached with fresh water before planting 1-2 year old sapling.

b) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant , has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

c) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

d) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

- Alkali grass (*Puccinellia airoides)*
- Desert Saltgrass (*Distichlis stricta)*
- Wildrye (*Elymus spp)*
- Bermuda grass (*Cynodon dactylon)*
- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main, on farm and inter-farm canals.

Establish Compost / Bio-gas sites

In design phase, establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.

Table 3 gives a list of indigenous trees and bushes that can be used in planning tree lines and fence lines around farms, pump houses and irrigation canals. They should be chosen with experience and knowledge.

Table4: List of Indigenous Trees and Bushes for IDIP-II

Trees	Bushes
1. Apricot - Armenica vulgaris Lam	24. Siberian pea shrub - Caragana arborescens Lam.
2. Cherry-plum - Prunus divaricata Ledeb	25. Redhaw hawthorn - Crataegus sanguinea Pall.
3. Asian sumac - Ailanthus altissima	**26. – Calligonum aphyllum Gurke.**
4. Birch - Bertula pendula Roth	**27. – Calligonum microcurpum Borszcz**
5. Siberian elm - Ulmus pumila L.	**28. – Calligonum caput-medusae Schrenk.**
6. Elm - Ulmus laevis Pall.	**29. – Calligonum serosum (Litv.) Litv.**
7. Common Pear - Pyrus communis	30. Tatar honeysuckle - Lonicera tatarica L.
8. Tatarian maple -Acer tataricum	31. Violet willow - Salix daphnoides Vill.
9. Ash-leaved maple - Acer negundo	32. Caspian willow - Salix caspica Pall
10. Larch Siberian - Larix sibirica Ledeb.	**33. – Salix rubra Huds**
11. Bastard acacia - Robinia pseudoacacia L.	34. Mespilus rotundifolious - Amelanchier rotundifolia (Lat.) Dum./Cours.
12. White saxaul - Haloxylon persicum Bunge	35. Russian olive - Elaeagnus angustifolia
13. Black saxaul - Haloxylon aphyllum (Minkw.) Iljin	36. Rotundifolious Juneberry - Amelanchier rotundifolia (lat.) Dum./Cours
14. Pine Crimean -Pinus pallasiana D.Don.	37. Wig-tree - Cotinus coggygria Scop.
15. Archangel fir -Pinus sylvestris L.	38. Golden currant - Ribes aureum Pursh.
16. White poplar - Populus alba L.	39. French tamarisk -Tamarix ramosissima Ledeb.
17. Poplar balsamic - Populus balsamifera	40. Loose tamarisk -Tamarix lara Willd
18. Bay leaf poplar - Populus laurifolia Ledeb.	41. Coniferous ephedra - Ephedra distachy L.
19.Poplar diversifolious- Populus diversifolia Schrenk	42. Paletskiy Saltwort - Salsola paletskiana litv.
20. Poplar Siberian - Populus barsamifera L. (var. sibirica)	43. Rihter Saltwort - Salsola richteri (Moq.) Kar. Ex. Litv.
21. Black poplar - Populus nigra L.	44. Glasswort - Aellenia subaphylla (C. A. Mey) Aell.
22. White mulberry - Morus alba L.	
23. Siberian apple - Malus pallasiana Jus.	

4.1.2 Crop Rotation

This is a sequence in which crops are grown on the same piece of land over a number of years-
Used to be important for:

- The maintenance of soil fertility
- The prevention of a build up of soil borne diseases, pests and weeds;
- The control of erosion

Nowadays, technical innovations, such as use of fertilizers, pesticide and herbicides , have reduced the necessity of crop rotation. However, there are number of serious soil borne disease and nematode infections the control of which requires a sound rotation program. Thus, alfalfa, rice , wheat and others are planted with a 5-6 year interval.

Some general rules relating to crop rotation are :

- The continuous growing of cereals or pulses should be avoided
- Leguminous crops should not be sown in sequence , even one crop is seed and other for forage;
- Crops with common root diseases should not be sown in succession. For instances, tobacco should not be planted following tomatoes.

4.1.13 Other Impacts

Other possible environmental impacts would include:

(1) Dust generation caused by certain construction operation such as excavation, which ca be mitigated by wetting excavation sites and other sources of dust to control its emission , and public information.
(2) Noise generation which can be mitigated by use of properly maintained equipment and public information, and
(3) Land use conflicts caused by temporary use of land for temporary facilities for construction contractors (accommodation, camp canteen, camp facilities , medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction.

Projects may face other possible impacts such as (1) dust generation caused by certain
construction operation , such as excavation, which can be mitigated by wetting excavation sites and other sources of dust control its emission, and public information. (2) noise generation which can be mitigated by use of properly maintained equipment and public information; and (3) land use

conflict caused by temporary use of land for temporary facilities for construction contractors (accommodation , camp canteen, camp facilities, medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction. Planning "Buffer Zones" in irrigation Canals and drains, specified Government Regulation has to be followed as follows:

Table 5 : Government Regulations- Buffer Zones (Irrigation Canals and Drains)

Capacity of Irrigation Canals (m^3 / sec)	Width of the Inner Buffer Zones for inspection Roads and Deposit Sediment from Canal (m)	Width of the Outer Buffer Zone for Vegetation and limited Agriculture (m)
1	6	
5	10	
25	20	
50	75	
100 or more	100	

Collector Drains Buffer Zones- Provided by CWR and MOA- (both sides of the Collector Drain)

10	5m for inspection road and 10-20 m for spoil 10-20 m for agricultural traffic & field drains
10-20	100 meters (either side of the collector)
21-50	200 meters (either siude of the collector)
.50	300 meters (either side of the collector)

Source: MOA, Republic of Uzbekistan

This regulation should be strictly enforced on IDIP-II Projects.

4.2 Environmental Impacts Related to Construction

Reconstruction of the Big Almaty Canal , sections of the project , joining collector with discharging drainage water into primary , secondary and tertiary canals. All open collector and drains will be cleaned and deepened. After the proper design , the project will be open for construction and operation. This will result in the following conditions:

1)Temporary increase in silt

To mitigate this, provisions are there in the standard contract document supplied to contractor for adequate supervision of operations and adherence only, use of silt traps and careful deposition of spoils.

The incorporation of the above measures will have to be placed into BOQ for sub project contract documentations and supervision of contractors.

2)Temporary closure of irrigation system

Participation by Water User Association (WUA) and Farmers. The information are to be given through dialogue and community awareness campaign. Ask WUA and villagers for permission to close the irrigation system temporarily. They are very important that WUA and farmers involved in all aspect of civil works.

3) Disposal of Excavated spoil from main and inter-farm drains.

Excavated soil (spoil) will be deposited alongside the drain in accordance with the guideline laid down by GOK/ MOEB with respect to easement dimension.- either side of drain and /or canal. Spoil will be deposited and formed using bulldozer into trapezoidal formation.

4)Disposal of Excavated soil (spoil) from on- farm Drains and Canals.

Spoil will be deposited alongside canals and drains in accordance with WUA and farmer instructions. If required and instructed, the contractors may deposit spoil on farm fields at the expense of farmers.

5) Dust generation

The mitigation measures recommended is the appropriate timing of operations wetting of surfaces and notice to /involvement of public. The workers on construction sites should have international personal safety / protection equipment supplied by the contractor.

6. Noise Generation:

Mitigation measures:

Appropriate timing and operation of machine are to be discussed with the farmers and WUA. Notice will be given to public and WUA- farmers will be involved in timing and reduction of noise level in the project areas.

7. Waste Material:

Replacement and repair of the irrigation and drainage structure will result in waste material (concrete and steel). These are to be disposed of by the civil works contractor as per CWR / MOEB guidelines.

8. Land Use Conflict for Construction

The CWR , MOA and GOK assessed that there will be no land use conflict for construction. This also confirmed by the client, the CWR, and guarantee given by them to the World Bank. On farm negotiations would be made with

WUA and the landowners. However, civil works only will be done by participation agreement of land owners and WUA. The PMO / CWR should have the responsibility for dispute settlement.

9.Construction of Camp Sites and Living Facilities
Establishment and construction of camp sites, and Living facilities for the construction workers have to be established prior to construction work. An acceptable sanitary facility has to be established for the workers. This must satisfy environmental regulation and MOEB code.
The camp site has to be cleaned and returned to the original state before the construction.
Refuge should be properly collected and disposed off.

Mitigation measures are to be:
1)CWR & MOA agrees to allocate free sites for the construction of camp sites and living facilities. This has to be negotiated with the client and the local authorities. Construction of camp sites and living facilities will be funded by the contractor. Clean up costs for these facilities will be borne by the contractor.

10. Biodiversity Conservation / Sustainability
Environmental Sustainability of the project area is very low. To improve this situation following steps will be taken:
(1) Organize nursery at every sub-regions and WUA. Provide free extension service ,input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pump location, main , on farm and inter-farm canals.
(2) Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to be considered.

4.3 Environmental Impacts related to Operation

1) Soil modification as a result of intensified agriculture
The mitigation required
a) Encouragement of continued use of traditional management of water flows
b)The use of deep rooting grasses and shrubs to further strengthen the bunds
c) Minimum / zero tillage practices

2)Soil and water contamination due to increased use of agrochemicals including fertilizer and
pesticides.
The mitigation required

a)Mitigation required are agricultural extension services and Integrated pest management (IPM).
The agricultural extension service would include

a)Optimum , informed use of mineral fertilizer
b)Promotion of integrated pest management (IPM)
c) Discouragement on the use of persistent pesticide and herbicide.
d) Training on composting, reforestation, minimum or zero-tillage.
e) Biodiversity associated with introduced new plant species and varieties .
Promote Biodiversity for introduced crops and land use changes from protecting soil from wind by tree fencing and other environmental management practices.

(3) Environmental Sustainability & Bio-diversity Concerns.

Biological diversity refers to the variety of South Kazakhstan living biological resources. It is a function not simply of the number of ecosystem and distinct plants and animal species in existence at any given time, but also genetic differences within individual species.
Conservation of biological diversity is a form of natural resources management and should be practiced in Big Almaty Canal area. This can be done by reforestation activities of indigenous plants on vertical drainage sites, main and secondary canals, and other inter farm canals. A reforestation site plan will have to be prepared in IDIP-II (Phase B) design level.

5. Environmental Monitoring

Monitoring is necessary with respect to (i) water resources quality and quantity ; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance management, including inspection and proper repair of irrigation & drainage canals and structures.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources(CWR) , MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate to evaluate the success or failure of IDIP-II proposed project intervention in the Karatal.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information . Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project , the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the

Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as :

1. Soil salinity and high ground water tables;
2. Water Quality & Salinity .
3. Reforestation, Bio-Diversity and Desertification.

The variables to be analyzed are described in Annex……. It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15 and for one water samples is about USD 10. Most of the project farmers interviewed that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient . Such sampling density for 220,000 ha over 2 year life of the project would be extremely expensive.

The other alternative is to sample the pilot area (6,907 ha in Mahtaaral area) fully and for other project areas , sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project.
During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

Table 6 : Monitoring Plan of Big Almaty Canal (BAC)
CALCULATION IS DONE FOR 12, 500 Ha (Big Almaty Canal, about $ 8.2/ ha.)

Parameters to be Monitored	**Periodicity**	**Number of Samples**				Cost **of 1 analysis in $US**	**Total Cost in $US**
		Total Number of Samples	**Number of Indicators**	**Sum of Determination**	**Total/ yr**		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 125	3	375	150	15	2,250 **4,500**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 167	5	835		10	8,350 **16,700**
4. Water Quality							
4.a Ground Water Quality							
4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 13	1	13	13	10	130 **260**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 13	15	195	195	20	3,900 **7,800**
4.a.c Fertilizer	Annually	(1sample /1000 ha) 13	1	13	13	15	195 **390**
5.Pesticide residues in fish & fodder crops	Annually	2	20	40	40	20	800 **1600**
6.Reforestation , composting	Annually	1 $ Per /ha		$12,500.0	$12,500.0	$1 Per Ha	**$12,500 (including yearly Maintenance)**

and Tree Belts(Bio-drainage & Salinity Control)							
7. Equipments for Rayons &WUAs	Annually 15 hand held GPS units, computer download, 15 Electrical Conductivity meters				1 unit (GPS & Electrical Conductivity meters $250.0 X30	$250.0 for one unit	**$7,500** (one time purchase)
						Grand Total	**$51,250 ***

Source: The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1996.

* this $79,750 is based on 1996 figure and upgraded to $103,675 to reflect 2007 values (30% inflation).

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M, it will be easier for them to take this additional responsibility. This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that Total US$103,675 (based on 10 years of inflation) will be required to implement and maintain the Environmental Management and Monitoring Plan (EM & MP). There are three categories of inputs to the EMP . They are as follows in the Table 7.

1. Planning and Surveys and consultant assistance$15,995 (15.43 %)
2. Mitigation Management $80,180 (77.34%)
3. Equipment & Training $ 7,500(7.23 %)

Table 7: Estimated Budget for Environmental Management Plan (EMP – Big Almaty Canal -BAC)

Item	Qty	Unit Cost	Total Cost US$
Capital Cost-Equipments for Rayons			
GPS units (handheld), Computer download	7	250	1,750.0
Electrical Conductivity Meters(24 Rural Districts)	8	250	2000.0
Capital Cost- Equipment for WUA			
GPS units (Hand Held),computer download	7	250	1,750.0
Electrical Conductivity Meters(17 Rural Consumer Cooperatives of Water User RCCWU)	8	250	2000.0
Recurrent Costs			
Support to PMO for Baseline Survey	2	3,000	6,000
Support to PMO for M&E activities over 2 years	Lumpsum	10,000	10,000
Analysis for soil and water samples for 2 years by CWR &MOG	2 Yearly	19030	31,250
Support for reforestation & biodiversity by CF	Lumpsum	12,500	25,000
Total			79,750

Note : Total $ 79, 750 is based on 1996 values. and adjusted to 2007 inflation figures (X30%), which makes it (79,750X30%) $23,925 +79,750= **$103,675**

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out. The suggested report systems for environmental monitoring programs are made on the following consideration:

1. Monthly report from the Contractor

Contractors should regularly monitor the environmental –related issues and Environmental parameters based on the guidance from Environmental Management Specialist and requirements from Ryon Inspector. They should provide a monthly Report covering performance of environmental monitoring and progress of environmental related activities.

2. Monthly Environmental Management Report

   The requirement of Environmental Management Specialist is to produce a monthly performance report of environmental monitoring , summarizing the environmental monitoring of sub-projects and other related environmental problems.

3. Environmental Monitoring Report

   The Rayon office laboratories of IDIP-II need to submit PMO thematic monitoring report on the changes in salinity, changes in water use, changes in soil productivity, including baseline soil surveys and subsequent periodic surveys, as well as proposed suggestions for actions to solve key environmental problems if any (semi-annual monitoring and annual monitoring report).

4. Semi-Annual PMO Report

   Every half year, PMO needs to compile a quarterly environmental working report, summarizing the progress of EMP implementation, and monitoring status. The report from IDIP-II project and the Environmental Management Specialist should be attached to PMO report. This report may be integrated into “The Progress Report” and sent to WB for review. The copies may be sent to Oblast Office for reference.

6. FINDINGS AND RECOMMENDATIONS

6.1 The Need for an Environmental Impact Assessment (EIA)

This section evaluates the need for an Environmental Impact Studies (EIA). This should be based on the fact whether significant environmental impacts exist and that need a further detailed study or EIA.

As per as we have seen there are no negative environmental impacts due to IDIP-I proposed project formulation , design, implementation , and operation. The only negative impacts identified are transitory ones (can be mitigated) associated with construction operations. All other impacts for Big Almaty Canal are positive. The required mitigations are presented in sections and 7.4 of the Main EA Report..

The recommendation from the findings of this Environmental Assessment (EA) are that a follow up EIA or further detailed environmental impact study (EIA) study is not needed.

6.2 Potential Environmental Impacts, Possible Mitigation Measures and Responsible Agencies

The environmental monitoring program will be part of an integrated project monitoring program which will be established by the PMO. The PMO and the "Project Implementation Unit" (PIU) offices at Project area oblast will be responsible for implementing all environmental mitigation measures. Table 14 of the Main report EA presents all relevant issues with respect to the potential environmental impacts and the possible monitoring and mitigation enhancement measures. The table also lists those agencies who are responsible and also lists agencies which should have an involvement in the monitoring program and an input to the development and planning of the mitigation measures.

6.3 Environmental Assessment Requirement of MOEB

The Government of Kazakhstan (GOK) requirement is to present this Environmental Assessment (EA) report to MOEB. The instruction by MOEB call for report in which available data on the resources likely to be affected by IDIP-II are to be analyzed in terms of scope and intensity. An Environmental Assessment (EA) report are to be prepared by proponent (CWR) and should be included with the feasibility report and submitted for approval. This report provides a brief description of ecological and social sources, and trends in agriculture. Natural resources that are sensitive to change should be identified along with potential environmental problems. This report should be given a public review and then presented to the Ministry of Ecological and Biological Resources (MOEB). The MOEB reviews the EA and its comments (State Ecological Expertise) and forwarded to the concerned sections for approval.

The World Bank 4.01 "Environmental Assessment" has screened the IDIP-II Project and placed it in EA category "B", which means the preparation of an environmental analysis to define environmental management , monitoring and mitigation measures as necessary. The recommended mitigation measures in the State Ecological Expertise (SEE) review would become an integral part of integral part of project design and implementation. The archeological sites would be protected with the guideline and requirement of Kazakhstan law and acceptable to the World Bank. The assurance was also obtained from Kazakh Government about the use of agrochemicals for IDIP-II would be approved ,stored and distributed and used in accordance with the guidelines and requirements of Kazakhstan Government acceptable to the World Bank (WB).

6.4 CONCLUSION

For Big Almaty Canal (BAC) sub project an Environmental Impact Assessment (EIA) is not necessary. However, the appointment of a local / domestic Environmental Management Specialist to assist with the implementation of the Environmental Management / Monitoring Program and train WUA staff is considered very important task for the success of the Environmental Management and Monitoring Plan (EMP). A term of reference (TOR) for the Environmental Management Specialist (EMP) is prepared in the Annex T.

7. FUTURE DEVELOPMENT PLAN

The future environmental management and monitoring plan will mitigate the following:

1. Monitoring crop rotation for 6 years
2. Monitoring of surface and Ground Water for water quality (salinity & pesticide).
3. Water table depth
4. Drainage water for salinity , pesticide & fertilizers
5. Pesticide residues in fish , animal tissue and fodder crops
6. Reforestation of indigenous plant for biodiversity & desertification control.
7. Reclaim saline soil, saline surface and ground water.

For further details, please go through the Environmental Management and Mitigation Plan of the Main Environmental Assessment (EA) report..
The Environmental Management & Monitoring Plan is also part of future development plan.

ECOLOGICAL & ENVIRONMENTAL STUDIES OF IDIP-II PROJECT
ENVIRONMENTAL ASSESSMENT (EA)
KARATAL SUB-REGIONS, KARATAL RAYON

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A. Report

B. Tables

C. Figures

1. Summary of Karatal Environmental Assessment (EA)

The Environmental Assessment (EA) describes potential impacts of irrigation and drainage improvement and rehabilitation of 5,000 ha excluding pilot area.

Karatal has a total population of 4,819 with 2397 men and 2422 women.. The potential for waterlogging and secondary salinization will be managed by some vertical drainage, and a cleaned and deepened interfarm and on-farm collectors drains.

The soils of Karatal Sub-project are formed on quaternary sediments of heterogeneous layers of clays ,loams , sands and pebbles. Major soil types are *light Sierozems,* where depth to water table is less than <3 m , *meadow Sierozems (1.3 – 2.5 m), alluvial meadow (0.5 – 2 m) and medow (1-2 m).*
All the land in the project area , except settlement , is used for agriculture or cattle breeding.

About 85.4 % of the total area is non saline(<1 gm / l) and 12.6 is moderately saline (1 -3 gm of salt /litre)This is slightly polluted by pesticide and herbicide (Table 1).

The depth of ground water table , for about 78 % of the total area (Table 2) are more than 2 -5 m . About 22 % of the total area , the ground water are less than 2 m depth.
Impact Assessment :
The effect of IDIP –II on natural and social resources can be described as follows. Under the IDIP-II an area of 26,000 ha has been outlined for feasibility study. As proposed , after leaching and draining , the lands will be retuned to intensive farming . With drainage and better farming practices, changes in land use are expected. The impact assessment has been simplified into three main components: (1) Project design, (2) Project construction, and (3) Project Operation. Out of 6 project related activities, no adverse environmental impacts are expected.

If irrigation and drainage systems are not rehabilitated, the existing infrastructure will become further degraded, and agriculture will become difficult, the soils will become more saline and waterlogged. The land will turn into more un- productive and more desert condition.

Most of the potential impacts are effectively mitigated. The environmental impacts related to project design, construction, and operation will not effect the environment. Project documentation will be prepared on:

1. Regulation for closed vertical bore holes and destroyed horizontal canals to avoid contamination of ground water for village water use.
2. Regulation forbidding persistent chemical weed and pest killers.
3. Environmental sustainability and bio-diversity preservation for the IDIP-II

The Environmental Assessment , the main EA report, proposes that the Committee of Water Resources (CWR) and Ministry of Environment and Biological Resources (MOEB) will be responsible for project development and big role for IDIP-II EMP. For environmental monitoring , all the Rayons and WUA /equivalents will be trained in water and soil salinity monitoring procedures and equipments. One or more short courses for professional developments will be organized in project institutions.

A monitoring program will be formulated to avoid any unforeseen negative environmental effects when implementing Karatal IDIP-II project. This is required to guarantee efficiency of the mitigation measures and a monitoring program is very much required. In this connection the “Monitoring Plan” is referred (Table 5) for discussion. The main objective of the monitoring plan are as follows:

- Regular soil sampling for chemical analysis, weed and pest , and for fertilizer.
- Regular surface , ground and drainage water sampling inside irrigation and drainage project (IDIP-II) for chemical analysis, weed and pests, and fertilizers. Depending on the initial results of the monitoring , the space and intensity of analysis could be increased or decreased.
- The fodder crops, animal tissues and milk should be analyzed for pesticides. Depending on the results, the analysis could be continued or discontinued.

The total monitoring cost for 5000 ha of Kartal is about $ 45,500 (Table 7). If we spread the cost for the whole area it comes to about $9.0 per hectors. It is worth to spend that money on monitoring.

The findings and recommendations for an Environmental Impact Assessment (EIA).

As we have seen from the EA document , there are no negative environmental impacts due to ATK (Arys-Turkestan) project formulation, design, implementation, and operation. Some of the impacts identified are transitory ones and can be mitigated during construction and operation. All impacts for Arys-Turkestan are positive. There are no need for further EIA study.

ANNEX- G
KARATALSKY IDS
Karatal Rayon
ALMATY OBLAST

2.Project Location and brief description

The project area is about 5000 ha and spread out within the territory of Ushtobe town okrug, Bastobe and Eskeldy rural okrugs of Karatal Rayon of Almaty Oblast.

The I&D system is located on the right bank of the river Karatal in its middle reach. The part of the irrigated land is very close to the eastern part eastern town of Ushtobe. A railway line also passes through through the Subproject area.

The location of the project area are presented in the location Map AK 1

Following are the large farms within the area:

1. IIXKX <Optinoye> - Total area – 3737 ha, of them 2364 ha are irrigated land.
2. Ltd.Co <Ushtobinsky>- total area – 11014 ha , of which 2699 ha irrigated land.
3. Ltd. Co <Shygys- Karatal> total area – 21244 ha , of which 2170 ha irrigated land .

The drainage network consists of surface collectors and main collectors. Water is then discharged through outfall drain into river Karatal. The total length of the drainage networks is 81 km.

Population and labor:

According to the survey, total population of the Sub Region are 4819 people with 1328 families. About 40.4 % of the population are able bodied and can work.

Climate:

The climate of this Sub Region is continental with cold winter and hot dry summer. Large fluctuation of temperature are observer during the day and during the year. Below zero monthly average temperature are for 5 months period from November to March and first frost are in October. The coldest month is January .

The non –frost period is very long eg. 142 to 165 days. The average quantity of rainfall is 236 mm / year. Snow falls in November –December and stays till March.

Relief :
The Sub Region is a floodplain terrace of Karatal River.
Yield and Crop Production:
Rice, wheat , barley, soya , sugar beet and permanent grass are grown in the sub region. From the last year record – Rice (44 to 51.9 %), permanent grasses (4-12 %) and wheat (18-26%0.
At present , low yield occurs in the Sub Regions. The reason of low yield are :

- Water deficit, because of irrigation canals depreciation, salinity and waterlogging as result of inadequate drainage system.
- Insufficient fertilizer application , improper crop rotation , and poorly managed / developed crop cultivation.

It is learned from research that many years of rice growing on the same field (3 to 5 Years)leads to decrease of yield and rapid loss of natural fertility of irrigated lands.

Table 1 : Extent of Salinity Within Almaty and Zhambul

Target oblast	Target Sub-projects	Total Area, thousands of ha	None Saline, 1 gm/l, % of Total Area	Modeteratelly Salinity, 1-3 gm/l, % of Total Area	Highly Saline 3-10 gm/l, % Total Area	Very Highly Saline, > 10 gm/l , % of Total Area
Zhambyl oblast	Baizaksky rayon	5000	-	64.7	35.3	-
	Shuysky rayon	5000	32.5	67.5	-	-
	Zhambylsky rayon	5000	70.0	30.0	-	-
	Kordaysky rayon	5000	75.0	25.0	-	-
	Merkensky rayon	5000	67.0	20.0	13.0	-
Alamtynskya oblast						
	Karatalsky irrigation system	5000	85.39	12.68	1	0.93
	Akdalinsky irrigation system	5000	89	11	-	-
	Malaisarynsky irrigation system	2500	45.1	36	18.9	-
	Enbekshy Kazakhsky rayon	12500	62	25	13	-

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

Table 3 : Extent of Water Table Depth within Almaty and Zhambul

Sub-project	Oblast	Rayon	Total Area, ha	The Depth of Ground Water Table <2m, as % of Total Area	The Depth of Ground Water Table from 2 m to 5 m, as % of Total Area	The Depth of Ground Water Table > 5 m, as % of Total Area
1	Zhambul oblast	Baizaksky rayon	5000	82.5	17.5	-
2		Shuysky rayon	5000	18.0	72.0	-
3		Zhambylsky rayon	5000	34.0	37.0	29.0
4		Kordaysky rayon	5000	13.0	70.0	17.0
5		Merkensky rayon	5000	20.0	80.0	-
6	Almaty oblast	Karatalsky irrigation system	5000	21.94	78.06	-
7		Akdalinsky irrigation system	5000	44	56	-
8		Malaisarynsky irrigation system	2500		33	67
9		Enbekshy Kazakhsky rayon	12500		45.91	54.09

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

With reference to Table 1, it can be said that 85.4 % of the Karatal Sub Region area are non saline, 12 .7 % are moderately saline (1-3 gm /l). The rest negligible amount (1.9 %) are high to very highly saline (>3-10 gm /l).

The Table 2 explains 78 % of water table depth within the Sub regions. are between 2 to 5 meters . About 12 % area , the water table depth is less than 2 meters.

From the above it can be said that indicative and qualitative assessment of soil degradation is medium (about 85 %).

This is because of lowering down of organic matter content is the main cause of decrease in soil fertility. For this the reason, the priority is to increase production of alfalfa in the project area. This crop rotation will also increase the quantity of organic substances in the soils under crop rotation. Alfalfa is a very important crop for soil conservation and cattle feeding. It is proposed to cultivate one fourth area of the project with alfalfa .

Project description and environmental description can be obtained from Environmental Assessment (EA) Main report and engineering part can be seen in the Mid Term Engineering Report.
The Environmental Assessment (EA) Main Report describes the issues as mentioned by the World Bank suggested format OD 4.0 , Annex A-1, as follows:

1. Policy ,legal and Administrative Framework
2. Description of the Proposed Project
3. Description of the Environment
4. Significant Environmental Impacts
5. Analysis of Alternatives
6. Mitigation and Management Plan
7. Environmental Management and Training
8. Monitoring plan
9. Inter-Agency and Public /NGO Involvement
10. List of references
11. Appendices

Because of the repetitive nature of the topics , some of the above subject matters are only described once in EA Main Report not in each Sub Regions report. The topics on 3,4,6,8 are only described in this report.

3. Potential Environmental Impact

This section will determine and distinguish between significant positive and negative impacts, direct and indirect impacts, immediate and long term impacts. This will also identify unavoidable or irreversible impacts.
For further information and explanation on this subject, please refer to Environmental Assessment Main Report.

Table 3 : Environmental Impacts by Sub-Project Related Activities

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project Karatal I&D System			
1.Rehabilitation & Construction of Irrigation & drainage network and associated infrastructure	No (+)	Yes (-)	No (+)
2. Improved Agronomic Practices	No (+)	No (+)	No (+)
3. Improved Soil and Land Improvement / Reclamation		No (+)	No (+)
4. Crop Rotation & Improved Agricultural Practices (IAP)	No (+)	No (+)	No (+)
		No (+)	No (+)
5. Integrated Pest Management and Fertilizer Application	No (+)	No (+)	No (+)
6.Bio-drainage &	No (+)		

Reforestation		No (+)	No (+)
7. Improved WUA Management	No (+)	No (+)	No (+)

D = Project design ; C= Project construction and O= Project Operation
No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures), (+) Positive effect (No Adverse Impact) and (-) negative effect and to be addressed by mitigation.

4. Environmental Management

4.1 Impacts Related to Design

The design of Irrigation and drainage system for Karatal is not expected to produce negative impacts on the South Kazakhstan Oblast irrigation and drainage rehabilitation part. The design/ construction of new drains and rehabilitation of existing drains will not increase the amount of salt and agricultural chemicals entering natural waterways.
According to Table 1 salinity within Karatal 94% of the area are moderately to highly saline (1-<10gm/l), For the whole area(100%) , depth of ground water (Table 2) are beyond 2 to 5 meters.
This is for the reason:

- The salinity content of the 98% of the project drains are between 1-<10 gm/l (Table 1).
- The quantity of water carried by the drains are low when compared to the discharge of the Karatal River.

Land Resources
As proposed in the plan ,5000 ha has been selected for feasibility study. The objective is to rehabilitate reliable irrigation supplies, for moderate to high saline soils, where substantial improvement of land productivity can be achieved with relatively low investment. As a result of drainage improvement, minor changes in land use are expected.

Further description of soils is provided by Soil Expert in the Mid Term Report.

Water Resources
Some canal will be lined and there will be improvement in water supply to irrigated lands. Salt content (mineralization) in the drainage water will be kept within limits of 1 to 3 gm /l. After mixing the drainage water with irrigated surface water (1.5 -2.0 g/l), they can be used as irrigation water. For further details please consult engineering report.

4.1.1 Bio-drainage and Salinity Control

Many drainage system are dysfunctional and another option particularly on moderate to high saline land (Table…1) would be to introduce bio-drainage techniques to control soil salinity and water table levels by using especially established plantation of trees, bushes, grasses and crops.

Tree Belts
The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage, decreasing ground water levels and helping to tackle the problem of secondary salinity and waterlogging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent %. As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions.

a) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt, high saline soil may be leached with fresh water before planting 1-2 year old sapling.

b) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant, has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

c) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

d) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

- Alkali grass (*Puccinellia airoides)*
- Desert Saltgrass (*Distichlis stricta)*
- Wildrye (*Elymus spp)*
- Bermuda grass (*Cynodon dactylon)*
- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main, on farm and inter-farm canals.

Establish Compost / Bio-gas sites

In design phase, establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.

Table 3 gives a list of indigenous trees and bushes that can be used in planning tree lines and fence lines around farms, pump houses and irrigation canals. They should be chosen with experience and knowledge.

Table 4: List of Indigenous Trees and Bushes for IDIP-II

Trees	Bushes
1. Apricot - Armenica vulgaris Lam	24. Siberian pea shrub - Caragana arborescens Lam.
2. Cherry-plum - Prunus divaricata Ledeb	25. Redhaw hawthorn - Crataegus sanguinea Pall.
3. Asian sumac - Ailanthus altissima	**26. – Calligonum aphyllum Gurke.**
4. Birch - Bertula pendula Roth	**27. – Calligonum microcurpum Borszcz**
5. Siberian elm - Ulmus pumila L.	**28. – Calligonum caput-medusae Schrenk.**
6. Elm - Ulmus laevis Pall.	**29. – Calligonum serosum (Litv.) Litv.**
7. Common Pear - Pyrus communis	30. Tatar honeysuckle - Lonicera tatarica L.
8. Tatarian maple -Acer tataricum	31. Violet willow - Salix daphnoides Vill.
9. Ash-leaved maple - Acer negundo	32. Caspian willow - Salix caspica Pall
10. Larch Siberian - Larix sibirica Ledeb.	**33. – Salix rubra Huds**
11. Bastard acacia - Robinia pseudoacacia L.	34. Mespilus rotundifolious - Amelanchier rotundifolia (Lat.) Dum./Cours.
12. White saxaul - Haloxylon persicum Bunge	35. Russian olive - Elaeagnus angustifolia
13. Black saxaul - Haloxylon aphyllum (Minkw.) Iljin	36. Rotundifolious Juneberry - Amelanchier rotundifolia (lat.) Dum./Cours
14. Pine Crimean -Pinus pallasiana D.Don.	37. Wig-tree - Cotinus coggygria Scop.
15. Archangel fir -Pinus sylvestris L.	38. Golden currant - Ribes aureum Pursh.
16. White poplar - Populus alba L.	39. French tamarisk -Tamarix ramosissima Ledeb.
17. Poplar balsamic - Populus balsamifera	40. Loose tamarisk -Tamarix lara Willd
18. Bay leaf poplar - Populus laurifolia Ledeb.	41. Coniferous ephedra - Ephedra
19.Poplar diversifolious- Populus diversifolia Schrenk	
20. Poplar Siberian - Populus barsamifera L. (var. sibirica)	
21. Black poplar - Populus nigra L.	
22. White mulberry - Morus alba L.	
23. Siberian apple - Malus pallasiana	

Jus.	distachy L. 42. Paletskiy Saltwort - Salsola paletskiana litv. 43. Rihter Saltwort - Salsola richteri (Moq.) Kar. Ex. Litv. 44. Glasswort - Aellenia subaphylla (C. A. Mey) Aell.

4.1.2 Crop Rotation

This is a sequence in which crops are grown on the same piece of land over a number of years-
Used to be important for:

- The maintenance of soil fertility
- The prevention of a build up of soil borne diseases, pests and weeds;
- The control of erosion

Nowadays, technical innovations, such as use of fertilizers , pesticide and herbicides, have reduced the necessity of crop rotation. However, there are number of serious soil borne disease and nematode infections the control of which requires a sound rotation program . Thus, alfalfa, rice, wheat and others are planted with a 5-6 year interval.

Some general rules relating to crop rotation are :

- The continuous growing of cereals or pulses should be avoided
- Leguminous crops should not be sown in sequence, even one crop is seed and other for forage;
- Crops with common root diseases should not be sown in succession. For instances , tobacco should not be planted following tomatoes.

Other Impacts

Other possible environmental impacts would include:

(1) Dust generation caused by certain construction operation such as excavation, which ca be mitigated by wetting excavation sites and other sources of dust to control its emission, and public information.
(2) Noise generation which can be mitigated by use of properly maintained equipment and public information, and
(3) Land use conflicts caused by temporary use of land for temporary facilities for construction contractors (accommodation, camp canteen, camp facilities , medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction.

Projects may face other possible impacts such as (1) dust generation caused by certain
construction operation , such as excavation, which can be mitigated by wetting excavation sites and other sources of dust control its emission, and public information. (2) noise generation which can be mitigated by use of properly maintained equipment and public information; and (3) land use conflict caused by temporary use of land for temporary facilities for construction contractors (accommodation , camp canteen, camp facilities, medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction. Planning "Buffer Zones" in irrigation Canals and drains, specified Government Regulation has to be followed as follows:

Table 5: Government Regulations- Buffer Zones (Irrigation Canals and Drains)

Capacity of Irrigation Canals (m^3 / sec)	Width of the Inner Buffer Zones for inspection Roads and Deposit Sediment from Canal (m)	Width of the Outer Buffer Zone for Vegetation and limited Agriculture (m)
1	6	
5	10	
25	20	
50	75	
100 or more	100	

Collector Drains Buffer Zones- Provided by CWR and MOA- (both sides of the Collector Drain)

10	5m for inspection road and 10-20 m for spoil 10-20 m for agricultural traffic & field drains
10-20	100 meters (either side of the collector)
21-50	200 meters (either side of the collector)
.50	300 meters (either side of the collector)

Source: MOA, Republic of Uzbekistan

This regulation should be strictly enforced on IDIP-II Projects.

4.2 Environmental Impacts Related to Construction

Reconstruction of the Karatal, sections of the project, joining collector with discharging drainage water into primary , secondary and tertiary canals. All open collector and drains will be cleaned and deepened. After the proper design, the project will be open for construction and operation. This will result in the following conditions:

1)Temporary increase in silt

To mitigate this, provisions are there in the standard contract document supplied to contractor for adequate supervision of operations and adherence to the contract. Confining operation to dry to the dry season only, use of silt traps and careful deposition of spoils.
The incorporation of the above measures will have to be placed into BOQ for sub project contract documentations and supervision of contractors.

2)Temporary closure of irrigation system
Participation by Water User Association (WUA) and Farmers. The information are to be given through dialogue and community awareness campaign. Ask WUA and villagers for permission to close the irrigation system temporarily. They are very important that WUA and farmers involved in all aspect of civil works.

3) Disposal of Excavated spoil from main and inter-farm drains.
Excavated soil (spoil) will be deposited alongside the drain in accordance with the guideline laid down by GOK/ MOEB with respect to easement dimension.- either side of drain and /or canal. Spoil will be deposited and formed using bulldozer into trapezoidal formation.

4)Disposal of Excavated soil (spoil) from on- farm Drains and Canals.
Spoil will be deposited alongside canals and drains in accordance with WUA and farmer instructions. If required and instructed, the contractors may deposit spoil on farm fields at the expense of farmers.

5) Dust generation
The mitigation measures recommended is the appropriate timing of operations wetting of surfaces and notice to /involvement of public. The workers on construction sites should have international personal safety / protection equipment supplied by the contractor.

6. Noise Generation:
Mitigation measures:
Appropriate timing and operation of machine are to be discussed with the farmers and WUA. Notice will be given to public and WUA- farmers will be involved in timing and reduction of noise level in the project areas.

7. Waste Material :

Replacement and repair of the irrigation and drainage structure will result in waste material (concrete and steel). These are to be disposed of by the civil works contractor as per CWR / MOEB guidelines.

8. Land Use Conflict for Construction
The CWR , MOA and GOK assessed that there will be no land use conflict for construction. This also confirmed by the client, the CWR, and guarantee given by them to the World Bank. On farm negotiations would be made with WUA and the landowners. However, civil works only will be done by participation agreement of land owners and WUA. The PMO / CWR should have the responsibility for dispute settlement.

9.Construction of Camp Sites and Living Facilities
Establishment and construction of camp sites, and Living facilities for the construction workers have to be established prior to construction work. An acceptable sanitary facility has to be established for the workers. This must satisfy environmental regulation and MOEB code.
The camp site has to be cleaned and returned to the original state before the construction.
Refuge should be properly collected and disposed off.

Mitigation measures are to be:
1)CWR & MOA agrees to allocate free sites for the construction of camp sites and living facilities. This has to be negotiated with the client and the local authorities. Construction of camp sites and living facilities will be funded by the contractor. Clean up costs for these facilities will be borne by the contractor.

10. Biodiversity Conservation / Sustainability
Environmental Sustainability of the project area is very low. To improve this situation following steps will be taken:
(1) Organize nursery at every sub-regions and WUA. Provide free extension service ,input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pump location, main , on farm and inter-farm canals.
(2) Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use

compost for home gardens and farmers field. Possibility of Bio-gas for power generation to be considered.

4.3 Environmental Impacts related to Operation

1) Soil modification as a result of intensified agriculture
The mitigation required
a) Encouragement of continued use of traditional management of water flows
b)The use of deep rooting grasses and shrubs to further strengthen the bunds
c) Minimum / zero tillage practices

2)Soil and water contamination due to increased use of agrochemicals including fertilizer and
pesticides.
The mitigation required
a)Mitigation required are agricultural extension services and Integrated pest management (IPM).
The agricultural extension service would include

a)Optimum , informed use of mineral fertilizer
b)Promotion of integrated pest management (IPM)
c) Discouragement on the use of persistent pesticide and herbicide.
d) Training on composting, reforestation, minimum or zero-tillage.
e) Biodiversity associated with introduced new plant species and varieties .
Promote Biodiversity for introduced crops and land use changes from protecting soil from wind by tree fencing and other environmental management practices.

(3) Environmental Sustainability & Bio-diversity Concerns.

Biological diversity refers to the variety of South Kazakhstan living biological resources. It is a function not simply of the number of ecosystem and distinct plants and animal species in existence at any given time, but also genetic differences within individual species.
Conservation of biological diversity is a form of natural resources management and should be practiced in Karatal area. This can be done by reforestation activities of indigenous plants on vertical drainage sites, main and secondary

canals, and other inter farm canals. A reforestation site plan will have to be prepared in IDIP-II (Phase B) design level.

5. Environmental Monitoring

Monitoring is necessary with respect to (i) water resources quality and quantity; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance management, including inspection and proper repair of irrigation & drainage canals and structures.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources(CWR) , MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate to evaluate the success or failure of IDIP-II proposed project intervention in the Karatal.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information . Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project , the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as :

1. Soil salinity and high ground water tables;
2. Water Quality & Salinity .
3. Reforestation, Bio-Diversity and Desertification.

The variables to be analyzed are described in Table 19 Main Report EA. It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15…...and for one water samples is about USD 10. Most of the project farmers interviewed that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient . Such sampling density for 220,000 ha over 2 year life of the project would be extremely expensive.

The other alternative is to sample the pilot area (6,907 ha in Mahtaaral area) fully and for other project areas, sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project.
During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

Table 6 : Monitoring Plan of Karatal

CALCULATION IS DONE FOR 5,000 Ha (Karatal, about $9/ ha.)

Parameters to be Monitored	Periodicity	Number of Samples				Cost of 1 analysis in $US	Total Cost in $US
		Total Number of Samples	Number of Indicators	Sum of Determination	Total/ yr		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 50	3	150	150	15	2,250 **4,500**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 67	5	3340		10	3,340 **6,680**
4. Water Quality							
4.a Ground Water Quality							
4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 5	1	5	50	10	500 **1000**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 5	15	75	1125	20	1,500 **3,000**
4.a.c Fertilizer	Annually	(1sample /1000 ha) 5	1	5	75	15	1,125 **2,250**
5.Pesticide residues in fish & fodder crops	Annually	2	20	40	40	20	800 **1600**
6.Reforestation , composting and Tree Belts(Bio-drainage &	Annually	1 $ Per /ha		$5000.0	$5,000.0	$1 Per Ha	**$5,000.0 (including yearly Maintenance)**

Salinity Control)							
7. Equipments for Rayons &WUAs	Annually 3 hand held GPS units, computer download, 3 Electrical Conductivity meters				1 unit (GPS & Electrical Conductivity meters $250.0 X12	$250.0 for one unit	**$3,000** (one time purchase)
						Grand Total	**$30,030 ***

Source: The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1996.

* this $30,030 is based on 1996 figure and upgraded to $45,500 to reflect 2007 values (30% inflation).

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M, it will be easier for them to take this additional responsibility. This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that Total US$45,500..(based on 10 years of inflation) will be required to implement and maintain the Environmental Management and Monitoring Plan (EM & MP). There are three categories of inputs to the EMP . They are as follows in the Table 7.

1. Planning and Surveys and consultant assistance$ 5,900 (13.13%)
2. Mitigation Management $36,800 (81.24%)
3. Equipment & Training $ 2,800 (5.63 %)

Table 7: Estimated Budget for Environmental Management Plan (EMP - Karatal)

Item	Qty	Unit Cost	Total Cost US$
Capital Cost-Equipments for Rayons			
GPS units (handheld), Computer download	3	250	7,50.0
Electrical Conductivity Meters(24 Rural Districts)	3	250	7,50.0
Capital Cost- Equipment for WUA			
GPS units (Hand Held),computer download	3	250	7,50.0
Electrical Conductivity Meters(17 Rural Consumer Cooperatives of Water User RCCWU)	3	250	7,50.0
Recurrent Costs			
Support to PMO for Baseline Survey	1 each	3,000	3,000
Support to PMO for M&E activities over 2 years	Lumpsum	5,000	5,000
Analysis for soil and water samples for 2 years by CWR &MOG	2 Yearly	19030	19,030
Support for reforestation & biodiversity by CF	Lumpsum	5,000	5,000
Total			35,030

Note : Total $ 35,000 (round figure) is based on 1996 values. and adjusted to 2007 inflation figures (X30%), which makes it (35,000X30%) $10,500 +35,000= **$45,500**

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out.

The suggested report systems for environmental monitoring programs are made on the following consideration:

1. Monthly report from the Contractor

Contractors should regularly monitor the environmental –related issues and Environmental parameters based on the guidance from Environmental Management Specialist and requirements from Ryon Inspector. They should provide a monthly Report covering performance of environmental monitoring and progress of environmental related activities.

2. Monthly Environmental Management Report

   The requirement of Environmental Management Specialist is to produce a monthly performance report of environmental monitoring , summarizing the environmental monitoring of sub-projects and other related environmental problems.

3. Environmental Monitoring Report

   The Rayon office laboratories of IDIP-II need to submit PMO thematic monitoring report on the changes in salinity, changes in water use, changes in soil productivity, including baseline soil surveys and subsequent periodic surveys, as well as proposed suggestions for actions to solve key environmental problems if any (semi-annual monitoring and annual monitoring report).

4. Semi-Annual PMO Report

   Every half year, PMO needs to compile a quarterly environmental working report, summarizing the progress of EMP implementation, and monitoring status. The report from IDIP-II project and the Environmental Management Specialist should be attached to PMO report. This report may be integrated into “The Progress Report” and sent to WB for review. The copies may be sent to Oblast Office for reference.

6. FINDINGS AND RECOMMENDATIONS

6.1 The Need for an Environmental Impact Assessment (EIA)

This section evaluates the need for an Environmental Impact Studies (EIA). This should be based on the fact whether significant environmental impacts exist and that need a further detailed study or EIA.

As per as we have seen there are no negative environmental impacts due to IDIP-I proposed project formulation , design, implementation , and operation. The only negative impacts identified are transitory ones (can be mitigated) associated with construction operations. All other impacts for Karatal are positive. The required mitigation are presented in sections and 7.4.

The recommendation from the findings of this Environmental Assessment (EA) are that a follow up EIA or further detailed environmental impact study (EIA) study is not needed.

6.2 Potential Environmental Impacts, Possible Mitigation Measures and Responsible Agencies

The environmental monitoring program will be part of an integrated project monitoring program which will be established by the PMO. The PMO and the "Project Implementation Unit" (PIU) offices at Project area oblast will be responsible for implementing all environmental mitigation measures. Table …… presents all relevant issues with respect to the potential environmental impacts and the possible monitoring and mitigation enhancement measures. The table also lists those agencies who are responsible and also lists agencies which should have an involvement in the monitoring program and an input to the development and planning of the mitigation measures.

6.3 Environmental Assessment Requirement of MOEB

The Government of Kazakhstan (GOK) requirement is to present this Environmental Assessment (EA) report to MOEB. The instruction by MOEB call for report in which available data on the resources likely to be affected by IDIP-II are to be analyzed in terms of scope and intensity. An Environmental Assessment (EA) report are to be prepared by proponent (CWR) and should be included with the feasibility report and submitted for approval. This report provides a brief description of ecological and social sources , and trends in agriculture. Natural resources that are sensitive to change should be identified along with potential environmental problems. This report should be given a public review and then presented to the Ministry of Ecological and Biological Resources (MOEB). The MOEB reviews the EA and its comments (State Ecological Expertise) and forwarded to the concerned sections for approval.

The World Bank 4.01 “Environmental Assessment” has screened the IDIP-II Project and placed it in EA category “B”, which means the preparation of an environmental analysis to define environmental management , monitoring and mitigation measures as necessary. The recommended mitigation measures in the State Ecological Expertise (SEE) review would become an integral part of integral part of project design and implementation. The archeological sites would be protected with the guideline and requirement of Kazakhstan law and acceptable to the World Bank. The assurance was also obtained from Kazakh Government about the use of agrochemicals for IDIP-II would be approved ,stored and distributed and used in accordance with the guidelines and requirements of Kazakhstan Government acceptable to the World Bank (WB).

6.4 CONCLUSION

For Karatal sub project an Environmental Impact Assessment (EIA) is not necessary. However, the appointment of a local / domestic Environmental Management Specialist to assist with the implementation of the Environmental Management / Monitoring Program and train WUA staff is considered very important task for the success of the Environmental Management and Monitoring Plan (EMP). A term of reference (TOR) for the Environmental Management Specialist (EMP) is prepared in the Annex T.

7. FUTURE DEVELOPMENT PLAN

The future environmental management and monitoring plan will mitigate the following:

1. Monitoring crop rotation for 6 years
2. Monitoring of surface and Ground Water for water quality (salinity & pesticide).
3. Water table depth

4. Drainage water for salinity , pesticide & fertilizers
5. Pesticide residues in fish , animal tissue and fodder crops
6. Reforestation of indigenous plant for biodiversity & desertification control.
7. Reclaim saline soil, saline surface and ground water.

For further details, please go through the Environmental Management and Mitigation Plan of the Main Environmental Assessment (EA) report.
The Environmental Management & Monitoring Plan is also part of future development plan.

ECOLOGICAL & ENVIRONMENTAL STUDIES OF IDIP-II PROJECT
ENVIRONMENTAL ASSESSMENT (EA)
AKDALA SUB-REGIONS,BALKASH RAYON

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ANNEX-H

1. Summary of Akdala Environmental Assessment (EA)

The Environmental Assessment (EA) describes potential impacts of irrigation and drainage improvement and rehabilitation of 5,000 ha in Balkash Rayon of Almaty Oblast.

Akdala has a total population of 1401 with 687 men and 714 women.. The potential for waterlogging and secondary salinization will be managed by some vertical drainage, and a cleaned and deepened interfarm and on-farm collectors drains.

The soils of Akdala Sub-project are mainly Sierozems formed on loess, alluvium loamy carbonate soils and loamy sands .All the land in the project area , except settlement , is used for agriculture or cattle breeding.

About 89.0 % of the total area is non saline(<1 gm / l) and 11.0 is moderately saline (1 -3 gm of salt /litre). This is slightly polluted by pesticide and herbicide (Table 1).

The depth to ground water table , for about 44 % of the total area (Table 2) are less than 2 m . About 56 % of the total area , the ground water are more than 2-5 m depth.

Impact Assessment :

The effect of IDIP –II on natural and social resources can be described as follows. Under the IDIP-II an area of 26,000 ha has been outlined for feasibility study. As proposed , after leaching and draining , the lands will be retuned to intensive farming . With drainage and better farming practices, changes in land use are expected. The impact assessment has been simplified into three main components: (1) Project design , (2) Project construction, and (3) Project Operation. Out of 6 project related activities, no adverse environmental impacts are expected.

If irrigation and drainage systems are not rehabilitated, the existing infrastructure will become further degraded, and agriculture will become difficult, the soils will become more saline and waterlogged. The land will turn into more un- productive and more desert condition.

Most of the potential impacts are effectively mitigated. The environmental impacts related to project design, construction, and operation will not effect the environment. Project documentation will be prepared on:

1. Regulation for closed vertical bore holes and destroyed horizontal canals to avoid contamination of ground water for village water use.
2. Regulation forbidding persistent chemical weed and pest killers.
3. Environmental sustainability and bio-diversity preservation for the IDIP-II

The Environmental Assessment , the main EA report, proposes that the Committee of Water Resources (CWR) and Ministry of Environment and Biological Resources (MOEB) will be responsible for project development and big role for IDIP-II EMP. For environmental monitoring , all the Rayons and WUA /equivalents will be trained in water and soil salinity monitoring procedures and equipments. One or more short courses for professional developments will be organized in project institutions.

A monitoring program will be formulated to avoid any unforeseen negative environmental effects when implementing Akdala IDIP-II project. This is required to guarantee efficiency of the mitigation measures and a monitoring program is very much required. In this connection the "Monitoring Plan" is referred (Table 5) for discussion. The main objective of the monitoring plan are as follows:

- Regular soil sampling for chemical analysis, weed and pest , and for fertilizer.
- Regular surface , ground and drainage water sampling inside irrigation and drainage project (IDIP-II) for chemical analysis, weed and pests, and fertilizers. Depending on the initial results of the monitoring , the space and intensity of analysis could be increased or decreased.
- The fodder crops, animal tissues and milk should be analyzed for pesticides. Depending on the results, the analysis could be continued or discontinued.

The total monitoring cost for 5000 ha of Akdala is about $ 45,500 (Table 7). If we spread the cost for the whole area it comes to about $9.0 per hectors. It is worth to spend that money on monitoring.

The findings and recommendations for an Environmental Impact Assessment (EIA).

As we have seen from the EA document , there are no negative environmental impacts due to Akdala project formulation, design , implementation, and operation. Some of the impacts identified are transitory ones and can be mitigated during construction and operation. All impacts for Akdala are positive. There are no need for further EIA study.

ANNEX-H
AKDALA Sub Regions
ALMATY OBLAST

2.Project Location and Brief Description

The project area is about 5000 ha of irrigation area , located in the lower part of Ili River in the boundaries of Akdalinskaya and Bakanasskaya delta. The Akdala Sub Region is part of "White Steppe". Since 1953, the Akdala irrigation system is systematically developed for rice growing .The 3 new rice – cattle breeding farms were started in Akdala from 1993. Akdala system consist of two large irrigation systems: Tasmurunskaya IDS (area 16.3 th. Ha) and Bakansskaya rice system (15.7 th. Ha). The irrigation water is supplied by two main canals from Ili River without dams. The location of the Sub Project is presented on location map no. A-A-1 or Figure 1.

Ile River , which forms the irrigation source of Akdala Sub regions, comes from the junction of two rivers Tekes and Kunges rivers. The length of Ile River from the junction to Lake Balkhsh is 950 km. Ile River is fed by perennial ice and glaciers of the high mountains. Ile River has ice-snow recharge , increase in flow in July-August and decreases smoothly in January-February. The mineralization (salt) of Ile- Kapchagai is low , on average it varies from 300-350 mg/l. Only once in April 2001 , the salt reaches up to 504 mg / l.

Population and Labor :
There are 9602 persons on the project area. The number of able bodied person to work on the project are 4229 person and number of families 2110.
Climate:
The climate of Akdala is continental with large daily and yearly variation of temperature. Yearly average day temperature is 7.4 ^{0}C. The climate is similar to that of desert condition. Only with irrigation, this area is very favorable for growing rice , vegetables, fruit trees and grapes.

Soils are mainly Sierozems formed on loess, alluvial loamy carbonate soils and loamy sands. Alluvium meadow soils are formed along river banks and in other low lying areas. The organic matter is <1% and available N,P and K levels are low . Soils are sandy loam to light loams near the surface , changing to heavy loams at depth. Carbonate contents vary from 3.5 to 12 %
Soil salinity is the result of secondary salinization due to rising water tables and inadequate drainage from irrigation. Main types of soil salinity are chloride-sulphate among anions and sodium and sodium – calcium among cations.

The present land use in the Akdala area are rice , wheat and permanent grass. Rice takes about 35% , permanent grasses 34-35 % and wheat 19-27% of the total area. The above land use figures were reported in 2003, 2004 and 2005. The crop yield are generally low. The reason for low yield of crops for the following:

- Insufficient water, because of the deterioration of irrigation system , salinity and high ground water (improper functioning of drainage system , etc.)
- Inappropriate farming system and no proper crop rotation

To increase the yield of rice, all agricultural field must be fully drained. Research proved the points that the growth of rice on the same field for more than 3 years leads to decrease of yield .In irrigated soils natural fertility which is the organic matter in the topsoil, are being used by continuous rice cultivation.
The cheap and easy way to increase the yield & organic matter content of the soil is crop rotation of rice with alfalfa in the extension areas.

Table 1 : Extent of Salinity Within Almaty and Zhambul

Target oblast	Target Sub-projects	Total Area, thousands of ha	None Saline, 1 gm/l, % of Total Area	Modeteratel y Salinity, 1-3 gm/l, % of Total Area	Highly Saline 3-10 gm/l, % Total Area	Very Highly Saline, > 10 gm/l , % of Total Area
Zhambyl oblast	Baizaksky rayon	5000	-	64.7	35.3	-
	Shuysky rayon	5000	32.5	67.5	-	-
	Zhambylsky rayon	5000	70.0	30.0	-	-
	Kordaysky rayon	5000	75.0	25.0	-	-
	Merkensky rayon	5000	67.0	20.0	13.0	-
Alamtynskya oblast						
	Karatalsky irrigation system	5000	85.39	12.68	1	0.93
	Akdalinsky irrigation system	5000	89	11	-	-
	Malaisarynsky irrigation system	2500	45.1	36	18.9	-
	Enbekshy Kazakhsky rayon	12500	62	25	13	-

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

Table 2 : Extent of Water Table Depth within Almaty and Zhambul

Sub-project	Oblast	Rayon	Total Area, ha	The Depth of Ground Water Table <2m, as % of Total Area	The Depth of Ground Water Table from 2 m to 5 m, as % of Total Area	The Depth of Ground Water Table > 5 m, as % of Total Area
1	Zhambul oblast	Baizaksky rayon	5000	82.5	17.5	-
2		Shuysky rayon	5000	18.0	72.0	-
3		Zhambylsky rayon	5000	34.0	37.0	29.0
4		Kordaysky rayon	5000	13.0	70.0	17.0
5		Merkensky rayon	5000	20.0	80.0	-
6	Almaty oblast	Karatalsky irrigation system	5000	21.94	78.06	-
7		Akdalinsky irrigation system	5000	44	56	-
8		Malaisarynsky irrigation system	2500		33	67
9		Enbekshy Kazakhsky rayon	12500		45.91	54.09

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

With reference to Table 1, it can be said that 89.0 % of the Akdala Sub Region area are non saline, 11 .0 % are moderately saline (1-3 gm /l). There are no high to very high saline soil in the Sub Region.

The Table 2 explains that the depth of ground water table for 56% of the area (out of total 5000 ha) are between 2-5 meters. The rest 44 % is within 2 meters.

The indicative and qualitative assessment of soil degradation (about 89%) is medium.

This is because of lowering down of organic matter content is the main cause of decrease in soil fertility. For this the reason, the priority is to increase production of alfalfa in the project area. This crop rotation will also increase the quantity of organic substances in the soils under crop rotation. Alfalfa is a very important crop for soil conservation and cattle feeding. It is proposed to cultivate one fourth area of the project area with alfalfa.

Project description and environmental description can be obtained from Environmental Assessment (EA) Main report and engineering part can be seen from the Mid Term Engineering Report.

The Environmental Assessment (EA) Main Report describes the issues as mentioned by the World Bank suggested format OD 4.0 , Annex A-1, as follows:

1. Policy ,legal and Administrative Framework
2. Description of the Proposed Project
3. Description of the Environment
4. Significant Environmental Impacts
5. Analysis of Alternatoives
6. Mitigation and Management Plan
7. Environmental Management and Training
8. Monitoring plan
9. Inter-Agency and Public /NGO Involvement
10. List of references
11. Appendices

Because of the repetitive nature of the topics , the above subject matters are only described once in EA Main Report not in each Sub Regions report.

3. Potential Environmental Impact

This section will determine and distinguish between significant positive and negative impacts, direct and indirect impacts , immediate and long term impacts. This will also identify unavoidable or irreversible impacts.
For further information and explanation on this subject , please refer to Environmental Assessment Main Report.

Table 3 : Environmental Impacts by Sub-Project Related Activities

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project Karatal I&D System			
1.Rehabilitation & Construction of Irrigation & drainage network and associated infrastructure	No (+)	Yes (-)	No (+)
2. Improved Agronomic Practices	No (+)	No (+)	No (+)
3. Improved Soil and Land Improvement / Reclamation	No (+)	No (+)	No (+)
4. Crop Rotation & Improved Agricultural Practices (IAP)	No (+)	No (+)	No (+)
5. Integrated Pest Management and Fertilizer Application	No (+)	No (+)	No (+)
6.Bio-drainage & Reforestation	No (+)	No (+)	No (+)
7. Improved WUA Management	No (+)	No (+)	No (+)

D = Project design ; C= Project construction and O= Project Operation
No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures), (+) Positive effect (No Adverse Impact) and (-) negative effect and to be addressed by mitigation.

4. Environmental Management

4.1 Impacts Related to Design

The design of Irrigation and drainage system for Akdala is not expected to produce negative impacts on the South Kazakhstan Oblast irrigation and drainage rehabilitation part. The design/ construction of new drains and rehabilitation of existing drains will not increase the amount of salt and agricultural chemicals entering natural waterways.
According to Table 4 (EA Main Report), about 89 % of the project area are non saline, the rest 11 % are moderately saline (1-3 gm/ l). The depth of ground water for 56 % of the area (Table 5 EA Main Report) are beyond 2 to 5 meters. The rest 44 % are less than 2 meters. They can be summarized as follows:

- The 89% of Akdala are non saline, and only 11 % are moderately saline.
- The quantity of water carried by the drains are low when compared to the discharge of the Ili River.

Land Resources
As proposed in the plan , 40,000 ha has been selected for feasibility study. The objective is to rehabilitate reliable irrigation supplies, for moderate to high saline soils, where substantial improvement of land productivity can be achieved with relatively low investment. As a result of drainage improvement, minor changes in land use are expected.
Further description of soils is provided by Soil Expert in the Mid Term Report.

Water Resources
Some canal will be lined and there will be improvement in water supply to irrigated lands. Salt content (mineralization) in the drainage water will be kept within limits of 1 to 3 gm /l. After mixing the drainage water with irrigated surface water (1.5 -2.0 g/l), they can be used as irrigation water. For further details please consult engineering report.

3.1.1 Bio-drainage and Salinity Control

Many drainage system are dysfunctional and another option particularly on moderate to high saline land (Table…1) would be to introduce bio-drainage techniques to control soil salinity and water table levels by using especially established plantation of trees, bushes, grasses and crops.

Tree Belts
The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage , decreasing ground water levels

and helping to tackle the problem of secondary salinity and waterlogging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent % . As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions.

a) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt , high saline soil may be leached with fresh water before planting 1-2 year old sapling.

b) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant, has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

c) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

d) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

- Alkali grass (*Puccinellia airoides)*
- Desert Saltgrass (*Distichlis stricta)*
- Wildrye (*Elymus spp)*
- Bermuda grass (*Cynodon dactylon)*
- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main, on farm and inter-farm canals.

Establish Compost / Bio-gas sites

In design phase, establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA.

Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.

Table 3 gives a list of indigenous trees and bushes that can be used in planning tree lines and fence lines around farms, pump houses and irrigation canals. They should be chosen with experience and knowledge.

Table 4: List of Indigenous Trees and Bushes for IDIP-II

Trees	Bushes
1. Apricot - Armenica vulgaris Lam	24. Siberian pea shrub - Caragana arborescens Lam.
2. Cherry-plum - Prunus divaricata Ledeb	25. Redhaw hawthorn - Crataegus sanguinea Pall.
3. Asian sumac - Ailanthus altissima	**26. – Calligonum aphyllum Gurke.**
4. Birch - Bertula pendula Roth	**27. – Calligonum microcurpum Borszcz**
5. Siberian elm - Ulmus pumila L.	**28. – Calligonum caput-medusae Schrenk.**
6. Elm - Ulmus laevis Pall.	**29. – Calligonum serosum (Litv.) Litv.**
7. Common Pear - Pyrus communis	30. Tatar honeysuckle - Lonicera tatarica L.
8. Tatarian maple -Acer tataricum	31. Violet willow - Salix daphnoides Vill.
9. Ash-leaved maple - Acer negundo	32. Caspian willow - Salix caspica Pall
10. Larch Siberian - Larix sibirica Ledeb.	**33. – Salix rubra Huds**
11. Bastard acacia - Robinia pseudoacacia L.	34. Mespilus rotundifolious - Amelanchier rotundifolia (Lat.) Dum./Cours.
12. White saxaul - Haloxylon persicum Bunge	35. Russian olive - Elaeagnus angustifolia
13. Black saxaul - Haloxylon aphyllum (Minkw.) Iljin	36. Rotundifolious Juneberry - Amelanchier rotundifolia (lat.) Dum./Cours
14. Pine Crimean -Pinus pallasiana D.Don.	37. Wig-tree - Cotinus coggygria Scop.
15. Archangel fir -Pinus sylvestris L.	38. Golden currant - Ribes aureum Pursh.
16. White poplar - Populus alba L.	39. French tamarisk -Tamarix ramosissima Ledeb.
17. Poplar balsamic - Populus balsamifera	40. Loose tamarisk -Tamarix lara Willd
18. Bay leaf poplar - Populus laurifolia Ledeb.	41. Coniferous ephedra - Ephedra distachy L.
19.Poplar diversifolious- Populus diversifolia Schrenk	42. Paletskiy Saltwort - Salsola paletskiana litv.
20. Poplar Siberian - Populus barsamifera L. (var. sibirica)	43. Rihter Saltwort - Salsola richteri (Moq.) Kar. Ex. Litv.
21. Black poplar - Populus nigra L.	44. Glasswort - Aellenia subaphylla (C. A. Mey) Aell.
22. White mulberry - Morus alba L.	
23. Siberian apple - Malus pallasiana Jus.	

4.1.2 Crop Rotation

This is a sequence in which crops are grown on the same piece of land over a Number of years-
The crop rotation is used to be important for:

- The maintenance of soil fertility
- The prevention of a build up of soil borne diseases, pests and weeds;
- The control of erosion

Nowadays , technical innovations, such as use of fertilizers , pesticide and herbicides , have reduced the necessity of crop rotation. However, there are number of serious soil borne disease and nematode infections the control of which requires a sound rotation program . Thus , alfalfa, rice , wheat and others are planted with a 5-6 year interval.

Some general rules relating to crop rotation are :

- The continuous growing of cereals or pulses should be avoided
- Leguminous crops should not be sown in sequence , even one crop is seed and other for forage;
- Crops with common root diseases should not be sown in succession. For instances , tobacco should not be planted following tomatoes.

4.1.3 Other Impacts

Other possible environmental impacts would include:

(1) Dust generation caused by certain construction operation such as excavation, which ca be mitigated by wetting excavation sites and other sources of dust to control its emission , and public information.
(2) Noise generation which can be mitigated by use of properly maintained equipment and public information, and
(3) Land use conflicts caused by temporary use of land for temporary facilities for construction contractors (accommodation, camp canteen, camp facilities , medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction.

Projects may face other possible impacts such as (1) dust generation caused by certain
construction operation , such as excavation, which can be mitigated by wetting excavation sites and other sources of dust control its emission, and public information. (2) noise generation which can be mitigated by use of

properly maintained equipment and public information; and (3) land use conflict caused by temporary use of land for temporary facilities for construction contractors (accommodation , camp canteen, camp facilities, medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction. Planning "Buffer Zones" in irrigation Canals and drains, specified Government Regulation has to be followed as follows:

Table 5 : Government Regulations- Buffer Zones (Irrigation Canals and Drains)

Capacity of Irrigation Canals (m^3 / sec)	Width of the Inner Buffer Zones for inspection Roads and Deposit Sediment from Canal (m)	Width of the Outer Buffer Zone for Vegetation and limited Agriculture (m)
1	6	
5	10	
25	20	
50	75	
100 or more	100	

Collector Drains Buffer Zones- Provided by CWR and MOA- (both sides of the Collector Drain)

10	5m for inspection road and 10-20 m for spoil 10-20 m for agricultural traffic & field drains
10-20	100 meters (either side of the collector)
21-50	200 meters (either siude of the collector)
.50	300 meters (either side of the collector)

Source: MOA, Republic of Uzbekistan

This regulation should be strictly enforced on IDIP-II Projects.

4.2 Environmental Impacts Related to Construction

Reconstruction of the Akdala , sections of the project , joining collector with discharging drainage water into primary , secondary and tertiary canals. All open collector and drains will be cleaned and deepened. After the proper design , the project will be open for construction and operation. This will result in the following conditions:

1)Temporary increase in silt

To mitigate this, provisions are there in the standard contract document supplied to contractor for adequate supervision of operations and adherence to the contract. Confining operation to dry to the dry season only, use of silt traps and careful deposition of spoils.

The incorporation of the above measures will have to be placed into BOQ for sub project contract documentations and supervision of contractors.

2)Temporary closure of irrigation system

Participation by Water User Association (WUA) and Farmers. The information are to be given through dialogue and community awareness campaign. Ask WUA and villagers for permission to close the irrigation system temporarily. They are very important that WUA and farmers involved in all aspect of civil works.

3) Disposal of Excavated spoil from main and inter-farm drains.

Excavated soil (spoil) will be deposited alongside the drain in accordance with the guideline laid down by GOK/ MOEB with respect to easement dimension.- either side of drain and /or canal. Spoil will be deposited and formed using bulldozer into trapezoidal formation.

4)Disposal of Excavated soil (spoil) from on- farm Drains and Canals.

Spoil will be deposited alongside canals and drains in accordance with WUA and farmer instructions. If required and instructed, the contractors may deposit spoil on farm fields at the expense of farmers.

5) Dust generation

The mitigation measures recommended is the appropriate timing of operations wetting of surfaces and notice to /involvement of public. The workers on construction sites should have international personal safety / protection equipment supplied by the contractor.

6. Noise Generation:

Mitigation measures:

Appropriate timing and operation of machine are to be discussed with the farmers and WUA. Notice will be given to public and WUA- farmers will be involved in timing and reduction of noise level in the project areas.

7. Waste Material :

Replacement and repair of the irrigation and drainage structure will result in waste material (concrete and steel). These are to be disposed of by the civil works contractor as per CWR / MOEB guidelines.

8. Land Use Conflict for Construction
The CWR , MOA and GOK assessed that there will be no land use conflict for construction. This also confirmed by the client, the CWR, and guarantee given by them to the World Bank. On farm negotiations would be made with WUA and the landowners. However, civil works only will be done by participation agreement of land owners and WUA. The PMO / CWR should have the responsibility for dispute settlement.

9.Construction of Camp Sites and Living Facilities
Establishment and construction of camp sites, and Living facilities for the construction workers have to be established prior to construction work. An acceptable sanitary facility has to be established for the workers. This must satisfy environmental regulation and MOEB code.
The camp site has to be cleaned and returned to the original state before the construction.
Refuge should be properly collected and disposed off.

Mitigation measures are to be:
CWR & MOA agrees to allocate free sites for the construction of camp sites and living facilities. This has to be negotiated with the client and the local authorities. Construction of camp sites and living facilities will be funded by the contractor. Clean up costs for these facilities will be borne by the contractor.

10. Biodiversity Conservation / Sustainability
Environmental Sustainability of the project area is very low. To improve this situation following steps will be taken:
(1) Organize nursery at every sub-regions and WUA. Provide free extension service ,input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pump location, main , on farm and inter-farm canals.
(2) Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to be considered.

4.3 Environmental Impacts related to Operation

1) Soil modification as a result of intensified agriculture
The mitigation required

a) Encouragement of continued use of traditional management of water flows
b)The use of deep rooting grasses and shrubs to further strengthen the bunds
c) Minimum / zero tillage practices

2)Soil and water contamination due to increased use of agrochemicals including fertilizer and pesticides.
The mitigation required
a)Mitigation required are agricultural extension services and Integrated pest management (IPM).

The agricultural extension service would include

a)Optimum , informed use of mineral fertilizer
b)Promotion of integrated pest management (IPM)
c) Discouragement on the use of persistent pesticide and herbicide.
d) Training on composting, reforestation, minimum or zero-tillage.
e) Biodiversity associated with introduced new plant species and varieties .
Promote Biodiversity for introduced crops and land use changes from protecting soil from wind by tree fencing and other environmental management practices.

(3) Environmental Sustainability & Bio-diversity Concerns.

Biological diversity refers to the variety of South Kazakhstan living biological resources. It is a function not simply of the number of ecosystem and distinct plants and animal species in existence at any given time, but also genetic differences within individual species.
Conservation of biological diversity is a form of natural resources management and should be practiced in Akdala area. This can be done by reforestation activities of indigenous plants on vertical drainage sites, main and secondary canals, and other inter farm canals. A reforestation site plan will have to be prepared in IDIP-II (Phase B) design level.

5. Environmental Monitoring

Monitoring is necessary with respect to (i) water resources quality and quantity ; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance management, including inspection and proper repair of irrigation & drainage canals and structures.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources(CWR) , MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate to evaluate the success or failure of IDIP-II proposed project intervention in the Akdala.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information . Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project , the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as :

1. Soil salinity and high ground water tables;
2. Water Quality & Salinity .
3. Reforestation, Bio-Diversity and Desertification.

The variables to be analyzed are described in Annex……. It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15…...and for one water samples is about USD 10. Most of the project farmers interviewed that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient . Such sampling density for 220,000 ha over 2 year life of the project would be extremely expensive.

The other alternative is to sample the pilot area (6,907 ha in Mahtaaral area) fully and for other project areas , sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project.
During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

Table 6 : Monitoring Plan of Akdala
CALCULATION IS DONE FOR 5,000 Ha (Akdala, about $9.0 / ha.)

Parameters to be Monitored	Periodicity	Number of Samples				Cost of 1 analysis in $US	Total Cost in $US
		Total Number of Samples	Number of Indicators	Sum of Determina tion	Total/ yr		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 50	3	150	150	15	2,250 **4,500**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 67	5	3340		10	3,340 **6,680**
4. Water Quality							
4.a Ground Water Quality							
4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 5	1	5	50	10	500 **1000**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 5	15	75	1125	20	1,500 **3,000**
4.a.c Fertilizer	Annually	(1sample /1000 ha) 5	1	5	75	15	1,125 **2,250**
5.Pesticide residues in fish & fodder crops	Annually	2	20	40	40	20	800 **1600**
6.Reforestation , composting and Tree Belts(Bio-drainage & Salinity Control)	Annually	1 $ Per /ha		$5000.0	$5,000.0	$1 Per Ha	**$5,000.0 (including yearly Maintenance)**
7. Equipments for Rayons &WUAs	Annually 3 hand held GPS units, computer download, 3 Electrical Conductivity meters				1 unit (GPS & Electrical Conductivity meters $250.0 X12	$250.0 for one unit	**$3,000** (one time purchase)
						Grand Total	**$30,030 ***

Source: The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1996.

* this $30,030 is based on 1996 figure and upgraded to $45,000 to reflect 2007 values (30% inflation).

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M , it will be easier for them to take this additional responsibility . This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that Total US$..45,500 (based on 10 years of inflation)... will be required to implement and maintain the Environmental Management and Monitoring Plan (EM & MP). There are three categories of inputs to the EMP . They are as follows in the Table 7.

1. Planning and Surveys and consultant assistance$6000.0 (13.13%)
2. Mitigation Management $36,700 (81.24%)
3. Equipment & Training $ 2,800 (5.63 %)

Table 7: Estimated Budget for Environmental Management Plan (EMP - Akdala)

Item	Qty	Unit Cost	Total Cost US$
Capital Cost-Equipments for Rayons			
GPS units (handheld), Computer download	3	250	7,50.0
Electrical Conductivity Meters(24 Rural Districts)	3	250	7,50.0
Capital Cost- Equipment for WUA			
GPS units (Hand Held),computer download	3	250	7,50.0
Electrical Conductivity Meters(17 Rural Consumer Cooperatives of Water User RCCWU)	3	250	7,50.0
Recurrent Costs			
Support to PMO for Baseline Survey	1 each	3,000	3,000
Support to PMO for M&E activities over 2	Lumpsum	5,000	5,000

years			
Analysis for soil and water samples for 2 years by CWR &MOG	2 Yearly	19030	19,030
Support for reforestation & biodiversity by CF	Lumpsum	5,000	5,000
Total			35,030

Note : Total $ 35,000 (round figure) is based on 1996 values. and adjusted to 2007 inflation figures (X30%), which makes it (35,000X30%) $10,500 +35,000= **$45,500**

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out. The suggested report systems for environmental monitoring programs are made on the following consideration:

1. Monthly report from the Contractor

Contractors should regularly monitor the environmental –related issues and Environmental parameters based on the guidance from Environmental Management Specialist and requirements from Rayon Inspector. They should provide a monthly Report covering performance of environmental monitoring and progress of environmental related activities.

2. Monthly Environmental Management Report

   The requirement of Environmental Management Specialist is to produce a monthly performance report of environmental monitoring , summarizing the environmental monitoring of sub-projects and other related environmental problems.

3. Environmental Monitoring Report

   The Rayon office laboratories of IDIP-II need to submit PMO thematic monitoring report on the changes in salinity, changes in water use, changes in soil productivity, including baseline soil surveys and subsequent periodic surveys, as well as proposed suggestions for actions to solve key environmental problems if any (semi-annual monitoring and annual monitoring report).

4. Semi-Annual PMO Report

   Every half year, PMO needs to compile a quarterly environmental working report, summarizing the progress of EMP implementation , and monitoring status. The report from IDIP-II project and the Environmental Management Specialist should be attached to PMO report. This report may be integrated into “The Progress Report” and sent to WB for review. The copies may be sent to Oblast Office for reference.

6. FINDINGS AND RECOMMENDATIONS

6.1 The Need for an Environmental Impact Assessment (EIA)

This section evaluates the need for an Environmental Impact Studies (EIA). This should be based on the fact whether significant environmental impacts exist and that need a further detailed study or EIA.

As per as we have seen there are no negative environmental impacts due to IDIP-I proposed project formulation , design, implementation , and operation. The only negative impacts identified are transitory ones (can be mitigated) associated with construction operations. All other impacts for Akdala are positive. The required mitigation are presented in sections and 7.4.

The recommendation from the findings of this Environmental Assessment (EA) are that a follow up EIA or further detailed environmental impact study (EIA) study is not needed.

6.2 Potential Environmental Impacts, Possible Mitigation Measures and Responsible Agencies

The environmental monitoring program will be part of an integrated project monitoring program which will be established by the PMO. The PMO and the “Project Implementation Unit” (PIU) offices at Project area oblast will be responsible for implementing all environmental mitigation measures. Table 14 MR EA presents all relevant issues with respect to the potential environmental impacts and the possible monitoring and mitigation enhancement measures. The table also lists those agencies who are responsible and also lists agencies which should have an involvement in the monitoring program and an input to the development and planning of the mitigation measures.

6.3 Environmental Assessment Requirement of MOEB

The Government of Kazakhstan (GOK) requirement is to present this Environmental Assessment (EA) report to MOEB. The instruction by MOEB call for report in which available data on the resources likely to be affected by IDIP-II are to be analyzed in terms of scope and intensity. An Environmental Assessment (EA) report are to be prepared by proponent (CWR) and should be included with the feasibility report and submitted for approval. This report provides a brief description of ecological and social sources , and trends in agriculture. Natural resources that are sensitive to change should be identified along with potential environmental problems. This report should be given a public review and then presented to the Ministry of Ecological and Biological Resources (MOEB). The MOEB reviews the EA and its comments (State Ecological Expertise) and forwarded to the concerned sections for approval.

The World Bank 4.01 “Environmental Assessment” has screened the IDIP-II Project and placed it in EA category “B”, which means the preparation of an environmental analysis to define environmental management , monitoring and mitigation measures as necessary. The recommended mitigation measures in the State Ecological Expertise (SEE) review would become an integral part of integral part of project design and implementation. The archeological sites would be protected with the guideline and requirement of Kazakhstan law and acceptable to the World Bank. The assurance was also obtained from Kazakh Government about the use of agrochemicals for IDIP-II would be approved ,stored and distributed and used in accordance with the guidelines and requirements of Kazakhstan Government acceptable to the World Bank (WB).

6.4 CONCLUSION

For Akdala sub project an Environmental Impact Assessment (EIA) is not necessary. However, the appointment of a local / domestic Environmental Management Specialist to assist with the implementation of the Environmental Management / Monitoring Program and train WUA staff is considered very important task for the success of the Environmental Management and Monitoring Plan (EMP). A term of reference (TOR) for the Environmental Management Specialist (EMP) is prepared in the AnnexT.

7. FUTURE DEVELOPMENT PLAN

The future environmental management and monitoring plan will mitigate the following:

1. Monitoring crop rotation for 6 years.
2. Monitoring of surface and Ground Water for water quality (salinity & pesticide).
3. Water table depth
4. Drainage water for salinity , pesticide & fertilizers
5. Pesticide residues in fish , animal tissue and fodder crops
6. Reforestation of indigenous plant for biodiversity & desertification control.
7. Reclaim saline soil, saline surface and ground water.

For further details, please go through the Environmental Management and Mitigation Plan of the Main Environmental Assessment (EA) report..
The Environmental Management & Monitoring Plan is also part of future development plan.

ECOLOGICAL & ENVIRONMENTAL STUDIES OF IDIP-II PROJECT
ENVIRONMENTAL ASSESSMENT (EA)
UTEMIS SUB-REGIONS

ANNEX-I

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UTEMIS Sub-Project Area

1.Executive Summary of Utemis Environmental Assessment (EA)

The Environmental Assessment (EA) describes potential impacts of irrigation and drainage improvement and rehabilitation of 5000 ha

The Utemis of Baizak Rayon has total population of 7352. The potential for water logging and secondary salinization will be managed by some vertical drainage, and with cleaned and deepened inter farm and on farm collectors drains.

The project soil is typical grey Sierozem soils of the steppe. The soils are mainly meadow, meadow Sierozem and Sierozem meadow soils . The soils can be either non salinized or weakly , moderately or strongly saline. The soils are mainly light to medium loams, with some areas of loamy sands.
All land in the project area, except settlement, is used for agriculture or cattle breeding.

About 64.7 % are moderately saline (about 1-3 gm/l , Table 1)and 35.3 % are highly saline (3-10 gm /l). This is polluted with herbicide and pesticide. About 82.5 % of the area, the depth of ground water table is lower than 2 meters and 17 .5% are beyond 2-5 meters (Table 2). All drainage water of the Utemis IDS is disposed into Talas river through a number of main collectors.

Impact Assessment:
The effect of IDIP-II on Utemis natural and social resources can be described as follows. Under the IDIP-II an area of 5000 ha has been outlined for feasibility study. As proposed , after leaching the lands will be returned to intensive farming. With drainage and reclaimed saline soil , changes in land use are expected. The impact assessment has been simplified into three main components : (1) Project design , (2) Project Construction , and (3) project operation . Out of 7 project related activities , only in the construction phase ,rehabilitation of irrigation and drainage network (Table 3)may have some potential adverse environmental impacts .

If irrigation and drainage are not rehabilitated , the existing infrastructure will become further degraded , and agricultural lands will become unfertile and waterlogged with more pronounced saline condition. The land would turn into more desert condition.

Most of the potential impacts will be effectively mitigated. The environmental impacts related to project design , construction and operation will not effect the environment. Project documentation will be prepared on:

1. Regulation for closed vertical bore holes and destroyed horizontal canals to avoid contamination of ground water for village water use.
2. Regulation forbidding persistent chemical weed and pest killers

3. Environmental sustainability and bio-diversity preservation for the IDIP-II

The consultant proposes that the Committee of Water Resources (CWR)and Ministry of Environment and Biological Resources (MOEB) will be responsible for project development and will manage environmental program under Project Implementation Unit (PIU). To do so, there is a urgent need of a local Environmental Specialist , who will train Rayon Committee and WUA in water and soil salinity monitoring with equipments and procedures. One or more short courses for professional development will be organized in project institutions.

A monitoring program will be formulated to avoid any unforeseen negative environmental effects when implementing the Utemis IDIP-II Project. This is required to guarantee efficiency of the mitigation measures and a specific monitoring program is very much required.
Please refer to “Monitoring Program “ of Utemis (Table 7) and the main object of the monitoring program are as follows:

- Regular soil sampling for chemical analysis, weed and pest , and for fertilizers.

- Regular surface , ground and drainage water sampling inside the irrigation and drainage project (IDIP-II) for chemical analysis, weed and pest, and fertilizers .
  Depending on the initial results of the monitoring the space and intensity of analysis could be increased or decreased .

- The fodder crops , animal tissue and milk should be analyzed for pesticides. Depending on the results , the analysis could be continued or discontinued.

The total monitoring cost for 5000 ha of Utemis is about $ 45,500 USD (Table 6). If we spread the cost for the whole area it comes to about $9.0 per hectors. It very well spent money for monitoring.

Findings and recommendations for an Environmental Impact Assessment (EIA).
As we have seen from the document there are no negative environmental impacts due to IDIP-II project formulation, design, implementation and operation. The only negative impacts identified in irrigation and drainage rehabilitation work are transitory ones and can be mitigated during construction and operation . All other impacts for Utemis are positive.

ANNEX I
UTEMIS SUB REGIONS
ZHAMBUL OBLAST

2. Project Location and Brief Description

The project area is about 5511 hectors located along the "UTYEMYS" canal in the Baizak region of the Zhambul Oblast.
The location of the Utemis project area are presented in the Map Z-U-1 or Figure 1 of this report.
Climatic data is presented from Zhambul meteorological station, the average annual air temperature is 9.1 ^{0}C. The maximum and minimum temperature are 44^{0}C in July and - 41 ^{0} C in January respectively. The average annual precipitation is 353 mm and the bigger volume of precipitation occurs in Spring and Autumn. The frost free period lasts for 161 days and temperature exceeds above 10^{0} C for 182 days. Prominent wind direction is south easterly.

Talas River is formed within the borders of Kyrgyzstan territory. The junction of rivers of Karakol and Uchkoshoi , which collects water from mountain ranges like Kyrgyzsky, Talassky and Orta-Tau territory. The total length of the Talas River is 588 km of which 444 km is within the territory of Kazakhstan. Down below the city of Zhambul, the Talas River is intensively used for irrigation forming a dense irrigation network. After using this water for irrigation (Filtration & Evaporation), the Talas River gradually empty itself in the flat spaces of Muyunkum sands.

The soils of Utemis subproject are derived from the typical grey sierozem soils of the steppe. There are predominantly meadow, meadow sierozem and sierozem meadow soils , which can be either non salinized or moderately strongly salinized. The soils are mainly light to medium loams, with some areas of loamy sand. After development of the irrigation system, hydromorphic process contributed to soil formation. Of the 5,511 ha land , meadow soils occupy 2,129 ha , meadow sierozem occupies 1,846 ha and sierozem meadow soils 1, 536 ha.
Majority of the land currently remains non saline (65.2 %) or weakly saline (12.8%) condition .However, 22 % of land is now unusable , being either moderately (11.9%) , strongly (0.7%) or very strongly saline (0.4 %) . The type of salinity is mainly carbonate – sulphate and sulphate- chloride. Most of the sodium chloride and sulphate salts are found in the soil surface , indicating salinization is in progress. Ground water lies at a depth of less than 2m (1.3 to 1.8 m).

The source of irrigation lands in the study area is the inter farm canal "Utemysh". The capacity of the "Utemysh" canal is from the left bank and takes water from Talas River. Carrying capacity of the canal in the head 7,0 m^3/ s , this is earth canal and length 35,3 km, EF of canal factual is 0.5 .
Irrigation network consists of inter-farm canal and on- farm temporary sprinklers and hydro-technical structure. Further information can be obtained from Mid-Term Engineering report.

All the irrigation network canals are earth canals and of open type. These canals were built about 50-60 years ago without any designs or blueprints. Most of them lost their forms and constantly overgrown with sedge and ridge vegetation.
Many of the canal structure destroyed, deformed and not in working condition. Bridges do not have railings and barriers, under bridges slopes washed and destroyed. Collectors do not serve the purpose and overgrown with vegetation.

The present land use in the Utemis are rice , wheat and permanent grass. Rice takes about 35% , permanent grasses 34-35 % and wheat 19-27% of the total area. The above land use figures were reported in 2003, 2004 and 2005. The crop yields are generally low. The reason for low yield of crops for the following:

- Insufficient water, because of the deterioration of irrigation system, salinity and high ground water (improper functioning of drainage system, etc.)
- Inappropriate farming system and no proper crop rotation

To increase the yield of rice , all agricultural field must be fully drained. Research proved that the growth of rice on the same field for more than 3 years leads to decrease of yield . Irrigated soils natural fertility which is the organic matter, are exhausted by continuous rice cultivation.
The cheap and easy way to increase the yield & organic matter content of the soil is by crop rotation of rice with alfalfa in the extension areas.

Table 1 : Extent of Salinity Within Almaty and Zhambul

Target oblast	Target Sub-projects	Total Area, thousands of ha	None Saline, 1 gm/l, % of Total Area	Modeterately Salinity, 1-3 gm/l, % of Total Area	Highly Saline 3-10 gm/l, % Total Area	Very Highly Saline, > 10 gm/l , % of Total Area
Zhambyl oblast	Baizaksky rayon	5000	-	64.7	35.3	-
	Shuysky rayon	5000	32.5	67.5	-	-
	Zhambylsky rayon	5000	70.0	30.0	-	-
	Kordaysky rayon	5000	75.0	25.0	-	-
	Merkensky rayon	5000	67.0	20.0	13.0	-
Alamtynskya oblast						
	Karatalsky irrigation system	5000	85.39	12.68	1	0.93
	Akdalinsky irrigation	5000	89	11	-	-

	system					
	Malaisarynsky irrigation system	2500	45.1	36	18.9	-
	Enbekshy Kazakhsky rayon	12500	62	25	13	-

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

With reference to Table 1, it can be said that 65.0 % of the Utemis Sub Region area are moderately saline (1-3 gm /l). About 35 % are highly saline (3-10 gm /l) in the Utemis Sub Region.

The Table 2 explains that the depth of high ground water table for 82.5 % of the Utemis area (out of total 5000 ha) are less than 2 meters. The rest 17.5 % area are within 2-5 meters depth.

Decrease of yield is also a burning issue. This is because of lowering down of organic matter content is the main cause of decrease in soil fertility. For this reason, the priority is to increase production of alfalfa in the project area. This crop rotation will also increase the quantity of organic substances in the soils under crop rotation. Alfalfa is a very important crop for soil conservation and cattle feeding. It is proposed to cultivate one fourth area of the project area with alfalfa.

Project description and environmental description can be obtained from Environmental Assessment (EA) Main report and engineering part can be seen from the Mid Term Engineering Report.

The Environmental Assessment (EA) Main Report describes the issues as mentioned by the World Bank suggested format OD 4.0 , Annex A-1, as follows:

1. Policy ,legal and Administrative Framework
2. Description of the Proposed Project
3. **Description of the Environment**
4. **Significant Environmental Impacts**
5. Analysis of Alternatives
6. **Mitigation and Management Plan**
7. Environmental Management and Training
8. **Monitoring plan**
9. Inter-Agency and Public /NGO Involvement
10. List of references
11. Appendices

Because of the repetitive nature of the topics , some of the above subject matters are only described once in EA Main Report not in each Sub Regions report. The topics on 3,4,6,8 are only described in this report.

Table 2 : Extent of Water Table Depth within Almaty and Zhambul

Sub-project	Oblast	Rayon	Total Area, ha	The Depth of Ground Water Table <2m, as % of Total Area	The Depth of Ground Water Table from 2 m to 5 m, as % of Total Area	The Depth of Ground Water Table > 5 m, as % of Total Area
1	Zhambul oblast	Baizaksky rayon	5000	82.5	17.5	-
2		Shuysky rayon	5000	18.0	72.0	-
3		Zhambylsky rayon	5000	34.0	37.0	29.0
4		Kordaysky rayon	5000	13.0	70.0	17.0
5		Merkensky rayon	5000	20.0	80.0	-
6	Almaty oblast	Karatalsky irrigation system	5000	21.94	78.06	-
7		Akdalinsky irrigation system	5000	44	56	-
8		Malaisarynsky irrigation system	2500		33	67
9		Enbekshy Kazakhsky rayon	12500		45.91	54.09

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

3. Potential Environmental Impact

This section will determine and distinguish between significant positive and negative impacts, direct and indirect impacts , immediate and long term impacts. This will also identify unavoidable or irreversible impacts.

For further information and explanation on this subject , please refer to Environmental Assessment Main Report.

Table 3 : Environmental Impacts by Sub-Project Related Activities

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project UTEMIS I&D System			
1.Rehabilitation & Construction of Irrigation & drainage network and associated infrastructure	No (+)	Yes (-)	No (+)
2. Improved Agronomic Practices	No (+)	No (+)	No (+)
3. Improved Soil and Land Improvement / Reclamation	No (+)	No (+)	No (+)
4. Crop Rotation & Improved Agricultural Practices (IAP)	No (+)	No (+)	No (+)
5. Integrated Pest Management and Fertilizer Application	No (+)	No (+)	No (+)
6.Bio-drainage & Reforestation	No (+)	No (+)	No (+)
7. Improved WUA Management	No (+)	No (+)	No (+)

D = Project design ; C= Project construction and O= Project Operation

No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures), (+) Positive effect (No Adverse Impact) and (-) negative effect and to be addressed by mitigation.

4. Environmental Management

4.1 Impacts Related to Design

The design of Irrigation and drainage system for Utemis is not expected to produce negative impacts on the ZhambulOblast irrigation and drainage rehabilitation part. The design/ construction of new drains and rehabilitation of existing drains will not increase the amount of salt and agricultural chemicals entering natural waterways. According to Table 1 , about 65 % of the project area are non saline, the rest 35 % are highly saline (1-3 gm/ l). The depth of ground water for 83 % of the area (Table 2) are less than 2 meters. The rest 17 % are between 2-5 meters.
They can be summarized as follows:

- About 65 % of Utemis are moderately saline (1-3 gm/ l), and 35 % are highly saline (3 -10 gm /l).
- For about 83 % (out of 5000 ha), the ground water table depth is less than 2 m. The rest 17 % of the total area, the ground water table depth is between 2-5 m.
- The quantity of water carried by the drains are low when compared to the discharge of the Talas River.

Land Resources
As proposed in the plan , 5000 ha has been selected for feasibility study. The objective is to rehabilitate reliable irrigation supplies, for moderate to high saline soils, where substantial improvement of land productivity can be achieved with relatively low investment. As a result of drainage improvement, minor changes in land use are expected.
Further description of soils is provided by Soil Expert in the Mid Term Report.

Water Resources
Some canal will be lined and there will be improvement in water supply to irrigated lands. Salt content (mineralization) in the drainage water will be kept within limits of 1 to 3 gm /l. After mixing the drainage water with irrigated surface water (1.5 -2.0 g/l), they can be used as irrigation water. For further details please consult engineering report.

4.1.1 Bio-drainage and Salinity Control

Many drainage system are dysfunctional and another option particularly on moderate to high saline land (Table 1) would be to introduce bio-drainage techniques to control soil salinity and water table levels by using especially established plantation of trees, bushes, grasses and crops.

Tree Belts

The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage , decreasing ground water levels and helping to tackle the problem of secondary salinity and waterlogging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent % . As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions.

a) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt , high saline soil may be leached with fresh water before planting 1-2 year old sapling.

b) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant , has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

c) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

d) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

- Alkali grass (*Puccinellia airoides)*
- Desert Saltgrass (*Distichlis stricta)*
- Wildrye (*Elymus spp)*
- Bermuda grass (*Cynodon dactylon)*
- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main, on farm and inter-farm canals.

- Establish Compost / Bio-gas sites

In design phase, establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.

Table 3 gives a list of indigenous trees and bushes that can be used in planning tree lines and fence lines around farms, pump houses and irrigation canals. They should be chosen with experience and knowledge.

Table4: List of Indigenous Trees and Bushes for IDIP-II

Trees	Bushes
1. Apricot - Armenica vulgaris Lam	24. Siberian pea shrub - Caragana arborescens Lam.
2. Cherry-plum - Prunus divaricata Ledeb	25. Redhaw hawthorn - Crataegus sanguinea Pall.
3. Asian sumac - Ailanthus altissima	**26. – Calligonum aphyllum Gurke.**
4. Birch - Bertula pendula Roth	**27. – Calligonum microcurpum Borszcz**
5. Siberian elm - Ulmus pumila L.	**28. – Calligonum caput-medusae Schrenk.**
6. Elm - Ulmus laevis Pall.	**29. – Calligonum serosum (Litv.) Litv.**
7. Common Pear - Pyrus communis	30. Tatar honeysuckle - Lonicera tatarica L.
8. Tatarian maple -Acer tataricum	31. Violet willow - Salix daphnoides Vill.
9. Ash-leaved maple - Acer negundo	32. Caspian willow - Salix caspica Pall
10. Larch Siberian - Larix sibirica Ledeb.	**33. – Salix rubra Huds**
11. Bastard acacia - Robinia pseudoacacia L.	34. Mespilus rotundifolious - Amelanchier rotundifolia (Lat.) Dum./Cours.
12. White saxaul - Haloxylon persicum Bunge	35. Russian olive - Elaeagnus angustifolia
13. Black saxaul - Haloxylon aphyllum (Minkw.) Iljin	36. Rotundifolious Juneberry - Amelanchier rotundifolia (lat.) Dum./Cours
14. Pine Crimean -Pinus pallasiana D.Don.	37. Wig-tree - Cotinus coggygria Scop.
15. Archangel fir -Pinus sylvestris L.	38. Golden currant - Ribes aureum Pursh.
16. White poplar - Populus alba L.	39. French tamarisk -Tamarix ramosissima Ledeb.
17. Poplar balsamic - Populus balsamifera	40. Loose tamarisk -Tamarix lara Willd
18. Bay leaf poplar - Populus laurifolia Ledeb.	41. Coniferous ephedra - Ephedra distachy L.
19.Poplar diversifolious- Populus diversifolia Schrenk	42. Paletskiy Saltwort - Salsola paletskiana litv.
20. Poplar Siberian - Populus barsamifera L. (var. sibirica)	43. Rihter Saltwort - Salsola richteri (Moq.) Kar. Ex. Litv.
21. Black poplar - Populus nigra L.	44. Glasswort - Aellenia subaphylla (C. A. Mey) Aell.
22. White mulberry - Morus alba L.	
23. Siberian apple - Malus pallasiana Jus.	

4.1.2 Crop Rotation

This is a sequence in which crops are grown on the same piece of land over a number of years-
Used to be important for :-

- The maintenance of soil fertility
- The prevention of a build up of soil borne diseases, pests and weeds;
- The control of erosion

Nowadays , technical innovations, such as use of fertilizers , pesticide and herbicides , have reduced the necessity of crop rotation. However, there are number of serious soil borne disease and nematode infections the control of which requires a sound crop rotation program . Thus , alfalfa, rice , wheat and others crops are planted with a 5-6 year interval.

Some general rules relating to crop rotation are :

- The continuous growing of cereals or pulses should be avoided
- Leguminous crops should not be sown in sequence , even one crop is seed and other for forage;
- Crops with common root diseases should not be sown in succession. For instances , tobacco should not be planted following tomatoes.

4.1.2 Other Impacts

Other possible environmental impacts would include:

(1) Dust generation caused by certain construction operation such as excavation, which ca be mitigated by wetting excavation sites and other sources of dust to control its emission , and public information.
(2) Noise generation which can be mitigated by use of properly maintained equipment and public information, and
(3) Land use conflicts caused by temporary use of land for temporary facilities for construction contractors (accommodation, camp canteen, camp facilities , medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction.

Projects may face other possible impacts such as (1) dust generation caused by certain construction operation , such as excavation, which can be mitigated by wetting excavation sites and other sources of dust control its emission, and public information. (2) noise generation which can be mitigated by use of properly maintained equipment and public information; and (3) land use conflict caused by temporary use of land for temporary facilities for construction contractors (accommodation , camp canteen, camp facilities, medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction. Planning “Buffer Zones” in irrigation Canals and drains, specified Government Regulation has to be followed as follows:

Table 5 Government Regulations- Buffer Zones (Irrigation Canals and Drains)

Capacity of Irrigation Canals (m^3 / sec)	Width of the Inner Buffer Zones for inspection Roads and Deposit Sediment from Canal (m)	Width of the Outer Buffer Zone for Vegetation and limited Agriculture (m)
1	6	
5	10	
25	20	
50	75	
100 or more	100	

Collector Drains Buffer Zones- Provided by CWR and MOA- (both sides of the Collector Drain)

10	5m for inspection road and 10-20 m for spoil 10-20 m for agricultural traffic & field drains
10-20	100 meters (either side of the collector)
21-50	200 meters (either siude of the collector)
.50	300 meters (either side of the collector)

Source: MOA, Republic of Uzbekistan

This regulation should be strictly enforced on IDIP-II Projects.

4.2 Environmental Impacts Related to Construction

Reconstruction of the Akdala , sections of the project , joining collector with discharging drainage water into primary , secondary and tertiary canals. All open collector and drains will be cleaned and deepened. After the proper design , the project will be open for construction and operation. This will result in the following conditions:

1)Temporary increase in silt

To mitigate this, provisions are there in the standard contract document supplied to contractor for adequate supervision of operations and adherence to the contract. Confining operation to dry to the dry season only, use of silt traps and careful deposition of spoils.

The incorporation of the above measures will have to be placed into BOQ for sub project contract documentations and supervision of contractors.

2)Temporary closure of irrigation system

Participation by Water User Association (WUA) and Farmers. The information are to be given through dialogue and community awareness campaign. Ask WUA and villagers for permission to close the irrigation system temporarily. They are very important that WUA and farmers involved in all aspect of civil works.

3) Disposal of Excavated spoil from main and inter-farm drains.
Excavated soil (spoil) will be deposited alongside the drain in accordance with the guideline laid down by GOK/ MOEB with respect to easement dimension.- either side of drain and /or canal. Spoil will be deposited and formed using bulldozer into trapezoidal formation.

4)Disposal of Excavated soil (spoil) from on- farm Drains and Canals.
Spoil will be deposited alongside canals and drains in accordance with WUA and farmer instructions. If required and instructed, the contractors may deposit spoil on farm fields at the expense of farmers.

5) Dust generation
The mitigation measures recommended is the appropriate timing of operations wetting of surfaces and notice to /involvement of public. The workers on construction sites should have international personal safety / protection equipment supplied by the contractor.

6. Noise Generation:
Mitigation measures:
Appropriate timing and operation of machine are to be discussed with the farmers and WUA. Notice will be given to public and WUA- farmers will be involved in timing and reduction of noise level in the project areas.

7. Waste Material:
Replacement and repair of the irrigation and drainage structure will result in waste material (concrete and steel). These are to be disposed of by the civil works contractor as per CWR / MOEB guidelines.

8. Land Use Conflict for Construction
The CWR , MOA and GOK assessed that there will be no land use conflict for construction. This also confirmed by the client, the CWR, and guarantee given by them to the World Bank. On farm negotiations would be made with WUA and the landowners. However, civil works only will be done by participation agreement of land owners and WUA. The PMO / CWR should have the responsibility for dispute settlement.

9.Construction of Camp Sites and Living Facilities
Establishment and construction of camp sites, and Living facilities for the construction workers have to be established prior to construction work. An

acceptable sanitary facility has to be established for the workers. This must satisfy environmental regulation and MOEB code.
The camp site has to be cleaned and returned to the original state before the construction.
Refuge should be properly collected and disposed off.

Mitigation measures are to be:
CWR & MOA agrees to allocate free sites for the construction of camp sites and living facilities. This has to be negotiated with the client and the local authorities. Construction of camp sites and living facilities will be funded by the contractor. Clean up costs for these facilities will be borne by the contractor.

10. Biodiversity Conservation / Sustainability
Environmental Sustainability of the project area is very low. To improve this situation following steps will be taken:
(1) Organize nursery at every sub-regions and WUA. Provide free extension service ,input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pump location, main , on farm and inter-farm canals.
(2) Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to be considered.

4.3 Environmental Impacts related to Operation

1) Soil modification as a result of intensified agriculture
The mitigation required

a) Encouragement of continued use of traditional management of water flows
b)The use of deep rooting grasses and shrubs to further strengthen the bunds
c) Minimum / zero tillage practices

2)Soil and water contamination due to increased use of agrochemicals including fertilizer and pesticides.
The mitigation required
a)Mitigation required are agricultural extension services and Integrated Pest Management (IPM).

The agricultural extension service would include

a)Optimum , informed use of mineral fertilizer
b)Promotion of integrated pest management (IPM)
c) Discouragement on the use of persistent pesticide and herbicide.

d) Training on composting, reforestation, minimum or zero-tillage.
e) Biodiversity associated with introduced new plant species and varieties .
Promote Biodiversity for introduced crops and land use changes from protecting soil from wind by tree fencing and other environmental management practices.

(3) Environmental Sustainability & Bio-diversity Concerns.

Biological diversity refers to the variety of South Kazakhstan living biological resources. It is a function not simply of the number of ecosystem and distinct plants and animal species in existence at any given time, but also genetic differences within individual species.
Conservation of biological diversity is a form of natural resources management and should be practiced in Utemis area. This can be done by reforestation activities of indigenous plants on vertical drainage sites, main and secondary canals, and other inter farm canals. A reforestation site plan will have to be prepared for IDIP-II (Phase B) design level.

5. Environmental Monitoring

Monitoring is necessary with respect to (i) water resources quality and quantity ; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance management, including inspection and proper repair of irrigation & drainage canals and structures.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources(CWR) , MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate the success or failure of IDIP-II proposed project intervention in the Utemis.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information . Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project , the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as :

1. Soil salinity and high ground water tables;
2. Water Quality & Salinity .
3. Reforestation, Bio-Diversity and Desertification.

The variables to be analyzed are described in Table 19 of the Main Report. It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15….and for one water samples is about USD 10. Most of the project farmers interviewed had the opinion that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient . Such sampling density for 220,000 ha over 2 year life of the project would be extremely expensive.

The other alternative is to sample the pilot area (6,907 ha in Mahtaaral area) fully and for other project areas , sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project.
During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

Table 6 : Monitoring Plan of UTEMIS (5000 ha)
CALCULATION IS DONE FOR 5,000 Ha (Utemis about $9/ ha.)

Parameters to be Monitored	**Periodicity**	**Number of Samples**				Cost **of 1 analysis in $US**	**Total Cost in $US**
		Total Number of Samples	**Number of Indicators**	**Sum of Determina tion**	**Total/ yr**		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 50	3	150	150	15	2,250 **4,500**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 67	5	3340		10	3,340 **6,680**
4. Water Quality							
4.a Ground Water Quality							

4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 5	1	5	50	10	500 **1000**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 5	15	75	1125	20	1,500 **3,000**
4.a.c Fertilizer	Annually	(1sample /1000 ha) 5	1	5	75	15	1,125 **2,250**
5.Pesticide residues in fish & fodder crops	Annually	2	20	40	40	20	800 **1600**
6.Reforestation , composting and Tree Belts(Bio-drainage & Salinity Control)	Annually	1 $ Per /ha		$5000.0	$5,000.0	$1 Per Ha	**$5,000.0 (including yearly Maintenance)**
7. Equipments for Rayons &WUAs	Annually 3 hand held GPS units, computer download, 3 Electrical Conductivity meters				1 unit (GPS & Electrical Conductivity meters $250.0 X14	$250.0 for one unit	**$3,500** (one time purchase)
						Grand Total	**$30,500 ***

Source: The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1996.
* this $30,500 is based on 1996 figure and upgraded to **$45,500** to reflect 2007 reality (30% inflation).

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M , it will be easier for them to take this additional responsibility . This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that Total US$.45,500.(based on 10 years of inflation)... will be required to implement and maintain the Environmental Management and Monitoring Plan (EM & MP). There are three categories of inputs to the EMP . They are as follows in the Table 7.

1. Planning and Surveys and consultant assistance$6000.0 (13.13%)
2. Mitigation Management $36,700 (81.24%)
3. Equipment & Training $ 2,800 (5.63 %)

Table 7: Estimated Budget for Environmental Management Plan (EMP- Utemis)

Item	**Qty**	**Unit Cost**	**Total Cost US$**
Capital Cost-Equipments for Rayons			
GPS units (handheld), Computer download	3	250	7,50.0
Electrical Conductivity Meters(24 Rural Districts)	3	250	7,50.0
Capital Cost- Equipment for WUA			
GPS units (Hand Held),computer download	3	250	7,50.0
Electrical Conductivity Meters(17 Rural Consumer Cooperatives of Water User RCCWU)	3	250	7,50.0
Recurrent Costs			
Support to PMO for Baseline Survey	1 each	3,000	3,000
Support to PMO for M&E activities over 2 years	Lumpsum	5,000	5,000
Analysis for soil and water samples for 2 years by CWR &MOG	2 Yearly	19030	19,030
Support for reforestation & biodiversity by CF	Lumpsum	5,000	5,000
Total			35,030

Note : Total $ 35,000 (round figure) is based on 1996 values. and adjusted to 2007 inflation figures (X30%), which makes it (35,000X30%) $10,500 +35,000= **$45,500**

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out. The suggested report systems for environmental monitoring programs are made on the following consideration:

1. Monthly report from the Contractor

Contractors should regularly monitor the environmental –related issues and Environmental parameters based on the guidance from Environmental Management Specialist and requirements from Ryon Inspector. They should provide a monthly report covering performance of environmental monitoring and progress of environmental related activities.

2. Monthly Environmental Management Report

   The requirement of Environmental Management Specialist is to produce a monthly performance report of environmental monitoring , summarizing the environmental monitoring of sub-projects and other related environmental problems.

3. Environmental Monitoring Report

   The Rayon office laboratories of IDIP-II need to submit PMO thematic monitoring report on the changes in salinity, changes in water use, changes in soil productivity, including baseline soil surveys and subsequent periodic surveys, as well as proposed suggestions for actions to solve key environmental problems if any (semi-annual monitoring and annual monitoring report).

4. Semi-Annual PMO Report

   Every half year, PMO needs to compile a quarterly environmental working report, summarizing the progress of EMP implementation, and monitoring status. The report from IDIP-II project and the Environmental Management Specialist should be attached to PMO report. This report may be integrated into “The Progress Report” and sent to WB for review. The copies may be sent to Oblast Office for reference.

6. FINDINGS AND RECOMMENDATIONS

6.1 The Need for an Environmental Impact Assessment (EIA)

This section evaluates the need for an Environmental Impact Studies (EIA). This should be based on the fact whether significant environmental impacts exist and that need a further detailed study or EIA.

As per as we have seen there are no negative environmental impacts due to IDIP-I proposed project formulation , design, implementation , and operation. The only negative impacts identified are transitory ones (can be mitigated) associated with construction operations. All other impacts for Utemis are positive. The required mitigations are presented in sections and 7.4. of the Main EA report.

The recommendation from the findings of this Environmental Assessment (EA) are that a follow up EIA or further detailed environmental impact study (EIA) study is not needed.

6.2 Potential Environmental Impacts, Possible Mitigation Measures and Responsible Agencies

The environmental monitoring program will be part of an integrated project monitoring program which will be established by the PMO. The PMO and the “Project Implementation Unit” (PIU) offices at Project area oblast will be responsible for implementing all environmental mitigation measures. Table 14… presents all relevant issues with respect to the potential environmental impacts and the possible monitoring and mitigation enhancement measures. The table also lists those agencies who are responsible and also lists agencies which should have an involvement in the monitoring program and an input to the development and planning of the mitigation measures.

6.3 Environmental Assessment Requirement of MOEB

The Government of Kazakhstan (GOK) requirement is to present this Environmental Assessment (EA) report to MOEB. The instruction by MOEB call for report in which available data on the resources likely to be affected by IDIP-II are to be analyzed in terms of scope and intensity. An Environmental Assessment (EA) report are to be prepared by proponent (CWR) and should be included with the feasibility report and submitted for approval. This report provides a brief description of ecological and social sources , and trends in agriculture. Natural resources that are sensitive to change should be identified along with potential environmental problems. This report should be given a public review and then presented to the Ministry of Ecological and Biological Resources (MOEB). The MOEB reviews the EA and its comments (State Ecological Expertise) and forwarded to the concerned sections for approval.

The World Bank 4.01 “Environmental Assessment” has screened the IDIP-II Project and placed it in EA category “B”, which means the preparation of an environmental analysis to define environmental management , monitoring and mitigation measures as necessary. The recommended mitigation measures in the State Ecological Expertise (SEE) review would become an integral part of project design and implementation. The archeological sites would be protected with the guideline and requirement of Kazakhstan law and acceptable to the World Bank. The assurance was also obtained from Kazakh Government about the use of agrochemicals for IDIP-II would be approved, stored and distributed and used in accordance with the guidelines and requirements of Kazakhstan Government acceptable to the World Bank (WB).

6.4 CONCLUSION

For Utemis Sub project an Environmental Impact Assessment (EIA) is not necessary. However, the appointment of a local / domestic Environmental Management Specialist to assist with the implementation of the Environmental Management / Monitoring Program and train WUA staff is considered very important task for the success of the Environmental Management and Monitoring Plan (EMP). A term of reference (TOR) for the Environmental Management Specialist (EMP) is prepared in the Annex….

7.FUTURE DEVELOPMENT PLAN

The future environmental management and monitoring plan will mitigate the following:

1. Monitoring crop rotation for 6 years.
2. Monitoring of surface and Ground Water for water quality (salinity & pesticide).
3. Water table depth
4. Drainage water for salinity , pesticide & fertilizers
5. Pesticide residues in fish , animal tissue and fodder crops
6. Reforestation of indigenous plant for biodiversity & desertification control.
7. Reclaim saline soil, saline surface and ground water.

For further details, please go through the Environmental Management and Mitigation Plan of the Main Environmental Assessment (EA) report.
The Environmental Management & Monitoring Plan is also part of future development plan.

ECOLOGICAL & ENVIRONMENTAL STUDIES OF IDIP-II PROJECT
ENVIRONMENTAL ASSESSMENT (EA)
TASUTKEL SUB-REGIONS, SHUYSKY RAYON

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ANNEX-J
Tasutkel Sub Regions

1. Summary of Big Almaty Canal Environmental Assessment (EA)

The Environmental Assessment (EA) describes potential impacts of irrigation and drainage improvement and rehabilitation of 12,500 ha .

Tasutkel has total population of 10,257 of which 5050 are male and 5207 are female. The potential for water logging and secondary salinization will be managed by some vertical drainage , and with cleaned and deepened interfarm and on-farm collectors drains. Total number of in-farm canals in the project area is not known.

The soil of the Tasutkel PMC Sub-project are formed on quaternary deposits with layers of grain size, from sand to clay. Soil formation has occurred recently under the influence of ground waterresulting from irrigation.. All the project area, except settlement is used for agriculture or cattle breeding.

The water salinity, the 32.5 % are non saline(<1gm / l) , and 67.5 % are moderately saline (Table 1, 1-3 gm /l). Further they are polluted with pesticide and herbicides.
The depth to ground water, 72 % are beyond 2 to 5 meter and 18 % are less than 5 meter depth.
Impact Assessment:
The effect of IDIP-II on natural and social resources can be described as follows. Under the IDIP-II an area of 5000 ha has been outlined for feasibility study. As proposed, after leaching the lands will be returned to intensive farming. With drainage rehabilitation ,changes in land use are expected. The impact assessment has been simplified into three main components: (1) Project design (2) Project construction and (3)Project Operation. Out of 7 project related activities, no adverse environmental impacts are expected.

If irrigation and drainage systems are not rehabilitated , the existing infrastructure will become further degraded, and agricultural will become more waterlogged and saline. The land would turn into more desert condition.

Most of the potential impacts are effectively mitigated. The environmental impacts related to project design, construction and operation will not affect the environment. Project documentation will be prepared on:

1. Regulation for closed vertical bore holes and destroyed horizontal canals to avoid contamination of ground water for village water use.
2. Regulation forbidding persistent chemical weed and pest killers.
3. Environmental sustainability and bio-diversity preservation for the IDIP

The consultant proposes that the Committee of Water Resources (CWR) and Ministry of Environment and Biological Resources (MOEB) will be responsible for project development and will manage environmental programs. To do so , a small amount of Rayon and WUA will be trained in water and soil salinity monitoring with equipments and procedures. One or more short courses for professional development will be organized in project institutions.

A monitoring program will be formulated to avoid any unforeseen negative environmental effects when implementing the Tasutkel PMC, IDIP –II project. This is required to guarantee efficiency of the mitigation measures and a monitoring program is very much required. Please refer to “Monitoring Plan “ of Tasutkel PMC (Table 6.) and main object of the monitoring plan are as follows:

- Regular soil sampling for chemical analysis, weed and pest, and for fertilizers.
- Regular surface, ground and drainage water sampling inside the irrigation and drainage project (IDIP-II) for chemical analysis, weed and pests, and fertilizers. Depending on the initial results of the monitoring the space and intensity of analysis could be increased or decreased..
- The fodder crops, animal tissues and milk should be analyzed for pesticides. Depending on the results, the analysis could be continued or discontinued.

The total monitoring cost for 5000 ha of Tasutkel PMC is about $ US 45,500 (Table 7). If we spread the cost to the whole area it comes to about $9.0 per hectors. It is worth to spend that money on monitoring

The findings and recommendations for an Environmental Impact Assessment (EIA).
As we have seen from the document there are no negative environmental impacts due to IDIP-II project formulation, design, implementation, and operation . The only negative impacts identified are transitory ones and can be mitigated during construction and operation. All other impacts for Tasutkel are positive.

Tasutkel Sub Project
Shuysky Rayon
ZHAMBUL OBLAST

2.Brief General Description and Location

The location details of the Tasutkel PMC IDS Sub Project area are given in Figure 1 or Map No. MAP Z- SPMK -1. The climatic data representative of the Big Shu Canal is very similar to that at Utemis and Tasotkel dam. The minimum temperature in January is -11.6 and the maximum temperature in July is 31.9. The maximum precipitation is 64 mm in April and minimum precipitation is 8 mm in August.

The detailed irrigation and drainage description , including rehabilitation design and cost are available from Mid Term and Final Report.

Soil of the area is derived from typical steppe grey sierozem soils . Any major variation in soil properties across the project area would be a result of differing levels of water table , due to inadequate drainage of irrigation water , and consequent development of secondary salinity. Some areas at this site have been lost to salinity and waterlogging but a salinity map for the sub project is not yet available.

Main crops grown in Tasutkel –PMC IDS are grains and vegetables, but there is a desire to return to sugar beet production.

Constraints to agricultural production are as follows:

- The state of disrepair of the irrigation and drainage system and unleveled condition of the land and prevent timely and precise delivery of precise amount of irrigation water to crops. A non functioning drainage system causes water tables to rise and thus induce secondary salinity.
- Extent of limitation of macronutrients and micronutrients is not known and hence economically optimum levels of fertilizer needed for each crop are not clear.
- Limitation due to pests , diseases and weeds are inevitable , but use of agrochemicals or any other methods for their management is minimal.
- Quality of seeds of modern varieties is not available.
- There is danger of economic imperatives will drive cropping pattern in each year and that a systematic long term rotation

Opportunities for Improvement of Agriculture

- A water use efficiency (WUE) approach is required in rationalizing water use , preferably with the help of soil and crop water balance modeling. It is critical that the drainage system be returned to full and effective operational capacity to prevent salinization. Land leveling is necessary to ensure timely and even distribution of water in fields and thus contribute to WUE.

- Field studies to assess nutrient deficiencies affecting the crops grown is required, with fertilizer response functions established to calculate economically optimum rates of fertilizer application.
- IPM approach are needed to manage the main pest, disease and weed constraints, including use of crop rotation to disrupt life cycles of yield reducing organisms.
- Systematic , sustainable crop rotations need to be instituted.
- Regular farmers training is required to facilitate on farm demonstration of best bet ICSM.

Out of 5000 ha , from Table 1 about 32 % of the area are non saline (< 1gm /l), and 67% of the area are moderately saline (1-3 gm of salt / lit). The Tasutkel area of Shyysky Rayon has no waterlogging and ground water problem and 72 %of the area the ground water is at 2-5 meter depth. About 18 % of the area , the ground water is beyond 2 meters (Table 2).

Table 1 : Extent of Salinity in Almaty and Zhambul

Target oblast	Target Sub-projects	Total Area, thousands of ha	None Saline1 gm/l, % of Total Area	Mode rately Salinity, 1-3 gm/l, % of Total Area	Highly Saline 3-10 gm/l, % Total Area	Very Highly Saline, > 10 gm/l , % of Total Area
Zhambyl oblast	Baizaksky rayon	5000	-	64.7	35.3	-
	Shuysky rayon	5000	32.5	67.5	-	-
	Zhambylsky rayon	5000	70.0	30.0	-	-
	Kordaysky rayon	5000	75.0	25.0	-	-
	Merkensky rayon	5000	67.0	20.0	13.0	-
Alamtynskya oblast						
	Karatalsky irrigation system	5000	85.39	12.68	1	0.93
	Akdalinsky irrigation system	5000	89	11	-	-
	Malaisarynsky irrigation system	2500	45.1	36	18.9	-
	Enbekshy Kazakhsky rayon	12500	62	25	13	-

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

Table 2 : Extent of Water Table Depth within Almaty and Zhambul

Sub-project	Oblast	Rayon	Total Area, ha	The Depth of Ground Water Table <2m, as % of Total Area	The Depth of Ground Water Table from 2 m to 5 m, as % of Total Area	The Depth of Ground Water Table > 5 m, as % of Total Area
1	Zhambul oblast	Baizaksky rayon	5000	82.5	17.5	-
2		Shuysky rayon	5000	18.0	72.0	-
3		Zhambylsky rayon	5000	34.0	37.0	29.0
4		Kordaysky rayon	5000	13.0	70.0	17.0
5		Merkensky rayon	5000	20.0	80.0	-
6	Almaty oblast	Karatalsky irrigation system	5000	21.94	78.06	-
7		Akdalinsky irrigation system	5000	44	56	-
8		Malaisarynsky irrigation system	2500		33	67
9		Enbekshy Kazakhsky rayon	12500		45.91	54.09

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

3. Potential Environmental Impact

This section will determine and distinguish between significant positive and negative impacts, direct and indirect impacts , immediate and long term impacts. This will also identify unavoidable or irreversible impacts.
For further information and explanation on this subject , please refer to Environmental Assessment Main Report.

Table 3 : Environmental Impacts by Sub-Project Related Activities

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project Karatal I&D System 1.Rehabilitation & Construction of Irrigation & drainage network and associated infrastructure	No (+)	Yes (-)	No (+)
2. Improved Agronomic Practices	No (+)	No (+)	No (+)
3. Improved Soil and Land Improvement / Reclamation	No (+)	No (+)	No (+)
4. Crop Rotation & Improved Agricultural Practices (IAP)	No (+)	No (+)	No (+)
5. Integrated Pest Management and Fertilizer Application	No (+)	No (+)	No (+)
6.Bio-drainage & Reforestation	No (+)	No (+)	No (+)
7. Improved WUA Management	No (+)	No (+)	No (+)

D = Project design ; C= Project construction and O= Project Operation
No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures), (+) Positive effect (No Adverse Impact) and (-) negative effect and to be addressed by mitigation.

4. Environmental Management

4.1 Impacts Related to Design

The design of Irrigation and drainage system for Tasutkel PMC IDS of Zhambul Oblast is not expected to produce negative impacts on the Oblast irrigation and drainage rehabilitation project. The design/ construction of new drains and rehabilitation of existing drains will not increase the amount of salt and agricultural chemicals entering natural waterways.
According to Table 1 , salinity within Tasutkel PMC IDS of the area are moderately to highly saline (1-<10gm/l), For the whole area(100%) , depth of ground water (Table 2) are beyond 2 to 5 meters.
This is for the reason:

- About 32.5 % of Tasutkel Sub-Project are non saline (< 1 gm / l , Table 1). The other 67.5 % are moderately saline (1-3 gm / l , Table 1).
- The quantity of water carried by the drains are low when compared to the discharge of the Shu River.

Land Resources
As proposed in the plan ,5000 ha has been selected for feasibility study. The objective is to rehabilitate reliable irrigation supplies, for moderate to high saline soils, where substantial improvement of land productivity can be achieved with relatively low investment. As a result of drainage improvement, minor changes in land use are expected.

Water Resources
Some canal will be lined and there will be improvement in water supply to irrigated lands. Salt content (mineralization) in the drainage water will be kept within limits of 1 to 3 gm /l. After mixing the drainage water with irrigated surface water (1.5 -2.0 g/l), they can be used as irrigation water. For further details please consult engineering report.

Further description of soils is provided by Soil Expert in the Soil Report.

4.1.1 Bio-drainage and Salinity Control

Many drainage system are dysfunctional and another option particularly on moderate to high saline land (Table 1) would be to introduce bio-drainage techniques to control soil salinity and water table levels by using especially established plantation of trees, bushes, grasses and crops.

Tree Belts
The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local

air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage , decreasing ground water levels and helping to tackle the problem of secondary salinity and waterlogging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent % . As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions.

a) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt , high saline soil may be leached with fresh water before planting 1-2 year old sapling.

b) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant , has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

c) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

d) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

- Alkali grass (*Puccinellia airoides)*
- Desert Saltgrass (*Distichlis stricta)*
- Wildrye (*Elymus spp)*
- Bermuda grass (*Cynodon dactylon)*
- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main, on farm and inter-farm canals.
Establish Compost / Bio-gas sites

In design phase, establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.
Table 3 gives a list of indigenous trees and bushes that can be used in planning tree lines and fence lines around farms, pump houses and irrigation canals. They should be chosen with experience and knowledge.

Table 4: List of Indigenous Trees and Bushes for IDIP-II

Trees	Bushes
1. Apricot - Armenica vulgaris Lam 2. Cherry-plum - Prunus divaricata Ledeb 3. Asian sumac - Ailanthus altissima 4. Birch - Bertula pendula Roth 5. Siberian elm - Ulmus pumila L. 6. Elm - Ulmus laevis Pall. 7. Common Pear - Pyrus communis 8. Tatarian maple -Acer tataricum 9. Ash-leaved maple - Acer negundo 10. Larch Siberian - Larix sibirica Ledeb. 11. Bastard acacia - Robinia pseudoacacia L. 12. White saxaul - Haloxylon persicum Bunge 13. Black saxaul - Haloxylon aphyllum (Minkw.) Iljin 14. Pine Crimean -Pinus pallasiana D.Don. 15. Archangel fir -Pinus sylvestris L. 16. White poplar - Populus alba L. 17. Poplar balsamic - Populus balsamifera 18. Bay leaf poplar - Populus laurifolia Ledeb. 19.Poplar diversifolious- Populus diversifolia Schrenk 20. Poplar Siberian - Populus barsamifera L. (var. sibirica) 21. Black poplar - Populus nigra L. 22. White mulberry - Morus alba L. 23. Siberian apple - Malus pallasiana Jus.	24. Siberian pea shrub - Caragana arborescens Lam. 25. Redhaw hawthorn - Crataegus sanguinea Pall. **26. – Calligonum aphyllum Gurke.** **27. – Calligonum microcurpum Borszcz** **28. – Calligonum caput-medusae Schrenk.** **29. – Calligonum serosum (Litv.) Litv.** 30. Tatar honeysuckle - Lonicera tatarica L. 31. Violet willow - Salix daphnoides Vill. 32. Caspian willow - Salix caspica Pall **33. – Salix rubra Huds** 34. Mespilus rotundifolious - Amelanchier rotundifolia (Lat.) Dum./Cours. 35. Russian olive - Elaeagnus angustifolia 36. Rotundifolious Juneberry - Amelanchier rotundifolia (lat.) Dum./Cours 37. Wig-tree - Cotinus coggygria Scop. 38. Golden currant - Ribes aureum Pursh. 39. French tamarisk -Tamarix ramosissima Ledeb. 40. Loose tamarisk -Tamarix lara Willd 41. Coniferous ephedra - Ephedra distachy L. 42. Paletskiy Saltwort - Salsola paletskiana litv. 43. Rihter Saltwort - Salsola richteri (Moq.) Kar. Ex. Litv. 44. Glasswort - Aellenia subaphylla (C. A. Mey) Aell.

4.1.2 Crop Rotation

This is a sequence in which crops are grown on the same piece of land over a number of years-
Used to be important for:

- The maintenance of soil fertility
- The prevention of a build up of soil borne diseases, pests and weeds;
- The control of erosion

Nowadays , technical innovations, such as use of fertilizers, pesticide and herbicides , have reduced the necessity of crop rotation. However, there are number of serious soil borne disease and nematode infections the control of which requires a sound rotation program. Thus, alfalfa, rice, wheat and others are planted with a 5-6 year interval.

Some general rules relating to crop rotation are :

- The continuous growing of cereals or pulses should be avoided
- Leguminous crops should not be sown in sequence , even one crop is seed and other for forage;
- Crops with common root diseases should not be sown in succession. For instances , tobacco should not be planted following tomatoes.

4.1.3 Other Impacts

Other possible environmental impacts would include:

(1) Dust generation caused by certain construction operation such as excavation, which ca be mitigated by wetting excavation sites and other sources of dust to control its emission , and public information.
(2) Noise generation which can be mitigated by use of properly maintained equipment and public information, and
(3) Land use conflicts caused by temporary use of land for temporary facilities for construction contractors (accommodation, camp canteen, camp facilities , medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction.

Projects may face other possible impacts such as (1) dust generation caused by certain
construction operation , such as excavation, which can be mitigated by wetting excavation sites and other sources of dust control its emission, and public information. (2) noise generation which can be mitigated by use of

properly maintained equipment and public information; and (3) land use conflict caused by temporary use of land for temporary facilities for construction contractors (accommodation , camp canteen, camp facilities, medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction. Planning “Buffer Zones” in irrigation Canals and drains, specified Government Regulation has to be followed as follows:

Table 5 : Government Regulations- Buffer Zones (Irrigation Canals and Drains)

Capacity of Irrigation Canals (m^3 / sec)	Width of the Inner Buffer Zones for inspection Roads and Deposit Sediment from Canal (m)	Width of the Outer Buffer Zone for Vegetation and limited Agriculture (m)
1	6	
5	10	
25	20	
50	75	
100 or more	100	

Collector Drains Buffer Zones- Provided by CWR and MOA- (both sides of the Collector Drain)

10	5m for inspection road and 10-20 m for spoil 10-20 m for agricultural traffic & field drains
10-20	100 meters (either side of the collector)
21-50	200 meters (either siude of the collector)
.50	300 meters (either side of the collector)

Source: MOA, Republic of Uzbekistan

This regulation should be strictly enforced on IDIP-II Projects.

4.2 Environmental Impacts Related to Construction

Reconstruction of the Tasutkel , sections of the project , joining collector with discharging drainage water into primary , secondary and tertiary canals. All open collector and drains will be cleaned and deepened. After the proper design , the project will be open for construction and operation. This will result in the following conditions:

1)Temporary increase in silt
To mitigate this, provisions are there in the standard contract document supplied to contractor for adequate supervision of operations and adherence only, use of silt traps and careful deposition of spoils.
The incorporation of the above measures will have to be placed into BOQ for sub project contract documentations and supervision of contractors.

2)Temporary closure of irrigation system
Participation by Water User Association (WUA) and Farmers. The information are to be given through dialogue and community awareness campaign. Ask WUA and villagers for permission to close the irrigation system temporarily. They are very important that WUA and farmers involved in all aspect of civil works.

3) Disposal of Excavated spoil from main and inter-farm drains.
Excavated soil (spoil) will be deposited alongside the drain in accordance with the guideline laid down by GOK/ MOEB with respect to easement dimension.- either side of drain and /or canal. Spoil will be deposited and formed using bulldozer into trapezoidal formation.

4)Disposal of Excavated soil (spoil) from on- farm Drains and Canals.
Spoil will be deposited alongside canals and drains in accordance with WUA and farmer instructions. If required and instructed, the contractors may deposit spoil on farm fields at the expense of farmers.

5) Dust generation
The mitigation measures recommended is the appropriate timing of operations wetting of surfaces and notice to /involvement of public. The workers on construction sites should have international personal safety / protection equipment supplied by the contractor.

6. Noise Generation:
Mitigation measures:
Appropriate timing and operation of machine are to be discussed with the farmers and WUA. Notice will be given to public and WUA- farmers will be involved in timing and reduction of noise level in the project areas.

7. Waste Material :
Replacement and repair of the irrigation and drainage structure will result in waste material (concrete and steel). These are to be disposed of by the civil works contractor as per CWR / MOEB guidelines.
‘

8. Land Use Conflict for Construction
The CWR , MOA and GOK assessed that there will be no land use conflict for construction. This also confirmed by the client, the CWR, and guarantee given by them to the World Bank. On farm negotiations would be made with

WUA and the landowners. However, civil works only will be done by participation agreement of land owners and WUA. The PMO / CWR should have the responsibility for dispute settlement.

9.Construction of Camp Sites and Living Facilities
Establishment and construction of camp sites, and Living facilities for the construction workers have to be established prior to construction work. An acceptable sanitary facility has to be established for the workers. This must satisfy environmental regulation and MOEB code.
The camp site has to be cleaned and returned to the original state before the construction.
Refuge should be properly collected and disposed off.

Mitigation measures are to be:
1)CWR & MOA agrees to allocate free sites for the construction of camp sites and living facilities. This has to be negotiated with the client and the local authorities. Construction of camp sites and living facilities will be funded by the contractor. Clean up costs for these facilities will be borne by the contractor.

10. Biodiversity Conservation / Sustainability
Environmental Sustainability of the project area is very low. To improve this situation following steps will be taken:
(1) Organize nursery at every sub-regions and WUA. Provide free extension service ,input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pump location, main , on farm and inter-farm canals.
(2) Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to be considered.

4.3 Environmental Impacts related to Operation

1) Soil modification as a result of intensified agriculture
The mitigation required
a) Encouragement of continued use of traditional management of water flows
b)The use of deep rooting grasses and shrubs to further strengthen the bunds
c) Minimum / zero tillage practices

2)Soil and water contamination due to increased use of agrochemicals including fertilizer and pesticides.
The mitigation required

a)Mitigation required are agricultural extension services and Integrated pest management (IPM).

The agricultural extension service would include

a)Optimum , informed use of mineral fertilizer
b)Promotion of integrated pest management (IPM)
c) Discouragement on the use of persistent pesticide and herbicide.
d) Training on composting, reforestation, minimum or zero-tillage.
e) Biodiversity associated with introduced new plant species and varieties .
Promote Biodiversity for introduced crops and land use changes from protecting soil from wind by tree fencing and other environmental management practices.

(3) Environmental Sustainability & Bio-diversity Concerns.

Biological diversity refers to the variety of South Kazakhstan living biological resources. It is a function not simply of the number of ecosystem and distinct plants and animal species in existence at any given time, but also genetic differences within individual species.
Conservation of biological diversity is a form of natural resources management and should be practiced in Tasutkel area. This can be done by reforestation activities of indigenous plants on vertical drainage sites, main and secondary canals, and other inter farm canals. A reforestation site plan will have to be prepared in IDIP-II (Phase B) design level.

5. Environmental Monitoring

Monitoring is necessary with respect to (i) water resources quality and quantity ; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance management, including inspection and proper repair of irrigation & drainage canals and structures.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources(CWR) , MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate to evaluate the success or failure of IDIP-II proposed project intervention in the Tasutkel.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information . Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project , the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the

Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as :

1. Soil salinity and high ground water tables;
2. Water Quality & Salinity .
3. Reforestation, Bio-Diversity and Desertification.

The variables to be analyzed are described in Table 19 Main Report EA. It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15…...and for one water samples is about USD 10. Most of the project farmers interviewed that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient . Such sampling density for 220,000 ha over 2 year life of the project would be extremely expensive.

The other alternative is to sample the pilot area (6,907 ha in Mahtaaral area) fully and for other project areas , sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project.
During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

Table 6 : Monitoring Plan of Tasutkel PMC IDS, Shuysky Rayon, ZHAMBUL CALCULATION IS DONE FOR 5,000 Ha (SHU-PMK, about $ 9.0 / ha.)

Parameters to be Monitored	Periodicity	Number of Samples				Cost of 1 analysis in $US	Total Cost in $US
		Total Number of Samples	Number of Indicators	Sum of Determination	Total/ yr		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 50	3	150	150	15	2,250 **4,500**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 67	5	3340		10	3,340 **6,680**
4. Water Quality							
4.a Ground Water Quality							
4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 5	1	5	50	10	500 **1000**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 5	15	75	1125	20	1,500 **3,000**
4.a.c Fertilizer	Annually	(1sample /1000 ha) 5	1	5	75	15	1,125 **2,250**
5.Pesticide residues in fish & fodder crops	Annually	2	20	40	40	20	800 **1600**
6.Reforestation , composting	Annually	1 $ Per /ha		$5000.0	$5,000.0	$1 Per Ha	**$5,000.0 (including yearly Maintenance)**

and Tree Belts(Bio-drainage & Salinity Control)							
7. Equipments for Rayons &WUAs	Annually 3 hand held GPS units, computer download, 3 Electrical Conductivity meters				1 unit (GPS & Electrical Conductivity meters $250.0 X12	$250.0 for one unit	**$3,000** (one time purchase)
						Grand Total	**$30,030 ***

Source: The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1996.

* this $30,030 is based on 1996 figure and upgraded to $45,500 to reflect 2007 values (30% inflation).

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M, it will be easier for them to take this additional responsibility. This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that Total US$45,500..(based on 10 years of inflation).will be required to implement and maintain the Environmental Management and Monitoring Plan (EM & MP). There are three categories of inputs to the EMP. They are as follows in the Table 7.

1. Planning and Surveys and consultant assistance$ 5,940 (13.13%)
2. Mitigation Management $36,800 (81.24%)
3. Equipment & Training $ 2,800 (5.63 %)

Table 7: Estimated Budget for Environmental Management Plan (EMP – Tasutkel)

Item	Qty	Unit Cost	Total Cost US$
Capital Cost-Equipments for Rayons			
GPS units (handheld), Computer download	3	250	7,50.0
Electrical Conductivity Meters(24 Rural Districts)	3	250	7,50.0
Capital Cost- Equipment for WUA			
GPS units (Hand Held),computer download	3	250	7,50.0
Electrical Conductivity Meters(17 Rural Consumer Cooperatives of Water User RCCWU)	3	250	7,50.0
Recurrent Costs			
Support to PMO for Baseline Survey	1 each	3,000	3,000
Support to PMO for M&E activities over 2 years	Lumpsum	5,000	5,000
Analysis for soil and water samples for 2	2 Yearly	19030	19,030

years by CWR &MOG			
Support for reforestation & biodiversity by CF	Lumpsum	5,000	5,000
Total			35,030

Note: Total $ 35,000 (round figure) is based on 1996 values. and adjusted to 2007 inflation figures (X30%), which makes it (35,000X30%) $10,500 +35,000= **$45,500**

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out. The suggested report systems for environmental monitoring programs are made on the following consideration:

1. Monthly report from the Contractor

Contractors should regularly monitor the environmental –related issues and Environmental parameters based on the guidance from Environmental Management Specialist and requirements from Rayon Inspector. They should provide a monthly Report covering performance of environmental monitoring and progress of environmental related activities.

2. Monthly Environmental Management Report

   The requirement of Environmental Management Specialist is to produce a monthly performance report of environmental monitoring , summarizing the environmental monitoring of sub-projects and other related environmental problems.

3. Environmental Monitoring Report

   The Rayon office laboratories of IDIP-II need to submit PMO thematic monitoring report on the changes in salinity, changes in water use, changes in soil productivity, including baseline soil surveys and subsequent periodic surveys, as well as proposed suggestions for actions to solve key environmental problems if any (semi-annual monitoring and annual monitoring report).

4. Semi-Annual PMO Report

   Every half year, PMO needs to compile a quarterly environmental working report, summarizing the progress of EMP implementation , and monitoring status. The report from IDIP-II project and the Environmental Management Specialist should be attached to PMO report. This report may be integrated into “The Progress Report” and sent to WB for review. The copies may be sent to Oblast Office for reference.

6. FINDINGS AND RECOMMENDATIONS

6.1 The Need for an Environmental Impact Assessment (EIA)

This section evaluates the need for an Environmental Impact Studies (EIA). This should be based on the fact whether significant environmental impacts exist and that need a further detailed study or EIA.

As per as we have seen there are no negative environmental impacts due to IDIP-I proposed project formulation , design, implementation , and operation. The only negative impacts identified are transitory ones (can be mitigated) associated with construction operations. All other impacts for Tasutkel are positive. The required mitigation are presented in sections and 7.4.

The recommendation from the findings of this Environmental Assessment (EA) are that a follow up EIA or further detailed environmental impact study (EIA) study is not needed.

6.2 Potential Environmental Impacts, Possible Mitigation Measures and Responsible Agencies

The environmental monitoring program will be part of an integrated project monitoring program which will be established by the PMO. The PMO and the “Project Implementation Unit” (PIU) offices at Project area oblast will be responsible for implementing all environmental mitigation measures. Table 14 presents all relevant issues with respect to the potential environmental impacts and the possible monitoring and mitigation enhancement measures. The table also lists those agencies who are responsible and also lists agencies which should have an involvement in the monitoring program and an input to the development and planning of the mitigation measures.

6.3 Environmental Assessment Requirement of MOEB

The Government of Kazakhstan (GOK) requirement is to present this Environmental Assessment (EA) report to MOEB. The instruction by MOEB call for report in which available data on the resources likely to be affected by IDIP-II are to be analyzed in terms of scope and intensity. An Environmental Assessment (EA) report are to be prepared by proponent (CWR) and should be included with the feasibility report and submitted for approval. This report provides a brief description of ecological and social sources , and trends in agriculture. Natural resources that are sensitive to change should be identified along with potential environmental problems. This report should be given a public review and then presented to the Ministry of Ecological and Biological Resources (MOEB). The MOEB reviews the EA and its comments (State Ecological Expertise) and forwarded to the concerned sections for approval.

The World Bank 4.01 “Environmental Assessment” has screened the IDIP-II Project and placed it in EA category “B”, which means the preparation of an environmental analysis to define environmental management , monitoring and mitigation measures as necessary. The recommended mitigation measures in the State Ecological Expertise (SEE) review would become an integral part of integral part of project design and implementation. The archeological sites would be protected with the guideline and requirement of Kazakhstan law and acceptable to the World Bank. The assurance was also obtained from Kazakh Government about the use of agrochemicals for IDIP-II would be approved ,stored and distributed and used in accordance with the guidelines and requirements of Kazakhstan Government acceptable to the World Bank (WB).

6.4 CONCLUSION

For Tasutkel PMC IDS sub project an Environmental Impact Assessment (EIA) is not necessary. However, the appointment of a local / domestic Environmental Management Specialist to assist with the implementation of the Environmental Management / Monitoring Program and train WUA staff is considered very important task for the success of the Environmental Management and Monitoring Plan (EMP). A term of reference (TOR) for the Environmental Management Specialist (EMP) is prepared in the Annex T.

7. FUTURE DEVELOPMENT PLAN

The future environmental management and monitoring plan will mitigate the following:

1. Monitoring crop rotation for 6 years
2. Monitoring of surface and Ground Water for water quality (salinity & pesticide).
3. Water table depth
4. Drainage water for salinity , pesticide & fertilizers
5. Pesticide residues in fish , animal tissue and fodder crops
6. Reforestation of indigenous plant for biodiversity & desertification control.
7. Reclaim saline soil, saline surface and ground water.

For further details, please go through the Environmental Management and Mitigation Plan of the Main Environmental Assessment (EA) report..
The Environmental Management & Monitoring Plan is also part of future development plan.

ECOLOGICAL & ENVIRONMENTAL STUDIES OF IDIP-II PROJECT
ENVIRONMENTAL ASSESSMENT (EA)
KAPAL SUB-REGIONS,ZHAMBULSKY RAYON

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ANNEX-K
Kapal Sub Regions
Zhambulsky Rayon

1. Summary of Kapal Environmental Assessment (EA)

The Environmental Assessment (EA) describes potential impacts of irrigation and drainage improvement and rehabilitation of 12,500 ha .

Kapal has total population of 11,871 of which 5894 are male and 5977 are female. The potential for water logging and secondary salinization will be managed by some vertical drainage , and with cleaned and deepened interfarm and on-farm collectors drains. Total number of in-farm canals in the project area is not known.

The soil information is not available . But from the site visit of Environmental Specialist soils is derived from typical Steppe Grey Sierozem Soils. The surface soil (0-30 cm) is grey loam which forms very hard clod, as if slaked by carbonates. The soil of the Kapal Sub-project are formed on quaternary deposits with layers of grain size, from sand to clay. Soil formation has occurred recently under the influence of ground water resulting from irrigation.. All the project area, except settlement is used for agriculture or cattle breeding.

The extent of salinity (Table 1), the 70 % are non saline(<1gm / l) , and 30 % are moderately saline (Table 1, 1-3 gm /l). Further, they are slightly polluted with pesticide and herbicides.
The depth to ground water , 34 % are less than 2 meter depth , 37% are between 2- 5 meter and 29 % are more than 5 meter depth.
Impact Assessment:
The effect of IDIP-II on natural and social resources can be described as follows. Under the IDIP-II an area of 5000 ha has been outlined for feasibility study. As proposed, after leaching the lands will be returned to intensive farming. With drainage rehabilitation, changes in land use are expected. The impact assessment has been simplified into three main components: (1) Project design (2) Project construction and (3)Project Operation. Out of 7 project related activities, no adverse environmental impacts are expected.

If irrigation and drainage systems are not rehabilitated, the existing infrastructure will become further degraded, and agricultural will become more waterlogged and saline. The land would turn into more desert condition.

Most of the potential impacts are effectively mitigated. The environmental impacts related to project design, construction and operation will not affect the environment. Project documentation will be prepared on:

1. Regulation for closed vertical bore holes and destroyed horizontal canals to avoid contamination of ground water for village water use.
2. Regulation forbidding persistent chemical weed and pest killers.

3. Environmental sustainability and bio-diversity preservation for the IDIP

The consultant proposes that the Committee of Water Resources (CWR) and Ministry of Environment and Biological Resources (MOEB) will be responsible for project development and will manage environmental programs. To do so , a small amount of Rayon and WUA will be trained in water and soil salinity monitoring with equipments and procedures. One or more short courses for professional development will be organized in project institutions.

A monitoring program will be formulated to avoid any unforeseen negative environmental effects when implementing the Kapal PMC, IDIP –II project. This is required to guarantee efficiency of the mitigation measures and a monitoring program is very much required. Please refer to “Monitoring Plan “ of Kapal PMC (Table 6.) and main object of the monitoring plan are as follows:

- Regular soil sampling for chemical analysis, weed and pest , and for fertilizers.
- Regular surface, ground and drainage water sampling inside the irrigation and drainage project (IDIP-II) for chemical analysis, weed and pests , and fertilizers. Depending on the initial results of the monitoring the space and intensity of analysis could be increased or decreased..
- The fodder crops, animal tissues and milk should be analyzed for pesticides. Depending on the results , the analysis could be continued or discontinued.

The total monitoring cost for 5000 ha of Kapal is about $ US 45,500 (Table 7). If we spread the cost to the whole area it comes to about $9.0 per hectors. It is worth to spend that money on monitoring

The findings and recommendations for an Environmental Impact Assessment (EIA).
As we have seen from the document there are no negative environmental impacts due to IDIP-II project formulation, design , implementation , and operation . The only negative impacts identified are transitory ones and can be mitigated during construction and operation. All other impacts for Kapal are positive.

ANNEX –K
KAPAL I & D System In Zhambulsky Rayon
ZHAMBUL OBLAST

2. Brief Description and Sub Project Location

The irrigation plan are made for three rural districts such as Burylsky, Saztereksky and Kontereksky. The source of irrigation water is the inter farm canals "Utemis". The "Utemis" is carried from the left Bank by main canal and that one takes water from Talas River. The location of the Sub Regions is presented on location map with no. Z-K-1 or Figure 1.

The carrying capacity of Utemis canal in the head 7,0 $m^{3/}$s, the canal is earth canal, the length is 35,3 km, EF of canal factual is 0.5.
All the irrigation network are open type and mainly laid as earth canal. The canals were built 50-60 years ago and no blue prints were kept. The land part of canal are constantly overgrown with rush and sedge, and have deformed bed. Inside slopes are exposed to side wash and banks are eroded. The vegetation inside the canal have not been cleaned for the last 20 years. The present flumes network are 60-70 % damaged
Many reinforced concrete construction structures are destroyed, deformed. The water gates to the temporary sprinkler and elevators are not in working condition. The collectors do not work and for long time they have stopped working and overgrown with rush and sedge.

The soil of the area derived from typical steppe grey sierozem soils. In the Sub Project area , surface soil (0-30 cm) is grey loam which forms very hard clods from silty clay texture. The major variation in soil properties across the Kapal I & D system would have resulted from differing levels of water table , as result of inadequate drainage of irrigation water , and subsequent development of secondary salinity.
The temperature sum available for crop growth (degree-days), with a base temperature of 10^0 C, is 3600- 3700 ^{0}d. This permits growth of crops like cereals , sugar beet, potato, vegetables , melons and fruit trees, provided irrigation is available. Most rainfall comes in the spring period , March to May, with 80 -190 mm falling during the crop growing period when mean daily temperatures exceed to 10 ^{0}C. The frost free period lasts around 161 days. In winters , there is usually a 15-30 cm blanket of snow.

The present land use are winter wheat – Barley / Sun flower –Saffflor, / Onion – Carrots-Tomatoes. There are no shortage of irrigation water for vegetables

The present day drinking water is saline. The source is surface water within 5 meters. The source has been changed to 200 meters and the drinking water is no more saline.
The city of Taraz collects its waste water in a reservoir near the city center of Zhambul Rayon . This is big environmental problem for the population of Zhambul Rayon. The waste water reservoir is an environmental hazard and may cause surface and ground water pollution in the Zhambul Rayon area. A treatment plant is under way for the waste water reservoir so that this waste water can be used for irrigation and other purposes.

Out of 5000 ha , about 70 % of the area are non saline (< 1gm /l), and 30 % of the area are moderately saline (1-3 gm of salt / lit). The Zhambul area has almost no waterlogging (Table 2).

Table 1 : **Extent of Salinity in Almaty and Zhambul**

Target oblast	Target Sub-projects	Total Area, thousands of ha	None Saline 1 gm/l, % of Total Area	Modeterately Salinity, 1-3 gm/l, % of Total Area	Highly Saline 3-10 gm/l, % Total Area	Very Highly Saline, > 10 gm/l , % of Total Area
Zhambyl oblast	Baizaksky rayon	5000	-	64.7	35.3	-
	Shuysky rayon	5000	32.5	67.5	-	-
	Zhambylsky rayon	5000	70.0	30.0	-	-
	Kordaysky rayon	5000	75.0	25.0	-	-
	Merkensky rayon	5000	67.0	20.0	13.0	-
Almatynskya oblast	Karatalsky irrigation system	5000	85.39	12.68	1	0.93
	Akdalinsky irrigation system	5000	89	11	-	-
	Malaisarynsky irrigation system	2500	45.1	36	18.9	-
	Enbekshy Kazakhsky rayon	12500	62	25	13	-

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

Table 2 : Extent of Water Table Depth within Almaty and Zhambul

Sub-project	Oblast	Rayon	Total Area, ha	The Depth of Ground Water Table <2m, as % of Total Area	The Depth of Ground Water Table from 2 m to 5 m, as % of Total Area	The Depth of Ground Water Table > 5 m, as % of Total Area
1	Zhambul oblast	Baizaksky rayon	5000	82.5	17.5	-
2		Shuysky rayon	5000	18.0	72.0	-
3		Zhambylsky rayon	5000	34.0	37.0	29.0
4		Kordaysky rayon	5000	13.0	70.0	17.0
5		Merkensky rayon	5000	20.0	80.0	-
6	Almaty oblast	Karatalsky irrigation system	5000	21.94	78.06	-
7		Akdalinsky irrigation system	5000	44	56	-
8		Malaisarynsky irrigation system	2500	2500	33	67
9		Enbekshy Kazakhsky rayon	12500	12500	45.91	54.09

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

3. Potential Environmental Impact

This section will determine and distinguish between significant positive and negative impacts, direct and indirect impacts , immediate and long term impacts. This will also identify unavoidable or irreversible impacts.
For further information and explanation on this subject , please refer to Environmental Assessment Main Report.

Table 3 : Environmental Impacts by Sub-Project Related Activities

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project Karatal I&D System			
1.Rehabilitation & Construction of Irrigation & drainage network and associated infrastructure	No (+)	Yes (-)	No (+)
2. Improved Agronomic Practices	No (+)	No (+)	No (+)
3. Improved Soil and Land Improvement / Reclamation		No (+)	No (+)
4. Crop Rotation & Improved Agricultural Practices (IAP)	No (+)	No (+) No (+)	No (+) No (+)
5. Integrated Pest Management and Fertilizer Application	No (+)	No (+)	No (+)
6.Bio-drainage & Reforestation	No (+)	No (+)	No (+)
7. Improved WUA Management	No (+)	No (+)	No (+)

D = Project design ; C= Project construction and O= Project Operation
No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures), (+) Positive effect (No Adverse Impact) and (-) negative effect and to be addressed by mitigation.

4. Environmental Management

4.1 Impacts Related to Design

The design of Irrigation and drainage system for Kapal is not expected to produce negative impacts on the South Kazakhstan Oblast irrigation and drainage rehabilitation part. The design/ construction of new drains and rehabilitation of existing drains will not increase the amount of salt and agricultural chemicals entering natural waterways.
According to Table 4 (EA Main Report) salinity within Kapal 94% of the area are moderately to highly saline (1-<10gm/l), For the whole area(100%) , depth of ground water (Table 5 EA Main Report) are beyond 2 to 5 meters.
This is for the reason:

- The salinity content of the 70% of the Sub-project area drains are non saline (Table 1, 1 gm/l) and the rest 30 % are moderately saline (1-3 gm / l, Table 1).
- The quantity of water carried by the drains are low when compared to the discharge of the Kapal River.

Land Resources
As proposed in the plan , 5000 ha has been selected for feasibility study. The objective is to rehabilitate reliable irrigation supplies, for moderate to high saline soils, where substantial improvement of land productivity can be achieved with relatively low investment. As a result of drainage improvement, minor changes in land use are expected.
Further description of soils is provided by Soil Expert in the Mid Term Report.

Water Resources
Some canal will be lined and there will be improvement in water supply to irrigated lands. Salt content (mineralization) in the drainage water will be kept within limits of 1 to 3 gm /l. After mixing the drainage water with irrigated surface water (1.5 -2.0 g/l), they can be used as irrigation water. For further details please consult engineering report.

4.1.1 Bio-drainage and Salinity Control

Many drainage system are dysfunctional and another option particularly on moderate to high saline land (Table 1) would be to introduce bio-drainage techniques to control soil salinity and water table levels by using especially established plantation of trees, bushes, grasses and crops.

Tree Belts

The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage , decreasing ground water levels and helping to tackle the problem of secondary salinity and waterlogging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent % . As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions.

a) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt , high saline soil may be leached with fresh water before planting 1-2 year old sapling.

b) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant , has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

c) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

d) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

- Alkali grass (*Puccinellia airoides)*
- Desert Saltgrass (*Distichlis stricta)*
- Wildrye (*Elymus spp)*
- Bermuda grass (*Cynodon dactylon)*
- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main, on farm and inter-farm canals.

Establish Compost / Bio-gas sites

In design phase, establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.

Table 3 gives a list of indigenous trees and bushes that can be used in planning tree lines and fence lines around farms, pump houses and irrigation canals. They should be chosen with experience and knowledge.

Table 4: List of Indigenous Trees and Bushes for IDIP-II

Trees	Bushes
1. Apricot - Armenica vulgaris Lam 2. Cherry-plum - Prunus divaricata Ledeb 3. Asian sumac - Ailanthus altissima 4. Birch - Bertula pendula Roth 5. Siberian elm - Ulmus pumila L. 6. Elm - Ulmus laevis Pall. 7. Common Pear - Pyrus communis 8. Tatarian maple -Acer tataricum 9. Ash-leaved maple - Acer negundo 10. Larch Siberian - Larix sibirica Ledeb. 11. Bastard acacia - Robinia pseudoacacia L. 12. White saxaul - Haloxylon persicum Bunge 13. Black saxaul - Haloxylon aphyllum (Minkw.) Iljin 14. Pine Crimean -Pinus pallasiana D.Don. 15. Archangel fir -Pinus sylvestris L. 16. White poplar - Populus alba L. 17. Poplar balsamic - Populus balsamifera 18. Bay leaf poplar - Populus laurifolia Ledeb. 19.Poplar diversifolious- Populus diversifolia Schrenk 20. Poplar Siberian - Populus barsamifera L. (var. sibirica) 21. Black poplar - Populus nigra L. 22. White mulberry - Morus alba L. 23. Siberian apple - Malus pallasiana Jus.	24. Siberian pea shrub - Caragana arborescens Lam. 25. Redhaw hawthorn - Crataegus sanguinea Pall. **26. – Calligonum aphyllum Gurke.** **27. – Calligonum microcurpum Borszcz** **28. – Calligonum caput-medusae Schrenk.** **29. – Calligonum serosum (Litv.) Litv.** 30. Tatar honeysuckle - Lonicera tatarica L. 31. Violet willow - Salix daphnoides Vill. 32. Caspian willow - Salix caspica Pall **33. – Salix rubra Huds** 34. Mespilus rotundifolious - Amelanchier rotundifolia (Lat.) Dum./Cours. 35. Russian olive - Elaeagnus angustifolia 36. Rotundifolious Juneberry - Amelanchier rotundifolia (lat.) Dum./Cours 37. Wig-tree - Cotinus coggygria Scop. 38. Golden currant - Ribes aureum Pursh. 39. French tamarisk -Tamarix ramosissima Ledeb. 40. Loose tamarisk -Tamarix lara Willd 41. Coniferous ephedra - Ephedra distachy L. 42. Paletskiy Saltwort - Salsola paletskiana litv. 43. Rihter Saltwort - Salsola richteri (Moq.) Kar. Ex. Litv. 44. Glasswort - Aellenia subaphylla (C. A. Mey) Aell.

4.1.2 Crop Rotation

This is a sequence in which crops are grown on the same piece of land over a number of years-
Used to be important for:

- The maintenance of soil fertility
- The prevention of a build up of soil borne diseases, pests and weeds;
- The control of erosion

Nowadays , technical innovations, such as use of fertilizers , pesticide and herbicides , have reduced the necessity of crop rotation. However, there are number of serious soil borne disease and nematode infections the control of which requires a sound rotation program . Thus , alfalfa, rice , wheat and others are planted with a 5-6 year interval.

Some general rules relating to crop rotation are :

- The continuous growing of cereals or pulses should be avoided
- Leguminous crops should not be sown in sequence , even one crop is seed and other for forage;
- Crops with common root diseases should not be sown in succession. For instances , tobacco should not be planted following tomatoes.

4.1.3 Other Impacts

Other possible environmental impacts would include:

(1) Dust generation caused by certain construction operation such as excavation, which ca be mitigated by wetting excavation sites and other sources of dust to control its emission , and public information.
(2) Noise generation which can be mitigated by use of properly maintained equipment and public information, and
(3) Land use conflicts caused by temporary use of land for temporary facilities for construction contractors (accommodation, camp canteen, camp facilities , medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction.

Projects may face other possible impacts such as (1) dust generation caused by certain
construction operation , such as excavation, which can be mitigated by wetting excavation sites and other sources of dust control its emission, and public information. (2) noise generation which can be mitigated by use of properly maintained equipment and public information; and (3) land use

conflict caused by temporary use of land for temporary facilities for construction contractors (accommodation , camp canteen, camp facilities, medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction. Planning "Buffer Zones" in irrigation Canals and drains, specified Government Regulation has to be followed as follows:

Table 5: Government Regulations- Buffer Zones (Irrigation Canals and Drains)

Capacity of Irrigation Canals (m^3 / sec)	Width of the Inner Buffer Zones for inspection Roads and Deposit Sediment from Canal (m)	Width of the Outer Buffer Zone for Vegetation and limited Agriculture (m)
1	6	
5	10	
25	20	
50	75	
100 or more	100	

Collector Drains Buffer Zones- Provided by CWR and MOA- (both sides of the Collector Drain)

10	5m for inspection road and 10-20 m for spoil 10-20 m for agricultural traffic & field drains
10-20	100 meters (either side of the collector)
21-50	200 meters (either siude of the collector)
.50	300 meters (either side of the collector)

Source: MOA, Republic of Uzbekistan
This regulation should be strictly enforced on IDIP-II Projects.

4.2 Environmental Impacts Related to Construction

Reconstruction of the Kapal , sections of the project , joining collector with discharging drainage water into primary , secondary and tertiary canals. All open collector and drains will be cleaned and deepened. After the proper design , the project will be open for construction and operation. This will result in the following conditions:

1)Temporary increase in silt

To mitigate this, provisions are there in the standard contract document supplied to contractor for adequate supervision of operations and adherence only, use of silt traps and careful deposition of spoils.
The incorporation of the above measures will have to be placed into BOQ for sub project contract documentations and supervision of contractors.

2)Temporary closure of irrigation system
Participation by Water User Association (WUA) and Farmers. The information are to be given through dialogue and community awareness campaign. Ask WUA and villagers for permission to close the irrigation system temporarily. They are very important that WUA and farmers involved in all aspect of civil works.

3) Disposal of Excavated spoil from main and inter-farm drains.
Excavated soil (spoil) will be deposited alongside the drain in accordance with the guideline laid down by GOK/ MOEB with respect to easement dimension.- either side of drain and /or canal. Spoil will be deposited and formed using bulldozer into trapezoidal formation.

4)Disposal of Excavated soil (spoil) from on- farm Drains and Canals.
Spoil will be deposited alongside canals and drains in accordance with WUA and farmer instructions. If required and instructed, the contractors may deposit spoil on farm fields at the expense of farmers.

5) Dust generation
The mitigation measures recommended is the appropriate timing of operations wetting of surfaces and notice to /involvement of public. The workers on construction sites should have international personal safety / protection equipment supplied by the contractor.

6. Noise Generation:
Mitigation measures:
Appropriate timing and operation of machine are to be discussed with the farmers and WUA. Notice will be given to public and WUA- farmers will be involved in timing and reduction of noise level in the project areas.

7. Waste Material :
Replacement and repair of the irrigation and drainage structure will result in waste material (concrete and steel). These are to be disposed of by the civil works contractor as per CWR / MOEB guidelines.

8. Land Use Conflict for Construction
The CWR , MOA and GOK assessed that there will be no land use conflict for construction. This also confirmed by the client, the CWR, and guarantee given by them to the World Bank. On farm negotiations would be made with WUA and the landowners. However, civil works only will be done by

participation agreement of land owners and WUA. The PMO / CWR should have the responsibility for dispute settlement.

9.Construction of Camp Sites and Living Facilities
Establishment and construction of camp sites, and Living facilities for the construction workers have to be established prior to construction work. An acceptable sanitary facility has to be established for the workers. This must satisfy environmental regulation and MOEB code.
The camp site has to be cleaned and returned to the original state before the construction.
Refuge should be properly collected and disposed off.

Mitigation measures are to be:
1)CWR & MOA agrees to allocate free sites for the construction of camp sites and living facilities. This has to be negotiated with the client and the local authorities. Construction of camp sites and living facilities will be funded by the contractor. Clean up costs for these facilities will be borne by the contractor.

10. Biodiversity Conservation / Sustainability
Environmental Sustainability of the project area is very low. To improve this situation following steps will be taken:
(1) Organize nursery at every sub-regions and WUA. Provide free extension service ,input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pump location, main , on farm and inter-farm canals.
(2) Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to be considered.

4.3 Environmental Impacts related to Operation

1) Soil modification as a result of intensified agriculture
The mitigation required
a) Encouragement of continued use of traditional management of water flows
b)The use of deep rooting grasses and shrubs to further strengthen the bunds
c) Minimum / zero tillage practices

2)Soil and water contamination due to increased use of agrochemicals including fertilizer and pesticides.

The mitigation required

a)Mitigation required are agricultural extension services and Integrated pest management (IPM).

The agricultural extension service would include

a)Optimum , informed use of mineral fertilizer
b)Promotion of integrated pest management (IPM)
c) Discouragement on the use of persistent pesticide and herbicide.
d) Training on composting, reforestation, minimum or zero-tillage.
e) Biodiversity associated with introduced new plant species and varieties .
Promote Biodiversity for introduced crops and land use changes from protecting soil from wind by tree fencing and other environmental management practices.

(3) Environmental Sustainability & Bio-diversity Concerns.

Biological diversity refers to the variety of South Kazakhstan living biological resources. It is a function not simply of the number of ecosystem and distinct plants and animal species in existence at any given time, but also genetic differences within individual species.
Conservation of biological diversity is a form of natural resources management and should be practiced in Kapal IDS area. This can be done by reforestation activities of indigenous plants on vertical drainage sites, main and secondary canals, and other inter farm canals. A reforestation site plan will have to be prepared in IDIP-II (Phase B) design level.

5. Environmental Monitoring

Monitoring is necessary with respect to (i) water resources quality and quantity ; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance management, including inspection and proper repair of irrigation & drainage canals and structures.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources(CWR) , MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate to evaluate the success or failure of IDIP-II proposed project intervention in the Kapal IDS.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information . Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project , the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as :

1. Soil salinity and high ground water tables;
2. Water Quality & Salinity .
3. Reforestation, Bio-Diversity and Desertification.

The variables to be analyzed are described in Table 19 of the EA Main Report (page . It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15…...and for one water samples is about USD 10. Most of the project farmers interviewed that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient . Such sampling density for 220,000 ha over 2 year life of the project would be extremely expensive.

The other alternative is to sample the pilot area (6,907 ha in Mahtaaral area) fully and for other project areas , sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project.
During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

Table 6 : Monitoring Plan of Kapal

CALCULATION IS DONE FOR 5,000 Ha (Kapal, about $9.1 / ha.)

Parameters to be Monitored	Periodicity	Number of Samples				Cost of 1 analysis in $US	Total Cost in $US
		Total Number of Samples	Number of Indicators	Sum of Determination	Total/ yr		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 50	3	150	150	15	2,250 **4,500**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 67	5	3340		10	3,340 **6,680**
4. Water Quality							
4.a Ground Water Quality							
4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 5	1	5	50	10	500 **1000**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 5	15	75	1125	20	1,500 **3,000**
4.a.c Fertilizer	Annually	(1sample /1000 ha) 5	1	5	75	15	1,125 **2,250**
5.Pesticide residues in fish & fodder crops	Annually	2	20	40	40	20	800 **1600**
6.Reforestation , composting	Annually	1 $ Per /ha		$5000.0	$5,000.0	$1 Per Ha	**$5,000.0 (including yearly Maintenance)**

and Tree Belts(Bio-drainage & Salinity Control)							
7. Equipments for Rayons &WUAs	Annually 3 hand held GPS units, computer download, 3 Electrical Conductivity meters				1 unit (GPS & Electrical Conductivity meters $250.0 X12	$250.0 for one unit	**$3,000** (one time purchase)
						Grand Total	**$30,030 ***

Source: The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1996.

* this $30,030 is based on 1996 figure and upgraded to $45,500 to reflect 2007 values (30% inflation).

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M , it will be easier for them to take this additional responsibility . This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that Total US$45,500..(based on 10 years of inflation)... will be required to implement and maintain the Environmental Management and Monitoring Plan (EM & MP). There are three categories of inputs to the EMP . They are as follows in the Table 7.

1. Planning and Surveys and consultant assistance$ 5,940 (13.13%)
2. Mitigation Management $36,800 (81.24%)
3. Equipment & Training $ 2,800 (5.63 %)

Table 7: Estimated Budget for Environmental Management Plan (EMP - Kapal)

Item	Qty	Unit Cost	Total Cost US$
Capital Cost-Equipments for Rayons			
GPS units (handheld), Computer download	3	250	7,50.0
Electrical Conductivity Meters(24 Rural Districts)	3	250	7,50.0
Capital Cost- Equipment for WUA			
GPS units (Hand Held),computer download	3	250	7,50.0
Electrical Conductivity Meters(17 Rural Consumer Cooperatives of Water User RCCWU)	3	250	7,50.0
Recurrent Costs			
Support to PMO for Baseline Survey	1 each	3,000	3,000
Support to PMO for M&E activities over 2 years	Lumpsum	5,000	5,000
Analysis for soil and water samples for 2	2 Yearly	19030	19,030

years by CWR &MOG			
Support for reforestation & biodiversity by CF	Lumpsum	5,000	5,000
Total			35,030

Note : Total $ 35,000 (round figure) is based on 1996 values. and adjusted to 2007 inflation figures (X30%), which makes it (35,000X30%) $10,500 +35,000= **$45,500**

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out. The suggested report systems for environmental monitoring programs are made on the following consideration:

1. Monthly report from the Contractor

Contractors should regularly monitor the environmental –related issues and Environmental parameters based on the guidance from Environmental Management Specialist and requirements from Rayon Inspector. They should provide a monthly Report covering performance of environmental monitoring and progress of environmental related activities.

2. Monthly Environmental Management Report

   The requirement of Environmental Management Specialist is to produce a monthly performance report of environmental monitoring , summarizing the environmental monitoring of sub-projects and other related environmental problems.

3. Environmental Monitoring Report

   The Rayon office laboratories of IDIP-II need to submit PMO thematic monitoring report on the changes in salinity, changes in water use, changes in soil productivity, including baseline soil surveys and subsequent periodic surveys, as well as proposed suggestions for actions to solve key environmental problems if any (semi-annual monitoring and annual monitoring report).

4. Semi-Annual PMO Report

   Every half year, PMO needs to compile a quarterly environmental working report, summarizing the progress of EMP implementation , and monitoring status. The report from IDIP-II project and the Environmental Management Specialist should be attached to PMO report. This report may be integrated into “The Progress Report” and sent to WB for review. The copies may be sent to Oblast Office for reference.

6. FINDINGS AND RECOMMENDATIONS

6.1 The Need for an Environmental Impact Assessment (EIA)

This section evaluates the need for an Environmental Impact Studies (EIA). This should be based on the fact whether significant environmental impacts exist and that need a further detailed study or EIA.

As per as we have seen there are no negative environmental impacts due to IDIP-I proposed project formulation , design, implementation , and operation. The only negative impacts identified are transitory ones (can be mitigated) associated with construction operations. All other impacts for Kapal are positive. The required mitigation are presented in sections and 7.4.

The recommendation from the findings of this Environmental Assessment (EA) are that a follow up EIA or further detailed environmental impact study (EIA) study is not needed.

6.2 Potential Environmental Impacts, Possible Mitigation Measures and Responsible Agencies

The environmental monitoring program will be part of an integrated project monitoring program which will be established by the PMO. The PMO and the “Project Implementation Unit” (PIU) offices at Project area oblast will be responsible for implementing all environmental mitigation measures. Table …… presents all relevant issues with respect to the potential environmental impacts and the possible monitoring and mitigation enhancement measures. The table also lists those agencies who are responsible and also lists agencies which should have an involvement in the monitoring program and an input to the development and planning of the mitigation measures.

6.3 Environmental Assessment Requirement of MOEB

The Government of Kazakhstan (GOK) requirement is to present this Environmental Assessment (EA) report to MOEB. The instruction by MOEB call for report in which available data on the resources likely to be affected by IDIP-II are to be analyzed in terms of scope and intensity. An Environmental Assessment (EA) report are to be prepared by proponent (CWR) and should be included with the feasibility report and submitted for approval. This report provides a brief description of ecological and social sources , and trends in agriculture. Natural resources that are sensitive to change should be identified along with potential environmental problems. This report should be given a public review and then presented to the Ministry of Ecological and Biological Resources (MOEB). The MOEB reviews the EA and its comments (State Ecological Expertise) and forwarded to the concerned sections for approval.

The World Bank 4.01 “Environmental Assessment” has screened the IDIP-II Project and placed it in EA category “B”, which means the preparation of an environmental analysis to define environmental management , monitoring and mitigation measures as necessary. The recommended mitigation measures in the State Ecological Expertise (SEE) review would become an integral part of integral part of project design and implementation. The archeological sites would be protected with the guideline and requirement of Kazakhstan law and acceptable to the World Bank. The assurance was also obtained from Kazakh Government about the use of agrochemicals for IDIP-II would be approved ,stored and distributed and used in accordance with the guidelines and requirements of Kazakhstan Government acceptable to the World Bank (WB).

6.4 CONCLUSION

For Kapal IDS Sub- project an Environmental Impact Assessment (EIA) is not necessary. However, the appointment of a local / domestic Environmental Management Specialist to assist with the implementation of the Environmental Management / Monitoring Program and train WUA staff is considered very important task for the success of the Environmental Management and Monitoring Plan (EMP). A term of reference (TOR) for the Environmental Management Specialist (EMP) is prepared in the Annex T.

7. FUTURE DEVELOPMENT PLAN

The future environmental management and monitoring plan will mitigate the following:

1. Monitoring crop rotation for 6 years
2. Monitoring of surface and Ground Water for water quality (salinity & pesticide).
3. Water table depth
4. Drainage water for salinity , pesticide & fertilizers
5. Pesticide residues in fish , animal tissue and fodder crops
6. Reforestation of indigenous plant for biodiversity & desertification control.
7. Reclaim saline soil, saline surface and ground water.

For further details, please go through the Environmental Management and Mitigation Plan of the Main Environmental Assessment (EA) report..
The Environmental Management & Monitoring Plan is also part of future development plan.

ECOLOGICAL & ENVIRONMENTAL STUDIES OF IDIP-II PROJECT
ENVIRONMENTAL ASSESSMENT (EA)
BIG SHU CANAL,MERKENSKY RAYON

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ANNEX-K
Big Shu Canal Sub Regions
Merkensky Rayon

1. Summary of Big Shu Canal Environmental Assessment (EA)

The Environmental Assessment (EA) describes potential impacts of irrigation and drainage improvement and rehabilitation of 5000 ha .

Big Shu Canal has total population of 29,899 of which 14,569 are male and 15,330 are female. The potential for water logging and secondary salinization will be managed by some vertical drainage , and with cleaned and deepened interfarm and on-farm collectors drains. Total number of in-farm canals in the project area are not known.

The soil information is not available . But from the site visit of Environmental Specialist soils is derived from typical Steppe Grey Sierozem Soils. Any major variation in soil properties across the project area would be result of differing levels of water table , due to inadequate drainage of irrigation water, and consequent development of secondary salinity. And Salinity map for the sub project is not yet available.. All the project area, except settlement is used for agriculture or cattle breeding.

The extent of salinity (Table 1), the 67 % are non saline(<1gm / l) , 20 % are moderately saline (Table 1, 1-3 gm /l) and 13% are highly saline . Further, they are slightly polluted with pesticide and herbicides.
The depth to ground water , 20 % are less than 2 meter depth and 80% are between 2- 5 meter depth (Table 2).

Impact Assessment:
The effect of IDIP-II on natural and social resources can be described as follows. Under the IDIP-II an area of 5000 ha has been outlined for feasibility study. As proposed, after leaching the lands will be returned to intensive farming. With drainage rehabilitation ,changes in land use are expected. The impact assessment has been simplified into three main components: (1) Project design (2) Project construction and (3)Project Operation. Out of 7 project related activities, no adverse environmental impacts are expected.

If irrigation and drainage systems are not rehabilitated , the existing infrastructure will become further degraded, and agricultural will become more waterlogged and saline. The land would turn into more desert condition.

Most of the potential impacts are effectively mitigated. The environmental impacts related to project design, construction and operation will not affect the environment. Project documentation will be prepared on :

1. Regulation for closed vertical bore holes and destroyed horizontal canals to avoid contamination of ground water for village water use.

2. Regulation forbidding persistent chemical weed and pest killers.
3. Environmental sustainability and bio-diversity preservation for the IDIP

The consultant proposes that the Committee of Water Resources (CWR) and Ministry of Environment and Biological Resources (MOEB) will be responsible for project development and will manage environmental programs. To do so , a small amount of Rayon and WUA will be trained in water and soil salinity monitoring with equipments and procedures. One or more short courses for professional development will be organized in project institutions.

A monitoring program will be formulated to avoid any unforeseen negative environmental effects when implementing the Big Shu Canal, IDIP –II project. This is required to guarantee efficiency of the mitigation measures and a monitoring program is very much required. Please refer to “Monitoring Plan “ of Kapal PMC (Table 6.) and main object of the monitoring plan are as follows:

- Regular soil sampling for chemical analysis, weed and pest , and for fertilizers.
- Regular surface, ground and drainage water sampling inside the irrigation and drainage project (IDIP-II) for chemical analysis, weed and pests , and fertilizers. Depending on the initial results of the monitoring the space and intensity of analysis could be increased or decreased..
- The fodder crops, animal tissues and milk should be analyzed for pesticides. Depending on the results , the analysis could be continued or discontinued.

The total monitoring cost for 5000 ha of Big Shu Canal Sub-regions is about $ US 45,500 (Table 7). If we spread the cost to the whole area it comes to about $9.0 per hectors. It is worth to spend that money on monitoring

The findings and recommendations for an Environmental Impact Assessment (EIA).
As we have seen from the document there are no negative environmental impacts due to IDIP-II project formulation, design , implementation , and operation . The only negative impacts identified are transitory ones and can be mitigated during construction and operation. All other impacts for Big Shu Canal are positive.

ANNEX –L
Big Shu Canal Sub – Region
Merkensky Rayon
ZHAMBUL OBLAST

2.Brief General Description and Location

The location of the Big Shu Canal Sub Project is indicated in Figure 1 or Sub Project area Map Z-BCK-1. The command area of Big Shu Canal is only 5000 ha and includes the following okrugs (Rural Sub Districts)

The climate is very similar to that at Tasotkel Dam PMK. The Temperature sum available for crop growth (degree days) , with a base temperature of 10 ^{0}C, is 3600-3700 ^{0} d. This permits growth of crops like cereals, sugar beet, potato, vegetables , melons and fruit trees , provided irrigation is available. Precipitation is of about the order received at Makhtaaral , but more than at Kyzyl-Orda . Most rainfall comes in the spring period, March to May , with 80-190 mm falling during the crop growing period when mean daily temperature exceed 10 ^{0}C. The frost free period lasts around 161 days . In winters , there is usually a 15-30 cm blanket of snow over the ground.

Big Shu River starts on the territory of the Republic of Kyrgyzstan from the river junction of Kochkor and Zhuanaryk . The Shu River starts to overflow its bank and further disappears in the sands of Southern Kazahkhstan desert. The total length of Shu River is 1186 km. The recharge of Shu River is from icy-snow mountains. The maximum flow is in July and the minimum flow is in January.

Soil description of the Sub Projec site is not available but, as observed by International Environmentalist on site visits, the soil of the area is derived from typical steppe grey sierozem soils. Any major variation in soil properties across the project area would be a result of differing levels of water table, due to inadequate drainage and irrigation water, and consequent development of secondary salinity. Some areas at this site have been lost to salinity and waterlogging but a salinity map for the project area is not yet available.

The current land use and the main crops grown at this location are grains and vegetables , but there is desire to return to sugar beet production.
The constraints to agriculture production are as follows :

- The state of disrepair of irrigation and drainage system and unleveled condition of the land prevent timely and precise delivery of required amounts of irrigation water to crops. A non functioning drainage system causes water tables to rise and thus induce secondary salinity.
- Optimum levels of fertilizer needed are not known for common crops .

- Limitation due to pests , diseases, and weeds are inevitable , but use of agro-chemicals for their management is minimal.
- Modern seed varieties are not available.
- Economic imperatives will drive cropping patterns . But a sustainable , long term cropping pattern may not be followed.

Out of 5000 ha , about 67 % of the area are non saline (< 1gm /l), and 33 % of the area are moderately to highly saline (1-10 gm of salt / lit., Table 1). The Big Shu Canal area has no waterlogging and ground water are more than 2- 5 meter depth (80 %) and 20% are within 2 meter depth(Table 2) .

Table 1 : **Extent of Salinity in Almaty and Zhambul**

Target oblast	Target Sub-projects	Total Area, thousands of ha	None Saline1 gm/l, % of Total Area	Mode rately Salinity, 1-3 gm/l, % of Total Area	Highly Saline 3-10 gm/l, % Total Area	Very Highly Saline, > 10 gm/l , % of Total Area
Zhambyl oblast	Baizaksky rayon	5000	-	64.7	35.3	-
	Shuysky rayon	5000	32.5	67.5	-	-
	Zhambylsky rayon	5000	70.0	30.0	-	-
	Kordaysky rayon	5000	75.0	25.0	-	-
	Merkensky rayon	5000	67.0	20.0	13.0	-
Alamtynskya oblast						
	Karatalsky irrigation system	5000	85.39	12.68	1	0.93
	Akdalinsky irrigation system	5000	89	11	-	-
	Malaisarynsky irrigation system	2500	45.1	36	18.9	-
	Enbekshy Kazakhsky rayon	12500	62	25	13	-

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

Table 2: Extent of Water Table Depth within Almaty and Zhambul

Sub-project	Oblast	Rayon	Total Area, ha	The Depth of Ground Water Table <2m, as % of Total Area	The Depth of Ground Water Table from 2 m to 5 m, as % of Total Area	The Depth of Ground Water Table > 5 m, as % of Total Area
1	Zhambul oblast	Baizaksky rayon	5000	82.5	17.5	-
2		Shuysky rayon	5000	18.0	72.0	-
3		Zhambylsky rayon	5000	34.0	37.0	29.0
4		Kordaysky rayon	5000	13.0	70.0	17.0
5		Merkensky rayon	5000	20.0	80.0	-
6	Almaty oblast	Karatalsky irrigation system	5000	21.94	78.06	-
7		Akdalinsky irrigation system	5000	44	56	-
8		Malaisarynsky irrigation system	2500		33	67
9		Enbekshy Kazakhsky rayon	12500		45.91	54.09

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

3. Potential Environmental Impact

This section will determine and distinguish between significant positive and negative impacts, direct and indirect impacts , immediate and long term impacts. This will also identify unavoidable or irreversible impacts.
For further information and explanation on this subject , please refer to Environmental Assessment Main Report.

For further information and explanation on this subject , please refer to Environmental Assessment Main Report.

Table 3 : Environmental Impacts by Sub-Project Related Activities

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project Karatal I&D System			
1.Rehabilitation & Construction of Irrigation & drainage network and associated infrastructure	No (+)	Yes (-)	No (+)
2. Improved Agronomic Practices	No (+)	No (+)	No (+)
3. Improved Soil and Land Improvement / Reclamation	No (+)	No (+)	No (+)
4. Crop Rotation & Improved Agricultural Practices (IAP)	No (+)	No (+)	No (+)
5. Integrated Pest Management and Fertilizer Application	No (+)	No (+)	No (+)
6.Bio-drainage & Reforestation	No (+)	No (+)	No (+)
7. Improved WUA Management	No (+)	No (+)	No (+)

D = Project design ; C= Project construction and O= Project Operation
No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures), (+) Positive effect (No Adverse Impact) and (-) negative effect and to be addressed by mitigation.

4. Environmental Management

4.1 Impacts Related to Design

The design of Irrigation and drainage system for Big Shu Canal of Zhambul Oblast is not expected to produce negative impacts on the Oblast irrigation and drainage rehabilitation project. The design/ construction of new drains and rehabilitation of existing drains will not increase the amount of salt and agricultural chemicals entering natural waterways.
According to Table 1 , about 67 % within Big Shu Canal area are non saline (< 1 gm / l), and about 33 % are moderately to highly saline (1-<10gm/l), For the 80% of the area , depth of ground water (Table 2) are beyond 2 to 5 meters and for the rest 20 % the ground water is within 2 meters.
This is for the reason:

- The salinity content of the 100% of the project drains are between 1-<10 gm/l (Table 1).
- The quantity of water carried by the drains are low when compared to the discharge of the Big Shu Canal.

Land Resources
As proposed in the plan , 5000 ha has been selected for feasibility study. The objective is to rehabilitate reliable irrigation supplies, for moderate to high saline soils, where substantial improvement of land productivity can be achieved with relatively low investment.   As a result of drainage improvement, minor changes in land use are expected.

Water Resources
Some canal will be lined and there will be improvement in water supply to irrigated lands. Salt content (mineralization) in the drainage water will be kept within limits of 1 to 3 gm /l. After mixing the drainage water with irrigated surface water (1.5 -2.0 g/l), they can be used as irrigation water. For further details please consult engineering report.
Further description of soils is provided by Soil Expert in the Soil Report.

4.1.1 Bio-drainage and Salinity Control

Many drainage system are dysfunctional and another option particularly on moderate to high saline land (Table…1) would be to introduce bio-drainage techniques to control soil salinity and water table levels by using especially established plantation of trees, bushes, grasses and crops.

Tree Belts

The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage , decreasing ground water levels and helping to tackle the problem of secondary salinity and waterlogging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent % . As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions.

a) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt , high saline soil may be leached with fresh water before planting 1-2 year old sapling.

b) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant , has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

c) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

d) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

- Alkali grass (*Puccinellia airoides)*
- Desert Saltgrass (*Distichlis stricta)*
- Wildrye (*Elymus spp)*
- Bermuda grass (*Cynodon dactylon)*

- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main, on farm and inter-farm canals.

Establish Compost / Bio-gas sites

In design phase, establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.

Table 3 gives a list of indigenous trees and bushes that can be used in planning tree lines and fence lines around farms, pump houses and irrigation canals. They should be chosen with experience and knowledge.

Table 4: List of Indigenous Trees and Bushes for IDIP-II

Trees	Bushes
1. Apricot - Armenica vulgaris Lam	24. Siberian pea shrub - Caragana arborescens Lam.
2. Cherry-plum - Prunus divaricata Ledeb	25. Redhaw hawthorn - Crataegus sanguinea Pall.
3. Asian sumac - Ailanthus altissima	**26. – Calligonum aphyllum Gurke.**
4. Birch - Bertula pendula Roth	**27. – Calligonum microcurpum Borszcz**
5. Siberian elm - Ulmus pumila L.	**28. – Calligonum caput-medusae Schrenk.**
6. Elm - Ulmus laevis Pall.	**29. – Calligonum serosum (Litv.) Litv.**
7. Common Pear - Pyrus communis	30. Tatar honeysuckle - Lonicera tatarica L.
8. Tatarian maple -Acer tataricum	31. Violet willow - Salix daphnoides Vill.
9. Ash-leaved maple - Acer negundo	32. Caspian willow - Salix caspica Pall
10. Larch Siberian - Larix sibirica Ledeb.	**33. – Salix rubra Huds**
11. Bastard acacia - Robinia pseudoacacia L.	34. Mespilus rotundifolious - Amelanchier rotundifolia (Lat.) Dum./Cours.
12. White saxaul - Haloxylon persicum Bunge	35. Russian olive - Elaeagnus angustifolia
13. Black saxaul - Haloxylon aphyllum (Minkw.) Iljin	36. Rotundifolious Juneberry - Amelanchier rotundifolia (lat.) Dum./Cours
14. Pine Crimean -Pinus pallasiana D.Don.	37. Wig-tree - Cotinus coggygria Scop.
15. Archangel fir -Pinus sylvestris L.	38. Golden currant - Ribes aureum Pursh.
16. White poplar - Populus alba L.	39. French tamarisk -Tamarix ramosissima Ledeb.
17. Poplar balsamic - Populus balsamifera	40. Loose tamarisk -Tamarix lara Willd
18. Bay leaf poplar - Populus laurifolia Ledeb.	41. Coniferous ephedra - Ephedra distachy L.
19.Poplar diversifolious- Populus diversifolia Schrenk	42. Paletskiy Saltwort - Salsola paletskiana litv.
20. Poplar Siberian - Populus barsamifera L. (var. sibirica)	43. Rihter Saltwort - Salsola richteri (Moq.) Kar. Ex. Litv.
21. Black poplar - Populus nigra L.	44. Glasswort - Aellenia subaphylla (C. A. Mey) Aell.
22. White mulberry - Morus alba L.	
23. Siberian apple - Malus pallasiana Jus.	

4.1.2 Crop Rotation

This is a sequence in which crops are grown on the same piece of land over a number of years. The crop rotation practice should be used exclusively for Big Shu Canal in Merkensky Rayon.
The crop rotation is used to be important for:

- The maintenance of soil fertility
- The prevention of a build up of soil borne diseases, pests and weeds;
- The control of erosion

Nowadays , technical innovations, such as use of fertilizers , pesticide and herbicides , have reduced the necessity of crop rotation. However, there are number of serious soil borne disease and nematode infections the control of which requires a sound rotation program . Thus, alfalfa, rice , wheat and others are planted with a 5-6 year interval.

Some general rules relating to crop rotation are :

- The continuous growing of cereals or pulses should be avoided
- Leguminous crops should not be sown in sequence , even one crop is seed and other for forage;
- Crops with common root diseases should not be sown in succession. For instances , tobacco should not be planted following tomatoes.

4.1.3 Other Impacts

Other possible environmental impacts would include:

(1) Dust generation caused by certain construction operation such as excavation, which ca be mitigated by wetting excavation sites and other sources of dust to control its emission , and public information.
(2) Noise generation which can be mitigated by use of properly maintained equipment and public information, and
(3) Land use conflicts caused by temporary use of land for temporary facilities for construction contractors (accommodation, camp canteen, camp facilities , medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction.

Projects may face other possible impacts such as (1) dust generation caused by certain
construction operation , such as excavation, which can be mitigated by wetting excavation sites and other sources of dust control its emission, and

public information. (2) noise generation which can be mitigated by use of properly maintained equipment and public information; and (3) land use conflict caused by temporary use of land for temporary facilities for construction contractors (accommodation , camp canteen, camp facilities, medical centre, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction. Planning "Buffer Zones" in irrigation Canals and drains, specified Government Regulation has to be followed as follows:

Table 5 : Government Regulations- Buffer Zones (Irrigation Canals and Drains)

Capacity of Irrigation Canals (m^3 / sec)	Width of the Inner Buffer Zones for inspection Roads and Deposit Sediment from Canal (m)	Width of the Outer Buffer Zone for Vegetation and limited Agriculture (m)
1	6	
5	10	
25	20	
50	75	
100 or more	100	

Collector Drains Buffer Zones- Provided by CWR and MOA- (both sides of the Collector Drain)

10	5m for inspection road and 10-20 m for spoil 10-20 m for agricultural traffic & field drains
10-20	100 meters (either side of the collector)
21-50	200 meters (either siude of the collector)
.50	300 meters (either side of the collector)

Source: MOA, Republic of Uzbekistan

This regulation should be strictly enforced on IDIP-II Projects.

4.2 Environmental Impacts Related to Construction

Reconstruction of the Big Shu Canal Sub-project , sections of the project , joining collector with discharging drainage water into primary , secondary and tertiary canals. All open collector and drains will be cleaned and deepened. After the proper design , the project will be open for construction and operation. This will result in the following conditions:

1)Temporary increase in silt

To mitigate this, provisions are there in the standard contract document supplied to contractor for adequate supervision of operations and adherence only, use of silt traps and careful deposition of spoils.

The incorporation of the above measures will have to be placed into BOQ for sub project contract documentations and supervision of contractors.

2)Temporary closure of irrigation system

Participation by Water User Association (WUA) and Farmers. The information are to be given through dialogue and community awareness campaign. Ask WUA and villagers for permission to close the irrigation system temporarily. They are very important that WUA and farmers involved in all aspect of civil works.

3) Disposal of Excavated spoil from main and inter-farm drains.

Excavated soil (spoil) will be deposited alongside the drain in accordance with the guideline laid down by GOK/ MOEB with respect to easement dimension.- either side of drain and /or canal. Spoil will be deposited and formed using bulldozer into trapezoidal formation.

4)Disposal of Excavated soil (spoil) from on- farm Drains and Canals.

Spoil will be deposited alongside canals and drains in accordance with WUA and farmer instructions. If required and instructed, the contractors may deposit spoil on farm fields at the expense of farmers.

5) Dust generation

The mitigation measures recommended is the appropriate timing of operations wetting of surfaces and notice to /involvement of public. The workers on construction sites should have international personal safety / protection equipment supplied by the contractor.

6. Noise Generation:

Mitigation measures:

Appropriate timing and operation of machine are to be discussed with the farmers and WUA. Notice will be given to public and WUA- farmers will be involved in timing and reduction of noise level in the project areas.

7. Waste Material :

Replacement and repair of the irrigation and drainage structure will result in waste material (concrete and steel). These are to be disposed of by the civil works contractor as per CWR / MOEB guidelines.

8. Land Use Conflict for Construction
The CWR , MOA and GOK assessed that there will be no land use conflict for construction. This also confirmed by the client, the CWR, and guarantee given by them to the World Bank. On farm negotiations would be made with WUA and the landowners. However, civil works only will be done by participation agreement of land owners and WUA. The PMO / CWR should have the responsibility for dispute settlement.

9.Construction of Camp Sites and Living Facilities
Establishment and construction of camp sites, and Living facilities for the construction workers have to be established prior to construction work. An acceptable sanitary facility has to be established for the workers. This must satisfy environmental regulation and MOEB code.
The camp site has to be cleaned and returned to the original state before the construction.
Refuge should be properly collected and disposed off.

Mitigation measures are to be:
1)CWR & MOA agrees to allocate free sites for the construction of camp sites and living facilities. This has to be negotiated with the client and the local authorities. Construction of camp sites and living facilities will be funded by the contractor. Clean up costs for these facilities will be borne by the contractor.

10. Biodiversity Conservation / Sustainability
Environmental Sustainability of the project area is very low. To improve this situation following steps will be taken:
(1) Organize nursery at every sub-regions and WUA. Provide free extension service ,input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pump location, main , on farm and inter-farm canals.
(2) Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to be considered.

4.3 Environmental Impacts related to Operation

1) Soil modification as a result of intensified agriculture
The mitigation required
a) Encouragement of continued use of traditional management of water flows
b)The use of deep rooting grasses and shrubs to further strengthen the bunds
c) Minimum / zero tillage practices

2)Soil and water contamination due to increased use of agrochemicals including fertilizer and
pesticides.
The mitigation required
a)Mitigation required are agricultural extension services and Integrated pest management (IPM).
The agricultural extension service would include

a)Optimum , informed use of mineral fertilizer
b)Promotion of integrated pest management (IPM)
c) Discouragement on the use of persistent pesticide and herbicide.
d) Training on composting, reforestation, minimum or zero-tillage.
e) Biodiversity associated with introduced new plant species and varieties .
Promote Biodiversity for introduced crops and land use changes from protecting soil from wind by tree fencing and other environmental management practices.

(3) Environmental Sustainability & Bio-diversity Concerns.

Biological diversity refers to the variety of South Kazakhstan living biological resources. It is a function not simply of the number of ecosystem and distinct plants and animal species in existence at any given time, but also genetic differences within individual species.
Conservation of biological diversity is a form of natural resources management and should be practiced in Big Shu Canal area. This can be done by reforestation activities of indigenous plants on vertical drainage sites, main and secondary canals, and other inter farm canals. A reforestation site plan will have to be prepared in IDIP-II (Phase B) design level.

5. Environmental Monitoring

Monitoring is necessary with respect to (i) water resources quality and quantity ; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance management, including inspection and proper repair of irrigation & drainage canals and structures.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources(CWR) , MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate to evaluate the success or failure of IDIP-II proposed project intervention in the Big Shu Canal.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information . Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project , the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as :

1. Soil salinity and high ground water tables;
2. Water Quality & Salinity .
3. Reforestation, Bio-Diversity and Desertification.

The variables to be analyzed are described in Table 19. It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15.and for one water samples is about USD 10. Most of the project farmers interviewed that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient . Such sampling density for 220,000 ha over 2 year life of the project would be extremely expensive.

The other alternative is to sample the pilot area (6,907 ha in Mahtaaral area) fully and for other project areas , sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project.

During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

Table 6 : Monitoring Plan of Big SHU Canal-Merkensky Rayon ZHAMBUL
CALCULATION IS DONE FOR 5,000 Ha (SHU-PMK, about $/ ha.)

Parameters to be Monitored	Periodicity	Number of Samples				Cost of 1 analysis in $US	Total Cost in $US
		Total Number of Samples	Number of Indicators	Sum of Determination	Total/ yr		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 50	3	150	150	15	2,250 **4,500**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 67	5	3340		10	3,340 **6,680**
4. Water Quality							
4.a Ground Water Quality							
4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 5	1	5	50	10	500 **1000**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 5	15	75	1125	20	1,500 **3,000**
4.a.c Fertilizer	Annually	(1sample /1000 ha) 5	1	5	75	15	1,125 **2,250**
5.Pesticide residues in fish & fodder crops	Annually	2	20	40	40	20	800 **1600**
6.Reforestation	Annually	1 $ Per /ha		$5000.0	$5,000.0	$1 Per Ha	**$5,000.0**

, composting and Tree Belts(Bio-drainage & Salinity Control)							**(including yearly Maintenance)**
7. Equipments for Rayons &WUAs	Annually 3 hand held GPS units, computer download, 3 Electrical Conductivity meters				1 unit (GPS & Electrical Conductivity meters $250.0 X12	$250.0 for one unit	**$3,000** (one time purchase)
						Grand Total	**$30,030 ***

Source: The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1996.

* this $30,030 is based on 1996 figure and upgraded to $45,500 to reflect 2007 values (30% inflation).

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M , it will be easier for them to take this additional responsibility . This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that Total US$45,500..(based on 10 years of inflation)... will be required to implement and maintain the Environmental Management and Monitoring Plan (EM & MP). There are three categories of inputs to the EMP . They are as follows in the Table 7.

1. Planning and Surveys and consultant assistance$ 5,940 (13.13%)
2. Mitigation Management $36,810 (81.24%)
3. Equipment & Training $ 2,800 (5.63 %)

Table 7: Estimated Budget for Environmental Management Plan (EMP – SHU-PMK- ZHAMBUL)

Item	Qty	Unit Cost	Total Cost US$
Capital Cost-Equipments for Rayons			
GPS units (handheld), Computer download	3	250	7,50.0
Electrical Conductivity Meters(24 Rural Districts)	3	250	7,50.0
Capital Cost- Equipment for WUA			
GPS units (Hand Held),computer download	3	250	7,50.0
Electrical Conductivity Meters(17 Rural Consumer Cooperatives of Water User RCCWU)	3	250	7,50.0
Recurrent Costs			
Support to PMO for Baseline Survey	1 each	3,000	3,000

Support to PMO for M&E activities over 2 years	Lumpsum	5,000	5,000
Analysis for soil and water samples for 2 years by CWR &MOG	2 Yearly	19030	19,030
Support for reforestation & biodiversity by CF	Lumpsum	5,000	5,000
Total			35,030

Note : Total $ 35,000 (round figure) is based on 1996 values. and adjusted to 2007 inflation figures (X30%), which makes it (35,000X30%) $10,500 +35,000= **$45,500**

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out. The suggested report systems for environmental monitoring programs are made on the following consideration:

1. Monthly report from the Contractor

Contractors should regularly monitor the environmental –related issues and Environmental parameters based on the guidance from Environmental Management Specialist and requirements from Ryon Inspector. They should provide a monthly Report covering performance of environmental monitoring and progress of environmental related activities.

2. Monthly Environmental Management Report

   The requirement of Environmental Management Specialist is to produce a monthly performance report of environmental monitoring , summarizing the environmental monitoring of sub-projects and other related environmental problems.

3. Environmental Monitoring Report

   The Rayon office laboratories of IDIP-II need to submit PMO thematic monitoring report on the changes in salinity, changes in water use, changes in soil productivity, including baseline soil surveys and subsequent periodic surveys, as well as proposed suggestions for actions to solve key environmental problems if any (semi-annual monitoring and annual monitoring report).

4. Semi-Annual PMO Report

   Every half year, PMO needs to compile a quarterly environmental working report, summarizing the progress of EMP implementation , and monitoring status. The report from IDIP-II project and the Environmental Management Specialist should be attached to PMO report. This report may be integrated into “The Progress Report” and sent to WB for review. The copies may be sent to Oblast Office for reference.

6. FINDINGS AND RECOMMENDATIONS

6.1 The Need for an Environmental Impact Assessment (EIA)

This section evaluates the need for an Environmental Impact Studies (EIA). This should be based on the fact whether significant environmental impacts exist and that need a further detailed study or EIA.

As per as we have seen there are no negative environmental impacts due to IDIP-I proposed project formulation , design, implementation , and operation. The only negative impacts identified are transitory ones (can be mitigated) associated with construction operations. All other impacts for Big Shu Canal are positive. The required mitigation are presented in sections and 7.4.

The recommendation from the findings of this Environmental Assessment (EA) are that a follow up EIA or further detailed environmental impact study (EIA) study is not needed.

6.2 Potential Environmental Impacts, Possible Mitigation Measures and Responsible Agencies

The environmental monitoring program will be part of an integrated project monitoring program which will be established by the PMO. The PMO and the “Project Implementation Unit” (PIU) offices at Project area oblast will be responsible for implementing all environmental mitigation measures. Table 14 (EA Main Report) presents all relevant issues with respect to the potential environmental impacts and the possible monitoring and mitigation enhancement measures. The table also lists those agencies who are responsible and also lists agencies which should have an involvement in the monitoring program and an input to the development and planning of the mitigation measures. The cost has not been received from the Design Engineers.

6.3 Environmental Assessment Requirement of MOEB

The Government of Kazakhstan (GOK) requirement is to present this Environmental Assessment (EA) report to MOEB. The instruction by MOEB call for report in which available data on the resources likely to be affected by IDIP-II are to be analyzed in terms of scope and intensity. An Environmental Assessment (EA) report are to be prepared by proponent (CWR) and should be included with the feasibility report and submitted for approval. This report provides a brief description of ecological and social sources , and trends in agriculture. Natural resources that are sensitive to change should be identified along with potential environmental problems. This report should be given a public review and then presented to the Ministry of Ecological and Biological Resources (MOEB). The MOEB reviews the EA and its comments (State Ecological Expertise) and forwarded to the concerned sections for approval.

The World Bank 4.01 “Environmental Assessment” has screened the IDIP-II Project and placed it in EA category “B”, which means the preparation of an environmental analysis to define environmental management , monitoring and mitigation measures as necessary. The recommended mitigation measures in the State Ecological Expertise (SEE) review would become an integral part of integral part of project design and implementation. The archeological sites would be protected with the guideline and requirement of Kazakhstan law and acceptable to the World Bank. The assurance was also obtained from Kazakh Government about the use of agrochemicals for IDIP-II would be approved ,stored and distributed and used in accordance with the guidelines and requirements of Kazakhstan Government acceptable to the World Bank (WB).

5.4 CONCLUSION

For Big Shu Canal of Merkensky Rayon Sub project an Environmental Impact Assessment (EIA) is not necessary. However, the appointment of a local / domestic Environmental Management Specialist to assist with the implementation of the Environmental Management / Monitoring Program and train WUA staff is considered very important task for the success of the Environmental Management and Monitoring Plan (EMP). A term of reference (TOR) for the Environmental Management Specialist (EMP) is prepared in the Annex…T (EA Main Report)

6. FUTURE DEVELOPMENT PLAN

The future environmental management and monitoring plan will mitigate the following:

1. Monitoring crop rotation for 6 years
2. Monitoring of surface and Ground Water for water quality (salinity & pesticide).
3. Water table depth
4. Drainage water for salinity , pesticide & fertilizers
5. Pesticide residues in fish , animal tissue and fodder crops
6. Reforestation of indigenous plant for biodiversity & desertification control.
7. Reclaim saline soil, saline surface and ground water.

For further details, please go through the Environmental Management and Mitigation Plan of the Main Environmental Assessment (EA) report..
The Environmental Management & Monitoring Plan is also part of future development plan.

ECOLOGICAL & ENVIRONMENTAL STUDIES OF IDIP-II PROJECT
ENVIRONMENTAL ASSESSMENT (EA)
GMC IDS, Kurdaisky Rayon, Zhambul Oblast

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ANNEX-K
GMC IDS Sub Regions
Kurdaisky Rayon

1. Summary of GMC IDS (KURDAI) Environmental Assessment (EA)

The Environmental Assessment (EA) describes potential impacts of irrigation and drainage improvement and rehabilitation of 5000 ha.

The GMC IDS (Kordai) has total population of 5,102 of which 2,555 are male and 2,547 are female. The potential for water logging and secondary salinization will be managed by some vertical drainage, and with cleaned and deepened interfarm and on-farm collectors drains. Total number of in-farm canals in the project area are not known.

The soil information is not available. But from the site visit of Environmental Specialist, soils is derived from typical Steppe Grey Sierozem Soils. Any major variation in soil properties across the project area would be result of differing levels of water table , due to inadequate drainage of irrigation water, and consequent development of secondary salinity. The salinity map for the sub project is not yet available. All the project area, except settlement is used for agriculture or cattle breeding.

The extent of salinity (Table 1), the 75 % are non saline(<1gm / l) and 25 % are moderately saline (Table 1, 1-3 gm /l). Further, they are slightly polluted with pesticide and herbicides.
The depth to ground water, 13 % are less than 2 meter depth, 80% are between 2- 5 meter depth (Table 2) and 17 % are more than 5 meter depth.

Impact Assessment:
The effect of IDIP-II on natural and social resources can be described as follows. Under the IDIP-II an area of 5000 ha has been outlined for feasibility study. As proposed, after leaching the lands will be returned to intensive farming. With drainage rehabilitation ,changes in land use are expected. The impact assessment has been simplified into three main components: (1) Project design (2) Project construction and (3)Project Operation. Out of 7 project related activities, no adverse environmental impacts are expected.

If irrigation and drainage systems are not rehabilitated, the existing infrastructure will become further degraded, and agricultural will become more waterlogged and saline. The land would turn into more desert condition.

Most of the potential impacts are effectively mitigated. The environmental impacts related to project design, construction and operation will not affect the environment. Project documentation will be prepared on :

1. Regulation for closed vertical bore holes and destroyed horizontal canals to avoid contamination of ground water for village water use.

2. Regulation forbidding persistent chemical weed and pest killers.
3. Environmental sustainability and bio-diversity preservation for the IDIP

The consultant proposes that the Committee of Water Resources (CWR) and Ministry of Environment and Biological Resources (MOEB) will be responsible for project development and will manage environmental programs. To do so, a small amount of Rayon and WUA will be trained in water and soil salinity monitoring with equipments and procedures. One or more short courses for professional development will be organized in project institutions.

A monitoring program will be formulated to avoid any unforeseen negative environmental effects when implementing the GMC IDS (Kordai), IDIP –II project. This is required to guarantee efficiency of the mitigation measures and a monitoring program is very much required. Please refer to "Monitoring Plan " of GMC IDS (Kordai, Table 6.) and main object of the monitoring plan are as follows:

- Regular soil sampling for chemical analysis, weed and pest , and for fertilizers.
- Regular surface, ground and drainage water sampling inside the irrigation and drainage project (IDIP-II) for chemical analysis, weed and pests, and fertilizers. Depending on the initial results of the monitoring the space and intensity of analysis could be increased or decreased.
- The fodder crops, animal tissues and milk should be analyzed for pesticides. Depending on the results, the analysis could be continued or discontinued.

The total monitoring cost for 5000 ha of GMC IDS Sub-regions is about $ US 45,500 (Table 7). If we spread the cost to the whole area it comes to about $9.0 per hectors. It is worth to spend that money on monitoring

The findings and recommendations for an Environmental Impact Assessment (EIA).
As we have seen from the document there are no negative environmental impacts due to IDIP-II project formulation, design, implementation, and operation. The only negative impacts identified are transitory ones and can be mitigated during construction and operation. All other impacts for GMC IDS (Kordai) are positive.

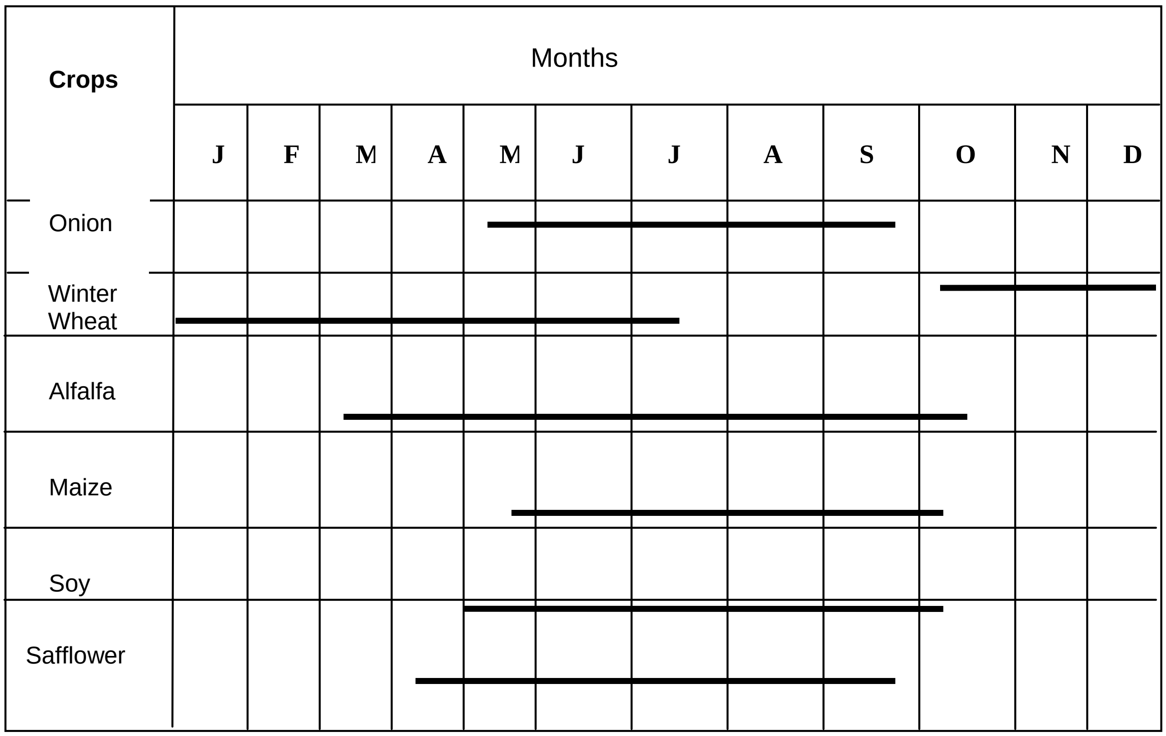
ANNEX- M
GMC IDS (KORDAI)
KURDAISKY RAYON
ZHAMBUL OBLAST

1. Location and Brief General Description

The location of the GMC IDS (Kordai) Sub- project area are presented in the Map K-GMK / LMK-1 or Figure 1 of this report.
Climatic details is very similar to that at Tasutkel Dam-PMK and data is presented from Zhambul meteorological station. The average annual air temperature is 9.1 ^{0}C, maximum and minimum temperature are 44^{0}C in July and - 41 ^{0} C in January respectively. The average annual precipitation is 353 mm and the bigger volume of precipitation occurs in Spring and Autumn. The frost free period lasts for 161 days and temperature exceeds above 10^0 C for 182 days. Prominent wind direction is south easterly. In winters, there is usually a 15-30 cm of blanket of snow covering on the ground.
Soil description of the Sub-project site is not available but, as observed by International Environmental Specialist on site visits, the soil of the area is derived from typical steppe grey sierozem soils. In the Sub-project area, surface soil (0-30 cm)is a light brown sandy loam which forms the hard clods, as if slaked by salinity. The major variation in soil properties across the Sub-project would have resulted from differing levels of water table, as a result, of inadequate drainage of irrigation water, and consequent development of secondary salinity. A salinity map for this Sub-project is not yet available.

Crops currently grown are mainly vegetables, with a large proportion of beetroot, and Lucerne. The area originally produced sugar beet and the Government desires a return to sugar beet cultivation.

Figure 2 : Crop Calendar



Source : “Company Akzhar Pulsar”

The following Figure 1, it can be shown that the growing season of Crops in the Sub – Project area are as follows:

- Onion from 20th. Of March to 15th. Of September
- Maize from 2nd. Of to 2nd. Of September
- Alfalfa from 20th. Of March to 15 th. Of October.
- Winter wheat from 20th. October to end of June
- Soya bean from 30th of April to 25th. Of September
- Safflower from 20th. Of April to 20 th. Of September.

Table 1 : **Extent of Salinity in Almaty and Zhambul**

Target oblast	Target Sub-projects	Total Area, thousands of ha	None Saline1 gm/l, % of Total Area	Mode rately Salinity, 1-3 gm/l, % of Total Area	Highly Saline 3-10 gm/l, % Total Area	Very Highly Saline, > 10 gm/l , % of Total Area
Zhambyl oblast	Baizaksky rayon	5000	-	64.7	35.3	-
	Shuysky rayon	5000	32.5	67.5	-	-
	Zhambylsky rayon	5000	70.0	30.0	-	-
	Kordaysky rayon	5000	75.0	25.0	-	-
	Merkensky rayon	5000	67.0	20.0	13.0	-
Alamtynskya oblast						
	Karatalsky irrigation system	5000	85.39	12.68	1	0.93
	Akdalinsky irrigation system	5000	89	11	-	-
	Malaisarynsky irrigation system	2500	45.1	36	18.9	-
	Enbekshy Kazakhsky rayon	12500	62	25	13	-

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

Table 2 : Extent of Water Table Depth within Almaty and Zhambul

Sub-project	Oblast	Rayon	Total Area, ha	The Depth of Ground Water Table <2m, as % of Total Area	The Depth of Ground Water Table from 2 m to 5 m, as % of Total Area	The Depth of Ground Water Table > 5 m, as % of Total Area
1	Zhambul oblast	Baizaksky rayon	5000	82.5	17.5	-
2		Shuysky rayon	5000	18.0	72.0	-
3		Zhambylsky rayon	5000	34.0	37.0	29.0
4		Kordaysky rayon	5000	13.0	70.0	17.0
5		Merkensky rayon	5000	20.0	80.0	-
6	Almaty oblast	Karatalsky irrigation system	5000	21.94	78.06	-
7		Akdalinsky irrigation system	5000	44	56	-
8		Malaisarynsky irrigation system	2500		33	67
9		Enbekshy Kazakhsky rayon	12500		45.91	54.09

Source of Information: State Institution of South Kazakhstan Hydro-geological and Land Reclamation Survey Carried out by the Committee of Water Resources, Ministry of Agriculture, Republic of Kazakhstan, 2005

Out of 5000 ha , about 75 % of the area are non saline (< 1gm /l), and 25 % of the area are moderately saline (1-3 gm of salt / lit). The GMC-IDS (Kordai) area has no waterlogging and ground water for 70 % of the area are between 2-5 meters. . About 87 % of the area has more than 2 to 5 meter ground water depth (Table 2).

3. Potential Environmental Impact

This section will determine and distinguish between significant positive and negative impacts, direct and indirect impacts, immediate and long term impacts. This will also identify unavoidable or irreversible impacts.
For further information and explanation on this subject, please refer to Environmental Assessment Main Report.

Table 3 : Environmental Impacts by Sub-Project Related Activities

Project Related Activities by Sub Project	Potential Environmental Impacts		
	Project Design (D)	Project Construction (C)	Project Operation (O)
Sub Project GMC I&D System 1.Rehabilitation & Construction of Irrigation & drainage network and associated infrastructure	No (+)	Yes (-)	No (+)
2. Improved Agronomic Practices	No (+)	No (+)	No (+)
3. Improved Soil and Land Improvement / Reclamation	No (+)	No (+)	No (+)
4. Crop Rotation & Improved Agricultural Practices (IAP)	No (+)	No (+)	No (+)
5. Integrated Pest Management and Fertilizer Application	No (+)	No (+)	No (+)
6.Bio-drainage & Reforestation	No (+)	No (+)	No (+)
7. Improved WUA Management	No (+)	No (+)	No (+)

D = Project design; C= Project construction and O= Project Operation
No= No adverse environmental impacts; Yes = Potential adverse environmental impacts (to be addressed by mitigation measures), (+) Positive effect (No Adverse Impact) and (-) negative effect and to be addressed by mitigation.

4. Environmental Management

4.1 Impacts Related to Design

The design of Irrigation and drainage system for GMC- IDS (Kordai) of Zhambul Oblast is not expected to produce negative impacts on the Oblast irrigation and drainage rehabilitation project. The design/ construction of new drains and rehabilitation of existing drains will not increase the amount of salt and agricultural chemicals entering natural waterways.
According to Table 1, salinity within GMC-IDS of the area are non saline to moderately saline (1- 3 gm/l), For the whole area (100%) , depth of ground water (Table 3) are beyond 2 to 5 meters.
This is for the reason:

- The salinity content of the 100% of the project drains are between <1-3 gm/l (Table 1).
- The quantity of water carried by the drains are low when compared to the discharge of the Left Branch of Shu River.

Land Resources
As proposed in the plan, 5000 ha has been selected for feasibility study. The objective is to rehabilitate reliable irrigation supplies, for moderate to high saline soils, where substantial improvement of land productivity can be achieved with relatively low investment. As a result of drainage improvement, minor changes in land use are expected.

Water Resources
Some canal will be lined and there will be improvement in water supply to irrigated lands. Salt content (mineralization) in the drainage water will be kept within limits of 1 to 3 gm /l. After mixing the drainage water with irrigated surface water (1.5 -2.0 g/l), they can be used as irrigation water. For further details please consult engineering report.
Further description of soils is provided by Soil Expert in the Soil Report.

4.1.1 Bio-drainage and Salinity Control

Many drainage system are dysfunctional and another option particularly on moderate to high saline land (Table 1) would be to introduce bio-drainage techniques to control soil salinity and water table levels by using especially established plantation of trees, bushes, grasses and crops.

Tree Belts

The cultivation of 2,3 or 5 rows of trees as shelter belts and their careful location in respect of prevailing wind directions and surface slopes can improve the local air quality, adjusting temperature and humidity levels over the irrigated field. In addition trees can provide biological drainage , decreasing ground water levels and helping to tackle the problem of secondary salinity and water logging. Experimental data shows that protective tree lines can reduce wind velocities over the irrigated field by 20 to 70 percent % . As a result evaporation from fields is reduced by 20 to 30 % leading to the increase of crop yield of 10 to 15 percent %. Tree belt can thus help increase crop yields at the same time as improving ecological conditions.

a) The farmers and WUAs will not be willing or able to plant large areas. However, bio-drainage could be introduced by planting single, double or three rows of trees or bushes along irrigation canals and drainage networks. These would have double purpose of providing bio-drainage as well as acting as shelterbelts to protect against wind erosion. Our past experiences suggest that poplar trees and possibly willow could be suitable. Some local species to willow and poplar are sensitive to salt, high saline soil may be leached with fresh water before planting 1-2 year old sapling.

b) Annual crops may also be used in bio-drainage, however, perennial tree crops and bushes are more effective. Deep rooting grasses may also help to lower the water table. If the species planted is salt tolerant , has a deep rooting system and uses large quantities of water, it will dry out the subsoil. This may slow down upward movement of salts via capillary pore of soil.

c) Safflower and sunflower are both deep rooted moderately salt tolerant crops, but they are not as efficient as grasses and fodder crops for lowering water table due to their short growing season. Other rotations could be tested that combine perennial and annual crops to diversify the system and meet the goals of reduced soil salinity, lowering of water table, and better soil quality.

d) If the areas to be reclaimed are more than moderately saline or abandoned marginal lands, the choices are limited. First to look for salt tolerant fodder and grass crops, eg.:

- Alkali grass (*Puccinellia airoides)*
- Desert Saltgrass (*Distichlis stricta)*
- Wildrye (*Elymus spp)*

- Bermuda grass (*Cynodon dactylon)*
- Wheat grass (*Agropyron spp)*

-Organize nursery at every sub-regions and WUA. Provide free extension service, input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pumping location, main, on farm and inter-farm canals.

Establish Compost / Bio-gas sites

In design phase, establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to vertical drains pump sites are to be considered.

Table 3 gives a list of indigenous trees and bushes that can be used in planning tree lines and fence lines around farms, pump houses and irrigation canals. They should be chosen with experience and knowledge.

Table 4: List of Indigenous Trees and Bushes for IDIP-II

Trees	Bushes
1. Apricot - Armenica vulgaris Lam	24. Siberian pea shrub - Caragana arborescens Lam.
2. Cherry-plum - Prunus divaricata Ledeb	25. Redhaw hawthorn - Crataegus sanguinea Pall.
3. Asian sumac - Ailanthus altissima	**26. – Calligonum aphyllum Gurke.**
4. Birch - Bertula pendula Roth	**27. – Calligonum microcurpum Borszcz**
5. Siberian elm - Ulmus pumila L.	**28. – Calligonum caput-medusae Schrenk.**
6. Elm - Ulmus laevis Pall.	**29. – Calligonum serosum (Litv.) Litv.**
7. Common Pear - Pyrus communis	30. Tatar honeysuckle - Lonicera tatarica L.
8. Tatarian maple -Acer tataricum	31. Violet willow - Salix daphnoides Vill.
9. Ash-leaved maple - Acer negundo	32. Caspian willow - Salix caspica Pall
10. Larch Siberian - Larix sibirica Ledeb.	**33. – Salix rubra Huds**
11. Bastard acacia - Robinia pseudoacacia L.	34. Mespilus rotundifolious - Amelanchier rotundifolia (Lat.) Dum./Cours.
12. White saxaul - Haloxylon persicum Bunge	35. Russian olive - Elaeagnus angustifolia
13. Black saxaul - Haloxylon aphyllum (Minkw.) Iljin	36. Rotundifolious Juneberry - Amelanchier rotundifolia (lat.) Dum./Cours
14. Pine Crimean -Pinus pallasiana D.Don.	37. Wig-tree - Cotinus coggygria Scop.
15. Archangel fir -Pinus sylvestris L.	38. Golden currant - Ribes aureum Pursh.
16. White poplar - Populus alba L.	39. French tamarisk -Tamarix ramosissima Ledeb.
17. Poplar balsamic - Populus balsamifera	40. Loose tamarisk -Tamarix lara Willd
18. Bay leaf poplar - Populus laurifolia Ledeb.	41. Coniferous ephedra - Ephedra distachy L.
19.Poplar diversifolious- Populus diversifolia Schrenk	42. Paletskiy Saltwort - Salsola paletskiana litv.
20. Poplar Siberian - Populus barsamifera L. (var. sibirica)	43. Rihter Saltwort - Salsola richteri (Moq.) Kar. Ex. Litv.
21. Black poplar - Populus nigra L.	44. Glasswort - Aellenia subaphylla (C. A. Mey) Aell.
22. White mulberry - Morus alba L.	
23. Siberian apple - Malus pallasiana Jus.	

4.1.2 Crop Rotation

This is a sequence in which crops are grown on the same piece of land over a number of years-
Used to be important for:

- The maintenance of soil fertility
- The prevention of a build up of soil borne diseases, pests and weeds;
- The control of erosion

Nowadays , technical innovations, such as use of fertilizers , pesticide and herbicides , have reduced the necessity of crop rotation. However, there are number of serious soil borne disease and nematode infections the control of which requires a sound rotation program. Thus, alfalfa, rice, wheat and others are planted with a 5-6 year interval.

Some general rules relating to crop rotation are:

- The continuous growing of cereals or pulses should be avoided
- Leguminous crops should not be sown in sequence , even one crop is seed and other for forage;
- Crops with common root diseases should not be sown in succession. For instances, tobacco should not be planted following tomatoes.

4.1.3 Other Impacts

Other possible environmental impacts would include:

(1) Dust generation caused by certain construction operation such as excavation, which ca be mitigated by wetting excavation sites and other sources of dust to control its emission, and public information.
(2) Noise generation which can be mitigated by use of properly maintained equipment and public information, and
(3) Land use conflicts caused by temporary use of land for temporary facilities for construction contractors (accommodation, camp canteen, camp facilities , medical center, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction.

Projects may face other possible impacts such as (1) dust generation caused by certain
construction operation , such as excavation, which can be mitigated by wetting excavation sites and other sources of dust control its emission, and public information. (2) noise generation which can be mitigated by use of properly maintained equipment and public information; and (3) land use conflict caused by temporary use of land for temporary facilities for

construction contractors (accommodation, camp canteen, camp facilities, medical center, sanitation and other applicable facilities as described within the construction contract), which will be rented from land owners and re-instated to its former state after completion of the construction. Planning "Buffer Zones" in irrigation Canals and drains, specified Government Regulation has to be followed as follows:

Table 5 : Government Regulations- Buffer Zones (Irrigation Canals and Drains)

Capacity of Irrigation Canals (m^3 / sec)	Width of the Inner Buffer Zones for inspection Roads and Deposit Sediment from Canal (m)	Width of the Outer Buffer Zone for Vegetation and limited Agriculture (m)
1	6	
5	10	
25	20	
50	75	
100 or more	100	

Collector Drains Buffer Zones- Provided by CWR and MOA- (both sides of the Collector Drain)

10	5m for inspection road and 10-20 m for spoil 10-20 m for agricultural traffic & field drains
10-20	100 meters (either side of the collector)
21-50	200 meters (either siude of the collector)
.50	300 meters (either side of the collector)

Source: MOA, Republic of Uzbekistan

This regulation should be strictly enforced on IDIP-II Projects.

4.2 Environmental Impacts Related to Construction

Reconstruction of the Karatal, sections of the project, joining collector with discharging drainage water into primary, secondary and tertiary canals. All open collector and drains will be cleaned and deepened. After the proper design, the project will be open for construction and operation. This will result in the following conditions:

1) Temporary increase in silt

To mitigate this, provisions are there in the standard contract document supplied to contractor for adequate supervision of operations and adherence only, use of silt traps and careful deposition of spoils.
The incorporation of the above measures will have to be placed into BOQ for sub project contract documentations and supervision of contractors.

2)Temporary closure of irrigation system
Participation by Water User Association (WUA) and Farmers. The information are to be given through dialogue and community awareness campaign. Ask WUA and villagers for permission to close the irrigation system temporarily. They are very important that WUA and farmers involved in all aspect of civil works.

3) Disposal of Excavated spoil from main and inter-farm drains.
Excavated soil (spoil) will be deposited alongside the drain in accordance with the guideline laid down by GOK/ MOEB with respect to easement dimension.- either side of drain and /or canal. Spoil will be deposited and formed using bulldozer into trapezoidal formation.

4)Disposal of Excavated soil (spoil) from on- farm Drains and Canals.
Spoil will be deposited alongside canals and drains in accordance with WUA and farmer instructions. If required and instructed, the contractors may deposit spoil on farm fields at the expense of farmers.

5) Dust generation
The mitigation measures recommended is the appropriate timing of operations wetting of surfaces and notice to /involvement of public. The workers on construction sites should have international personal safety / protection equipment supplied by the contractor.

6. Noise Generation:
Mitigation measures:
Appropriate timing and operation of machine are to be discussed with the farmers and WUA. Notice will be given to public and WUA- farmers will be involved in timing and reduction of noise level in the project areas.

7. Waste Material :
Replacement and repair of the irrigation and drainage structure will result in waste material (concrete and steel). These are to be disposed of by the civil works contractor as per CWR / MOEB guidelines.

8. Land Use Conflict for Construction
The CWR , MOA and GOK assessed that there will be no land use conflict for construction. This also confirmed by the client, the CWR, and guarantee given by them to the World Bank. On farm negotiations would be made with WUA and the landowners. However, civil works only will be done by

participation agreement of land owners and WUA. The PMO / CWR should have the responsibility for dispute settlement.

9.Construction of Camp Sites and Living Facilities
Establishment and construction of camp sites, and Living facilities for the construction workers have to be established prior to construction work. An acceptable sanitary facility has to be established for the workers. This must satisfy environmental regulation and MOEB code.
The camp site has to be cleaned and returned to the original state before the construction.
Refuge should be properly collected and disposed off.

Mitigation measures are to be:
1)CWR & MOA agrees to allocate free sites for the construction of camp sites and living facilities. This has to be negotiated with the client and the local authorities. Construction of camp sites and living facilities will be funded by the contractor. Clean up costs for these facilities will be borne by the contractor.

10. Biodiversity Conservation / Sustainability
Environmental Sustainability of the project area is very low. To improve this situation following steps will be taken:
(1) Organize nursery at every sub-regions and WUA. Provide free extension service ,input, indigenous plant and seedlings to farmers and WUA members. Establish tree lines to vertical drain and horizontal drain sites, pump location, main , on farm and inter-farm canals.
(2) Establish Compost / Bio-gas sites
Mitigation: Establish compost /Bio-gas sites in each sub regions and WUA. Use household wastes for composting with direct participation of WUA. Use compost for home gardens and farmers field. Possibility of Bio-gas for power generation to be considered.

4.3 Environmental Impacts related to Operation

1) Soil modification as a result of intensified agriculture
The mitigation required
a) Encouragement of continued use of traditional management of water flows
b)The use of deep rooting grasses and shrubs to further strengthen the bunds
c) Minimum / zero tillage practices

2)Soil and water contamination due to increased use of agrochemicals including fertilizer and
pesticides.
The mitigation required

a)Mitigation required are agricultural extension services and Integrated pest management (IPM).
The agricultural extension service would include

a)Optimum , informed use of mineral fertilizer
b)Promotion of integrated pest management (IPM)
c) Discouragement on the use of persistent pesticide and herbicide.
d) Training on composting, reforestation, minimum or zero-tillage.
e) Biodiversity associated with introduced new plant species and varieties .
Promote Biodiversity for introduced crops and land use changes from protecting soil from wind by tree fencing and other environmental management practices.

(3) Environmental Sustainability & Bio-diversity Concerns.

Biological diversity refers to the variety of South Kazakhstan living biological resources. It is a function not simply of the number of ecosystem and distinct plants and animal species in existence at any given time, but also genetic differences within individual species.
Conservation of biological diversity is a form of natural resources management and should be practiced in Karatal area. This can be done by reforestation activities of indigenous plants on vertical drainage sites, main and secondary canals, and other inter farm canals. A reforestation site plan will have to be prepared in IDIP-II (Phase B) design level.

5. Environmental Monitoring

Monitoring is necessary with respect to (i) water resources quality and quantity; (ii) environmental indicators related to design and construction; (iii) agricultural impacts such as input use (seeds, fertilizer and pesticide) and outputs; and (iv) maintenance, management, including inspection and proper repair of irrigation & drainage canals and structures.

The primary water and soil quality monitoring program will be implemented under a arrangement between the Committee of Water Resources (CWR), MOEB, and the Project Management Office (PMO). The objectives of this monitoring program are to provide farm families with information on soil and water quality of their land and to provide the PMO with the information required to evaluate to evaluate the success or failure of IDIP-II proposed project intervention in the Karatal.

Presently the Ministry of Ecological and Biological Resources (MOEB) collects different water and soil information. Currently their sampling density is inadequate and sometime meaningless for the management of irrigated land for agriculture. With this IDIP-II project, the CWR will be responsible for additional collection, analysis and reports, which are extremely important to assist the

Monitoring and Evaluation of the Project activities. This will be done using a denser and more responsible sampling network. The principles and objectives of monitoring will be enforced and to the extent possible all samples are to be analyzed at Rayon office laboratories.

The Environmental Monitoring system will give valuable information on a range of environmental variables such as:

1. Soil salinity and high ground water tables;
2. Water Quality & Salinity.
3. Reforestation, Bio-Diversity and Desertification.

The variables to be analyzed are described in the Table 19 of the Main Report. It is advised that this data collection to be done twice yearly, before and after each growing season for soil and four times a year for surface and ground water. The sampling planning must be done with respect to allocated budget and CWR, MOEB, MAWR. The IDIP-II must allocate fund and personnel for this monitoring.

The total cost of materials and supplies to MOEB for one (1) soil analysis is about USD 15.and for one water samples is about USD 10. Most of the project farmers interviewed that the current sampling density of about one (1) sample per 100 ha is insufficient to obtain a realistic idea of soil conditions. The MOEB estimates that one sample per 26 ha would be sufficient . Such sampling density for 220,000 ha over 2 year life of the project would be extremely expensive.

The other alternative is to sample the pilot area (6,907 ha in Mahtaaral area) fully and for other project areas, sampling density will be decreased. This may establish a sustainable budget and except pilot areas, other project areas sampling can be less expensive. The data collected this way may bring indirect benefit must be evaluated for project purposes. But this indirect information is very difficult to understand in terms of engineering and agricultural planning / forecasting.

An agreement with CWR / MOEB about sampling density must be worked out before design and construction phase of the IDIP-II project. The consultant proposes herein a sampling density of one sample per 100 ha and should be enough for the objective of the project.
During the first year of the project, sampling would be done to identify the critical areas. Efforts will be made to develop a stratified sampling method for less important areas and higher density sampling for important areas.

Table 6 : Monitoring Plan of GMC-IDS, Kordaisky Rayon, ZHAMBUL OBLAST
CALCULATION IS DONE FOR 5,000 Ha (SHU-PMK, about $9/ ha.)

Parameters to be Monitored	**Periodicity**	**Number of Samples**				Cost **of 1 analysis in $US**	**Total Cost in $US**
		Total Number of Samples	**Number of Indicators**	**Sum of Determination**	**Total/ yr**		
1. Soil Salinity	Each 2 years	(1 sample /100 ha) 50	3	150	150	15	2,250 **4,500**
2. Soil Pesticide	Each 2years	(included in above calculation)					
3. Water Table	Each 2 years	(1 sample / 75 ha) 67	5	3340		10	3,340 **6,680**
4. Water Quality							
4.a Ground Water Quality							
4.a.a salinity	Monthly during vegetation period	(1sample /1000 ha) 5	1	5	50	10	500 **1000**
4.a.b Pesticide & Microelement	Every Quarterly during vegetation	(1 sample/1000 ha) 5	15	75	1125	20	1,500 **3,000**
4.a.c Fertilizer	Annually	(1sample /1000 ha) 5	1	5	75	15	1,125 **2,250**
5.Pesticide residues in fish & fodder crops	Annually	2	20	40	40	20	800 **1600**
6.Reforestation	Annually	1 $ Per /ha		$5000.0	$5,000.0	$1 Per Ha	**$5,000.0**

, composting and Tree Belts(Bio-drainage & Salinity Control)							**(including yearly Maintenance)**
7. Equipments for Rayons &WUAs	Annually 3 hand held GPS units, computer download, 3 Electrical Conductivity meters				1 unit (GPS & Electrical Conductivity meters $250.0 X12	$250.0 for one unit	**$3,000** (one time purchase)
						Grand Total	**$30,030 ***

Source: The Hazra Engineering International Company, Nippon Koei Comapany , LTD, Makhtaraal District Irrigation and Drainage Project , Environmental Impact Assessment, September 1996.

* this $30,030 is based on 1996 figure and upgraded to $45,500 to reflect 2007 values (30% inflation).

The agency (CWR) has to decide who is going to pay for the sampling and analysis for the 3 years of project life. Otherwise it will be very costly for the IDIP-II to pay 3 years at the rate indicated in the monitoring. An arrangement to analyze samples at Rayon level should be given preferences. A budget can also be prepared for supplies and materials for the three years and will require payment for analysis altogether. This will save the project from costly analysis.

Effort should also be given to train local WUA personals for soil and water sample collections and carrying out simple tests on soil and water salinity. The training and equipment should be provided by the IDIP-II project. This should be discussed with the WUA and farmers during the public consultations. The main responsibility of WUAs is the (operation & maintenance) O&M , it will be easier for them to take this additional responsibility . This can be formulated in a law for future smooth running of Irrigation and Drainage Management Project. This requires a committee and management staff required for formation and development of WUA that are needed urgently.

It is estimated that Total US$45,500..(based on 10 years of inflation).will be required to implement and maintain the Environmental Management and Monitoring Plan (EM & MP). There are three categories of inputs to the EMP . They are as follows in the Table 7.

1. Planning and Surveys and consultant assistance$ 5,940 (13.13%)
2. Mitigation Management $36,800 (81.24%)
3. Equipment & Training $ 2,800 (5.63 %)

Table 7: Estimated Budget for Environmental Management Plan (EMP – SHU-PMK- ZHAMBUL)

Item	Qty	Unit Cost	Total Cost US$
Capital Cost-Equipments for Rayons			
GPS units (handheld), Computer download	3	250	7,50.0
Electrical Conductivity Meters(24 Rural Districts)	3	250	7,50.0
Capital Cost- Equipment for WUA			
GPS units (Hand Held),computer download	3	250	7,50.0
Electrical Conductivity Meters(17 Rural Consumer Cooperatives of Water User RCCWU)	3	250	7,50.0
Recurrent Costs			
Support to PMO for Baseline Survey	1 each	3,000	3,000
Support to PMO for M&E activities over 2 years	Lumpsum	5,000	5,000
Analysis for soil and water samples for 2	2 Yearly	19030	19,030

years by CWR &MOG			
Support for reforestation & biodiversity by CF	Lumpsum	5,000	5,000
Total			35,030

Note : Total $ 35,000 (round figure) is based on 1996 values. and adjusted to 2007 inflation figures (X30%), which makes it (35,000X30%) $10,500 +35,000= **$45,500**

The monitoring system should work and manageable, there is a need for an Efficient and Workable Reporting System for the Monitoring to be effective and workable. This has to be instigated by the Project Monitoring Office (PMO).

The World Bank TOR for preparing the TOR and Environmental Management Plan and Monitoring (Sample of Terms of Reference for Preparing Environmental Assessment- Project Category B), O.D.4.0., the environmental monitoring plan to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. In the plan there will be an estimate of capital and operating costs and description of other inputs (such as training and institutional strengthening that are needed to carry it out. The suggested report systems for environmental monitoring programs are made on the following consideration:

1. Monthly report from the Contractor

Contractors should regularly monitor the environmental –related issues and Environmental parameters based on the guidance from Environmental Management Specialist and requirements from Ryon Inspector. They should provide a monthly Report covering performance of environmental monitoring and progress of environmental related activities.

2. Monthly Environmental Management Report

   The requirement of Environmental Management Specialist is to produce a monthly performance report of environmental monitoring, summarizing the environmental monitoring of sub-projects and other related environmental problems.

3. Environmental Monitoring Report

   The Rayon office laboratories of IDIP-II need to submit PMO thematic monitoring report on the changes in salinity, changes in water use, changes in soil productivity, including baseline soil surveys and subsequent periodic surveys, as well as proposed suggestions for actions to solve key environmental problems if any (semi-annual monitoring and annual monitoring report).

4. Semi-Annual PMO Report

   Every half year, PMO needs to compile a quarterly environmental working report, summarizing the progress of EMP implementation, and monitoring status. The report from IDIP-II project and the Environmental Management Specialist should be attached to PMO report. This report may be integrated into “The Progress Report” and sent to WB for review. The copies may be sent to Oblast Office for reference.

6. FINDINGS AND RECOMMENDATIONS

6.1 The Need for an Environmental Impact Assessment (EIA)

This section evaluates the need for an Environmental Impact Studies (EIA). This should be based on the fact whether significant environmental impacts exist and that need a further detailed study or EIA.

As per as we have seen there are no negative environmental impacts due to IDIP-I proposed project formulation, design, implementation, and operation. The only negative impacts identified are transitory ones (can be mitigated) associated with construction operations. All other impacts for GMC IDS are positive. The required mitigation are presented in sections and 7.4.

The recommendation from the findings of this Environmental Assessment (EA) are that a follow up EIA or further detailed environmental impact study (EIA) study is not needed.

6.2 Potential Environmental Impacts, Possible Mitigation Measures and Responsible Agencies

The environmental monitoring program will be part of an integrated project monitoring program which will be established by the PMO. The PMO and the “Project Implementation Unit” (PIU) offices at Project area oblast will be responsible for implementing all environmental mitigation measures. Table 14 of the EA main Report presents all relevant issues with respect to the potential environmental impacts and the possible monitoring and mitigation enhancement measures. The table also lists those agencies who are responsible and also lists agencies which should have an involvement in the monitoring program and an input to the development and planning of the mitigation measures.

6.3 Environmental Assessment Requirement of MOEB

The Government of Kazakhstan (GOK) requirement is to present this Environmental Assessment (EA) report to MOEB. The instruction by MOEB call for report in which available data on the resources likely to be affected by IDIP-II are to be analyzed in terms of scope and intensity. An Environmental Assessment (EA) report are to be prepared by proponent (CWR) and should be included with the feasibility report and submitted for approval. This report provides a brief description of ecological and social sources, and trends in agriculture. Natural resources that are sensitive to change should be identified along with potential environmental problems. This report should be given a public review and then presented to the Ministry of Ecological and Biological Resources (MOEB). The MOEB reviews the EA and its comments (State Ecological Expertise) and forwarded to the concerned sections for approval.

The World Bank 4.01 “Environmental Assessment” has screened the IDIP-II Project and placed it in EA category “B”, which means the preparation of an environmental analysis to define environmental management , monitoring and mitigation measures as necessary. The recommended mitigation measures in the State Ecological Expertise (SEE) review would become an integral part of integral part of project design and implementation. The archeological sites would be protected with the guideline and requirement of Kazakhstan law and acceptable to the World Bank. The assurance was also obtained from Kazakh Government about the use of agrochemicals for IDIP-II would be approved ,stored and distributed and used in accordance with the guidelines and requirements of Kazakhstan Government acceptable to the World Bank (WB).

6.4 CONCLUSION

For GMC IDS Sub project an Environmental Impact Assessment (EIA) is not necessary. However, the appointment of a local / domestic Environmental Management Specialist to assist with the implementation of the Environmental Management / Monitoring Program and train WUA staff is considered very important task for the success of the Environmental Management and Monitoring Plan (EMP). A term of reference (TOR) for the Environmental Management Specialist (EMP) is prepared in the Annex T.

7. FUTURE DEVELOPMENT PLAN

The future environmental management and monitoring plan will mitigate the following:

1. Monitoring crop rotation for 6 years
2. Monitoring of surface and Ground Water for water quality (salinity & pesticide).
3. Water table depth
4. Drainage water for salinity, pesticide & fertilizers
5. Pesticide residues in fish, animal tissue and fodder crops
6. Reforestation of indigenous plant for biodiversity & desertification control.
7. Reclaim saline soil, saline surface and ground water.

For further details, please go through the Environmental Management and Mitigation Plan of the Main Environmental Assessment (EA) report.
The Environmental Management & Monitoring Plan is also part of future development plan.

Questionnaire

1. Your Name/last name/

2. Age

3. Address

4. Do you like your rayon? (yes, no)

5. The reason, why yes/ no?

6. Your assessment of the Rayon environment condition?

7. What do you think is the reason?

8. What is the quality of the drinking water of the Rayon?

9. Do you have an area to grow a crop?

10. What do you grow?

11. Is there any problem in growing the crop?

12. The reason of the problem?

13. Do you plant trees?

14. If not what is the reason?

15. What do you think, what should be done to improve the life conditions?

16. How is your health condition, do you have serious disease? What is it?

17. The causes to the disease?

Thank you for response.

ANNEX T : ENVIRONMENTAL MANAGEMENT SPECIALIST(EMS)- TOR

Purpose and Scope of Work

(1) The Irrigation and drainage Improvement Project , Phase 2 , feasibility study is subject to an environmental assessment (EA) , which will follow World bank and MOEB guideline.

(2) The International Environmental Specialist has already prepared the Environmental Assessment (EA) with limited collaboration of National Environmentalist (Kazakh). This needs further follow up with MOEB which can be done by National Environmentalist.

Objectives

- Identification of the measures required to mitigate potential negative environmental impacts during the design, implementation, operation and maintenance of the IDIP-II project;
- Determination of the need for an Environmental Impact Assessment (EIA) during the implementation of the IDIP-II project; and
- Development of an environmental management and monitoring plan , which includes an estimate of cost of environmental monitoring and mitigation of adverse impacts.

Tasks

(1) Prepare environmental quality criteria for the selection of project sites;

(2) Prepare list of data requirements for submission to the Committee of Water Resources (CWR) and the Ministry of Environment and Biological Resources (MOEB);

(3) Using the data provided by the CWR & MOEB, evaluate potential negative environmental impacts to determine if an EIA is required during the implementation of the loan project;

(4) On the basis of the IEE, prepare a costed Environmental Management Plan;

(5) Organize and conduct a one day (1)public consultation in each project target Oblasts. The consultation will review the positive and negative environmental impacts of the proposed IDIP-II ; and

(6) Undertake other tasks assigned by the Team Leader that will fall within the scope of work.

Reporting Requirements

A. Input Report

The input report is a brief listing of the items set out below, to be submitted before departure at the end of the input. The report to be submitted to either The Team Leader or Project Director as advised by the Project Director.

(1) Dates of Assignment
(2) Dates of Travel (International and local) and locations visited
(3) Meetings attended and names and designations of those involved, main topics discussed and main points of agreement or disagreement.
(4) Any training sessions and seminar attended , with details as in above 3..
(5) The items on SEE which have been completed and proposals and proposals for completion of any outstanding items.
(6) Papers , reports , maps drawing , computer disks and other technical output , together with the details of their distribution. Copy should be given to Team leader.
(7) A directory of paper and computer files, including the description of their content

B. Initial Environmental Examination n to be no longer than 30 Pages

(1) Description of the Project ;
(2)Description of the environment;
(3) Potential Environmental Impacts .& mitigation measures;
(4) Institutional requirements and costed environmental monitoring program;
(5) Findings and Recommendations ; and
(6) Conclusion

C. Summary of State Environmental Expertise (SEE)
The Summary of SEE highlights the main findings of IEE