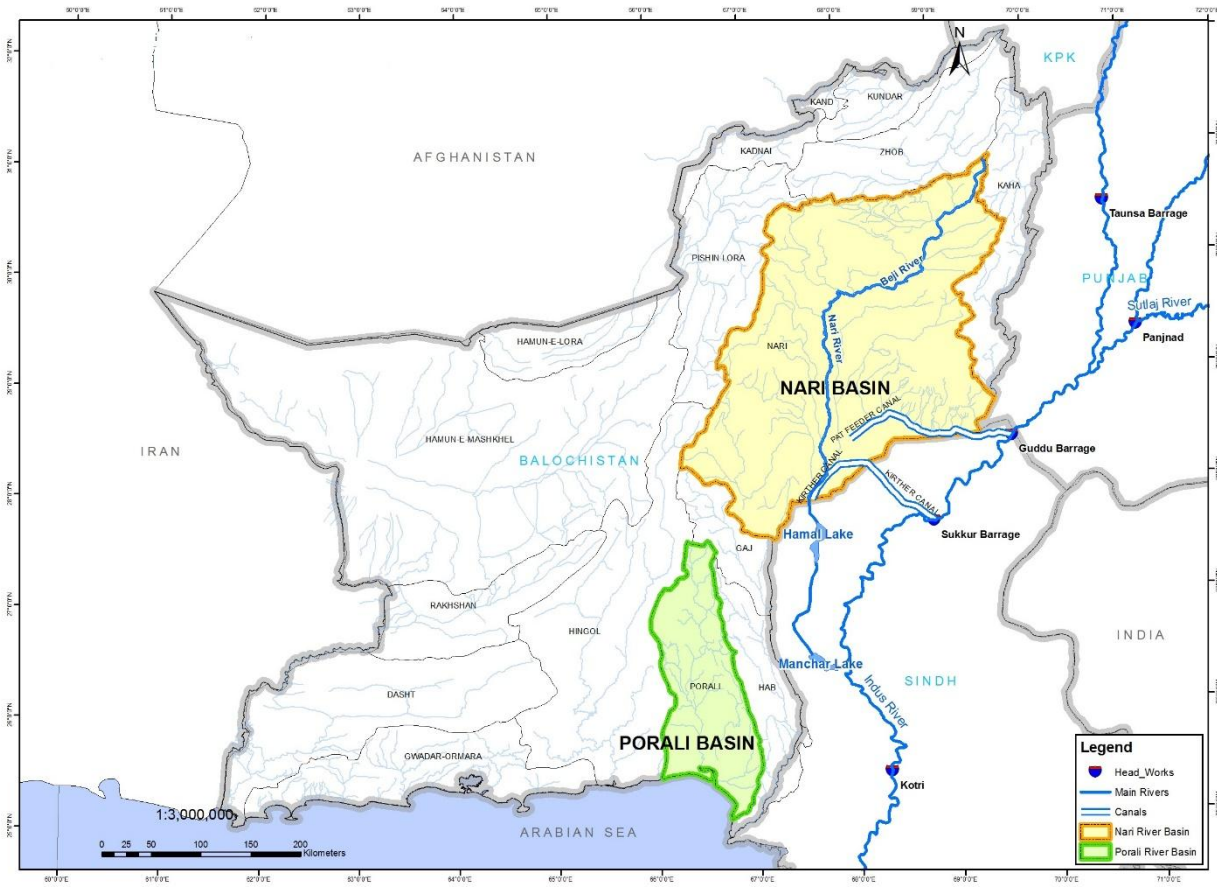




Irrigation Department Government of Balochistan

Balochistan Integrated Water Resources Management and Development Project



ENVIRONMENTAL ASSESSMENT Executive Summary Reviewed Draft for Disclosure January 2016

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List of Acronyms

BEPA	Balochistan Environmental Protection Agency
BID	Balochistan Irrigation Department
BSSIP	Balochistan Small Scale Irrigation Project
DDT	Dichlorodiphenyltrichloroethane
EA	Environmental Assessment
EMP	Environmental Management Plan
ESSU	Environmental and Social Safeguard Unit
GOB	Government of Balochistan
IUCN	International Union for Conservation of Nature
MCM	Million Cubic Meter
NEQS	National Environmental Quality Standards
MEC	Monitoring and Evaluation Consultant
PMU	Project Management Unit
PSIAC	Project Supervision and Implementation Assistance Consultant
UNESCO	United Nations Educational, Scientific and Cultural Organization
WAPDA	Water and Power Development Authority
WBG	World Bank Group
WWF	World Wild Fund

Conversions

<i>British Units</i>	<i>Metric Units</i>	<i>Metric Units</i>	<i>British Units</i>
1 ft	0.305 m	1 m	3.28 ft
1 mile	1.609 km	1 km	0.621 miles
1 cusec (ft ³ /s)	0.283 cumec (m ³ /s)	1 cumec (m ³ /s)	35.315 cusec (ft ³ /s)
1 acre	0.405 Ha	1 ha	2.47 acre

1 Executive Summary

This report is an Environmental Assessment for the proposed Integrated Water Resources Management and Development Project, in the Balochistan province of Pakistan. The Environmental Assessment is based on field studies and data collected between 2013 and 2014, and conducted by a consultant team that also undertook the feasibility study and design work for the project, and that prepared Environmental Impact Assessments for the Nari and Porali river basins under a prior World Bank funded Balochistan Small Scale Irrigation Project (BSSIP).

Balochistan is the largest province in Pakistan but also the most sparsely populated largely on account of scarce and unreliable water resources that limit agriculture to 5 percent of the land area. Agriculture is nonetheless the mainstay of Balochistan economy representing ~60 percent of GDP. Two-thirds of the population live in rural areas and are mainly dependent on agriculture. Given sparse and irregular rainfall irrigation is critical for agriculture in the province. Increasing agricultural productivity to improve livelihoods requires additional investment in infrastructure and greatly improved water management. The latter requires increased data, information and knowledge, and increased capacity for water management and planning at community level and across different levels of government.

1.1 Project description

The Balochistan Integrated Water Resources Management and Development Project (proposed by the Government of Balochistan) aims to improve water resources planning, management and monitoring by the government, and to increase the adoption of water-efficient practices and technologies by water users, in targeted communities in the Nari and Porali River basins of Balochistan (Figure 1). The Project will invest in (i) professional and institutional capacity building, (ii) hydro-meteorological data collection, management and use, (iii) new and rehabilitated infrastructure for irrigation, rural water supply and flood protection schemes, (iv) improved watershed and rangeland management in areas associated with the targeted irrigation schemes, and (v) improved on-farm water management and agricultural productivity. The Project will be implemented in the Nari (69,224 km²) and Porali (11,616 km²) river basins with a focus on specific irrigation schemes and surrounding areas.

The infrastructure investments will include (i) perennial irrigation schemes including construction of river off-takes and water distribution structures, channel lining and drainage works, (ii) spate irrigation schemes including construction of diversion head-works, main canals and distributaries, and command area development, (iii) flood protection works including earthen bunds with rip rap, earthen spurs with stone pitching, and gabion structures, (iv) new water supply schemes with intake structures and rehabilitation of existing schemes.

The Project plans to implement eight irrigation schemes (four in each basin), 16 water supply schemes, nine flood protection works, and various watershed and rangeland management activities. The irrigation work involves construction and or rehabilitation of infrastructure and increases in the volume of water diverted for irrigation.

Total number of beneficiaries from all schemes is expected to total ~706,000 people. A large population will benefit indirectly from the project, including landless farm laborers and temporary and permanent laborers in the construction and manufacturing sectors. It is expected that ~77,000 ha of additional land will be under improved irrigation by 2021. Flood protection works

are expected to directly benefit ~82,000 people and protect ~15,000 ha of land. Potable water supply sub-projects are expected to directly benefit ~29,000 people.

The project will be implemented over a period of six years at a total estimated cost of US\$253.72 million, including financing from the International Development Agency (US\$205.56M), the International Fund for Agricultural Development (US\$38.06M) and the Government of Balochistan (US\$10.11M).

1.2 Environmental Baseline

Balochistan covers ~44 percent of the land area of Pakistan. Land use is only reported for around half of the total area of the province. The reported area is classified as rangelands, agricultural lands, forests, barren and unproductive mountain slopes. Around one quarter of the reported areas is under cultivation or forest; the rest is used for grazing (productive and non-productive rangelands and barren lands). Mountains dominate the province, and valley floors and piedmont plains represent 15 percent of the landscape. It is these two landforms on which most human settlements, farms, and roads are developed.

The Nari and Porali river basins where the Project will be implemented, feature diverse physical and biological characteristics with a wide variety of biodiversity. Variations in physical features and climatic conditions have produced diverse landscapes, ecosystems and habitats that are important to the national and global heritage. The flora and fauna as well as their habitat are directly or indirectly threatened by human activities which lead to degradation, displacement and, in severe cases, extinction.

1.2.1 Nari River Basin

The Nari Basin covers ~20 percent of Balochistan and is the largest river basin in the province. Its stratigraphy is complex with lateral variations in contemporaneous sedimentation across five geological zones and parent geology characterized by zones of convergence and slip faulting. Alluvial deposits in the central and lower parts of the valleys consist of layers of clay, gravel, silt, sand or an admixture of these materials. Mean annual rainfall across the basin varies from 150 to 350 mm. The river terminates in Hamal Lake with periodic overflows into Manchar Lake. There are two important protected areas in the basin: the Ziarat Juniper Biosphere Reserve and Wam Games Reserve.

1.2.2 Porali River Basin

The Porali River is one of the four rivers of Balochistan draining into the Arabian Sea. The basin crosses the Lasbela, Khuzdar and Awaran Districts of Balochistan. In the Lasbela district the Porali River is gravel-bedded. The River flows from the high relief Wadh-Khuzdar region after which it widens, as a result of monsoon floods, into the Bela region of the basin until it empties into the Arabian Sea. Annual rainfall in the Basin varies between 100 mm and 400 mm between years, with the north of the basin somewhat wetter than the south. Hot deserts, semi-deserts and savanna with scanty terrestrial vegetation characterize the Porali basin. Seasonal rivers, streams, and gorges as in the mountain areas of the neighboring Hingol National Park have patches of vegetation. Miani Hor is Ramsar site characterized by a swampy, subtropical mangrove. It receives freshwater input from a number of seasonal streams. It supports a sizeable population of biodiversity. The proposed schemes in the Porali Basin are mostly in the mid-lower reaches of the basin where sedimentation and deforestation reflect a history of disturbance in the upper watershed.

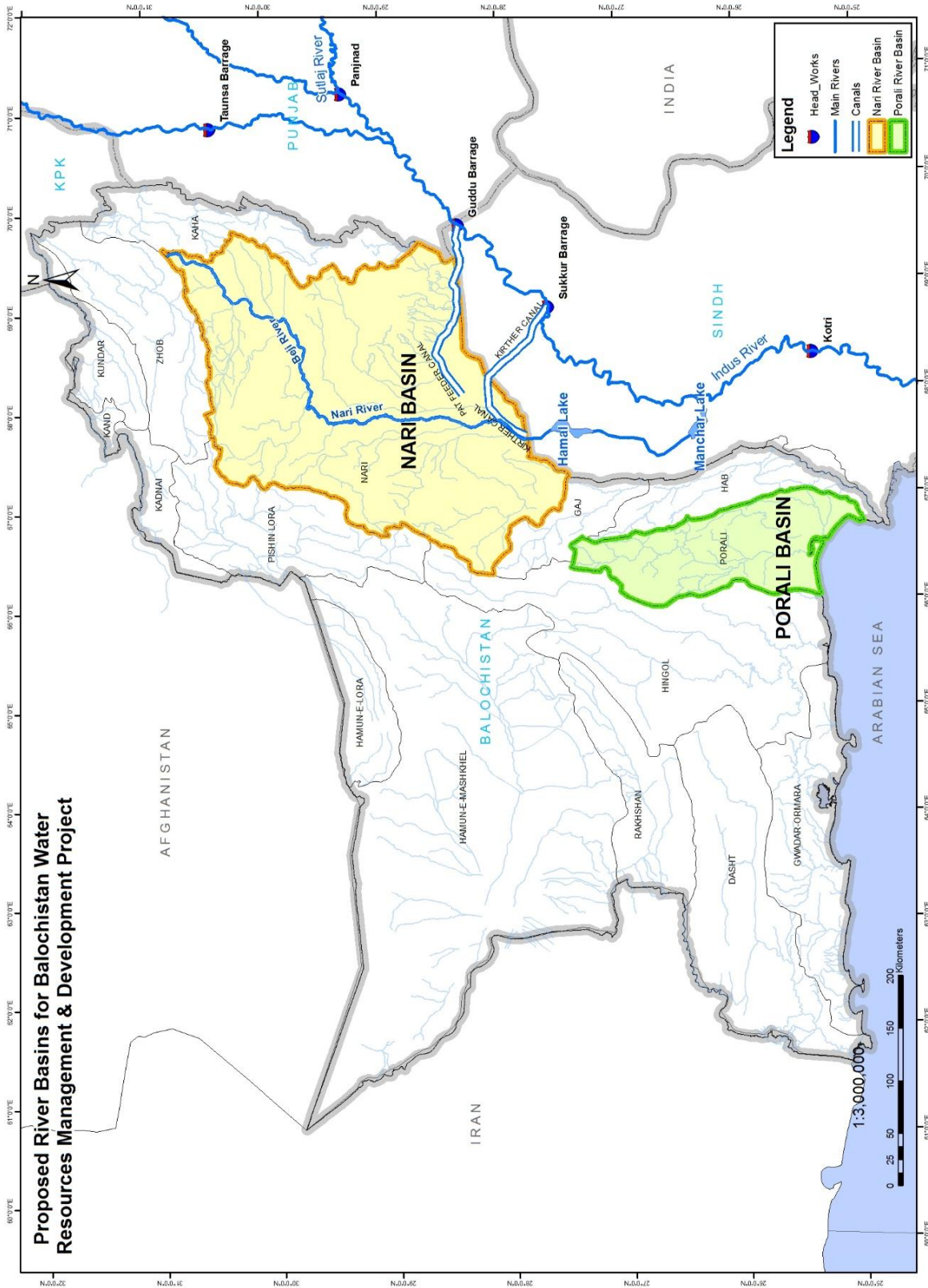


Figure 1: River Basins under the Project.

1.3 Potential Impacts and Mitigation Measures

No private land acquisition is expected and the impacts from the proposed activities are temporary in nature and limited to the construction period. Many of the environmental issues are mainstreamed in the Project design.

Project activities have the potential to modify river flow regimes and degrade water quality, leading to impacts on river health. Degradation of rangelands and erosion has reduced the natural capacity for groundwater recharge. Improper assessment of sub-surface ground water levels prior to design for spate irrigation schemes may affect recharge and hence groundwater resources. Improper design could also lead to degradation of groundwater quality.

1.4 Cumulative Impact Assessment

A cumulative impact assessment has been conducted to evaluate the combined effects of all the project interventions, together with the potential impacts from related concurrent interventions in the project basins, over the next ten years. The main focus of the cumulative impact assessment is on the aggregate impacts on river flow regimes in terms of “valued environmental components”. In addition to the project interventions, other existing and potential water resources investments and interventions in the project basins include (i) delay-action dams constructed and planned by the Government of Balochistan, (ii) The “100 Dams” project of the Government of Balochistan, and (iii) new dams planned by the federal Water and Power Development Authority. Delay action dams are groundwater recharge structure built on streamlines. In the Nari Basin 44 delay action dams have been constructed (total storage capacity 22 MCM) and in the Porali Basin 13 have been constructed (total storage capacity 16 MCM). The Government of Balochistan 100 Dams project was planned in 2008 to mitigate the sharply depleting groundwater table as well as to protect medium and high-level floods. The Federal Government approved it for financing in 2010, and physical works began in 2011 for the first of three phases. Of the 24 completed dams two are located in Nari / Porali basins: Kumbri Dam (Nari basin, storage capacity of 24 MCM), Lohi Dam (Porali basin, 4.7 MCM). 14 further dams are planned in the Nari basin and five in the Porali basin. All of these dams are designed to slow flow/flood velocities and are not designed as long-term water storage reservoirs. WAPDA is planning three medium-sized dams for the study area: Naulong Dam (Nari, 299 MCM), Winder Dam (Porali, 45 MCM) and Pilar Dam (Porali, 111 MCM). These dams have been under consideration for more than seven years, and are still at feasibility stage with further studies underway.

A conservative estimate of aggregate impact of these developments is: (i) Project Schemes – diversions of 200 MCM (Nari) and 148 MCM (Porali), (ii) Delay Action Dams: no diversion but storage capacity of 22 MCM (Nari) and 16 MCM (Porali), (iii) 100 Dams project – unlikely that all or indeed any of the proposed dams will be built in the next 5 to 10 years and in any case as these are not diversion structures, nor are they reservoirs, downstream water flows, for agriculture and/or domestic purposes, are likely to remain unaffected, (iv) WAPDA Dams – unlikely that new WADPA dams will be constructed in the near future but the worst case scenario would be additional live storage of 299 MCM in Nari Basin and 156 MCM in the Porali Basin.

Hydrological assessments for the two basins indicate that considering delay action dams, the 100 Dams project and WAPDA dams, the volume of water available downstream more than 8 times higher (Nari) and 3.6 times higher (Porali) than the estimated minimum environmental

flows for these basins. Nonetheless, to monitor impacts and mitigate cumulative impacts it is recommended that (i) hydro-meteorological stations be installed to monitor river flow, (ii) aquatic biodiversity is protected by restoring the timing and duration of flood pulses and maintaining critical minimum flows in the dry season, (iii) the project work closely with the local communities as well as Forest and Wildlife, and Revenue Departments to ensure that natural habitats including rangelands and forests remain unaltered as a result of this project and (iv) during project operation care be taken to not convert ecologically important land to agriculture.

For aquatic habitats, a number of recommendations are provided to monitor and/or mitigate impact: (i) a short study to assess the suitability of fish farming be conducted, (ii) seasonal monitoring of water flow and quality be undertaken at the inflow locations to Miani Hor, (iii) support WWF and IUCN effort to obtain further protection for Miani Hor as a marine protected area with community-based management.

The project does not directly impact on the biodiversity and forest of Ziarat Juniper Biosphere Reserve, but there are possible risks of rangeland degradation, the Juniper forest contributes to the sustainability of the watershed and catchment conservation. A number of recommendations are made to improve the biodiversity of Juniper forest and protect the rangeland, such as, (i) introduce grazing control, scientific management of rangelands, protect forested land for further degradation, (ii) conduct a study to support the implementation of the 2013 Juniper Biosphere Reserve management plan, (iii) support current efforts by the GOB to declare Biosphere Reserve a national park.

1.5 Climate Change Impacts and Risks

Climate change impact will have a negative impact on both surface and groundwater resources in Balochistan. Based on climate change predictions of Pakistan Meteorological Department, temperatures in high Balochistan are expected to increase to 0.12-0.6 °C by 2050 and 0.27-1.35 °C by the end of the century. For lower Balochistan, the numbers are 0.04-2 °C by 2050 and 0.09-4.5 °C by the end of century. Future climate change is expected to increase the variability in rainfall and temperatures and most likely reduce water availability. Hence, improved water management is critical for the future economic and social development of Balochistan

1.6 Environmental Management Plan

The EMP aims to manage adverse impacts of project interventions and compensate and enhance the environmental and social status of the Project area.

The EMP will be managed through a number of tasks and activities and project and site specific management plans. In order to make the Contractors fully aware of the implications of the EMP and responsible for ensuring compliance, technical specifications in the tender documents will include compliance with mitigation measures proposed in the EA as well as World Bank Group's EHS guidelines. The Contractor must be made accountable through contract documents for the obligations regarding the environmental and social components of the project. The Project Supervision and Implementation Assistance Consultant will be responsible for supervising the contractors for the implementation of the EMP. The PSIAC will appoint dedicated environment staff to ensure EMP implementation and will be responsible for effectiveness monitoring.

Prior to the commencement of construction activities, contractors will prepare project and site-specific management plans including: (i) erosion, sediment and drainage control plan, (ii) pollution prevention plan, (iii) waste disposal and effluent management plan, (iv) traffic

management plan, (v) borrow area management and restoration plan, (vi) occupational health and safety plan, (vii) drinking water supply and sanitation plan, (viii) flora and fauna protection management plan, (ix) construction camp management plan, (x) fuel and hazardous substances management plan, (xi) emergency preparedness plan, and (xii) communication plan. An integrated pest management plan is prepared and included in the EA. To address likely impact on Physical and Cultural Resources in the Project area, a Cultural Heritage Management Plan (CHMP) will be developed during the first year of project implementation. Further, to address the assessed cumulative impacts the following will be prepared: (i) fish farming enhancement plan, (ii) Biodiversity management plan for both Miani Hor and Ziarat Biosphere Reserve, (iii) mitigation plan, and (iv) monitoring plan.

Table 1: Mitigation Plan

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
A. ENVIRONMENTAL AND SOCIAL IMPACTS DURING PRE-CONSTRUCTION STAGE				
Negative Impacts				
A.1 General Design Considerations	Failure of previous similar interventions/projects and schemes.	<ul style="list-style-type: none"> The causes of failure of previous interventions in terms of design and / or construction faults will be studied and incorporated into the detailed designs. 	Design Consultant	PMU
	Schemes will only benefit some influential people of the area and not benefit the poor and vulnerable peoples most in need.	<ul style="list-style-type: none"> Location of the proposed schemes is identified based on field survey, need assessment, and consultations with local community to have a proper geographical dispersion of interventions to ensure equitable distribution of benefits. The project intervenes in both basins in a manner that ensures that there are many individual beneficiaries from project activities. 	Design Consultant	PMU
A.2 Land Acquisition	About four acres of land may be required on temporary basis for contractor' camp.	<ul style="list-style-type: none"> Only government land to be used; no private or community land to be used. In extreme case where private land acquisition is unavoidable, it will be compensated under the guidelines presented in the resettlement policy framework included in the Social Impacts Assessment and Mitigation Plan. 	Design Consultant	PMU
A.3 Design Considerations: Impacts on Ecology, Soil and Land	Sub-basin / Watershed and Scheme site location. Improper selection with reference to site ecology (i.e. improper project siting) may lead to erosion and loss of useful agricultural land.	<ul style="list-style-type: none"> Appropriate site selection and design were conducted according to national and the WB guidelines in order to entail no or minimal disturbance to local ecology, soil and land. 	Design Consultant	PMU
	Improper site selection and design can lead to removal of vegetation and cutting of trees.	<ul style="list-style-type: none"> Schemes located in ecologically sensitive areas not approved, in order to avoid impact on flora /fauna. 	Design Consultant	PMU
	Sub-basin / Watershed and	<ul style="list-style-type: none"> Plantation plan / forest / rangeland management consideration during design phase. 	Design Consultant	PMU

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
	Scheme site location may lead to deforestation in the sub-basins.			
A.4 Design Considerations: Impacts on Surface Water	Watershed / Scheme Site interventions may affect natural drainage / run-off. This can stress local natural stream flow –which may cause surface water quality degradation and contamination of water resources and affect downstream ecology.	<ul style="list-style-type: none"> • During design stage, watershed hydrological modelling is being conducted at the scheme site to account for effects on natural drainage and surface water quality. 	Design Consultant	PMU
	Improper design considerations for suspended silt / maintenance of minimum flows may degrade downstream ecology.	<ul style="list-style-type: none"> • Designs to consider flow regulatory structures / schemes and minimum flow requirements. 	Design Consultant	PMU
	Excessive diversion/use of surface water resources may lead to depletion of natural surface water resources.	<ul style="list-style-type: none"> • Design to consider proper water utilization rates under schemes as not to deplete water resources. 	Design Consultant	PMU
A.5 Design Considerations: Impacts on Groundwater	Improper assessment of sub-surface ground water levels prior to design stage for Non-	<ul style="list-style-type: none"> • Extensive ground water table studies have been carried out during feasibility stage. • Schemes are designed according to Ground water recharge/ pumping regulations. 	Design Consultant	PMU

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
	perennial schemes may lead to depletion of ground water resources.			
	Improper capacity lead to inappropriate fertilizer and pesticide use in irrigation may lead to degradation of sub-surface water quality and contamination.	<ul style="list-style-type: none"> An integrated pest management plan is prepared under the national regulatory guidance. Extensive training is designed under the On Farm Water Management Program for the proper use of pesticide. 	EA Consultant	PMU
A.6 Contractors' mobilization	If contractors are not made responsible to comply with ESMP, there will be several construction related impacts	<p>In order to make the Contractors fully aware of the implications of the ESMP and responsible for ensuring compliance, technical specifications in the tender documents will include compliance with mitigation measures proposed in ESA as well as IFC EHS guidelines. The Contractor must be made accountable through contract documents for the obligations regarding the environmental and social components of the project.</p> <p>Contractor needs to prepare the following site specific management plans to manage and mitigate/reverse potential adverse environmental impacts in compliance with ECPs and mitigation measures proposed in the EA. All these plans are to be reviewed and approved by PSIAC and PMU</p> <ul style="list-style-type: none"> Erosion, sediment and drainage control plan Pollution Prevention Plan Waste Disposal and Effluent Management Plan Traffic Management Plan Borrow Area Management and Restoration Plan Occupational Health and Safety Plan Drinking Water Supply and Sanitation Plan Management Plan for Protection of Flora and Fauna Construction Camp Management Plan Fuel and Hazardous Substances Management Plan Emergency Preparedness Plan 	Contractor	PSIAC, PMU

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
		<ul style="list-style-type: none"> • Communication Plan • Construction and Operation Phase Security 		
B. SOCIAL IMPACTS DURING CONSTRUCTION STAGE				
Positive Impacts				
B.1 Hiring of Workers	Generation of employment.	<ul style="list-style-type: none"> • Temporary employment for local workers and technicians, local unskilled labors. Also, employment of locals during surveys. 	Contractor	PSIAC, PIU
	Increased economic activity.	<ul style="list-style-type: none"> • Establishment of new businesses and commercial enterprises; local employment. • New market for local produces, more sale and revenue generation. • As a result of the influx of a workforce, there shall be a higher demand for locally produced food, goods and services benefiting local farmers, producers, traders including small shops within project area. 	Contractor	PSIAC, PIU
Negative Impacts				
B.2 Land Acquisition	Temporary land acquisition by the contractor during construction.	<ul style="list-style-type: none"> • Only government land to be used; no private or community land to be used. • In extreme case where private land acquisition is unavoidable, it will be compensated under the guidelines presented in the resettlement policy framework included in the Social Impacts Assessment and Mitigation Plan. 	Contractor	PSIAC, PIU
B.3 Increased Traffic	Safety hazards due to increased traffic especially for children and elderly people.	<ul style="list-style-type: none"> • Traffic Management Plan addressing general access to be implemented. • Safety and security actions and procedures to protect local community during construction phase. 	Contractor	PSIAC, PIU
B.4 Occupational Health & Safety	Risk of accidents and unsafe working conditions for workforce.	<ul style="list-style-type: none"> • Occupational Health and Safety Plan to be implemented. • Emergency Preparedness Plan to be implemented. • Contractor follows IFC Performance; Standards on Labor and Working Conditions; • Safety training for all workers. 	Contractor	PSIAC, PIU
B.5 Safety, security, and vandalism	Security risks for workers and project staffs, especially in Porali River basin area.	<ul style="list-style-type: none"> • Continued consultations with the tribal leaders and local community leaders on security matters. • Security at the work sites and camps. • Identification cards to workers. • Access to the camps must be controlled through gated entrances and entrance and exit logs shall be maintained at each gate. • Preparation and implementation of the contractor's Communication plan to 	Contractor	PSIAC, PIU

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
		<ul style="list-style-type: none"> engage local leaders and community. Implement ECP 19: Construction and Operation Phase Security 		
	<p>Inadequate construction site security poses a significant risk to assets, construction materials and property. Theft/vandalism of assets, materials and property would increase construction costs and cause delays in project completion.</p>	<ul style="list-style-type: none"> Ensure security at the work sites and camps. Employ night watchman for periods of significant on-site storage or when the area necessitates. Ensure there is proper fencing around construction site perimeter, chain-link at least 2.4 m high and secured with a steel chain and lock. Pre-employment screening investigations should be used to verify the applicants relating to their employment, education and criminal history background. Identification cards to workers Implement ECP 19: Construction and Operation Phase Security 	Contractor	PSIAC, PIU
B.6 Migrant Workers	Possible cultural conflicts between communities and workers.	<ul style="list-style-type: none"> Awareness campaign; Code of conduct for workers. Grievance mechanism. Develop and implement strong community participation plan. 	Contractor	PSIAC, PIU
	Risks of HIV/AIDS and STI due to the flow of migrant workers.	<ul style="list-style-type: none"> Awareness creation on HIV/AIDS infection and diseases through a well-designed campaign implementation plan targeting all risk-prone groups. Empowering women through employment in the construction work. 	Contractor	PSIAC, PIU
	Increased pressures on local facilities (i.e., mosques, health care facilities) due to in-flux of migrant labors.	<ul style="list-style-type: none"> Construction contractors will provide all required facilities for workers, so workers will not put pressure on local facilities. 	Contractor	PSIAC, PIU
B.7 Storage of Materials	Health and safety risk of the community due to the existence of a construction site(s) and the storage and	<ul style="list-style-type: none"> The Contractor shall follow IFC EHS guidelines. If there are any hazardous materials, they shall be safely stored on construction site locations under lock and key. 	Contractor	PSIAC, PIU

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
	use of hazardous chemicals.			
B.8 Construction Activities	Temporary interruption of irrigation water supply during construction works.	<ul style="list-style-type: none"> • Prepare construction schedule to avoid farming seasons. • For longer construction scheme, the contractor shall be prohibited from interrupting the water supply to any canal or reducing it below the allocated discharge of these canals by providing diversion canals on the section where work is planned on priority basis. • The Contractor shall programme the Works to utilize the low water demand periods in the command area. • The Contractor shall submit a construction schedule to the Engineer for approval on mobilization. If in case, the closure of water supply is unavoidable, the Contractor needs to share his plan with the farmers and get their consensus. 	Contractor	PSIAC, PIU
C. ENVIRONMENTAL IMPACTS DURING CONSTRUCTION STAGE				
Negative Impacts				
C.1 Air Pollution	Emissions of dust and air pollution will be generated from excavation works, operation of construction equipment and vehicles, material transport, and site clearance	<ul style="list-style-type: none"> • Water the soil surface and any non-asphalted roads, especially in the dry season. • Water the soil before starting excavating. • The storage and handling of spoil, subsoil, topsoil and materials should be carefully managed to minimize the risk of wind-blown material and dust. • Cover hauling vehicles carrying dusty materials moving outside the construction site. • Fit vehicles with appropriate exhaust systems and emission control devices. • Limit the idling time of vehicles not more than 2 minutes. • Implement ECP 10: Air Quality Management. 	Contractor	PSIAC, PIU
C.2 Clearing of Vegetation and Trees	Clearing of natural vegetation and trees in project areas. There may also be pressure on forests (illegal logging) by influx of workers.	<ul style="list-style-type: none"> • Vegetation clearance shall be limited to the extent required for execution of works. • Avoid cutting down of tree species of conservation significance and those that are protected, even those that act as nesting and breeding sites. • Tree plantation will be carried out in and other suitable areas near the river training works at a ratio of 5 new trees per each tree cut. • Contractor will follow ECPs 12 and 13 on Protection of Flora and Fauna while tree cutting. • Include environmental management and awareness as part of training for employees during construction. 	Contractor	PSIAC, PIU

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
C.3 Creation of Access Routes	Access routes will damage the land quality as well as standing crops.	<ul style="list-style-type: none"> Construction Contractors will be prohibited from using agricultural lands for access routes. 	Contractor	PSIAC, PIU
C.4 Earthworks	Fertile top soils that are enriched with nutrients required for plant growth or agricultural development will be impacted	<ul style="list-style-type: none"> Strip the top soil to a depth of 35 cm and store in stock piles of height not exceeding 2m. Remove unwanted materials from top soil like grass, roots of trees and others. Spread the topsoil to maintain the physico-chemical and biological activity of the soil. The stored top soil will be utilized for covering all disturbed area and along the proposed plantation sites. Implement ECP 7: Top Soil Management 	Contractor	PSIAC, PIU
C.5 Excavation Works	Excavation works will impact on the loss of habitats especially the terrestrial invertebrates that live in the ground.	<ul style="list-style-type: none"> Avoid construction during the rainy season Minimize digging of trenches and vegetation clearance to minimum required level. 	Contractor	PSIAC, PIU
C.6 Noise and Vibration Pollution	Operation of piling activities, excavation, operation of heavy equipment and transport vehicles, and blasting operation will cause noise and vibration affecting workers and the nearby population.	<ul style="list-style-type: none"> Construction activities near settlements will be limited to day time only (8AM – 6PM). High noise producing equipment will be provided with mufflers or acoustic enclosures. Install acoustic enclosures around generators and install temporary noise control barriers where appropriate to reduce noise levels. Fit high efficiency mufflers to appropriate construction equipment. Notify affected communities in advance regarding major noisy operation, e.g. blasting. Implement ECP: 11 Noise and Vibration Management 	Contractor	PSIAC, PIU
C.7 Construction Camps	Impact on surrounding environment and communities from Construction Camps	<ul style="list-style-type: none"> During construction phase the contractor site camps should be properly managed. Water usage, fuelwood cutting, deforestation, trees injury should be avoided. Community of the area should not be affected. Proper sanitation and construction machinery should be maintained according to environmental standards. The Contractor needs to establish main and site camps. The main camp may be a rented building in the Lasbela city and will be for the Contractor project 	Contractor	PSIAC, PIU

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
		management staff while site camps shall be for the labour and Contractor's machinery operators. The site camps shall be located where the construction works are in progress.		
C.8 Increased movement of traffic	Increased Traffic on local roads will affect access to the trading centre and, houses close to the road, deteriorate safety (especially the school children), spillage of fuels and chemicals, and damage to infrastructures and properties due to vibration	<ul style="list-style-type: none"> • Contractor will implement traffic management plan to ensure uninterrupted traffic movement during construction. • Restrict truck deliveries, where practicable, to day time working hours. • Restrict the transport of oversize loads. • Enforce on-site speed limit, especially close to the sensitive receptors, schools, health centres, etc. • Implement ECP 15: Road Transport and Road Traffic Management • Inspect structures within the close proximity of construction site for damages. 	Contractor	PSIAC, PIU
C.9 Contamination and Effluents	Contamination of soil and water due to the accidental spills and leakage of fuels and chemicals.	<ul style="list-style-type: none"> • Contractor will prepare and implement Pollution Prevention Plan and ECP. • Implement ECP 2: Fuels and Hazardous Goods Management • Contractor to confine the contaminants immediately after such accidental spillage • Contractor to collect contaminated soils and washouts containing petroleum products treat and dispose them in environment friendly manner • All areas intended for storage of hazardous materials to be quarantined and provided with adequate facilities to combat emergency situations complying all the applicable statutory stipulation 	Contractor	PSIAC, PIU
	Impact of spoils, solid waste, and waste effluents.	<ul style="list-style-type: none"> • Implement ECP 1 Waste Management and ECP 2 Fuels and Hazardous Goods Management. • Siting of fuel and hazardous material storage sites, including refuelling facilities, batching plants and construction yards are to be located outside the flood embankments and at least 500 m away from any residential areas. • Hazardous waste will be disposed of by designated contractors. 	Contractor	PSIAC, PIU
C.10 Impact of borrow and quarry activities	Impact of borrow and quarry activities.	<ul style="list-style-type: none"> • Borrow/quarry areas will be developed close to the project area for extraction of earth material and aggregates for river protection works. • No private lands or agriculture lands will be used for borrowing. • Minimize volume of borrow material by using dredged material generated from 	Contractor	PSIAC, PIU

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
		<p>the project.</p> <ul style="list-style-type: none"> • The use of explosive should be used as low as possible to reduce noise, vibration, and dust. • Control dust and air pollution by application of watering. • Photographs recorded of each borrow area showing pre-construction baseline for comparison with after rehabilitation • Implement ECP 9: Quarry Areas Development and Management. 		
C.11 Archaeological and Religious Sites	Disturbance/damage to unidentified archaeological asset or graveyard.	<ul style="list-style-type: none"> • No archaeological sites are reported with in the construction areas. However, in case any artefact or site of archaeological, cultural, historical, or religious significance are discovered during construction activities, the works will be stopped in that area, and the appropriate department will be informed. 	Contractor	PSIAC, PIU
	Disturbance to sites of religious importance	<ul style="list-style-type: none"> • Location of all schemes are at a safe distance from sites of religious importance, however if sites of religious significance are encountered during construction activities, the works will be stopped in that area, and the appropriate department will be informed, as outlined in the chance finds procedure. 	Contractor	PSIAC, PIU
	Likely impacts on Physical and Cultural Resources	<ul style="list-style-type: none"> • An additional study to develop a cultural heritage management plan will be carried out in the first six months of the project. 	Consultant	ESSU/PMU
C.12 Construction Activities: Impacts on Ecology, Wildlife and habitats	Loss of faunal habitat at locations of construction works, camp, staff quarters and on access/haul routes due to the felling of trees. Fragment and lead to loss of critical habitats for resident and migratory birds.	<ul style="list-style-type: none"> • Minimize construction in the critical habitats of birds. • Care should be taken to make sure bird nests are not destroyed. If there is no option available, rehabilitate them in other neighbouring trees. Also protect and rehabilitate injured or orphaned birds. • Use of existing access road and limit the width of new access roads. • Implement ECP 13 Protection of Fauna for species with conservation significance especially endangered and near threatened. 	Contractor	PSIAC, PIU
	Deforestation and loss of habitat may affect the Balochistan black bear (found in found in	<ul style="list-style-type: none"> • Tree clearance shall be limited to the extent required for execution of works. • Contractor will follow ECP 12: Protection of Flora while tree cutting • Implement ECP 13: Protection of Fauna for species with conservation significance especially endangered and near threatened. 	Contractor	PSIAC, PIU

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
	Ziarat, Kalat and Khuzdar), which is a critically endangered species.	<ul style="list-style-type: none"> • Include environmental management and awareness as part of training for employees during construction 		
	Impact on river habitats (i.e., breeding and nesting sites)	<ul style="list-style-type: none"> • Control of sediment flow from the construction activities • Silt curtains along river training works to control sediment runoff. • Minimize and restrict clearing of riverine vegetation as much as possible. • Implement ECP 13 Protection of Fauna for species with conservation significance especially endangered and near threatened. • Project activities are mostly confined to the diversion of flood water or diversion sub-surface water through Perennial Irrigation Schemes, so are not expected to affect the fish and marsh crocodile, which mostly reside in lagoon areas. 	Contractor	PSIAC, PIU
	Loss of temporary breeding pools and pans due to refilling by construction soil or gravel.	<ul style="list-style-type: none"> • Schedule construction during the dry season to reduce impact since the amphibian populations will be low during non-breeding season • Fence off the trenches with nets to prevent amphibians falling into the trap. • Implement ECP 13 Protection of Fauna for species with conservation significance especially endangered and near threatened. 	Contractor	PSIAC, PIU
C.13 Construction Activities: Impacts on Downstream and Protected Areas	Impact on downstream river habitats from construction activities, such as construction of flood protection and river training works. The Porali River and its tributaries drain into the Miani Hor, a designated Ramsar site.	<ul style="list-style-type: none"> • Control of sediment flow from the construction activities. • Implementation of ECPs, including ECP 1 Waste Management and ECP 2 Fuels and Hazardous Goods Management. • Silt curtains along river training works to control sediment runoff. 	Contractor	PSIAC, PIU
D. SOCIAL IMPACTS DURING OPERATION & MAINTENANCE STAGE				
Positive Impacts				
D.1 Overall Project Implementation	Access to irrigation water, farming capacity and technology, flood	<ul style="list-style-type: none"> • Benefit 705,579 people (about 86,549 households) by 8 Irrigation, 16 Potable Water, and 2 Flood Protection schemes; improved Watershed and Rangeland Management, and environmental protection of protected and wetland areas. 	MEC	PMU

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
	protection, water watershed and rangeland management, environmental protection, potable supply, and			
D.2 Improvement of Irrigation System and Water use Practices	Access to improved irrigation system and improved water use practices	<ul style="list-style-type: none"> Improved irrigation system and improved water use practices will lead to a considerable increase in cultivatable land, thus increase crop production and improve income and livelihoods of farmers. The implementation of project will result in increased crop production, resulted by increase in cropping intensity from 20% to 100% and improvement in yield /acre. Productivity of crops is expected to more than double after project implementation. After project implementation, in the Porali River basin, total crop production is expected to increase from 184,235 tons to 450,627 tons (an increase of 266, 392 tons). The irrigation sub-projects and on-farm water management practices are expected to benefit 544,490 people (68, 061 households). It is expected that by 2021, 77,000 ha of additional land will be under improved irrigation. 	MEC	PMU
D.3 Flood Protection Works	Damage of command areas by flood waters	<ul style="list-style-type: none"> Prevention of floods from entering into the command area by constructing flood protection works, will improve the livelihood of the population and protect crops, Flood schemes will reduce the likelihood of devastating damage and the economic burden associated with recovery following the flood. Flood protection works are expected to directly benefit 81,760 people (10, 220 households) and protect 14, 557 ha of land. The estimated avoided damages/year due to flood protection works are in USD \$753,882, \$462,271, \$124,720 and \$1,340,873 for infrastructure, livestock production, crop production, respectively. Construction of flood water diversion structure will play a pivotal role in increasing the income of households at farm level. This will help in increasing the area under cultivation along with cultivation of improved varieties. Flood water diversion schemes in the province will help in improving the family 	MEC	PMU

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
		nutrition through availability of better and nutritious food and thus contribute to better health of households.		
D.4 Opportunities for Women	Loss of opportunities for women and social uplift	<ul style="list-style-type: none"> Project will enhance opportunities for women to participate in profitable agriculture, by tailoring interventions to their specific needs and by promoting gender equity in rural communities. It is expected that 352,789 women will benefit directly from implementation of Irrigation Schemes, Potable Water, Flood Protection and Watershed and Rangeland Management. 	MEC	PMU
D.5 Water Supply to Communities	Water supply and waterborne disease in the Project area.	<ul style="list-style-type: none"> Potable water supply sub-projects are expected to directly benefit 29,220 people (3, 653 households). Lifestyle in surrounding areas will be improved by ensuring sustained supply of potable water. Sanitation and water borne diseases in the area will be improved. Sustained water supply will contribute significantly on reduction to households spending on water borne diseases. Improvement in livestock quantity and composition due to consistent availability of water will improve economic income and food security of people. 	MEC	PMU
D.6 Social Implications due to improved watershed and rangeland management:	Poor Watershed and Rangeland Management.	<ul style="list-style-type: none"> Watershed management activities will be undertaken in both Project river basins, including soil and water conservation measures, rainwater harvesting and plantations. About 280,161 people (32,960 households) are expected to benefit from the implementation of the improved Watershed and Rangeland Management practices. 	MEC	PMU
	Biomass productivity for sustenance.	<ul style="list-style-type: none"> Production of fuel wood for use by low income households. 	MEC	PMU
	Social forestry jobs	<ul style="list-style-type: none"> Will create local jobs for harvesting timber and non-timber products. 	MEC	PMU
	Grazing area and food stock for livestock.	<ul style="list-style-type: none"> Improvement in livestock (quantity and composition) due to more consistent food stock availability for grazing animals. Develop livestock potential of the area through management of pasture lands 	MEC	PMU
Negative Impacts				
D.7 Management and Maintenance of	Social disturbance due to poor expectation management of the project.	<ul style="list-style-type: none"> Make formal arrangement for continued communication and engagement with local stakeholders, in the form of a community engagement cell. Hire an independent monitoring consultant, for regular monitoring of the project. Ensure consistent communication with local communities, even if there are hurdles in project implementation 	MEC	PMU

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
Project	Low system efficiency due to poor maintenance.	<ul style="list-style-type: none"> • Development and implementation of a proactive maintenance plan for the proposed project/site with predefined periodicity. • Monitoring on regular basis at each project /site location and reporting maintenance status. 	MEC	PMU
D.8 Restriction on Open-access Grazing	Restriction on open-access grazing may affect livelihoods of farmers.	<ul style="list-style-type: none"> • Development of comprehensive and fair rotational grazing plan. • All users of grazing land will be given equal rights and access. 	MEC	PMU
D.9 Downstream and Protected Areas	Alteration of Ecological flows of the Porali River may have an effect on the fish and shrimp in Miani Hor and thus impact livelihoods' of people which depend on these resources.	<ul style="list-style-type: none"> • Environmental flow assessments are determined to maintain the hydrological regimes and provide protection of river flows and ecosystem characteristics. • Assessments show that the minimum environmental flow required for Porali River is 0.111 BCM and after diversion and consumption 0.582 BCM water will be released downstream, which is more than 5 times minimum requirements. Thus, there should be no negative impact. 	MEC	PMU
	More cultivated land will lead to increased usage of pesticides and fertilizers, which have negative effect on downstream areas, especially the Miani Hor and eventually impact the livelihoods of people.	<ul style="list-style-type: none"> • Disseminate information regarding sustainable use of fertilizers and insecticides to keep the use at an optimal level. • A comprehensive education and awareness programme for farmers; development of a biodiversity database; community-based sustainable use programmes. • The ESMP included an Integrated Pest Management plan. 	MEC	PMU
E. ENVIRONMENTAL IMPACTS DURING OPERATION & MAINTENANCE STAGE				
Positive Impacts				
E.1 Protection and Conservation	Groundwater recharge	<ul style="list-style-type: none"> • Improved recharge of ground water tables in the project area by water storing techniques and plantation. • Improved watershed and rangeland management technologies to improve soil moisture retention, reducing erosion and improving groundwater recharge. 	MEC	PMU/BID

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
	River morphology and flood protection.	<ul style="list-style-type: none"> The regulated hydrology regime will be more beneficial for the overall ecosystem health, even with reduced total quantity of water, than the current erratic regime. Flood water diversion schemes will bring very positive impact on the environment through increased fodder and agriculture crop production, which would take off pressure from the rangelands of the area in terms of provision of fodder and fuelwood. Flood water diversion scheme will also help in increasing the productivity of ecosystems and will therefore attract more faunal species in the area. This will help in maintaining and increasing the biodiversity in the project/scheme area. 	MEC	PMU/BID
E.2 Watershed and Rangeland Management: Environmental Implications	Highland pastures and biomass	<ul style="list-style-type: none"> Prevent grazing on degraded land, protect areas with good natural regeneration potential, reseeding/sowing rangelands with palatable species, Establish grazing management plans based on carrying capacities, and construction of watering ponds for livestock. Planting of palatable shrubs and trees and reseeding of grass as well as introduction of stall feeding based on fodder production Rangeland management will introduce rotational grazing and stocking rate limits. At the irrigation scheme level, watershed management will include drainage improvement, soil and water conservation measures and rehabilitation/protection of irrigable land degraded/endangered by erosion gullies. 	MEC	PMU/BID
	Soil erosion	<ul style="list-style-type: none"> River basin level activities will include soil and water conservation measures (e.g., hillside drains, contour trenches, rainwater harvesting in micro-catchments and plantations). Construction of water conservation and erosion control works (e.g., loose and pack stone check structures, groundwater recharge ponds, gabions, Kareze rehabilitation, streambed ponds, ditches etc.). Improved watershed and rangeland management technologies to improve soil moisture retention, reducing erosion and improving groundwater recharge. By 2021, it is expected that 70,000 ha of land area with high erosion risk will be treated. 	MEC	PMU/BID
	Destruction of ecosystem and deforestation.	<ul style="list-style-type: none"> Conservation of two important ecosystems in Balochistan, namely the Juniper forest in the catchment areas of Nari river basin and the Mangroves forest in the delta of Porali river basins. 	MEC	PMU/BID

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
		<ul style="list-style-type: none"> The Project will supplement existing environmental protection and conservation of protected juniper and mangrove forests. Reforestation efforts will also help in the recovery of the critically endangered Balochistan Black Bear. 		
Negative Impacts				
E.3 Fertilizers and Pesticides	Enhanced/ induced use of fertilizers and pesticides due to increased cultivation.	<ul style="list-style-type: none"> An Integrated Pest Management (IPM) plan (Annex B) is being prepared as part of the EMP and will be implemented during project operation stage. Disseminate information regarding sustainable use of fertilizers and insecticides to keep the use at an optimal level. A comprehensive education and awareness program on sustainable fertilizer use is planned under On Farm Water Management component. Development of a biodiversity database; community-based sustainable use programmes; developing and strengthening the protected areas system; developing a policy for ex-situ conservation of biodiversity; developing an effective policy framework and enabling legislation; and developing institutional capacity to manage biodiversity. 	MEC	PMU/BID
E.4 River Water use for Agriculture	High Residual Sodium Carbonate (RSC) levels in river water can cause crusting of seed beds, temporary saturation of the surface soil, high pH and the increased potential for diseases, weeds, soil erosion, lack of oxygen and inadequate nutrient availability.	<ul style="list-style-type: none"> Farmers will be educated on best practices to solve the RSC problem, which will include some of the following: <ul style="list-style-type: none"> Injection of sulfuric acid to dissociate the bicarbonate ions (PH around 6.2) giving off carbon dioxide. It allows the calcium and magnesium to stay in solution in relation with the sodium content. Add gypsum when soils have low free calcium plus leaching. Add sulfur to soils with high lime content plus leaching 	MEC	PMU/BID
E.5	Diversion will alter the	<ul style="list-style-type: none"> At the feasibility level, Porali and Nari flows are not assessed to be negatively 	MEC	PMU/BID

Project Activities	Environmental Impacts	Mitigation/Compensation/ Enhancement Measures	Institutional Responsibilities	
			Implementation	Supervision
Downstream, Mangrove Forest and Wetlands	natural flow rates and hydro period, degrade bankline and riparian habitats, and alter aquatic community structure and diversity in downstream areas. This may have a negative effect on the ecosystems in the Miani Hor.	<p>impacted by the project in terms of their vitality for Miani Hor.</p> <ul style="list-style-type: none"> Assessments show that the minimum environmental flow required for Nari and Porali Rivers are 0.082 BCM and 0.111 BCM¹ and that after diversion and consumption, 1.005 BCM and 0.582 BCM water will be released downstream, which is 12 times and 5 times more than the minimum requirements of these rivers. 		
	Pesticide residue in water bodies	<ul style="list-style-type: none"> Based on secondary information organochlorine pesticide residue in water is low but high in sediments in Miani Hor. Monitoring of organochlorine pesticide residue is recommended to establish the baseline during the early stage of project implementation and follow-up monitoring to compare with the baseline. The concentrations of DDT, HCH, Aldrin, Dieldrin, Endrin and Heptachlor in marine biota of Miani Hor are lower than the limit of carcinogenicity from fish consumption as set by United States Environmental Protection Agency. 	MEC	PMU/BID
	Limited sediment discharge in Maini Hor	<ul style="list-style-type: none"> Porali is a seasonal river that drains only when there is rain in its catchment area so very seldom it makes any impact on the water quality of Miani Hor.² Sediment will be evenly distributed both in project schemes and downstream stretches. 	MEC	PMU/BID

¹ ADB TA 4560-PAK (2008); Supporting Implementation of IWRM Policy in Balochistan, Asian Development Bank, the Philippines.

² Syed, N. A. et. Al (2014); A Study of the Dynamics of Miani Hor Coastal Lagoon, Pakistan and Failure of Damb Fish Harbour, International Journal of Science and Technology Volume 3 No. 8.

1.7 Environmental Monitoring

Environmental monitoring plan along with the frequency and responsible organization is presented in Table 2.

Table 2: Environmental Monitoring Plan

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency	
				Implementation	Supervision
Surface water flow and quality	10 locations (8 at the scheme level and two in the downstream discharge points (one before Hamal lake and one before Miani Hor discharge points))	Sampling and analysis of river water quality and waste water discharges for the parameters given in NEQS 2000 and Organochlorine Pesticides	Monthly during monsoon	Contractor	PSIAC, PMU
			Quarterly	Contractor	PSIAC, PMU
			Annually	External Monitor (PMU through a nationally recognized laboratory)	PSIAC, PMU
		Spot measurements of pH, conductivity, turbidity; visual inspection of presence of petroleum products	Monthly	PSIAC	PSIAC, PMU
Sediment quality	2 samples from downstream locations at Hamal Lake and Miani Hor	Laboratory measurements of organochlorine pesticide residue	Quarterly	External Monitor (PMU through a nationally recognized laboratory)	PSIAC, PMU
			Annually		MEC, PMU
Marine biota	Miani Hor	DDT, HCH, Aldrin, Dieldrin, Endrin and Heptachlor in marine biota of Miani Hor	Quarterly	External Monitor (PMU through a nationally recognized laboratory)	PSIAC, PMU
			Annually		MEC, PMU
Groundwater quality	16 samples, one from each water supply schemes	Sampling and analysis of groundwater quality for drinking water	Quarterly	Contractor	PSIAC, PMU
			Annually	External Monitor (PMU through a nationally recognized laboratory)	PSIAC, PMU
Air Quality (dust, smoke)	Along the access and haul road	Visual inspection to ensure good standard equipment is in use and dust suppression	Daily	Contractor	PSIAC, PMU

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency	
				Implementation	Supervision
		measures (sprinkling) are in place			
	Along the access and haul road	Visual inspection to ensure dust suppression work plan is being implemented	Daily	Contractor	PSIAC, PMU
Air Quality (PM ₁₀ , NO ₂ , SO ₂ , CO ₂ , CO)	Along the access and haul road	Air quality monitoring for 24 hours for the parameters specified in NEQS 2000	Quarterly	Contractor	PSIAC, PMU
			Annually	External Monitor (PMU through a nationally recognized laboratory)	PSIAC, PMU
Emissions from plant and equipment	Close to construction area	Visual inspection	Monthly	Contractor	PSIAC, PMU
Noise and vibration	Close to noise generating equipment and road	24 hour noise monitoring	Quarterly	Contractor	PSIAC, PMU
		24 hour noise monitoring	Annually	External Monitor (through a nationally recognized laboratory)	PSIAC, PMU
		Spot measurements	Monthly	PSIAC	PSIAC, PMU
Waste Management	Storage and camp area	Visual inspection that solid waste is disposed of at designated sites	Monthly	Contractor	PSIAC, PMU
Spills from hydrocarbon and chemical storage	Storage area	Visual inspection for leaks and spills	Monthly	Contractor	PSIAC, PMU
Operation of borrow sites	Borrow and quarry areas	Visual inspection of quarry sites	Monthly	Contractor	PSIAC, PMU
Biodiversity monitoring	Miani Hor	Collection of information on presence, seasonal behavior and biotope characteristics of aquatic species and flora in selected locations	Half yearly	PMU through Study Consultant	PSIAC, PMU
Traffic safety		Visual inspection to ensure Traffic Management Plan	Monthly	Contractor	PSIAC, PMU

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency	
				Implementation	Supervision
		is implemented			
Local roads		Visual inspection to ensure local roads are not damaged	Monthly	Contractor	PSIAC, PMU
Drinking water and sanitation		Ensuring construction workers are provided with safe water and sanitation facilities on site	Weekly	Contractor	PSIAC, PMU
Safety of workers		Usage of personal protective equipment	Monthly	Contractor	PSIAC, PMU
Erosion		Visual inspection in all areas where run-off leaves bare and at important drainage features (ditches, gullies, etc.) after major rainfall events	Weekly	Contractor	PSIAC, PMU
Reinstatement of work sites		Visual Inspection	After completion of all works	Contractor	PSIAC, PMU
Plantation		Visual inspection to ensure plantations are growing well	Monthly	Contractor	PSIAC, PMU, External Monitor

1.8 Capacity Building and Training

A budget of USD 0.25 million has been earmarked for capacity building. The training plan shall include a program for the delivery of intermittent training, to cover the subjects included in Table 3.

Table 3: Training Subjects for Inclusion in Contractors Training Plan

Training Subject	Target Audience
Environmental Code of Practices	All staff
Handling, use & disposal of hazardous material	Construction workers with authorised access to hazardous material storage areas and required to use hazardous material during their works
Waste Management	All staff (construction and camp staff)
Efficient & safe driving practices, including road & vehicle restrictions	Drivers & mobile plant operators

Training Subject	Target Audience
Actions to be taken in the event of major or minor pollution event on land	All construction staff
Use of flexible booms and surface skimmers in event of pollution event in water	All construction staff working on diversion weir, headwork structure and canals
Pollution prevention: Best practice	All staff
Health & Safety: Safe way to work & hazard awareness	All construction staff and O&M Staff
Health & Safety: Safe use of plant & equipment	Operators of plant & equipment
Health & Safety: Working at height	Staff colony and regulator construction staff
Health & Safety: Working near/on water	All construction staff working on diversion weir, headwork structure and canals
Health & Safety: Working near/on water	All construction staff working on barges
Health & Safety: Use of PPE	All construction staff
Occupational Health and Safety	To all persons entering the construction site
Emergency procedures and evacuation	All staff
Diver training	All divers
Spill clean-up training	Contractor's spill management staff
Fire fighting	All staff
Site inductions, including requirements under the Environmental Management Plan & details of environmentally sensitive areas of the site	All staff
Culturally sensitive awareness rising on HIV/AIDS and the spread of sexually transmitted diseases. Awareness raising on risks, prevention and available treatment of vector-borne diseases	All staff
Cultural sensitivities of the local population	On induction of all non-local staff

1.9 Cost of EMP

The cost of implementing the EMP is USD 29.14 million. Details of EMP costs are given in Table 4.

Table 4: EMP Implementation Cost Estimates

	Description	Estimated Cost (million USD)
1	Watershed and Rangeland Management (also included with project cost)	19.64
2	OFWM Demonstration (also included with project cost)	2.24
3	Implementation of EMP by Contractor (also included with project cost)	1.00
4	Environmental staff in PSIAC	0.75
5	ESSU staff in PMU	0.50
6	Internal auditing	0.25
7	Capacity building, institutional strengthening	0.25
8	Monitoring of air, noise, sediment, biota, and water quality	0.40
10	Tree plantation and landscaping	0.25
11	Biodiversity Conservation and Fisheries Studies	1.33
12	Physical and Cultural Heritage Management Plan	0.10
13	Communication Strategy	0.25
14	Monitoring and Evaluation Consultant	1.93
15	Contingencies	0.25
	Total	29.14

1.10 Stakeholder Consultation

Consultations on environmental aspects of the project were held with potentially affected groups and held with various stakeholders during the preparation of the Environmental Assessment. These consultations were initially held after environmental screening and then once the first draft EA report was prepared. They included group dialogues, individual household dialogue and focused discussions with women. A conscious attempt was made to include all the tribes in the project area to ensure that all opinions were considered.

The consultation revealed that project-affected people are either unaware or are ambivalent towards proposed development schemes. This general lack of awareness was evident through slight disapproval at some instances, possibly due to the fear of relocation. The concerns voiced by potentially affected communities informed the mitigation measures to avoid or reduce and manage negative impacts, including the formulation of a cross-agency project steering committee, and independent expert review of all infrastructure designs. Public awareness raising activities and regular engagement with affected communities will be emphasized in the communication plan as a way to regularly consult with potentially affected groups throughout project implementation.

1.11 Disclosure

This Environmental Assessment will be submitted to Balochistan EPA and the World Bank for disclosure in country and at the InfoShop. This Executive Summary will be translated into Urdu and the English and Urdu versions will be disclosed to the public on the BEPA website.

1.12 Overall Conclusion

The findings of this EA have provided information on the nature and extent of environmental impacts arising from the construction and operation of the Project. The EA has, where appropriate, identified mitigation measures to ensure compliance with environmental legislation and standards. The EA Report for the development of BIWRDP predicts that the Project will generally comply with national and provincial environmental legislation and standards and the WBG Policies, Procedures and Guidelines provided the proposed construction and operation stage mitigation measures are implemented. It also demonstrates the general acceptability of the residual impacts from the Project and the protection of the population and environmentally sensitive areas.