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Uzbekistan SKWRMIP: Environmental Assessment and Management Plan (March 7, 2013)

EXECUTIVE SUMMARY

A) ENVIRONMENTAL ASSESSMENT

Purpose of this report: Compling with the World Bank's safeguards policy (OP4.01), the GoU Ministry of Water Resources MAWR has carried out an environmental impact assessment (EA) for the South Karakalpakstan Water Resources Management Improvement Project (SKWRMIP), including stakeholder consultations; and thereupon, prepared an Enviromental Management Plan (EMP) which outlines the needed mitigation or monitoring measures, their costs and responsible institutions.

Main conclusion from the EA (OP4.01): The project design does not seek to promote a horizontal expansion of irrigated agriculture, but seeks to improve production per hectare and restore formerly irrigated areas. Hence the EA has indicated that, as a result of improved water management in the project area, the project would have an overall positive impact on the lower Amu Darya basin and the environment, without undermining the water requirements of the riparians or the Aral Sea. This conclusion was supported by a quantitative water balance comparing the pre and post project situations, as summarized below. The project safeguards are rated category B, and the applicable safeguards policies are as listed below. The likely negative impacts (typical to irrigation development/rehabilitation projects) will be limited, such as limited disruption of the ecosystem (e.g. removal of trees to enable developing the Bustan canal), resettlement, and safety at the construction sites; and will all be mitigated through the EMP, budgeted at around US$10 million (of which US$6m are resettlement compensations), excluding the dam-safety measures (TBD by appraisal, see indicative cost estimates below in the main text), under the responsibility of MAWR and the civil-works contractors.

'Natural Habitats' (OP 4.04): Over the last decades, improved water management has been needed to sustain the required seasonal water flow to Baday Tugay, a seasonally flooded forest. Riparian woodland is a unique flood plain forest of the desert zone in Central Asian arid steppes and lowlands. The area of riparian woodlands decreased catastrophically, and by 1998 only 10 % of the area of Tugay still exists. For the moment along the main riverbed of Amu Darya, only small woodland remains, including the Baday Tugay reserve (6,500 ha, a seasonally flooded forest adjacent to the project area). Additional water supply to the reserve needs to be provided from Amu Darya during the periods when river's discharge reaches peak runoff. One of the co-benefits of improving water management through the project components is to sustain the required seasonal water flow to Badai Tugay. The canal needed for water supply to the forest has been developed under DIWIP; whereas one of the co-benefits of SKWRIP (since it aims at raising water-use efficiency) is that it would help ensure the adequacy of the forest's water resource. Thus OP4.04 is just triggered to ensure monitoring this positive impact of SKWRIP on the water-resoource seasonal availability to the forest.
As for the small wetlands adjacent to Aral Sea downstream Amu Darya, the incremental water-balance analysis (given below in the EA) has indicated that the project will not increase the

abstraction from the river into the project command area, and this (zero incremental abstraction) will be assured through the project M&E activity (possibly facilitated by the SCADA tool, which will be financed by the project). The Government would be committed to avoid increasing this abstraction level.

Pest Management (OP 4.09): The project will not support the purchase of pesticides. The EA tried to infer the likely incremental impact from the project on agricultural residues, only by measuring the current pre-project residues level, to check if this level is within the standards. Uzhydromet (GoU Center for hydrometeorological services) measured soil pollution from agricultural residues during 2009-2010. Residues from pesticides and herbicides are commonly inferred by measuring parameters such as: hexachlorocyclohexane, alpha isomer (alpha HC), hexachlorocyclohexane, gamma isomer (gamma HC) and dichlorodiphenyltrichloromethylmethane (DDT). The DDT and its metabolites in the Amu Darya river were found to be within the limits of 0-0.005 microgram/dm3 (0.05 MAC). In the Tuyamuyun reservoir, isomers of alpha HC, gamma HC and DDT for 2009 were not revealed, and in 2010 the maximum concentration of alpha HC concentration was as low as 0 to 0.002 microgram/dm3. Also the Water Quality Index in Amu Darya river reflected low pollution from agricultural residues. Measurements on a sample of 56 hectares of agricultural lands found DDT in the range of 0.001 to 0.02 MAC, thus way below 1.0 MAC. The residual HC under all crops was negligible. Organophosphorous pesticides (OPP), herbicides and defoliants were not found in the soils of the surveyed raions.

Permisable standards for parameters that infer pollution from pesticides and fertilizers

N	Compound	unit	Standard Limit
1	Alpha-BHC	Ug/l	0.02
2	Gamma-BHC	Ug/l	0.02
3	BETA-BHC	Ug/l	0.02
4	Delta-BHC	Ug/l	0.02
5	Heptachlor	Ug/l	0.25
6	Aldrine	Ug/l	0.02
7	Heptachlorepoxide	Ug/l	0.05
8	DDE-p',p	Ug/l	0.10
9	Endosulfane-alpha	Ug/l	0.10
10	Dieldrin	Ug/l	0.10
11	Endrin	Ug/l	0.10
12	DDD-p',p	Ug/l	0.10
13	Endosulfane-beta	Ug/l	0.10
14	DDT-o,p	Ug/l	0.10
15	Endrin aldehyde	Ug/l	0.10
16	Methamidophos	Ug/l	0.25
17	Endosulfane sulphate	Ug/l	0.10
18	Malathion	Ug/l	0.25

The low pollution from agricultural residues can be attributed to: (A) the farmers' low income compared to the high cost of insecticides, which poses an incentive to ration the application of insecticides; and (B) the quality control performed on the agricultural produce both in the domestic and international markets.

Nevertheless, the project will stimulate agricultural activities in the project area and hence might lead to increased use of pesticides. If not properly managed, this can cause pesticide residue build-up in the soil as well as in surface and ground water, can disrupt agro-ecosystems and undermine sustainable agricultural production, and can pose human health risks. Also, insufficient infrastructure for storage and disposal of pesticides and related wastes may pose

environmental risks. In order to address these potential risks, the OP4.09 is striggered. The project will, as part of its capacity building activities under Component 2, support awareness raising activities and training programs targeted at WUAs and individual farmers. The training will promote application of biological control methods, cover the topics on optimal use of pesticides (preferable WHO class III) on the basis of economic thresholds, determination of adequate amounts, proper storage (away from water bodies and other sensitive receptors) and disposal. The project will benefit from the Intergrated Pest Management Program (IPMP) developed earlier under the Cotton Sub-Sector Improvement Project (closed in2003), which provided for equipment and technical assistance for the development of insect rearing and dispersal technologies allowing for biological control of pests. On a selected basis, the project will monitor soil and water quality for the changes of pesticide residue amounts.

'Involuntary Resettlement' (OP4.12): Project framework provides construction of 35 km section of the Bustan Canal and rehabilitation of another 35 km part of the same Bustan Canal which flows through the settlements. In this view, temporary and permanent allotment of lands for canal construction will be performed.

'Safety of Dams' (OP 4.37): The dam safety safeguards policy is triggered as the project will affect, and investments will depend on Tuyamuyun reservoir (Sultansanjar dam). The 2001 Dam Safety Inspection Report identified a number of dam safety issues, notably (i) safety of Sultansanjar Dam, (ii) rehabilitating the hydro-mechanical equipment; (iii) improving dam instrumentation; (iv) updating the O&M manual; and (v) preparing an Emergency Preparedness Plan (EPP). In 2009, the GOU undertook a "Dam Safety Assessment" that clarified which of the proposed measures have already been implemented. On the basis of this report and the meetings with stakeholders, it is recommended that, (i) prior to appraisal, a workshop is organized on site using the guidelines elaborated by US Federal Energy Regulatory Commission (FERC) for conducting Potential Failure Mode Analysis (PFMA; which would be a condition for project negotiations); and (ii) Gosvodkhoznadzor continues its safety inspection program by conducting two diagnostic inspections, one before project effectiveness (building on the outcome of the PFMA), and one in the last year of project implementation.

'Physical Cultural Resources' (OP 4.11): This policy is not triggered as there are no project activities affecting cultural resources. Nevertheless, "chance find" provisions will be incorporated in the works bid documents.

'Projects on International Waterways' (OP 7.50): The project operates on the Amu Darya River which is a transboundary water body, and also the drainage resulting from the project area returns back to the Aral Sea. Hence the project triggers OP 7.50. The project interventions (e.g. switching from pumping from the river to gravity diversion through construction of the Bustan canal and remodeling the secondary canals) will result in bulk-water savings, which will offset the increase in consumptive use due to crop intensification. Also as the water extra releases from Tuyamuyun dam to serve the pumping stations are no longer required, these extra releases could now be focused only on meeting the minimum environmental flows in the lower Amu Darya (as discussed in the following section). Hence the current amount and quality of the "environmental flows" returning to Aral Sea, and the irrigation withdrawals by Turkmenistan, will not be undermined (as explained below). The GOU officially notified the upstream and downstream riparians with a letter implying that the project will not undermine the quantity or quality of the current basin-water uses.

Water Balance with respect to the Tuyamuyun reservoir before and after the project

The present situation before SKWRIP:

Tuyamuyun reservoir was built in 1979 and is located in the lower reach of Amu Darya River on the border of the Republic of Turkmenistan and the Republic of Uzbekistan. Public and agricultural users of Khorezm, North Karakalpakstan and Turkmenistan strongly depend on the water of the Lower Amu Darya, as they consume water from Tuyamuyun reservoir. Tuyamuyun hydropower plant has a capacity of 150 MW and supplies Turkmenistan and Uzbekistan with water. Nevertheless, the reservoir's use is primary for irrigation, and secondarily for hydropower production. A Water Management Partnership Agreement was signed on January 16, 1996 by Turkmenistan and Uzbekistan on sharing operation of Tuyamuyun reservoir. According to the agreement, the parties agreed to cooperate over any emerging land acquisition and water use issues in the territory of both sides, and possibly resolving these issues through developing separate protocols. Another applicable agreement is the Partnership for O&M and Repair of economic entities located in border areas of Uzbekistan and Turkmenistan of March 10, 2008.

Due to the flat topography, the live storage in Tuyamuyun reservoir is around 5.5 BCM. Typically, this volume is adequate for intra-seasonal storage, but not for inter-year storage. Over the last 25 years, the annual inflow available at Tuyamuyun ranged from 27 to 60 BCM/year, with the mean annual being around 35 BCM/year, and a minimum 27 BCM/year recorded in 2001. In the past, prior to the irrigation developments in Tajikistan, Uzbekistan, and Turkemendtan, the Lower Aral Sea (LAS) needed to recieve a terminal flow at lower Amu Darya river of a sustainable minimum 25 BCM/year. As this is now becoming very difficult due to the upstream irrigation expansions in the last 3 decades, LAS has inevitably shrinked (current BSL level is 35m compared to its initial 53m BSL). The volume of water entering the reservoir during very dry years (such as 2001) is not sufficient for the water needs of water users downstream Tuyamuyun in the vegetation season, nor for meeting the required environmental flows. Currently, the annual average terminal environmental flow in lower Amu Darya, which can meet the water needs of the other smaller wetlands adjacent to Aral Sea, is estimated at around 5 to 6 BCM/year (including both the fresh water from lower Amu Darya, cum the saline water from the related drainage systems). The Republic of Uzbekistan is a party to a number of International Conventions and international agreements with the Aral Sea riparian countries, such as the Convention on protection and use of transboundary watercourses and international lakes, and Decision of the Heads of the states of Central Asia «On the main directions of the Program on specific actions on improvement of environmental and social-economic conditions in Aral Sea basin for the period of 2003-2010». In accordance with those, the Aral Sea riparian countries have committed to supplying around 5 BCM/year of water into the Aral Sea, and to providing a minimum flow of 2.5 BCM/year downstream of Takhtiash barrage to ensure the ecological survival of the Amu Darya delta.

The situation after SKWRIP:

By improving water management, SKWRIP would build on DIWIP achievements to re-route the saline drainage flows away from the Amu Darya to improve water quality in the downstream. DIWIP helped Uzbekistan comply with the aforementioned agreement signed with Turkmenistan in 1996 as to the joint and rational use of Amu Darya water. The agreement (Article 9) requires that both countries halt discharging drainage water into Amu Darya. The major change introduced by DIWIP has been the suspension of Beruni and Kyzylkum pumping stations that released mineralized drainage water into the Amu Darya and Lake Ayazkala. All drainage water from the project area now is now drained via the former channel of the Janadarya to the Aral Sea. The newly constructed main drain and the rehabilitated on-farm and inter-farm drainage system now flow by gravity, the areas of high water table are considerably reduced, and some of the

institutional issues were addressed. Thus DIWIP helped to comply with the 1996 agreement by re-directing the saline-drainage outflow to Aral Sea, with a better water quality.

Demand for irrigation water after SKWRIP is expected to increase as a result of restoring formerly irrigated areas, increasing crop yield, and an increase in cropping intensity.. Pre-project abstractions from the Amu Darya into the project area are estimated at 1,825 million cubic meters per year (MCM/year), with evapotranspiration estimated at 578 MCM/year, giving a ratio between evapotranspiration and abstraction of 32 percent. Thus the incremental crop evapotranspiration as a result of increased productivity on the entire area is estimated at 275 MCM/year.

Post-project evapotranspiration/abstraction ratio is estimated at 47 percent, largely due to: (A) increasing the off-farm irrigation conveyance effcieincy (diversion-to-farms/abstraction ratio) in particular as a result of canal lining and installation of geomembrane in the Bustan canal and water management improvements, including SCADA, and less significantly, due to (B) increasing the on-farm water-use efficiency (ET/diversion-to-farms ratio), through the on-farm demonstrations and farmer schools, which are limited to pilot scale under Component 2). A total evapotranspiration of 853 MCM/year will therefore result in an abstraction of 1,815 MCM/year. This corresponds to a net gain of 10 MCM/year, which corresponds to 0.02 percent of average inflow into Tuyamuyun reservoir, or a 0.1 percent reduction over current abstractions in the lower Amu Darya (see table below). Abstractions into the RBC will be monitored on a regular basis by the project, and will be made available for consultation.

	Pre-project	**Post-project**	**Δ**	**Comment**
Evapotranspiration (MCM/year)	578	853	275	Increases due to restoring formerly irrigated areas, increasing crop yield/ha (by 17% on average), and increasing cropping intensity.
Abstraction (MCM/year)	1,825	1,815	-10	Net reduction due to improving irrigation efficiency within project area. Will be monitored (verified) via the M&E activity (Component 3).
Efficiency (percent)	32	47	15	Increased through project interventions.
Total environmental flows in lower Amu Darya (fresh plus drainage water); in an average-flow year.	17,422 MCM/yr	17,147 MCM/year	275	Negligiable reduction. Project will actually increase the fresh-water environmental flows from 16,175 MCM/year pre-project to 16,185 MCM/year post-project (due to reducing abstraction from the river by around 10 MCM/yr). But the drainage water returning from project area will decrease from 1,247 MCM/yr to 962 MCM/yr due to increasing irrigation efficiency within the project area. Hence the (negligible) reduction in the summation of fresh plus drainage water. This calculation is for annual-average

				river flows. In a very low-flow year (e.g. 2001), both the pre-project and post-project environmental flows could fall below the minimum requirements (6 BCM/year).

Table 1: pre- and post-project comparison of key indicators

Based on the above analysis, SKWRIP will support the capacity to abide by the commitment to secure at least 5-6 BCM/year to the Aral Sea (during normal-inflow years, as the average inflow into Tuyamuyun reservoir is 35 BCM/year). It should be noted that decommissioning of Amu Darya pumping stations that are no longer needed once the gravity off-take into the SKWRIP area has been developed, may lead to additional reductions in release requirements from Tuyamuyun reservoir, as these pumping stations need large, extra releases from Tuyamuyun reservoir to maintain adequate water levels in the river. This could potentially lead to savings of 1.6 BCM/year, down from 4.2 BCM/year to 2.6 BCM/year. However, as these extra releases may be deemed environmental flows, it is advisable to continue to release them downstream the project abstraction point, to avoid altering the flow regime of the river and maintain its ecological function (see the wetlands section).

In conclusion, the project interventions would not pose any negative impact on the Aral Sea basin. As implied from the water balance, the project could not lead to incremental improvement of the environmental flows downstream Amu Darya because this would have required raising further the irrigation efficiency, at prohibitively high costs. Based on the very small reduction in the yearly environmental flow, no negative stream impacts are expected.

Public consultations: The EA and EMP have been discussed at a public consultation meeting held on February 6th 2013 in Beruni Khakimiyat. The consultations have been initiated by the MAWR PIU, with assistance of the TA consultants. The participants included representatives of local executive and environmental authorities as well as local communities, WUAs and other related stakeholders. The detailed Minutes of the consultations are presented in the Annex of the EA/EMP. The comments received during the public consultation meeting have been mainly implementation related (i.e. on detailed design, construction and operation), and will be incorporated during project implementation.

B) ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Based on the findings of the EA, beyond the issue of water balance and environmental flows discussed above, the EMP identified measures to mitigate the typical adverse environmental issues relating to construction and functioning of the Irrigation and Drainage systems, which would include:

- Pollution of surface water by sediments from canal cleaning and by construction wastes
- Change of irrigation flow and temporary disruption of irrigation water supply
- Impact on biodiversity: cutting of vegetation during site clearing
- Pollution of soil and surface water spills of fuel, oil and lubricants;
- Impact on health of workers and local population, engaged in construction and operation of mechanisms;
- Pollution of soil by wastes generated from cleaning of collectors and irrigation canals;

- Ecological infringement in canals and collectors, both inside and outside (in downstream) the project area (destruction of nutrition areas and cultivation of fish, birds and other animals);
- Increased traffic, dusting, effluxes, noise and vibration from operation and repair of vehicles and mechanisms.

The EMP identifies mitigation measures to be implemented by the project, which would be aimed at:

- Foreseeing creation of safe and healthy conditions facilitating the work and excluding breakdowns and accidents, provision of labor safety rules with the correct choice and technically sound sizes of work places and their arrangement;
- Introducing new effective materials and constructions, technologies of works execution in construction;
- Establishing proper sequence of rehabilitation works at collector irrigation systems so that any inconveninces to local users are minimized;
- Site fencing, providing access to work places and residential areas during construciton;
- Environmental provisions incorporated into contracts for construction and supervision;
- Implementing traffic safety measures;
- Development and implementation of plan on derivation of drainage water during reconstruction;
- Timely clearing of the site from construction wastes, and disposal of excavations only in the places established by monitoring bodies;
- Creation of water conservation zones on sites of new canals, based on SNIP 2.04.02-97 (Construction Norms and Rules);
- Post-construction site cleanup and rehabilitation.

C) CAPACITY TO IMPLEMENT THE EMP (denoted ESMP below, to account for the SA/SMP which comes in a separate report):

MAWR will have overall responsibility for the ESMP. In view of the good experience during implementation of DIWIP, the project will support MAWR in implementing the project through establishing a PIU that is adequately staffed with needed specialists, including ESMP specialists. Close involvement of I&D management staff at Oblast, Raion and WCA level will be ensured, as well as of regional governments. The PMU will maintain a main office in South Karakalpakstan under the supervision of a Deputy Director. The PIU will be assisted by national and international consultants for all aspects of project implementation, including the ESMP. An Environmental Officer will be appointed/hired as part of the M&E team/consultants to follow up the application of the ESMP. At the design/tendering phase, this Officer will ensure an early inclusion of the ESMP-related clauses in the NCB/ICB bid documents and contracts. Thereafter, at the construction/operation phase, the Officer will ensure implanting the ESMP in terms of: mitigations (by MAWR or by the contractors), monitoring (by MAWR), and training (by MAWR). To report on these ESMP activities, the Officer will provide an ESMP chapter as part of the project-wide semi-annual M&E report. ESMP training sessions will be delivered to the PIU staff and WUAs, as part of the project-wide training program. The PIU may mobilize additional consultants to provide the needed training and to help the PIU/MAWR to implement the ESMP. The Table below summarizes the ESMP and its budget (which is embedded in the project costs, “COSTAB”).

Checklist of effects/parameters to be monitored under the ESMP:

- Quality of ground and surface water in the project area and downstream;
- Land salinization and pollution from agricultural residues;
- Level of ground water and bogging;
- Impact on flora and fauna;
- Solid wastes;
- Soil loss in lands, canal-embankment erosion during the rehab works;
- Soil fertility;
- Bird species composition and wetlands biocenosis composition;
- Sedimentation at canal ends and at pumping locations on inter-farm canals.

Summary of the ESMP and its budget (TBC by appraisal):

Expense items	Environmental/ social impact	Mitigation or monitoring measures	Responsible	Cost $US
Mitigate disruption of ecosystem	Soil erosion	Procure drought-resisting plants for canal-bank stabilization to prevent wind erosion	PIU	600,000
	Disruption of flora and fauna	Restore trees and plants that would be cut down to access the construction site	PIU	
		Purchase special seeds, farm machinery, fertilizers for farm households	PIU	
Training on environment and water quality	None	Purchase stationeries, office and other equipment; rentals for training premises	PIU	474,000
Consultants for institutional development and training including for the ESMP	None	Consultant, likely international (60 months)	PIU	1,540,000
Monitoring and evaluation consultant, including for the ESMP-related M&E	None	Consultant, likely international (72 months)	PIU	1,500,000
Pilot plots	None	Four plots per district (hence total twelve) for: on-farm water improvement, water sharing, improving soil fertility, and application of IPM.	PIU	326, 000

Resettlement and compensation costs	None	Provide timely compensation payments (at full replacement cost) for loss of assets attributable directly to the project	PIU	6,186,320
	None	Resettlement assistance		
	None	Provide assistance to improve the displaced- persons livelihoods and standards of living (at least restore to the pre-project levels)	PIU	
Transportation of materials and personnel	Air pollution	Provide vehicles for transportation of materials, personnel, wastes; environmental tests for vehicles' exhaust	Contractor in coordination with MAWR	Embedded in works contract
	Safety and health	Provide traffic lights and warning signs for access roads and construction sites	Contractor in coordination with MAWR	Embedded in works contract
Contingencies	Soil erosion and salinization	Restore canals / control structures in case of bursting	Contractor in coordination with MAWR	Embedded in works contract
	Safety and health	Repair access roads	Contractor in coordination with MAWR	Embedded in works contract
	Environmental pollution	Measures on incidental oil and fuel spill clearance	Contractor in coordination with MAWR	Embedded in works contract
	Property ownership	Compensation for incidental damage to private entities or other emergency situations	Contractor in coordination with MAWR	Embedded in works contract
Compensatory water supply	Water shortage	Arrange temporary water intake either from canals, or using flexible irrigation pipes, in case of temporary closure of canals due to construction works	Contractor in coordination with MAWR	Embedded in works contract
Storage of construction materials, fuels and lubricants	Soil contamination	Provide containers for storage of solid wastes and used oil	Contractor in coordination with MAWR	Embedded in works contract
Additional ESMP-related studies (mostly related to the core project components).		(1) Engineering of loessial pits for provision of project works with soils of certain quality; (2) Arrange construction works within boundaries of existing allotments to reduce land disruptions; (3) Determine type/structure of canal concrete lining; (4) Develop new on-farm irrigation systems instead of existing ones (concrete flumes, aryks), and introduce flexible polyethylene pipes with hydrants; (5) Recover soil excavated at cleaning the irrigation network, with determining best possible	MAWR	TBD

		disposal and reclamation locations.		
Preliminary total:				10,471,467