Environmental Management Plan

December 2014

PRC: Hai River Estuary Pollution Control and Ecosystem Development Project

Prepared by Harbor Economic Area Administrative Commission Project Management Office for the Asian Development Bank. This is an updated version of the draft originally posted in November 2011 available on http://www.adb.org/sites/default/files/project-document/60456/43054-013-prc-eiaab.pdf.

APPENDIX: ENVIRONMENT MANAGEMENT PLAN (EMP)

A. Objectives

1. The objective of establishing an environmental management plan (EMP) is to propose appropriate mitigation measures, and recommend establishment of institutions or mechanisms to monitor and ensure compliance with environmental regulations and implementation of the proposed mitigation measures. Such institutions and mechanisms will seek to ensure continuously improving environmental protection activities during Project preparation, construction, and operation in order to prevent, reduce, or eliminate adverse impacts.

2. The EMP includes: (i) objectives, (ii) summary of impacts and mitigation measures, (iii) environmental monitoring and inspection, (iv) public consultations, (v) responsibilities and authorities for implementation, (vi) institutional strengthening and training, (vii) reporting and supervision, (viii) work plan, (ix) cost estimates, and (x) mechanism for feedback and adjustment. The EMP will be reviewed and updated at the end of the detailed design in order to be consistent with the final detailed design.

B. Summary of Potential Impacts and Mitigation Measures

3. Potential environmental issues and impacts during the pre-construction, construction and operation phases, as identified by the individual environmental impact assessments (EIAs), as well as corresponding mitigation measures designed to minimize the impacts are summarized in Table1.1. The mitigation measures will be incorporated into the tendering documents (where appropriate), construction contracts and operational management plans, and will be undertaken by contractors, the Project Implementation Offices (PIOs) under the supervision of the Project Management Office (PMO) and Tianjin Environmental Protection Department (TEPD) when necessary. The effectiveness of these measures will be evaluated based on the results of the environmental monitoring to determine whether they should be continued or improvements should be made. Improvements need to be confirmed through stipulated environmental management procedures. According to the ADB Safeguard Policy Statement (SPS) Policy (June, 2009), the greenhouse gas (GHG) emissions of the Project should be calculated based on the estimation methodologies provided by the Intergovernmental Panel on Climate Change (IPCC). The threshold to be considered for the continuously monitoring at year base is total GHG emission is above 100,000 tons of carbon dioxide equivalent per year for the aggregate emissions of direct sources and indirect sources of the Project. Mitigation measures for energy conservation and emission reduction is also listed in the **Table 1.1**.

Table 1.1: Summary of Potential Impacts and Mitigation Measures

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
A. Pre-Construction						
	1. EIA and Feasibility Study Stage	Site selections	• Various alternatives were screened according to the criteria that minimize adverse impacts on the environment. The recommended sites for each sub-project were selected.	DIs , EIA institutes, PIO	PMO, TEPD, IA	Included in the detailed design contract
		Engineering and technological alternatives	• Engineering and technological alternatives were evaluated based on pre-defined environmental and economic criteria.	DI, EIA institutes, PIO	PMO, TEPD, IA	Included in the detailed design contract
		Sector Strategy	• The project designed and suggested new urban development strategy that feed into the update of urban master plans with the goal of safe and sustainable urban development, with full access to environmental amenities.	DI, EIA institutes, PIO	PMO, TEPD, IA	Included in the detailed design contract
		Public consultations	• Several rounds of wide public consultations have been conducted on environmental and social issues during feasibility studies, and EIA and SEIA preparations.	EIA institutes, PPTA consultants, PIO	PMO, TEPD, IA	Included in the detailed design contract
	2. Design Stage	Updating EMP	• Mitigation measures defined in EMP will be reviewed, updated and incorporated into the detailed design to minimize adverse environmental impacts.	DIs, EIA institute, PIO	PMO, TEPD,IA	Included in the detailed design contract
	3. Biding and Construction Preparation	Bidding documents and contractors' qualifications	• Environmental provisions will be included in the RFPs. • Environmental section will be included in the TOR for bidders. • Environmental clauses for contractors in reference to the EMP and monitoring plan will be included in the construction and supply	PIO, EMCCs	PMO, TEPD, IA.	Included in the detailed design contract

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
			contracts.			
		Environmental operation and supervision manual	• Contractors will be required to prepare an environmental operation and supervision manual, for approval by PIO.	Contractors	PIO, PMO, TEPD.	Included in the detailed design contract
		Complaint and information disclosure office or appointed person	• Establish a complaint and information disclosure office or appoint a responsible person before starting construction. • Make sure that staff at the office is well trained to handle conflicts with residents from environmental impacts.	Contractors, PIO	IA,PMO, TEPD	Included in the detailed design contract
		Environmental protection training	• Environmental specialists and/or officials from TEPD will be invited to provide training on implementation and supervision of environmental mitigation measures to relevant persons, especially construction engineers and managers.	Contractors, PIO	TEPD, PMO, IA.	Included in the detailed design contract
		Engagement of EMCC	• Prior to start of construction, an environmental management company will be engaged.	PIO	PMO,IA	Included in the detailed design contract
B. Construction Phase						
Reuse of Wastewater	Ecology	Soil erosion	• Prepare a soil erosion plan to specify the mitigation, implementation and supervision measures.	Contractors	EPBs, PMO, OEE, PIO	Included in the sub-project construction budgets
Hai River Estuary Rehabilitation (River	1. Water Quality	Wastewater generated from machinery	• Regularly maintain construction equipment to prevent incident.	Contractors	EPBs, PMO, OEE, PIO,WRB	Included in the sub-project

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
Embankment Improvement and Landscaping)						construction budgets
	2. Air Quality	Dust generated from the process of transportation of materials and construction vehicles	• Cover vehicles delivering granular and/or fine materials to the sites. Avoid overloading of these vehicles.	Contractors	PIO, OEE, PMO, EPBs	Included in the sub-project construction budgets
	3. Solid Wastes	Construction solid wastes	• Collect and dispose solid waste in a timely manner, sort the construction solid waste and recover and reuse when possible and send the rest to landfill	Contractors	PIO, OEE, PMO, EPBs	Included in the sub-project construction budgets
	4.Ecology	Destruction to the species and habitats	• Carry out artificial adding and enhancement of sea creature after the completion of construction activities to compensate the loss of biomass	Contractors	PIO, OEE, PMO, EPBs	100
	5. Environmental risk	Lack of environmental awareness	• Educate construction worker on environmental policies. It is forbidden to dump and litter wastes.	Contractors	PIO, OEE, PMO, EPBs	
Storm Surges Disaster Reduction	1. Water Quality	Wastewater and oil sewage generated from machinery	• Oil wastewater and oil sewage generated from construction ships will be collected and treated on shore and cannot be discharged into marine based on Management Specifications on Seal of Pollution Discharge Facility for Ships in Coastal Areas.	Contractors	PIO, OEE, PMO, EPBs, WRB	Included in the sub-project construction budgets
		Domestic sewage	• The domestic sewage generated by construction ships cannot be discharged into marine directly. It should be treated by wastewater treatment facility in the ship according to the Marpol Treaty Supplementary Article No. 4 Rules of Pollution Prevention from Ship Domestic Wastewater or collected by sewage collection cabinet and delivered to qualified company for	Contractors	PIO, OEE, PMO, EPBs, WRB	Included in the sub-project construction budgets

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
			treatment.			
	2. Solid Wastes	Ship wastes	• Put the ship wastes in containers or garbage bags daily and deliver the wastes to Xingang landfill site. • The supervision of pollutant discharge of the project will be included in supervision and management system based on Tianjin Maritime Safety Administration of P.R.C. • The garbage disposal operations shall comply with the operating procedures as prescribed in the Discharge Standard for Pollutants from Ship (GB3552-83).	Contractors	PIO, OEE, PMO, EPBs	Included in the sub-project construction budgets
	3. Ecology	Aquatic wildlife damage	• Carry out sea creature release study. Use artificial sea creature enhancement to compensate the loss of biomass and restore the coastal biology resources. • A specific artificial adding plan should be done by construction enterprises, consulted with local fisheries and aquaculture authority. • If possible, restrict the construction activities at season when the aquatic species at their sensitive early life stages to minimize the direct physical impacts.	Contractors	PIO, OEE, PMO, EPBs	Included in the sub-project construction budgets
	4.Social considerations	Disturbance to shipping and harbor operation	• Coordinate all vessel activities within the harbor during construction period by the Harbor Authority.	Contractors	PIO, OEE, PMO, EPBs, Harbor Authority.	Included in the sub-project construction budgets
	5. Environmental Risks	Oil spillage accidents of the construction ship.	• Seal the pollution discharge equipment of construction ship by maritime authority based on *Regulations for Management Concerning Sealing of the Shipboard Pollutant Discharging Equipment in the Coastal Water*.	Contractors	PIO, OEE, PMO, EPBs	Included in the sub-project construction budgets

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
			• Check the machinery for leakage of lubricants and keep the machinery in good working order. • Refuel the machinery and the ship at least 30m from any water body. • Set the basic petroleum spill clean-up equipment on-site. All spills or leaks should be promptly contained, cleaned up and reported to the environmental emergencies response department • The supervision of pollutant discharge of the project will be included in supervision and management system based on Tianjin Maritime Safety Administration of P.R.C.			
Universal applicable for all of the five subprojects	1. Water Quality	Wastewater from construction camps	• Install movable environmental friendly toilet and oil-water separator in the construction camps and a designated company will be entrusted for collection of oils. • Use natural gas and LPG in the temporary dining room • Collect and treat discharged domestic wastewater in septic tanks before they are discharged to nearby sewer network • Unauthorized dumping of wastewater will be prohibited.	Contractors	PIO, OEE, PMO, WRB, EPBs	Included in the construction budgets
		Wastewater generated from machinery	• Build storage tank and temporary wastewater treatment facility to ensure the wastewater discharge comply with national standards. • Regularly maintain construction equipments to avoid accidents.	Contractors	PIO, OEE, PMO, WRB, EPBs	Included in the construction budgets
		Handling of chemicals	• A construction materials handling protocol (e.g., store the chemical away from watercourses and provision of retention areas	Contractors	PIO, OEE, PMO, WRB, EPBs	500000

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
			to contain accidental spills of such toxic, hazardous, and harmful construction materials as caustic and acidic substances, oil and petroleum products, and asphalt materials) will be prepared and applied to prevent soil and surface/ground water pollution. • A prevention and emergency response plan will be developed and implemented. • Train the workers (especially painters) on safe and diligent handling of chemicals to avoid accidental spills, and on emergency response when a spill would occur.			
		Solid wastes	• Dumping of construction solid wastes and garbage into water bodies will be prohibited.	Contractors	PIO, OEE, PMO, WRB, EPBs	Included in the construction budgets
	2. Air Quality	Dust from material delivery and construction vehicles	• Cover vehicles delivering granular and/or fine materials to the sites. Avoid overloading of these vehicles.	Contractors	PIO, OEE, PMO, EPBs	Included in the construction budgets
		Dust from construction sites	• All roads should be hardened by concrete or other materials. Keep road clean and prevent earth or material from dropping. • Select materials storage sites 300 m from residential areas. • Organize material storage sites: separate stone and sand materials; store concrete in separate storage place and reduce the on-site storage time of the construction wastes. • Set up appropriate walls around construction site and spray water on construction sites twice a day. • Minimize the transportation distance from the	Contractors	PIO, OEE, PMO, EPBs	Included in the construction budgets

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
			storage site to the construction site. • Stop construction during strong winds and cover the stockpile. • Contractors should use commercial concrete. Mixing equipment of cement and lime soil cannot be installed in the camp. • Clean energy should be used for cooking at the camp such as natural gas. Coal and woods cannot be used. • Upon completion of construction, clean up construction and demolition wastes in timely manner. Re-vegetate all the construction sites with trees and grasses.			
		Dust from transportation roads	• All roads and pavements used by vehicles of the contractors or suppliers will be kept clean and clear of all dust, mud, or extraneous materials dropped from their transportation vehicles by covering with tarpaulin sheets. • Spray water on access roads twice a day. • Control vehicle speeds on construction sites.	Contractors	PIO, OEE, PMO, EPBs	Included in the construction budgets
		Emissions from vehicles and equipment	• Vehicle emissions will comply with *GB18352-2005 (Article No. 3 &4), GB17691-2005, GB 11340-2005, GB3847-2005, and GB18285-2005*. Use gas purifiers to minimize the exhaust fumes. • Equipment and machinery emissions must comply with *GB16297-1996*. • A regular inspection and certification system will be initiated to make sure that exhaust gases complied with emission standards.	Contractors	PIO, OEE, PMO, EPBs	Included in the construction budgets
	3. Noise	Noise from equipment and vehicles	• Install noise barrier and vibration-proof equipment around the sites having high-noise machinery • Noise from equipment and machinery will comply with *GB12523-2011*.	Contractors	PIO, OEE, PMO, EPBs	Included in the construction budgets

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
			• Noisy construction work will be probated near the sensitive area and stopped between 22:00 and 06:00 hours. • Regularly maintain construction equipments to avoid noise generation. • Provide adequate route for big trucks to keep away from residential areas. • Control traffic on the site and limit blowing of horns.			
	4. Solid Wastes	Domestic wastes from construction camps	• Provide multi-compartment collection bins to facilitate reuse, recycle of solid wastes. • Collect the wastes regularly by the city sanitation bureau to the municipal sanitary landfill.	Contractors	PIO, OEE, PMO, EPBs	Included in the construction budgets
		Construction solid wastes	• Collect and cleanup wastes in a timely manner , sort construction wastes; recycle and reuse, if possible, and dispose of the rest of the solid wastes in landfill.	Contractors	PIO, OEE, PMO, EPBs	500000
	5. Soil Erosion	Excavation	• Avoid rainstorm days during excavation activities. • Stockpile the topsoil; build retaining walls where necessary before dumping. • Provide temporary detention ponds or containment to control silt runoff. • Build intercepting ditches and chutes to prevent outside runoff entering disposal sites, and divert runoff from sites to existing drainage or ponds. • Construct a drainage system to minimize the erosion of deposited materials.	Contractors	PIO, OEE, PMO, EPBs	Included in the construction budgets
		Transport and disposal of soils	• Refill the excavated soils on the construction site.	Contractors	PIO, OEE, PMO, EPBs	Included in the

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
			• Build settling ponds in construction sites. Soils in settling ponds will be cleared for use as refill soils.			construction budgets
		Construction vehicles	• Lay straws or cloths at the entry/exist of each construction site. • Regularly clean up the soils on the tires of construction vehicles	Contractors	PIO, OEE, PMO, EPBs	Included in the construction budgets
		Exposed surfaces	• Construct slope protection in erosion-prone section to prevent soil erosion and runoff. • As soon as refill and land leveling is done, re-vegetation with trees and grasses will be undertaken.	Contractors	PIO, OEE, PMO, EPBs	Included in the construction budgets
	6. Social and Cultural Considerations	Traffic jam or block	• Divert traffic at peak traffic hours	Contractors	PIO, OEE, PMO, EPBs, City traffic bureau.	Included in the construction budgets
	7.Sanitation and Safety	Health and sanitation of workers	• Identify all potential health hazardous, establish and implement professional health and sanitation plan for the engineering program. • Maintain and monitor sanitation condition in construction areas. • Provide medical facilities, health services and PPEs. • Health and sanitation on job training.	Contractors	OEE, PMO, PIO, EPBs	Included in the construction budgets
		Safety of the public and the workers	• Identify all potential safety hazardous, establish and implement safety plan for the engineering program. • Put up warning signs to alert the public of potential safety risks in and around the construction sites.	Contractors	OEE, PMO, PIO, EPBs	Included in the construction budgets

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
	8. Environmental Risks	Lack of environmental awareness	• Educate construction worker on environmental policies. It is forbidden to dump and litter wastes.	Contractors	OEE, PMO, PIO, EPBs	Included in the construction budgets
	9. Energy conservation and GHG emissions reduction	Equipment selection	• Select the equipments in compliance with the national standard and obtaining the energy conservation authentication.	Contractors	PIO, OEE, PMO, EPBs,	Included in the construction budgets
		Energy conservation of the transportation vehicles	• Set up transportation program to avoid the unnecessary running of vehicle. • Use low emission vehicles.	Contractors	PIO, OEE, PMO, EPBs, City traffic bureau.	Included in the construction budgets
		Worker training	• Train the construction workers on the energy conservation and emission reduction.	Contractors	PIO, OEE, PMO, EPBs.	Included in the construction budgets
C. Operation Phase						
Water Collection and Treatment	1. Water Quality	Effluent from WWTP impact on receiving water bodies	• Conduct environmental inspection by a local EMS before the formal operations to make sure the effluents meet Class IA of *GB18918-2002*. • Implement strict regular maintenance to ensure normal operation of all equipments. • Set up an effluent monitoring program to regularly monitor effluent and surface water quality.	POC	PMO, IA, WRB, EPBs	Included in the sub-project operation budgets
		Wastewater from management office	• Wastewater from management offices will be directly discharged to municipal sewers that will go to the municipal WWTP. • In cases where connection with municipal sewers is not available, septic tank or on-site	POC	PMO, EPBs, IA, WRB	Included in the sub-project operation budgets

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
			wastewater treatment facility will be installed for treating wastewater before being discharged into receiving water bodies.			
		WWTP malfunction	• Use dual power supply for the WWTP • Prepare O&M manuals • Provide adequate training to the operator on proper operation and maintenance of the facilities. • Set up appropriate internal and external protocols for communicating with EPBs, health and safety authorities, effluent reuse users, and other agencies.	POC	PMO, WRB, EPBs, IA	Included in the sub-project operation budgets
		Illegal industrial discharges	• Develop industrial pollution control, process control and management plans to keep adequate treatment of industrial waste before discharge into the sewer system. • Set up an industrial wastewater monitoring system, and strictly enforce prohibition of illegal industrial discharges.	POC	PMO, WRB, EPBs, IA	Included in the sub-project operation budgets
	2. Air Quality	Odor from WWTP	• Arrange the sludge dewatering process inside of appropriate building. • Clean up and dispose of sludge in timely manner. Avoid storage of dewatered sludge in WWTP for long time. • Haul the dewatered sludge for the final disposal in a sealed truck. • Carry out regular odor monitoring.	POC,DI	EPBs, PMO,IA,	Included in the sub-project operation budgets
		Odor from pumping station	• Cover the inflow chamber. • No new house to be built within 100 m sanitary buffer from pumping station. • Strengthen the management and forestation. • Carry out regular odor monitoring.	POC	EPBs, PMO,IA,	Included in the sub-project operation budgets

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
	3. Noise	Noise from pumping station	• Regularly maintain machinery and keep equipment in good condition. • Regularly monitor noise and set up mechanism for compliance.	POC	EPBs, PMO, IA,	Included in design and operation budgets
		Noise from equipment operation	• Selected low-noise equipment and vehicles. • Install high-noise equipment indoors with adequate thick walls, soundproof doors, and double-glazed windows.	POC	EPBs, PMO, IA,	Included in design and operation budgets
	4. Solid Wastes	Dewatered sludge from WWTP	• Carry chemical tests of sludge to identify whether the quality of sludge complies with *GB18918-2002*. • Maintain the sludge dewatering equipment on regular basis • Control water content of sludge • Use the dewatered sludge for protein production.	POC	EPBs, PMO, IA,	Included in design and operation budgets
	5. Ecology	Vegetation	• Provide a vegetation buffer zone around the WWTP and the pump stations. Provide buffer zone within the WWTP to separate different functional zones. Trees and bushes are recommended. Species of plants should be local	POC	EPBs, PMO, IA,	Included in design and operation budgets
	6.Environmental Risks	Accidental discharge from WWTP	• Enforce disinfection process before discharge. • Install automatic flow meter and water quality monitoring system. • Backup tanks should be used to receive wastewater in emergency. • Take measures if any potential incidents or illegal discharge is found during regular inspection and maintenance. • Through training, improve skills of workers on	POC	EPBs, PMO, IA,	Included in design and operation budgets

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
			handling emergencies. • Strengthen the skills of workers on handing daily operation management through on job training. • Use of backup equipment and pipelines to control the risk of accident spillage.			
		Leaking or bursting of pipes	• Use of high quality anti erosion pipes. Regularly check pipe connection prone to leak • Provide adequate supervision, management and proper maintenance to the sewer pipes. • Enhance the operation monitoring. • Provide an emergency response plan for the leaking or bursting of pipes.	POC	EPBs, PMO, IA,	Included in design and operation budgets
		Abnormal functioning of odor control facility	• Regularly check the odor control facility • Employ standby equipments for this type of accident.	POC	EPBs, PMO, IA,	Included in design and operation budgets
	7. Energy conservation and GHG emissions reduction	Idle machine and operator	• To arrange the treatment units in a form that can meet different influent volume and keep the operated equipments in its full productive capacity as possible. • Change the number of operation units based on the different flow volume of water. • Employ frequency-variable equipment.	POC	EPBs, PMO, IA,	Included in design and operation budgets
Reuse of Wastewater	1. Water Quality	Secondary pollution from sediments dredging in the wetland	• Calculate the rate of pollutant release in order to arrange a dredging plan. • Test and analyze the rate of phosphous release to determine the scope of environmental dredging. • Carry out environmental dredging and	POC	EPBs, PMO, IA,	Included in design and operation budgets

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
			engage special environmental-friendly dredger.			
	2. Air Quality	Odor from the wetland	• Conduct proper maintenance regularly. • Sequentially drain and refill the wetland cell over a period of several days, about 24 hours for each change. • Plant grass and plants may contribute to odor removal.	POC	EPBs, PMO, IA,	Included in design and operation budgets
	3. Solid waste	Trash and debris accumulation in the wetland	• Regularly maintenance to remove accumulated trash and debris in the wetland cell.	POC	EPBs, PMO, IA,	Included in design and operation budgets
	4. Ecology	Insects outburst	• Keep annual vegetation maintenance such as clear dead vegetation, and reduce the accumulation of vegetation in the pools of shallow stagnant water • Maintain a mosquito control program. Use ecological friendly insecticide or larvicides. Use fish, frogs, and bats to prey on mosquitoes and their larvae to maintain balanced ecosystem.	POC	EPBs, PMO, IA,	Included in design and operation budgets
		Management of vegetation	• Reap the plants by hand or use machines to control the overgrowth of the plants. • An annual vegetation harvest in summer should be planned.	POC	TEPD,PMO, IA,	Included in design and operation budgets
		Soil erosion	• Inspect the drainage structures and re-vegetated area to ensure they are maintained in accordance with the requirement of soil erosion prevention plan. • Maintain and stabilize the riverbank on time. Check the retaining wall regularly against any shift in position and collapse, especially in the	POC	TEPD,PMO, IA,	Included in design and operation budgets

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
			peak natural disaster season. • The local water resource bureau and environmental monitoring station will undertake regular monitoring of soil erosion. • Build a maintenance ramp to facilitate access to the site for the maintenance activities and for surveillance and control.			
	5.Environmental Risks	Flooding	• Inspect and check the wetland after starting operation to identify whether the desired residence time has been achieved. • The monitoring frequency of the water flow rate in the wetland should be increased during the flood season.	POC	TEPD,PMO,IA,	Included in design and operation budgets
Hai River Estuary Rehabilitation (River embankment improvement and landscaping)	1. Water Quality	Surface water	• Regularly monitor the groundwater quality and the water quality of the harbor area.	POC	PMO, EPBs, IA	Included in design and operation budgets
	2. Ecology	Vegetation	• Plant trees, ornamental and grass, which should be local species.	POC	PMO, EPBs, IA	Included in design and operation budgets
	3.Environmental and health risks	Embankment structure	• Conduct regularly monitoring in the embankment structure and maintain the structure	POC	PMO, EPBs, IA	Included in design and operation budgets
Environmental Monitoring and Emergency Response Center	1. Water Quality	Acid and alkali	• Neutralize acidic solutions that do not contain heavy metals or other hazardous substances with sodium hydroxide in equimolar amounts and discharge the acid as laboratory wastewater. • Neutralize alkaline solutions that do not contain heavy metals or other hazardous substances with hydrochloric acid in	POC	PMO, EPBs, IA,WRB	Included in design and operation budgets

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
			equimolar amounts and discharge the alkali as laboratory wastewater.			
		Use of detergent	• Use of environmental friendly detergent (such as Phosphorus free detergent and degradable detergent) to clean lab equipment	POC	PMO, EPBs, IA,WRB	Included in design and operation budgets
	2. Solid Wastes	Laboratory operation	• Avoid unnecessary sampling to reduce water consumption • Use of low pollution equipment	POC	PMO, EPBs, IA,WRB	Included in design and operation budgets
		Laboratory wastes	• Reuse the recyclable laboratory wastes in appropriate recycling procedure. • Collect the organic solvents in laboratories separately and recycle them by distillation if possible.	POC	PMO, EPBs, IA	Included in design and operation budgets
		Hazardous sewage and wastes	• Detoxify small amounts of hazardous chemical wastes in the laboratory by qualified staff or hand it over to qualified companies. • Collect separately and dispose of them by licensed hazardous waste vender.	POC	PMO, EPBs, IA	Included in design and operation budgets
Storm Surges Disaster Reduction	1.Environmental Risks	Structure failure of the breakwater and the embankments	• Carry out regularly routine maintenance and repair. • Carry out stabilization inspection. • A repair program shall be immediately initiated if structure failure is found.	POC	PMO, EPBs, IA	Included in design and operation budgets
Universal applicable for all of the five subprojects	1. Air Quality	Vehicles	• All vehicles must pass Euro-III equivalent test as part of annual vehicle safety and environmental protection inspection.	POC	EPBs, PMO, IA	Included in design and operation budgets
	2. Ecology	Vegetation	• All vegetation covers will be properly	POC	EPBs, PMO,	Included in

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
			maintained. Especially, wild grass over grown in the constructed wetland should be controlled and removed.		IA	design and operation budgets
	3. Environmental Risks	Emergency and accident	• Provide operation training to workers to avoid any incident caused by error. • Stipulate operation guideline, and apply responsibility system. • Prepare emergency response plan, including response, rescue, and report procedure. • Carry out awareness building and education activities to promote compliance with relevant national, provincial and municipal regulations and environmental emergency response plans. • Develop training plan of HIV control for workers	POC	EPBs, PMO, IA	Included in design and operation budgets
		Facility malfunction	• Maintain environment facilities and ships regularly.	POC	EPBs, PMO, IA	Included in design and operation budgets
		Insufficient environmental management capacity	• Conduct training for environmental management.	POC	EPB, PMO, IA	Included in design and operation budgets
	4. Energy conservation and GHG emissions reduction	Operation of equipment and vehicles	• Set up equipment operation program to avoid the unnecessary and low efficiency running of vehicle and equipment engines.	POC	EPBs, PMO, IA	Included in design and operation budgets
		Worker training	• Provide proper training to the operators and the managers.	POC	EPBs, PMO, IA	Included in design and operation

Project	Impact Factor/ Stage	Potential Impacts and/or Issues	Mitigation Measures	Project Implementing Company	Supervising Agency	Budget (CNY '000)
						budgets

ADB = Asian Development Bank, DI = design institute, EIA = environmental impact assessment, EMCC = environmental management company/consultant, EMP = environmental management plan, EMS= environmental monitoring station, GB = *Guo Biao* (national standards), GHG = greenhouse gas, m = meter, IA = implementation agency, ISS = international consultation and support of supervision and implementation, OEE = onsite environmental engineer, PIO = project implementation unit , POC = project operating company, PPE = personal protection equipment, PPTA = project preparatory technical assistance, PRC = People's Republic of China, TEPD = Tianjin environmental protection department , EPB = environmental protection bureau, TOR = terms of reference, PMO = project management office, RFP = request for proposal, EIA = environmental impact assessment, SS =suspended solids, WRB = water resource bureau (at the city level), WWTP = wastewater treatment plant.

C. Environmental Monitoring and Inspection

4. An environmental monitoring program is presented in Table 1.2. This program considers the scope of monitoring, environmental media, monitoring parameters, time and frequency, implementing and supervising agencies. The monitoring will follow the methodology provided in the national standard methods for monitoring pollutants[1]. Other associated standards are national environmental quality standards and pollutant discharge/emission standards.

5. **Internal Monitoring and Inspection.** During the construction, PIO with supervision from PMO will recruit environmental management company/consultant (EMCCs) for conducting internal environmental monitoring and inspections to ensure that environmental mitigation measures are properly implemented. EMCCs appointed for the Project implementation will also advice the PMO and IA on carrying out their environmental responsibilities. Inspections or audits will mainly cover construction activities, but these will also review the affected environment. The inspections or audit activities will be conducted every week. Monitoring results will be well-documented, and the contractors and PIO will be informed of the outcomes. During the operation period, project operating company (POC) will be responsible for internal monitoring and reporting to PMO, TEPD.

6. **Environmental Acceptance Monitoring and Audit.** Moreover, within 3 months after each sub-component completion, or no later than 1 year with permission from the responsible environmental authorities, environmental acceptance monitoring and audit reports will be (i) prepared by a qualified environmental institute in accordance with the Ministry of Environmental Protection (MEP) *Guideline on Project Completion Environmental Audit* (2001); (ii) reviewed for approval by environmental authorities who has given the approval to the same individual EIA, and (iii) finally submitted to the Asian Development Bank (ADB).

7. **Compliance Monitoring and Inspection.** The Tianjin Environmental Monitoring Station (TEMS) or District Environmental Monitoring Station (DEMS) will be responsible to undertake regular and random compliance monitoring and inspection before, during, and after construction, as well as in the event of emergencies. If abnormalities are found, Environmental Protection Bureaus (EPBs) will impose a fine and issue a notice of rectification with a specific deadline.

8. Environmental monitoring, including the environmental benefits monitoring, will be incorporated into the Project Performance Management System (PPMS). The PMO with assistance from the PIO and POC will be responsible for analyzing and consolidating the data through their management information system. The PPMS will be designed to allow adequate flexibility to adopt remedial actions regarding Project design, schedules, activities, and development impacts. At the beginning of the Project, the PMO, the PIO, and consultants will develop comprehensive PPMS procedures to systematically generate data on inputs and

[1] The methods are: a. Analytical Method for the Monitoring of Water and Wastewater (the Fourth Edition). b. Analytical Method for the Monitoring of Ambient and Waste gas. c. Analytical Method for the Monitoring of Pollutants in Sludge from Agricultural Use. d. Analytical Method for the Monitoring of Urban Wastes for Agricultural Use

outputs of the Project components and agree on environmental and related social economic indicators to be used to measure Project impacts. The PMO, the PIO, and POC will refine the PPMS framework, confirm achievable goals, firm up monitoring and recording arrangements, and establish systems and procedures no later than 6 months after loan effectiveness.

9. The monitoring results will be used to evaluate: (i) the extent and severity of environmental impacts compared with the predicted impacts, (ii) performance of the environmental protection measures or compliance with related rules and regulations, (iii) trends of impacts, and (iv) overall effectiveness of the EMPs. Effectiveness of mitigation measures and monitoring plans will be evaluated through a feedback reporting system. Modification of measures required by the EMPs will be performed, if necessary. The PMO and EPBs play critical roles in this feedback and adjustment mechanism as shown in **Figure 1.1**.

10. The environmental monitoring program is included in **Table1.2**. The cost estimates for the environmental monitoring program are shown in **Table1.2**. Before implementing the monitoring plan, responsible agencies will provide more accurate estimates of the costs and present a further detailed breakdown of the cost estimates. During Project implementation, the costs will be adjusted based on actual requirements. If there are unpredictable environmental impacts found during the implementation of the environmental monitoring, EIA and EMP should be updated in timely manner and mitigation measures will be put forward to reduce the impacts to the environment.

Table 1.2: Environmental Monitoring Program

Item	Parameters	Location	Time and Frequency	Implementing Agency	Supervising Agency
A. Construction (Internal Monitoring)					
1. Surface Water	COD, SS for WWTP, Wetland, ERC and Estuary Rehabilitation subproject;	2 locations on the Dagu River, 4 locations on the Hai River estuary	2 samples in each sampling; Sampling times: one before starting, one after completion, twice a year during the implementation.	OEE, contractor	PMO, TEPD
	COD, petroleum, SS, (Breakwater subproject).	6 locations around the construction site in the Bohai Gulf	1 sample in each sampling; Sampling times: one before the construction, one at rising tide and one at the ebb tide of every tidal cycle year during the construction period, and one after the construction.	OEE, contractor	PMO, TEPD
2. Air	TSP, PM_{10} for WWTP, Wetland, ERC and Estuary Rehabilitation subproject	For each subproject, 2 monitoring locations for each construction site	4 samples in each sampling and each sampling complete in one day; Sampling times: one before construction, one after construction, twice a year during the construction period.	OEE, contractor	PMO, TEPD
3. Noise	Leq (dB(A)) for WWTP, Wetland, ERC and Estuary Rehabilitation subproject	For each subproject, 1 location at the border of construction site.	2 samples (day-time and night-time) in each sampling; Monthly during peak construction period, quarterly in other periods.	OEE, contractor	PMO,TEPD
4. Soil and Vegetation	Removal of vegetation and exposed surface	All sites	Visual inspection weekly	OEE, contractor	PMO, TEPD
5. Sediments	Cu, Pb, Cd, petroleum (Breakwater subproject)	1~3 locations around the construction site in the Bohai Gulf	2 samples in each sampling; Sampling times: one before construction, one after construction, twice a year	OEE, contractor	PMO,TEPD

Item	Parameters	Location	Time and Frequency	Implementing Agency	Supervising Agency
			during the construction.		
6.Biodiversity	Chlorophyll a, phytoplankton, zooplankton and zoobenthos (breakwater and Estuary Rehabilitation subproject)	1~3 locations around the construction site in the Bohai Gulf	1 sample in each sampling; two samplings (spring and autumn) in a year	OEE, contractor	PMO,TEPD
B. Project Completion Environmental Acceptation					
1.Surface water	COD, SS for WWTP, Wetland, ERC and Estuary Rehabilitation subprojects	2 locations on the Dagu River, 4 locations on the Hai River estuary.	2 samples in each sampling; 1 sampling at each location.	EMC/ Licensed Lab	PMO, WRB,TEPD
	COD, SS (wetland subproject).	1 location on inlet and outlet of wetland	1 sample in each sampling ; 4 times a day for 3 consecutive days	EMC/ Licensed Lab	PMO, WRB,TEPD
2. Effluents of WWTP	pH, COD, BOD_5, SS, petroleum, TN, TP, NH_3-N, grease, fecal coliform	At the outlet of the WWTP	2 samples in each sampling ; For COD_{Cr}, TN, TP, NH_3-N, 12 samplings each day for 2 consecutive days. For the others, 6 samplings each day for 2 consecutive days.	EMC/ Licensed Lab	PMO, WRB,TEPD
3.Groundwater	NH_3^-N, ground water level (wetland subproject)	2 monitoring wells at the upstream and downstream of the wetland	1 sample in each sampling ; 1 sampling monthly at each locations, at least 6 samplings in a year, stop monitoring upon complying with standards.	EMC/ Licensed Lab	PMO, WRB,TEPD
	pH , NO_3-N, COD_{Cr}, NH_3-N, heavy metals, fecal coliform, ground water level (WWTP)	3 monitoring wells	1 sample in each sampling; 1 sampling monthly at each locations, at least 6 samplings in a year, stop monitoring upon complying with standards.	EMC/ Licensed Lab	PMO, WRB,TEPD

Item	Parameters	Location	Time and Frequency	Implementing Agency	Supervising Agency
4. Air Quality	TSP,PM_{10} (ERC subproject)	2 locations around the project sites	2 samples in each sampling; 4 samplings for 2 consecutive days at each location.	EMC/ Licensed Lab	PMO, TEPD
	NH_3, H_2S, odor (wetland and WWTP subproject)	2 locations at the project sites	2 samples in each sampling ; 4 samplings for 2 consecutive days at each location.	EMC/ Licensed Lab	PMO, TEPD
5. Noise	Leq (dB(A)) (WWTP subproject)	Minimal 4 locations around WWTP	Twice (day-time and night-time) a day when the WWTP is in full load.	EMC/ Licensed Lab	PMO, TEPD
6. Sludge	Water content, pH, Zn, Cu, As (WWTP subproject)	At sludge storage sites of WWTP	2 samples in each sampling; 2 sampling in one day;	EMC/ Licensed Lab	PMO, TEPD
7. Soil and Vegetation	Re-vegetation, landscaping	All subproject sites	Visual inspection	EMC/ Licensed Lab	PMO, TEPD
8.Biodiversity	Chlorophyll a, phytoplankton, zooplankton and zoobenthos (Breakwater and Estuary Rehabilitation subproject)	2 locations around the construction site in the Bohai Gulf	1 samples in each sampling; two samplings (spring and autumn) in a year	EMC/ Licensed Lab	PMO, TEPD
C. Operation (Compliance Monitoring)					
1.Surface water	COD, SS, petroleum, PCBs, pesticides, heavy metals (WWTP, Wetland, ERC and Estuary Rehabilitation subproject).	1 location on the Dagu River, 1 location on the Hai River estuary,	2 samples in each sampling; one sampling at each location; once a year	EMC/ Licensed Lab	EPBs, PMO,WRB
	COD, petroleum, SS, (Breakwater subproject).	2 locations around the construction site in the Bohai Gulf	1 samples in each sampling; one at rising tide and one at the ebb tide of every tidal cycle year for the first three	EMC/ Licensed Lab	EPBs, PMO,WRB

Item	Parameters	Location	Time and Frequency	Implementing Agency	Supervising Agency
			years, then once every five year.[2]		
2. Influent and effluent of WWTP	COD_{cr} ,BOD, SS, NH_3-N, TP	Influent at the inlet of the WWTP	At least once a day.	WWTP	EPBs, PMO
	pH, COD, BOD_5, SS, petroleum, TN, TP, NH_3-N , grease, fecal coliform, volume flow rate.	Effluent at the outlet of the WWTP	COD_{cr}, NH_3-N and volume flow rate is mandatory online monitoring. pH, BOD_5, SS, TN, TP and fecal coliform once per day, petroleum and grease once a month at least.	WWTP, EMC/Licensed Lab	EPBs, PMO
3. Groundwater	Salinity, ground water level (wetland subproject)	one monitoring wells at the upstream and downstream of the wetland each	One sampling at each well. Once a year	EMC/ Licensed Lab	EPBs, PMO
	pH, NO_3-N, COD_{Cr}, NH_3-N, heavy metals, fecal coliform, ground water level (WWTP subproject)	3 monitoring wells at the plant site	One sampling at each well. Once every three years.	EMC/ Licensed Lab	EPBs, PMO
4. Air Quality	NH_3,H_2S, Odor (WWTP, Wetland subproject)	The site with peak concentration of odor at the boundary of the WWTP/Wetland or at the boundary of the buffer belt.	2 samples in each sampling; 4 samplings at every two hours in one day[3]. Once a year.	EMC/ Licensed Lab	EPBs, PMO
		One site at downwind of the pump station.	2 samples in each sampling; 4 samplings at every two hours in one day. Once a year.	EMC/ Licensed Lab	EPBs, PMO
5. Noise	Leq (dB(A)) (WWTP and wetland subproject)	4 locations at boundary of WWTP	2 samplings each day: one during day time, one during night time, for 2 days at each location. Once a year.	EMC/ Licensed Lab	EPBs, PMO

[2] Technical Guidelines for tracing monitor the marine environmental impact of Construction Project
[3] Discharge standard of pollutants for municipal wastewater treatment plant.

Item	Parameters	Location	Time and Frequency	Implementing Agency	Supervising Agency
		1 locations for pump station	Twice (day-time and night-time) in one day. Once a year.	EMC/ Licensed Lab	EPBs, PMO
6. Soil and Vegetation	Quality of preventive works, vegetation survival and coverage rate, site survey and/or standard measurement of soil erosion during rainy season.	All sites	Visual inspections	EMC	EPBs, PMO
7. Sludge	Water content, Pb, Zn, Cu, Cd,Hg, Cr, As, Ni	one location at municipal sludge disposal site	One sample at the location, once a year.	EMC/ Licensed Lab	EPBs, PMO
8.Biodiversity	Chlorophyll a, phytoplankton, zooplankton and zoobenthos (Breakwater and Estuary Rehabilitation subproject)	One location around the construction site in the Bohai Gulf	2 samples (spring and autumn) at the location; once a year in the first two years after the completion of the project.	EMC/ Licensed Lab	EPBs, PMO
9. Eutrophication	Nitrogen, phosphorus and density of the algae (wetland subproject)	One location in the wetland cell.	Whenever there is a tendency of algae bloom.	Wetland	EPBs, PMO
10. Flooding	Flood levels monitoring	Coastal area in Northern breakwater location	Monthly	OA	OA

EMC = environmental monitoring center (at provincial level), EMS = environmental monitoring station (at district level), TEPD = Tianjin environmental protection department, PMO = project management office, OEE = onsite environmental engineer, WRB = water resource bureau (at the city level), IA = implementation agency, WWTP = wastewater treatment plant, ERC = environmental response center, BOD = biochemical oxygen demand, COD = chemical oxygen demand, dB(A) = A-weighted decibel , pH = measure of acidity and alkalinity, PM_{10} = particulate matter smaller than 10 micrometers, As = arsenic, Cd = cadmium, Cr = chromium, Cu = copper, H_2S = hydrogen sulfide, Hg = mercury, Zn = zinc,NH_3 = ammonia, NH_3-N = ammonia nitrogen, Ni = nickel, NO_2 = nitrogen dioxide, Pb = lead, pH = measure of acidity and alkalinity, PO_3^- = phosphate, SS = suspended solids, SO_2 = sulfur dioxide, TN = total nitrogen, TP = total phosphor, Leq = equivalent continuous noise level , m = meter, TSP = total suspended particulates, TH = total hydrocarbon, PCB = polychlorinated biphenyls, NO_3-N = nitrate. OA = Oceanic Administration

D. Public Consultation

1. Public Consultation during Project Preparation

11. Various public consultations were conducted in the course of the preparation of the feasibility study reports and EIAs. During the feasibility study reports, the respective municipal governments were consulted to assist in site and process selections. During EIAs and project preparatory technical assistance, public consultations with various groups of stakeholders were conducted. The main focuses of public consultations were to assess the environmental impacts of the proposed subcomponents on nearby communities and mitigation measures. These activities were carried out in accordance with MEP *Interim Guidelines on Public Participation in Environmental Impact Assessment* (2006), and ADB **Environmental Assessment Guideline** (2003).

2. Future Public Consultation Plan

12. Future plans for public involvement during the design, construction, and operation phases were developed during the Project preparation. These plans include public participation in (i) monitoring impacts and mitigation measures during the construction and operation stages, (ii) evaluating environmental and economic benefits and social impacts, and (iii) interviewing the public after the Project is completed. They include several types of consultations, e.g., site visits, workshops, investigation of specific issues, interviews, and public hearings (**Table 1.3**).

13. Public participation plans are part of the Project implementation and management plan. The PIO is responsible for public participation during Project implementation. The PIO will also establish an environmental management unit (EMU) for supervising implementation, continuing public consultation, monitoring progress, and responding to grievances. The staff at the offices will be well trained to handle crisis situations or conflicts with residents due to distress from environmental impacts. Costs for public participation activities during Project construction are included in the Project funding. The costs are estimated as 5,000 RMB for each expert workshop, 20,000 RMB for each public investigation on a particular issue, 5,000RMB for each public workshop, and 10,000 RMB for each press conference. Costs for public participation activities during operation will be covered by the PIO. In addition, the established feedback mechanisms (**Figure 1.1**) will ensure timely feedback and measures to address any concerns raised by the Project affected communities.

Table 1.3: Public Consultation Program

Organizer	Approach / Times	Subjects	Participants
1. Project Preparation			
PMO, PIO, DIs, EIA institutes,	• EIA public opinion surveys: at least once • Expert panel review: at	Project information; environmental quality status; major impacts and	PMO, PIO, DIs, EIA institutes, EPB, other provincial and municipal

Organizer	Approach / Times	Subjects	Participants
PPTA consultants	least once • Socioeconomic and AP surveys: once for the overall Project. • Public consultation meeting + questionnaire: three times for overall Project • Site visits: multiple times	benefits; mitigation measures; public attitudes, comments, and recommendations	government stakeholders, community representatives, enterprises and other stakeholders within construction and service area
2. Construction			
PMO, PIO, EMCC	• Public consultation and site visits: at least once a year	Adjusting mitigation measures if necessary, construction impacts, comments and suggestions	Work staff within construction area and representatives of residents
	• Expert workshop or press conference: As needed, based on public consultation	Comments and suggestions on mitigation measures, public opinions; adjusting mitigation measures accordingly	Experts from various sectors, media
	• Public information session: at least once a year	Adjusting mitigation measures if necessary, construction impacts, comments and suggestions	Representatives of residents and social sectors
3. Test Operation			
PMO, PIO, POC, EMCC	• Site visits: multiple, depending on results of project completion environmental audit	Comments and suggestions on operational impacts, public suggestions on corrective actions	Local residents and social sectors, EPBs
4. Operation			
PMO, POC	• Public opinion survey: once per year in the first five years of operation	Effects of mitigation measures, impacts of operation, comments and suggestions for corrective actions	Work staff adjacent to subproject sites.
	• Site visits: once every year.	Plant operational performance, informal interviews with local residents	managers and workers, local residents adjacent to the subproject sites
	• Public workshop: as needed based on public opinion survey and public complaints received	Public comments and suggestions on corrective measures	Representatives of residents and social sectors

Organizer	Approach / Times	Subjects	Participants
	• Expert workshop or press conference: as needed based on public consultation and workshop	Expert comments and suggestions on corrective measures	Experts from social sectors, media

AP = affected person, DI = design institute, EIA = environmental impact assessment, EMCC = environmental management company/ consultant, TEPD = Tianjin environmental protection department, PMO = project management office. PIO = project implementation unit, POC = project operating company, PPTA = project preparatory technical assistance.

E. Responsibilities and Authorities for Implementation

14. The Tianjin Reform and Development Commission (TRDC) have designated Tianjin Harbor Economic Area Administrative Commission (HEAAC) as the executive agency (EA). The Tianjin Harbor Industrial Park Construction and Development Co. Ltd (HIPCDC) will serve as the implementation agency (IA) for all of the Project subcomponents. HEAAC has established a project management office (PMO). The PMO is within HEAAC and is directed by the HEAAC and Tianjin Binhai New Area Government. The PMO will consist of at least a director/manager, financial specialist/accountant, procurement specialist, engineer, technical staff, and supporting staff. As a delegation of the EA, the PMO will have overall responsibility for supervising the implementation of mitigation measures and reporting to ADB.

15. The PMO, PIO, POC, and contractors will each nominate dedicated, trained, and qualified environment specialists to undertake environmental management activities and ensure effective EMP implementation. **Table 1.4** shows the environmental responsibilities in different phases of the Project.

Table 1.4: Environmental Responsibility Matrix

Phase	Agencies	Environmental Responsibilities
Preparation	DIs	Review and select alternatives (technological issues, design, sitting, etc.)
	EIA institutes	Prepare EIA and EMP for components, including public consultations
	TEPD	Review and approve EIA, including the EMP
	PPTA consultant	Provide technical assistance and prepare EIA, including public consultations
	PMO	Coordinate and supervise EIA and public consultations
	TMG	Review and endorse EIA, including the EMP, for posting at ADB website
	ADB	Review and approval of the SEIA, including the

Phase	Agencies	Environmental Responsibilities
		EMP.
Design	DIs	Update the EMP in cooperation with EIA institutes, and incorporate mitigation measures in engineering detail designs and contracts
	PMO, PIO	Review and approve environmental measures
Tendering and Contracting	PMO, PIO, contractor	Incorporate EMP clauses in RFPs and contracts
Construction	PIO	Make sure the implementation of mitigation measures and public consultations
	Contractors	Implement mitigation measures and internal monitoring
	PMO, EPBs,	Advise and supervise implementation of mitigation measures and monitoring
	EMCC contracted by PIO	Conduct internal monitoring and inspection, and public consultations
	EMC/EMS	Conduct compliance monitoring
Test Operation	EMC, PIO	Conduct project completion environmental acceptance, including sampling, lab tests, and prepare project completion environmental acceptance report
	EPB	Review and approve project completion environmental acceptance report, and promulgate corrective action orders if necessary
	EMCC	Participate in environmental acceptance and prepare progress reports
Operation	POC	Ensure proper operation of component facilities according to design standards, and implementation of mitigation measures and public consultations
	EMCC contracted by POC	Conduct internal environmental monitoring and inspection, supervise implementation of EMP, and conduct public consultations
	EMS on behalf of EPB	Conduct regular and unannounced environmental compliance monitoring and inspection

Note: DIs= Design Institutes, ADB = Asian Development Bank, EA = executing agency, EIA = environmental impact assessment, EMCC = environmental management company/consultant, EMP = environmental management plan, TEPD = Tianjin Environmental Protection Department, EMS = Environmental Monitoring Station at the city level, PMO = Project Management Office, PIO = project implementation unit, POC = project operating company, PPTA = project preparatory technical assistance, PRC = People's Republic of China, RFP = request for proposal, TMG=Tianjin Municipal Government

16. The PIO and POC will be largely responsible for environmental management and implementation of mitigation measures. They will ensure that the EMP are carried out and will engage design institutes and professional consultants to help with environmental management at the preparation, design, construction, and operation phases. The PIO and POC will be responsible for arranging environmental monitoring reviews and responding to any adverse impacts beyond those foreseen in the EIAs. The PIO and POC will also attend to the EPB and ADB's requests for mitigation measures. Construction contractors will be responsible for implementing mitigation measures during construction, while the PIOs will be responsible for implementing such measures during operation.

17. In accordance with the EMP, each PIO and POC will set up an EMU that will generally require two employees. The EMU will be responsible for: (i) implementing the EMPs and developing further implementation details; (ii) supervising contractors' implementation of mitigation measures during construction; (iii) implementing training programs for contractors; (iv) incorporating environmental management, monitoring, and mitigation measures into construction and operation management plans; (v) developing and implementing internal routine environmental monitoring; and (vi) reporting performance of the EMP to PMO and responsible agencies. The EMU will be supported and supervised respectively by the environmental monitoring center (EMC) and EPB.

18. TEPD will ensure the compliance with the PRC and local environmental regulations through regular and random environmental compliance monitoring and inspection during construction and operation. The TEMS/DEMS will conduct the actual environmental compliance monitoring and inspection. On the basis of the environmental compliance monitoring and inspection, the EPB will impose fines and order corrective actions, if necessary.

19. The HEAAC will provide the PIO and POC with financial and management authority to operate the Project facilities. The PIO and POC will be strengthened by environmental management training provided under the Project, as summarized in Table1.5. They will incorporate environmental management activities into construction management plans.

F. Institutional Strengthening and Training

20. An assessment undertaken during the project preparatory technical assistance indicates that PMO has adequate technical and institutional capacities for Project implementation. However, the PIOs and POCs have weak capacity in environmental management and monitoring. For proper implementation of the EMP, it is necessary to strengthen the capacity of the PIOs and POC. The proposed training is shown in **Table 1.5**.

21. It is considered that PMO, and PIO/POC—provides a reasonable framework for Project management and control. The definition of roles, responsibilities and relationships between

the PMO, PIO/POC, and other relevant agencies (e.g., TEPD) is adequate to ensure the effective implementation of the Project.

22. Environmental specialists in the PMO, PIO/POC, and contractors will receive training in environmental management, environmental monitoring and supervision, mitigation planning, emergency response, environmental policymaking, and other environmental management techniques. Funding of this training will be included in the Project budget and in the operation and maintenance budget in the operation phase.

Table 1.5: Institutional Strengthening and Training

Strengthening Activities	Target Agencies/ Attendees	Contents	Timing
Institutional Strengthening	PMO, PIO, POC, TEPD	• Defining institutional arrangements for environmental management, monitoring, and supervision • Defining positions and responsibilities or each position. • Appointing and recruiting personnel	During project preparation
	PMO, PIO, POC, TEPD	• Recruiting and contracting EMCC for internal environmental management consultancy and monitoring	Prior to project implementation
Environmental Management Clauses and Protocols	PIO, POC, EMCC/PMO, TEPD,	• Developing environmental management clauses and incorporating them into construction and operational contracts • Developing/refining environmental monitoring protocols • Developing environmental emergency response procedures	During project preparation
Monitoring equipment	PMO, PIO, POC, TEPD	• Procurement of lab equipment for environmental monitoring.	During project preparation
Training			
Environmental Laws, Regulations and Policies	PMO, PIO, POC, contractors	• Environmental laws and regulations • Environmental policies and plans • Basic environmental management • Environmental emergency response	Prior to project implementation

Strengthening Activities	Target Agencies/ Attendees	Contents	Timing
EMP Implementation	PMO, EMCC, PIO/POC, contractors	• Responsibility and duties for project construction, management and environmental protection • Tasks of environmental protection in the project construction • Key environmental protection contents in project construction • EMP improvement, corrective actions and settlement of disputes.	Prior to and during project implementation
Environmental Monitoring, Inspection and Reporting	PIO/POC, EMCC, contractors	• Monitoring and inspection methods, data collection and processing, interpretation of data, reporting system • Environmental reporting requirements	Prior to and during project implementation
Environmental Technologies and Equipment	PIO/POC, EMCC, contractors	• Engineering technologies, pollution control equipment selection and procurement	Prior to and during project Implementation
Advanced Training on Wastewater Treatment, river management, wetland park management, breakwater management, ERC management.	PMO, PIO/POC	• Study the basics of theory and practice, • Training on the international experiences and best practices • Operation, control and maintenance management	Prior to or at the beginning of project implementation
Community-Environmental and Hygiene Awareness Program	PIO/POC, contractors	• Water savings • 3R's (reduce, reuse, recycle) • Wastewater minimization • Solid waste minimization • Community, household and personal hygiene	During project implementation
Environmental Facility Operation and Maintenance	PIO/POC, contractors environmental facility managers,	• Operation and maintenance of environmental facilities • Safety operation regulations • Equipment management and emergency response procedures	Prior to and during project implementation

EMCC = environmental management company/consultant, EMP = environmental management plan, TEPD = Tianjin environmental protection department, PMO = project management office, PIO = project implementation unit, POC = project operating company.

G. Reporting and Supervision

23. **Internal Monitoring Reports**. During the construction period, results from the internal monitoring by EMCC contracted by PIO/POC and/or PMO will be reflected in the weekly construction reports. The reports will summarize: (i) environmental issues during construction; (ii) mitigation measures taken, if any and (iii) consequences of the impacts on the environment and/or surrounding communities.

24. The contractors will be trained to take immediate actions to remedy unexpected adverse impacts or ineffective or inefficient mitigation measures, as required by the EMPs. The PIO will also respond to these reports in order to ensure that contractors have taken appropriate and timely action. Additional measures may be taken, if needed, to ensure that all issues raised by the reports are appropriately addressed.

25. Results from the detailed internal environmental monitoring program and mitigation actions for the construction phase will be submitted monthly to the PIO/POC, quarterly to PMO, and bi-annually to TEPD. TEPD may request that further environmental mitigation actions be taken, as they deem necessary, and may determine further mitigation measures for different stages, if necessary.

26. **Compliance Monitoring Reports**. TEMS/DEMS authorized by TEPD will be responsible for environmental compliance monitoring and inspection according to the PRC environmental regulations during construction and operation. The compliance monitoring reports will include: (i) project background, (ii) construction and operation activities, (iii) environmental conditions, (iv) measurement or sampling taken during auditing and their locations, (v) analytical results, (vi) interpretation and implication of the monitoring results, (vii) determination of the compliance status with regard to applicable regulations and standards, and (viii) recommendations for improvement. These reports will be submitted to TEPD by DEMS/TEMS with a copy to PMO.

27. **Project Completion Environmental Audit Reports**. Project completion environmental audit report of the completion of each component will be prepared in accordance with the MEP Ministerial Guideline on Project Completion Environmental Audit (2001) within 3 months after completion. The report will focus on the Project compliance of environmental performance when it is put into the operation. The report will be sent to environmental authorities for review and approval. If non-compliance is found, the Project will be asked to be improved to the requirements before the official commencement of the operation.

28. **Independent Environmental Monitoring Reports**. The EA/PMO has the responsibility to monitor and assess overall Project activities under the Project design and monitoring framework, and will be accountable to ADB for ensuring the effective

implementation of the EMPs. The PMO will be as part of the loan implementation consultancy recruited through international competitive bidding, to fulfill its environmental supervision, monitoring and reporting to the ADB. The environmental monitoring reports will be submitted to the ADB and EA/PMO on a semi-annual basis. The reports will emphasize: (i) progress made in implementing the EMPs, (ii) implementation of mitigation measures, (iii) environmental compliance, (iv) institutional strengthening and training, (v) public consultations, and (vi) problems occurred and corrective actions taken. ADB may request that further environmental mitigation actions be taken, as they deem necessary, and may determine further mitigation measures for different stages, if necessary.

29. The environmental reporting plan is presented in **Table 1.6.**

Table 1.6: Environmental Reporting Plan

Reports		From	To	Frequency
Construction Phase				
Internal Monitoring	Internal monitoring report	Contractors	EMCC, PIO, POC	Monthly
	Internal monitoring report	EMCC	PMO, PIO, POC	Quarterly
Compliance Monitoring	Compliance monitoring report	EMS	TEPD	As per the PRC regulation
Test Operation				
Project Completion Environmental Acceptance	Project completion environmental acceptance report	EMC	TEPD, PMO, ADB	Once within 3 months of project completion
Operation Phase				
Internal Monitoring	Internal monitoring report	EMCC	PMO, PIO, POC, ADB	Quarterly for the first 3 years of operation
Compliance Monitoring	Compliance monitoring report	EMS	TEPD, ADB	As per the PRC regulation

ADB = Asian Development Bank, EMC= environmental monitoring station (at provincial level), EMCC = environmental management company/consultant, EMS = environmental monitoring station (at district level), TEPD = Tianjin environmental protection department, PMO = project management office, PIO = project implementation unit , POC = project operating company, PRC = People's Republic of China.

H. Work Plan

30. Before construction, the PMO and PIO will develop detailed responsibilities and requirements for contractors and will provide detailed cost estimates of mitigation measures and environmental monitoring in the construction contracts. The PMO and PIO also will detail the responsibilities of their environmental management offices and prepare their work schedules.

31. Before operation, the PIO/POC will develop detailed work plans for environmental management and monitoring during operation based on the EMP. These work plans will be submitted to EPBs to help them to supervise implementation.

I. Cost Estimates for Environmental Management

32. The PIO with help from the PMO will develop detailed plans for procurement of equipment and materials, and civil works for implementing mitigation measures and monitoring plans. These plans will be incorporated into Project contracts. Environmental considerations will be incorporated into the procurement to ensure environmentally responsive procurement.

33. Cost estimates for mitigation measures, environmental monitoring, public consultations, and capacity building are summarized in **Table 1.7**. The compliance monitoring costs will be borne by the PIO/POC as part of their implementation functions. Internal monitoring costs will be borne by the contractors and PIO/POC. Independent monitoring costs will be from the loan implementation consultancy budget. Before implementing a monitoring plan, responsible agencies will present a more detailed breakdown of the estimated budget. During Project implementation, the budgets will be adjusted based on actual requirements. Contractors will bear the costs for all mitigation measures during construction, which will be included in the tender and contract documents. The PIO will bear the costs related to mitigation measures during operation. Costs related to environmental supervision during construction and operation will be borne by the PIO/POC. Costs for capacity building will be borne by the Project as a whole. During the operation phase, the training costs will be included in the operation and maintenance budget.

Table 1.7: Cost Estimates for EMP

Item	**Incremental Investment** ('000 RMB)
Environmental Mitigation Measures	Included in construction budgets
Dredged Sediment for Land Reclamation Monitoring	800
Internal Environmental Monitoring	Included in construction budgets
Public Consultations	500
EIA + Environmental Management Consultancy	800
Environmental Management Training	500
TOTAL	2600 (this amount does not include the budgets in the construction plans)

EIA = environmental impact assessment, EMP = environmental management plan.
Note: All these costs are already included in the project budget.

J. Performance Indicator

34. Before the construction, performance indicators, targets, or acceptance criteria should be specified in EMP to describe the desired outcomes as measurable events. These indicators

will be responsive to changes in Project design, such as a major change in Project location or route, or in technology, unforeseen events, and monitoring results. The performance indicators should be objective, specific, accurate, reliable, measurable (quantitative or qualitative), achievable, realistic, and easy to use and understand. The following performance indicators listed in the **Table 1.8** are important to the Project for effective monitoring of the EMP implementation. The performance indicators will show how well the EMP is meeting its goals and objectives. Indicators could be numbers, facts, opinions or perceptions that measure the performance.

Table 1.8: Performance Indicators of the Project

Indicator	Measurement Methods	Measurement	
Management system effectiveness	• The management system has been established before the construction.	Yes	NO
	• The responsibilities for each job post in the Project have been well defined.	Yes	NO
	• The public participation programs have been implemented[4].	Yes	NO
Management system efficiency	• All of the work plans of the Project have been achieved on schedule/ or revised and approved schedule.	Yes	NO
EMP measurements financial support	• The fund from ADB has been used to support the EMP measurement according to the financial plan.	Yes	NO
	• The fund from TMG has been used to support the EMP measurement according to the financial plan	Yes	NO
GHG emission	• The carbon dioxide equivalent per year for the aggregate emissions of direct sources and indirect sources has been calculated.		tons
Recycling and reuse rate	• The recycling and reuse percentage of wastewater		%

ADB = Asian Development Bank, EMP = environmental management plan, TMG=Tianjin municipal government.

35. During the construction and operation of the Project, there might have negative impacts to the environment, mitigation measures will be taken into the Project. Performance indicators of these will measure: quality of wastewater discharged, groundwater, surface water, soil and air; noise and relevant public health indicators. Below is a list of possible indicators that measure the performance of the Project. The list in the **Table 1.9** is not meant to be exhaustive but merely representative of indicators for evaluating the Project. Neither is it intended to be taken in its entirety.

[4] It can be proved by site visiting and surveys to confirm the public is aware of the programs.

Table 1.9: Performance Indicators of Mitigation Measures and Their Relevant Standard

Period	Subproject	Indicators	Standard
Construction	Overall project	SS,COD, petroleum	Class IV, Marine Water Quality Standards (GB 3097-1997)
		PCBs, pesticides, heavy metal	Based on the human health risk assessment methods
		Noise	Emission Standard of Environment Noise for Boundary of Construction Site (GB12523-2011)
		TSP PM_{10}	Grade II, Ambient Air Quality Standard (GB3095-2012)
Operation	WWTP	pH, COD, BOD5, SS, petroleum, TN, TP, NH_3-N, grease, fecal coliform	Class IA, Discharge standard of pollutants for municipal wastewater treatment plant (GB18918-2002)
	Sediment dredging	PCBs, pesticides, heavy metal	Class B, Standard of Soil Quality Assessment for Exhibition Sites (HJ350-2007)
	Wetland/ WWTP	NH_3,H_2S, Odor	Grade II, Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB18918-2002)
	Breakwater	Biodiversity in the marine	"Shannon-Weaver" indicator

K. Mechanism for Grievance Redress Mechanisms

36. In the event of a grievance issue, the basic stages established for redress are:

(i). Stage 1: If a concern arises during construction, the affected person tries to resolve the issue of concern directly with the contractor and the project manager. The contractor will give a clear reply within 1 week. If successful, no further follow-up is required.

(ii). Stage 2: If not successful, the affected person can submit an oral or written petition/complaint to the PIO. For an oral complaint, the PIO must make written records properly. The PIO will give a clear reply within 2 weeks. The independent environmental monitor will assist the PIO in replying to the affected person.

(iii). Stage 3: If the affected person is not satisfied with the reply in Stage 2, she/he can appeal to the HIPCDC/IA after receiving the reply in Stage 2 and the HIPCDC will report to ADB officer immediately and give a clear reply within 2 weeks. The independent environmental monitor will assist the HIPCDC in replying to the affected person.

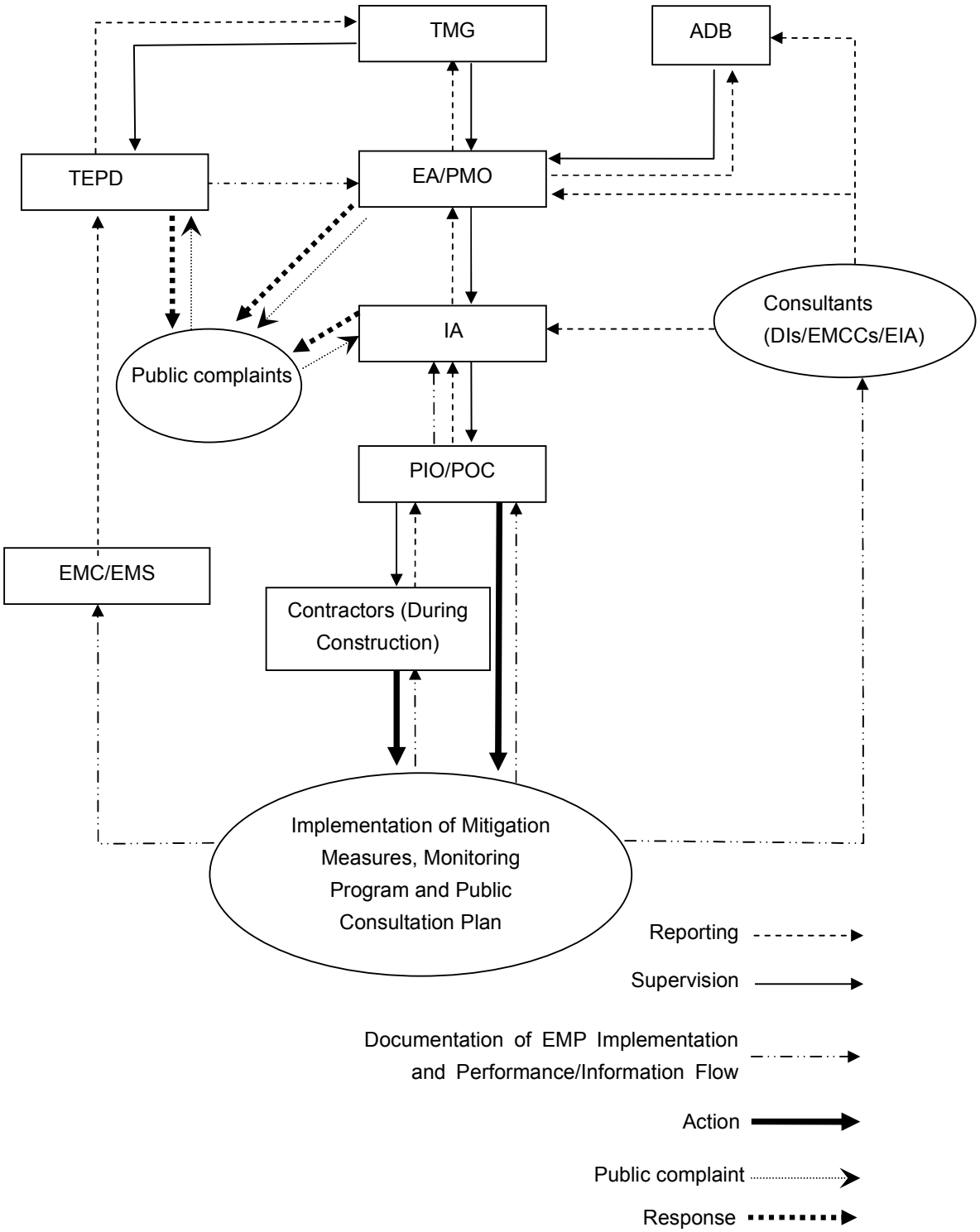
(iv). Stage 4: If the affected person is still not satisfied with the reply of HIPCDC, she/he

can appeal to the HEAAC/EA. The EA, through the PMO, must report to the ADB project officer as soon as the complaint is recorded, by submitting relevant documents. ADB project team will assess the situation, contact the affected people and the relevant government departments. The PMO, through consultation with ADB, TEPD, EMUs, EMC, and IEMs, must provide a clear reply to the affected person within 30 days. Stages (ii)-(iv) will be further refined during the detailed design stage.

L. Mechanism for Feedback and Adjustment

37. Based on the inspection and monitoring reports, environmental authorities will decide whether: (i) further mitigation measures are required as corrective action, or (ii) some improvement is required to environmental management practices. If it is found during inspection that there has been substantial deviation from the EMP or any changes made to the Project or any components which may cause substantial adverse environmental impacts or increase the number of affected people, then PMO should consult with environmental authorities and ADB immediately and form an environmental assessment team to conduct additional environmental assessment and, if necessary, further public consultation. The revised EIA reports including EMP should be submitted to the environmental authorities for approval, and finally report to ADB. The revised EMP will be passed to the contractor(s) and PIO/POC for implementation.

Figure 1.1: Mechanism for Feedback and Adjustment



ADB = Asian Development Bank, DI = design institute, EMCC = environmental management company/consultant, EMP = environmental management plan, IA=implementing agency TEPD = Tianjin Environmental Protection Bureau, EMC = Environmental Monitoring Center at provincial level, TPMO = Tianjin Project Management Office, EMS=environmental monitoring station at district level, TMG=Tianjin Municipal Government, PIC = project implementing company, POC = project operating company.