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Approach in Developing Environmental Management Plan (EMP)

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Abstract. The paper documents the Environmental Management Plan (EMP) developed during the Environmental Impact Assessment (EIA) studies conducted for road construction and upgrading in the 'State of Kuwait'. The Environmental Management Plan (EMP) plan was developed based on the baseline studies, impact assessment, impact evaluation and complying with KEPA (Kuwait Environmental Public Authority) guidelines and standards. The paper gives a framework for developing EMP and the components that should be included in the plan. The main components of EMP are: (i) Mitigation Program (ii) Monitoring Program (iii) Recommendations and (iv) EMP Implementation Program. The EMP should consist of cost estimates for monitoring program, equipment procurement, manpower, transportation, office cost, studies, reporting, stationeries, etc. EMP Implementation Program consists of 'Environmental Supervision Plan' which is an important instrument to ensure effective implementation of 'Environmental Management Plan'. In this paper the recommendations that are suggested are specific to the project and geographical conditions in the State of Kuwait. The vital active part of EMP is EMP implementation and execution program.

Keywords: Environmental Impact Assessment, Emergency Response Plan, Health and Safety

1. Introduction

Environmental Impact Assessment has become an increasingly well-known environmental management tool as a result of demands that is mounted on companies and industries to advance upon their environmental performance. It is now a common tool in the developed nations and is increasingly being functional in developing countries by overseas and local investors. It is applied to a variety of industrial and business activities; from small through medium to large scale concerns. However, it is noticed in many of the countries and in the State of Kuwait that most of the environmental impact assessment (EIA) practice appears to be directed at the scoping and assessment stages of EIA's. The mitigation, monitoring and management components of EIA's receive less attention at formulating and implementation level. Recently, attention is being focused on the need to demonstrate that impacts can be monitored and managed. The Environmental Management Plan (EMP) is the plan constructed during the process of EIA that provides a description of the methods and procedures for mitigating and monitoring impacts. EMP promotes the awareness and use of best practice environmental management by site operatives during construction and operative phase (Rizzolo, 2006).

The EMP document can be used throughout the project life cycle – commissioning, mobilization & construction, operation & maintenance and decommissioning. It is regularly updated to be aligned with the project progress from commissioning to mobilization to construction to operation to decommissioning. EMP's outline the environmental impacts, the mitigation measures, roles and responsibilities, timescales and cost of mitigation. EMP is a practical and achievable plan of management to ensure that any environmental impact during all the phases is minimized and lead in the direction of sustainable development.

An important objective of environmental assessment is to develop procedures and plans to ensure that the mitigation measures and monitoring requirements approved during the environmental compliance review will actually be carried out in subsequent stages of the project. Mitigation measures may then be of a more generic nature without compromising its importance to be implemented. The EMP is a dynamic and flexible document subject to review and updating. During the implementation of a project there is always the

possibility that unforeseen issues could arise, this EMP should therefore be revised where necessary to mitigate unanticipated impacts.

The study shows an EMP is developed to outline measures that are to be implemented in order to minimize adverse environmental degradation associated with the construction and upgrading of road in the State of Kuwait. It serves as a guide for the contractor and the workforce on their roles and responsibilities concerning environmental management on site (Saiccor, 2008), and it provides a framework for environmental monitoring throughout the development period. The EMP was developed based on the KEPA (Kuwait Environmental Public Authority) guidelines and standards.

Purpose of the EMP:

- Encourage good management practices through planning and commitment to environmental issues concerning any project;
- It tells how the management of the environment is reported and performance evaluated periodically;
- To provide rational and practical environmental guidelines that will assist in minimizing the potential environmental impact of activities;
- Helps in minimizing disturbance to the environment (physical, biological and ecological, socio-economic, cultural, and archeological,) ;
- Combat all forms of pollution through monitoring air, noise, land, water, waste, and energy and natural resources;
- Protection of sensitive and endangered flora and fauna;
- Prevent land degradation;
- Comply and adhere to all applicable laws, regulations, standards and guidelines for the protection of the environment;
- Adopt best practicable waste management for all types of waste (liquid and solid) with objective on prevention, minimization, recycling, treatment or disposal of wastes;
- Describe all monitoring procedures required to identify impacts on the environment;
- Train and bring awareness to employees and contractors with regard to environmental obligations and compliance.
- Reduce environmental risk and provide better Health, Safety and Environment (HS&E)
- Increase efficiency through minimum consumption and conservation of energy deplete-able resources
- An EMP also provides with a plan answering - what, where, when, how and who?
- Establishing the reporting system to be undertaken during the construction.
- The EMP also serves to highlight specific requirements that will be monitored during the development and should the environmental impacts not have been satisfactorily prevented or mitigated, corrective action will have to be taken.

2. Environmental Management Plan

Definition of an "**Environmental Management Plan**": *A plan or program that seeks to achieve a required end state and describes how activities, which have or could, have an adverse impact on the environment, will be mitigated, controlled, and monitored during the commissioning, mobilization, construction, operation, maintenance and decommissioning of a project; and that the positive benefits of the projects are enhanced.*

EPA, 2005 states that EMP is the action an organization is taking to determine how it affects the environment, complies with regulations, keeps track of environmental management activities, and meets environmental goals and targets. It also documents key elements of environmental management including the environmental policy, responsibilities, applicable standard operating procedures and Best Management Practices (BMP), record keeping, reports, communication, training, monitoring, and corrective action.

The EMP features the "Plan, Do, Check, Act" model (EPA, 2005) for ongoing improvement:

- **Plan -** Planning, including identifying environmental impacts and establishing environmental goals.
- **Do -** Implementing, including employee training and establishing operational controls.
- **Check -** Checking, including auditing, monitoring and taking corrective action.
- **Act -** Reviewing, including progress reviews and taking action to make needed changes.

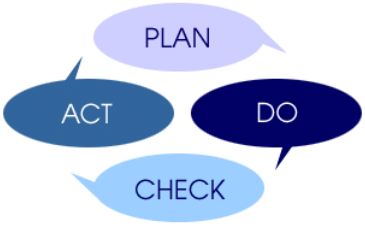

Fig. 1: EMP Cycle (Source: EPA, 2005)

Environmental management is easier if you have an EMP, because it will help you better track your environmental management activities and implement them in a more organized and streamlined manner.

An EMP gives you a framework (EPA, 2005) in which to:

- **Comply -** Assist you in assessing compliance with environmental regulations
- **Improve -** Allow you to identify opportunities for improvement and cost savings
- **Know -** Decrease costly confusion for your employees by spelling out exactly what is expected of them.

3. Approach

The EMP is most effectively developed when impacts are evaluated followed by detailed EIA completed with supporting baseline studies for the project and site. Impact evaluation signifies the importance for the mitigation measures suggested during the impact analysis or assessment (IA). The residual impact estimated with execution of proposed mitigation measures is vital towards developing EMP. This EMP details the mitigation measures to prevent, reduce and where possible offset any significant adverse effects on the environment throughout the different phases of the project (Magnox North Ltd., 2009). EMPs are therefore important tools for ensuring that the management actions arising from Environmental Impact Assessment (EIA) processes are clearly defined and implemented through all phases of the project life-cycle (Lochner, 2005).

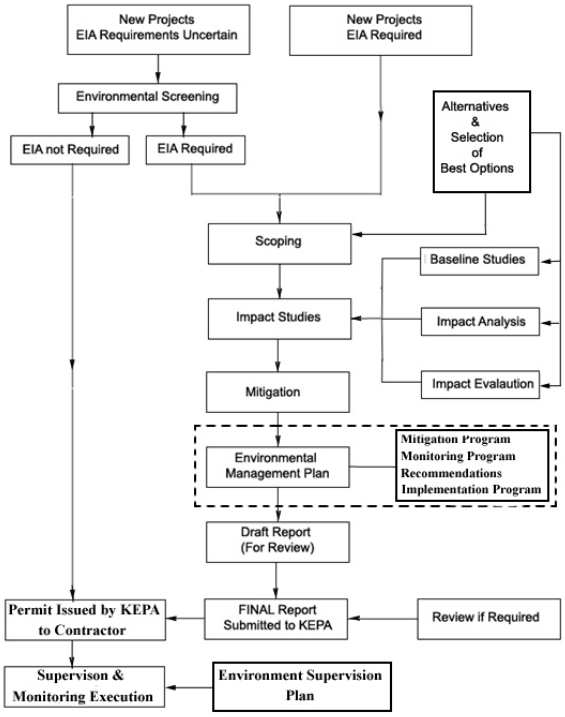

Fig. 1: Flow Chart for EIA and Showing the EMP

Figure 1 shows the steps in the EIA and when EMP is prepared. The main components of EMP are:

1. Mitigation Program
2. Monitoring Program
3. Recommendations
4. EMP Implementation Program

EMP adopted for roadways project was precautionary approach, or in the case of management recommendations, a philosophy of 'best practice'. The EMP considers the institutional arrangements for implementation. Responsibilities for mitigation and monitoring were defined along with arrangements for information flow, and for coordination between agencies responsible for mitigation. The developed EMP specifies the organizations and individuals that will be responsible for undertaking the mitigation and monitoring measures, e.g., for enforcement of remedial actions, monitoring, training, and financing.

4. Developed Environmental Management Plan (EMP)

The EMP plan was developed based on the KEPA (Kuwait Environmental Public Authority) guidelines and standards. EMP is developed to mitigate the negative impacts and enhance the positive impacts which was investigated during the studies of baseline conditions, impact assessment and evaluation for the project. The below EMP is developed for road construction and upgrading. Similar EMP plans were developed by the author for various other EIA projects (WES 2007, 2009a, 2009b, 2009c, 2010a, 2010b, 2010c and GEO 2011a, 2011b). The below EMP is one among them and is specific to roadways construction project.

4.1. Potential Impacts and Mitigation Programs

Table 5.1 and 5.2 depicts mitigation measures and monitoring programs for different phases of the project considering the potential impacts.

Table 1: Pollution Impacts and Mitigation Programs

Type of Pollution Source		Pollution Sources	Location of Pollution Sources	Major Pollutant or Parameter	Treatment Measures	Applicable Standards
Air Pollution	Construction Phase	Blasting; construction machinery and vehicles	Construction sites; access roads and surrounding areas	TSP, NO_2, SO_2	Dust control by frequent water spraying of construction sites and exposed earth surfaces; use of vehicles covers; vehicle and equipment well maintained, and operators trained in fuel efficiency and anti-idling	KEPA and Municipality standards and regulations
	Operation Phase	Traffic,	Road routes;	Smoke, TSP, NOx, SO_2	Vehicle operators trained in fuel efficiency and anti-idling; Well maintain vehicles; avoiding aged automobiles	Best engineering practices
Wastewater	Construction Phase	Construction camps; staff living; washing of construction equipment and vehicles, Workers camp	Work sites; Garage; workers camp	TSS, COD, BOD, petroleum	Sewage discharged into municipal sewers when possible, construction camps located away from water bodies; wastewater from equipment and vehicle washing treated with settling ponds	KEPA and Municipality standards and regulations
Solid Waste	Construction Phase	Excavation and filling sites; Demolition waste if any; workers and staff daily living	Construction road sites, workers camps; staff quarters	Spoils; domestic refuse and construction waste	Spoils disposed in designated site with retaining walls greening; refuse collected and transported to local landfill sites.	KEPA and Municipality standards and regulations
Noise and Vibration	Construction Phase	Blasting; use of heavy-duty vehicles and equipment; excavation.	Construction sites; access roads; surrounding areas	70–100 dB (30 m)	Scheduling operation to avoid peak hours and late night hours; use of new and well maintained equipment and vehicles	KEPA and Municipality standards and regulations, International standards
	Operation Phase	Automobile horning, high speeding vehicles;	Road route along sensitive locations such schools, prayer area, hospitals, residential areas etc.	70–100 dB (30 m)	Drivers required to prevent horning when passing near schools & hospitals during day time & during night time; avoid racing near sensitive areas; establishing green belts as sound barriers for sensitive areas	KEPA and Municipality standards and regulations, International standards
Soil Erosion	Construction Phase	Earth excavation; sediments concentration in surface run-off	Construction sites; spoil disposal sites	Soil loss	Optimization of horizontal and vertical section of the roadline; maximizing the use of spoils as refill materials; revegetate exposed areas immediately upon completion of earthworks; and build retaining walls	Municipality standards and regulations
	Operation Phase	Run-off from subgrade and spoil disposal sites	Subgrade and spoil disposal sites	Soil loss	Regular maintenance and revegatation	Best engineering practices

BOD = Biochemical Oxygen Demand, COD Chemical Oxygen Demand, dB = Decibel, m = Meter, NOx = Nitrogen Oxides, NO_2 = Nitrogen Dioxide, SO_2 = Sulfur Dioxide, TSP = Total Suspended Particles, TSS = Total Suspended Solids.

Environmental Monitoring plan is reported in the table below for construction and operation that is prone to bring adverse impact on to the environment and its activities.

4.2. Environmental Monitoring Programs

Table 2: Details of Environmental Monitoring Program

Monitoring Scope	Parameter (What)	Location (Where)	How	Why	Frequency (When)		Responsibility (Who)	Cost Estimates
					Construction	Operation		
Air	TSP, NOx, SO_2, CO	Along the road route, especially concentrating on populated and sensitive area	Field Measurement Portable Gas Analyzer, Air Mobile Lab	Must not exceed K-EPA guidelines	Monthly for 3 consecutive days	Biannual	Contractor & Management	
Wastewater and surface water, domestic, irrigation, drinking water	TSS, COD, BOD, DO, pH, Oil, Phenol	Effluent outlets, local drinking water supply sources; important water bodies	Laboratory Analysis	Must not exceed K-EPA guidelines	Monthly for 3 consecutive days	Monthly	Contractor & Management	
Noise	dB	Construction area and Sensitive spots	In situ Measurements. Portable noise/sound meters Day and night measurement	Must not exceed K-EPA guidelines. According to WB guidelines Noise level must not exceed 70 dB.	Monthly for 3 consecutive days	Quarterly	Contractor & Management	
Solid Waste	Demolition waste, earth materials; Slag, domestic refuse, metallic scraps, sludge	Disposal sites	In-situ observation	Avoid Contamination. Proper collection, disposal and treatment	Quarterly	Biannual for first two years, then annual thereafter	Contractor, Management & Municipality	
Spoils	Material resources	Entire road alignment	Visual inspection	Resource conservation	Biweekly	Twice a year at start and end of season	Contractor, Management & Municipality	
Energy	Electricity, fuel, gas, etc.	Site, vehicles, labor camp, offices	Inspection, Energy efficient system Maintenance, electricity consumption awareness, limiting unwanted use of electricity and fuel	Save resources and avoid wastage	Every day or Periodically monitoring the consumption of energy may be monthly basis.	Every day or Periodically monitoring the consumption of energy may be monthly basis.	Contractor, Management and Energy Auditors	
Soil erosion	Land degradation	Entire road alignment	Technical inspection	Avoid loss of soil by erosion, lead to high risk level, undesirable accretion	Biweekly	Biannual	Contractor, Management, Municipality & Relevant Ministry	
Public safety	Signs, culverts, public safety records	Entire road alignment	Hazard and HSE inspection, and implementation of safety measure, PPE (personal protective equipments)	Safety of people and workers	Monthly	Quarterly for the first ear, then annual thereafter	Contractors and Management	
Natural Scenic Beauty	Animal Species, vegetation and natural Landscape	Desert Landscape	Visual Aesthetic Inspection	Merits and concerns of Psychological impact	Monthly	Biannual	Contractors, Management & Kuwait Agriculture, and Landscape Planner	
Land acquisition and population resettlement	Compensation, income, housing, employment, social adaption	Relocated families and receiving communities	Government, concerned organization and Administrative Procedures	Adhere to government land acquisition laws, acts and notices	Before the project commences	Depends upon concerned authority	Relevant Ministry, land and revenue, Municipality, Public Works	
Health, Safety & Environment (HS&E)	Human, property and environment	Site, Surroundings and workers camp	Safety measures, Personal Protective Equipments, Mentioned in HSE Plan	For Protection of Life (at first) and second Environment and Third property. Adhering to Safety rules for construction works, rules for handling hazardous material, operating risk based equipments, safety for roads, driving and signals etc.	All the time during the mobilization, construction, of the road	All the time during the operation and maintenance of the road	Contractors during construction and maintenance. Government during the operation	

BOD = Biochemical Oxygen Demand, CO = Carbon Monoxide, COD Chemical Oxygen Demand, dB = Decibel, DO = Dissolved Oxygen, EPB = Environmental Protection Bureau, EPMO = Environmental Protection and Management Office,

LAR = Land Acquisition and Resettlement, NOx = Nitrogen Oxides, pH = Measure of Acidity/Alkalinity, SO_2 = Sulfur Dioxide, TSP = Total Suspended Particles, TSS = Total Suspended Solids.

4.3. Recommendations

Following recommendations are provided based on the baseline studies done for the road project in Kuwait (arid environment) with in EIA studies:

4.3.1 Sensitivity of Sabkha / Low-lying wetland

Proper consideration should be given while constructing on sabkha/ low-lying wetland. Generally sulphur, carbonate and salt contents are high in the sabkha in Kuwait. The piles and construction materials constructed should be resistant to this chemicals and reaction.

4.3.2 Animal Corridor

The construction should take care of the camel, cattle and desert wildlife movement especially along the corridors through passage underground through road and fencing the rest of the road.

4.3.3 Sand Drift and Accumulation

Sand drift and accumulation is a strong phenomenon in Kuwait. Kuwait spends millions to combat the accumulating sands along the public places, roads and around utilities. Sand barrier, concrete wall, berm, trench, sand trap and technically designed greenbelt along the direction of predominant wind direction would be a solution to keep the sand away from reaching the road and causing disturbance to mobility.

4.3.4 Tackling H_2S Contaminated Groundwater

The possibility of this occurrence of H2S associated with water is very less in the proposed study route because of greater depth of water table as compared to the excavation depth required for road works. Geotechnical reports do not show any evidence of H2S. Here recommendations are provided for the worst case situation.

There are various methods that should be chosen based on the level of H2S, the amount of water being treated, the levels of iron and manganese, and bacterial contamination. H2S can be reduced or removed by activated carbon filtration, shock chlorination, oxidizing chemical injection, oxidizing filtration, and water heater modification.

- *Activated carbon filters* are good when H_2S is present in low levels. The H_2S is absorbed onto the surface of the carbon particles.
- *Shock chlorination* may reduce, but not eliminate, the H_2S producing bacteria. It involves mixing a sufficient amount of a chlorine-based chemical with the water to create a solution containing 200 ppm of chlorine throughout the water system. It is left in the system for several hours. The system must be flushed with fresh water when the process is complete.
- *Oxidation* removes H_2S concentrations exceeding 6 ppm. It can be done by aeration, chlorination, ozone, and potassium permanganate. There should be at least 20 minutes of contact between the chemical and the water.
- *Oxidizing filters* will work for concentrations up to 6 ppm. The filter contains sand with a manganese dioxide coating that changes H_2S gas to tiny particles of sulfur that are trapped inside the filter.
- *Water heater modification* is necessary when H_2S is causing an odor within the water heating system. Replacing the magnesium corrosion control rod with one made of aluminum or other metals usually improves the situation.

4.3.5 Dewatering During Construction Works

Prior to installing equipment, a comprehensive assessment of the potential environmental impacts of dewatering should be undertaken during project feasibility phase, to highlight environmental risks and develop management strategies to overcome any significant environmental issues.

The assessment should include:

- Description of the dewatering technique (e.g. spears, bore field, or pit and sludge pump), commencement date, duration, anticipated volume and frequency of dewater discharge.
- Details of the local environment (before dewatering), including the seasonal variability of standing water levels, groundwater flow regime and quality, and the water values at risk down-gradient from the dewatered site and planned discharge point should be undertaken.

- The radius of influence and profile of any water table draw-down could be calculated via empirical methods or scientific modeling (including threat to any vegetation or existing structures from land settling) under the supervision of an experienced hydrogeologist.
- Advice on any measures proposed to limit the extent of offsite influence of the dewatering e.g. scheduling for end of dry season, sheet piling, hydraulic barriers, grout curtains or ground freezing.
- Definition of the quality of water to be discharged by either bore sampling or access to recorded data, including probable contaminant concentrations based on natural groundwater contaminants and the local land use history.
- The need and viability of the dewatering treatment before release into the environment e.g. aeration, chemical flocculation, filtration, odor control, pH adjustment or settling of solids.

4.4. EMP Implementation and Execution Programs

4.4.1 Environmental Audit

This section provides a checklist of the mitigation measures that must be taken to ensure that they are adequately carried out to meet various conditions stipulated by the authorities.

A. Planning and Design

1. Has the design followed appropriate standards set by the relevant agencies and/or authorities in Kuwait?

B. Mobilization and Construction Stage

For Base Camp:

1. Has the location been approved by the local authority?
2. Are the workers camps being kept clean and tidy for aesthetic and hygienic purposes?
3. Have the basic utilities and amenities been provided?

Damage and Interference (on Structure, Roads, and Other Property):

1. Have all precautions been taken to avoid damages and interference (other than to the extent that is necessary for them to be removed or diverted to permit the execution of the works) to: (a) Drainage systems? (b) Utilities? and (c) Structures, roads or other property?
2. Has written permission been obtained prior to any excavation or performance of any other work directly or indirectly affecting any utility (underground, overhead or on the surface)?
3. Has appropriate remedial action been taken for any damage to structures, roads or other property?

Access:

1. Has the arrangements for the alternative access been agreed by the relevant Authorities if any?
2. (Are the permanent accesses reinstated as soon as practicable after work is completed and the alternative access removed immediately if it is no longer required, and the ground surfaces properly reinstated?
3. Are all necessary precautions been taken to protect structures or works being carried out by others adjacent to and, for the time being, within the site from the effects of vibrations, undermining and any other earth movements, or the diversion of water flow arising from the work?

Site Clearing:

1. To incorporate disposal of waste material

Demobilization:

1. Upon completion of all contract works, are all areas of the project, including the contractor's working areas cleared from all construction debris, waste, surplus material, and rubbish?

Air Quality:

1. Is air monitoring carried out at locations and frequency determined by the proper authority such as KEPA?
2. Does the air quality comply with Ambient Air, Environmental Quality Regulations (KEPA)?

Site Clearing and Disposal of Waste Material:

1. Have all debris, spoil material, rubbish and other waste being cleared regularly from the site?
2. Is the disposal site for dumping of the waste material approved by the local authorities?
3. Is the access to the work sites free of all debris, waste and excavated material and other obstructions?

4. Are the waste oil and other scheduled wastes being handled and disposed according to procedures for scheduled wastes?

Transportation of Construction Materials and Construction Wastes:

1. Are the transportation routes being determined and approved by the authorities?
2. Are the loads of the lorries properly covered to avoid spillage?
3. Are mud and debris deposited on the roads cleaned?
4. Is there facility provided to clean the wheels before leaving the construction sites?
5. If there is any damage to the roads, public and private properties, has action been taken to repair the damage?
6. Is speed limit observed, especially near residential areas?

Socio-economic:

1. Has the contractor given the employment and sub-contracting jobs priority to the local people?

Safety:

1. Have the contractors ensured that all workers understand and comply with the standard safety procedures for handling heavy machinery, vehicles and equipment?
2. Is there a safety officer to oversee that the overall safety compliance has been adhered to?
3. Are first aid facilities available at all times at the construction site?
4. Is there available immediate transportation to hospital for medical treatment, if required?

4.4.2 Emergency Response Plan (ERP)

The project proponent is required to prepare a detailed Emergency Response Plan (ERP) during EMP, i.e. prior starting the project, and must get appropriate approval by the relevant authority. ERP is to provide a timely, coordinated response, following an unscheduled event of emergency within the proposed facility. This is in order to prevent loss of life and injury to working personnel, and minimize damage to facilities and environment. The emergency has to be defined and properly documented. The ERP shall include the followings but not limited to:

- Outline the steps required in the event of an emergency occurring within the proposed development.
- Ensure all injured and infected persons receive the best medical attention as quickly as possible.
- Stabilize, control immediate hazard and recommend action to be taken to isolate and secure the areas.
- Keep the site clear of unauthorized persons after an emergency for their own safety and the safety of the public.
- Communicate promptly with corporate representatives at the appropriate level.

4.4.3 Health, Safety & Environment (HS&E) Plan

A separate extensive HS&E was developed for different phases of the project for mobilization, construction, operation and maintenance (GEO. 2011a). Proper guidelines for handling and operation, procedures, PPE (Personal Protective Equipments), and signage are mentioned in the HSE document.

4.4.4 Environmental Management Office (EMO)

Management of Contractors - During the construction period, the contractor, who shall always station in the construction site, shall be mainly responsible for effective controlling and reducing the impact on the environmental as mentioned in EMP.

The main mechanism for implementation of the environmental management plan is to establishment of an Environmental Management Office (EMO) for the project by the contractor. The EMO can therefore monitor the mitigation plan of the project.

Supervision and monitoring are fundamental to the successful implementation of an EMP. Therefore, it is vital that monitoring of the extent to which the mitigation measures of this EMP, are adhered to by consultants and contractors, takes place. During implementation, the EMP should be revised once construction and operational activities are well defined. Additional information should be provided on (i) the responsibilities for reporting, (ii) the work plan, (iii) the procurement plan, (iv) detailed cost estimates, and (v) mechanisms for taking corrective action.

Project Office (contractor) requires appointing full time environmental staff responsible for carrying out environmental management stationed at EMO. The suggested position is Environmental Supervision Engineers (ESE) and two direct staff - assisting and working under him (i) Technician and (ii) Coordinating-Secretary.

Environmental Supervision Engineers will:

1) Review on behalf of the Project Office if the execution of the project meets the requirements of EIA and EMP particularly with regard to the site environmental management and impact mitigation measures required;
2) Supervise site environmental management system of the contractors including their performance, experience and handling of site environmental issues, and provide corrective instructions;
3) Review the EMP implementation by the contractors, verify and confirm environmental supervision procedures, parameters, monitoring locations, equipment and results;
4) Report EMP implementation status to Project Office and KEPA periodically
5) An integral part of Supervision Engineer, is to approve invoices or payments with consideration of EMP performance.

4.4.4 Environmental Supervision Plan (Framework)

The Environmental Supervision Plan was prepared adopting the standard framework adopted by China Railway Second Survey and Design Institute, 2009.

Environmental supervision is an important instrument to ensure effective implementation of Environmental Management Plan. The Environmental Supervision Engineer (ESE) shall prepare the project Environmental Supervision Plan prior to environmental supervision according to the codes and standards for environmental protection, design documents, construction contracts and supervision contracts and EMP, etc.

The supervision plan should be prepared focusing on:

1. Scope of environmental supervision: the area of the project and the area impacted by the project.
2. Scope of work: construction site, living camps, construction access roads, attached facilities, as well as the area with environmental pollution and ecological damage resulted from construction within the above scope.
3. Stage of work: environmental supervision of construction preparation, construction, project maintenance.
4. Time limit of supervision: from the stage of project construction preparation till expiration of the maintenance period of the project. The maintenance period lasts 1 year or depending upon the Ministry of Public Works (MPW) since completion of construction. Environmental supervision of the project is divided into the three stages, construction preparation, construction and defects liability period.
5. Targets of the work: Targets of environmental supervision are to fulfill the obligation of environmental supervision, serve the project independently, fairly, scientifically and effectively, and carry out overall environmental supervision in order to make the project measure up to the requirement of environmental protection in terms of design, construction and operation according to the laws, regulations and policy specified and released by the state and the relevant responsible department, the regulations, specifications and technical standard of the world bank, as well as the approved design documents, tender documents and the supervision and construction contracts signed legally.
6. Working procedures: The working procedures include working recording system, staff training, report system, letter communication, and regular environmental meetings. There shall be one environmental protection supervision meeting each month. During the meeting, the contractor will give a review to sum up the recent environmental protection work. The Environmental Supervision Engineer gives overall assessment about environmental protection of each bidding object of the current month. The achievement of the work will be approved, and the current problems will be put forward and the remedial requirement will be proposed. Meeting minutes will be taken for each meeting.
7. Preparation for work commencement: ESE shall prepare the environmental supervision work plan and submit to Project Office and KEPA.

The plan shall include the composition of the environmental supervision organization and the environmental supervision staff list. ESE shall get familiar with the contract condition and the relevant technical specification, and carry out field investigation, and get an overall knowledge on the site landform, surface features, hydrogeology and profile of the environment.

8. The work plan for environmental supervision and the provisions of environmental supervision shall be approved by the Project Office and KEPA.
9. Quality control should be integral part of EMO and Project Office.

10. ESE shall: carry out overall inspection, supervision and management for the construction, pay attention to control beforehand, timely prevent and control the unfavorable factors which might cause environmental impact, and take preventive measures before the accident happens; eliminate each hidden danger which might cause environmental impact; improve control subsequently, ensure that the project submitted by the contractor satisfies the drawings and technical specifications and measures for each environmental protection requirement.
11. Coordination, information collection and management: Coordination among various parties will be mainly achieved through meetings. The theme meetings will be convened regularly. Inspect and supervise the contractor to sort out the document and technical file in time in order to ensure that the engineering information and file classification are clear and complete, and the technical file and the drawings are simultaneous with the real object.

1. Environmental Supervision before Construction

Review of pollution prevention proposal: according to the process design of a specific project, "three waste" (waste water, waste gas, and solid waste) discharge link during the construction workmanship shall be reviewed. The advancement of treatment technology and feasibility of the treatment measures, which are adopted during the discharge of major pollutant and design, shall also be reviewed.

Before the project, the final method of disposal and source of the pollutant shall be planned and implemented specifically after reporting the responsible department of the environmental protection as per the regulations and treatment requirements of the related document. Review of environmental protection clause in the Construction Contract: construction contractor must abide by related requirements of environmental protection which shall be reflected in the construction contract in the way of specific clause. During the process of construction, strengthen supervision, inspection, and monitoring to reduce the pollution effect on the environment during the construction period, and carry out review on the level of civilized construction quality of the construction unit as well as construction environmental management.

2. Environmental Supervision during Construction

ESE will conduct daily on-site supervision, e.g. whether the construction is carried out as per clauses of the environmental protection and EMP, and whether the clauses are changed without approval; whether the environmental protection requirement is satisfied during the construction process by monitoring whether construction work is in line with the environmental protection standard, and whether it is carried out as per the design requirements of the environmental protection; whether each environmental protection measure (which can guarantee the environmental protection requirements) is implemented during the construction process.

The main contents are:

(1) Supervise water and soil loss caused by the major works and the temporary works. Inspect whether the facilities of water and soil conservation measure up to the requirement of design and whether soil is obtained and dumped as per the procedure and location; as a key point, it shall be supervised that the waste soil and stone during construction are not dumped to the side slope of the mountain in order not to spoil the scenery.
(2) Environmental supervision of industrial and domestic wastewater disposal: Supervise the source of the industrial and domestic wastewater, discharge amount and water quality index, construction progress of the disposal facilities, as well as the disposal result. Inspect and supervise whether it measures up to the approved requirement of discharge.
(3) Environmental supervision of atmospheric pollution: atmospheric pollution in the work area mainly comes from the exhaust gas and dust produced during the construction and production process. For the source of pollution, discharge is required to be done when it measures up to the standard. The specified environmental quality KEPA standard shall be met in the work area and the area under its impact measure up to relevant standard.
(4) Environmental supervision of noise control: In order to prevent the damage from sources of noise or vibration, it shall be prevented as per the design requirements. In particular, for the blast work, it is required that the noise environment quality in the work area and the area under its impact measure up to the relevant standard.
(5) Environmental supervision of solid waste disposal: solid waste disposal include industrial, domestic trash disposal and industrial slag disposal. It is required to ensure that the site is clean and tidy.

(6) Environmental supervision of the wildlife: Prevent the impact of water and soil loss. Control the construction as per the regulations of vegetation protection, especially the implementation of the measures of protection and relocation of the ancient trees, as well as separation of the rare animals.
(7) Environmental supervision of people's health: Ensure safety and reliability of the domestic drinking water, prevent infectious disease, and provide necessary welfare and sanitation.
(8) Supervision of construction and installation of the environmental protection facilities: supervise construction of the facilities of sewage treatment, acoustic protective screen and green work.

3. Supervision after Completion of Inspection

1. Assist the Owner in the organization of final acceptance of construction.
2. Prepare the final report for the environmental supervision of the project.

5. Conclusion

The developed EMP addresses the environmental impacts during the design, construction and operational phases of the project. EMP outlines the key environmental management and safeguards that will be initiated by the project proponent to manage the project's key environmental concerns. Environmental Management Plan (EMP) is the mechanism to ensure that environmental considerations are integrated into the project survey and design, contract documents and project supervision and monitoring. These are tools for mitigating or offsetting the potential adverse environmental impacts resulting from various activities of the project.

The EMP prepared consists mainly of mitigation measure, monitoring plan and recommendations. The recommendations that are suggested are specific to the project and geographical conditions in the State of Kuwait. The vital section of EMP is the EMP implementation and execution program. The EMP should consist of cost estimates for monitoring program, equipment procurement, manpower, transportation, office cost, studies, reporting, stationeries, etc.

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