

BEYOND
SMART CITIES



ENVIRONMENTAL IMPACT ASSESSMENT - EIA
KRISHNAJI PAWAR, LEED AP BD+C, GSAS CGP, ISO 14001:2015, GCP
ENVIRONMENTAL SPECIALIST COURSE



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**ENVIRONMENTAL IMPACTS,
MITIGATION MEASURES AND RISK
ASSESSMENT
FOR ENVIRONMENTAL PROFESSIONALS**
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WHAT SHOULD YOU LEARN





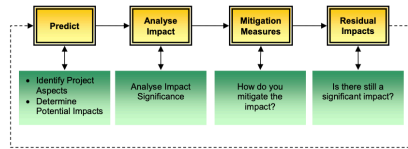
Strategy for Impact Prediction and Mitigation
Environmental Assessment Procedure
Environmental Impact Prediction and Mitigation
Mitigation measures
Risk Assessment
Identification of Accidental Environmental Hazards



STRATEGY FOR IMPACT PREDICTION AND MITIGATION

The Environmental Impact Assessment Procedure was followed for all development phases, construction, commissioning and operation, of Project in accordance with the Environmental Considerations specified by the MOE, the Abu Dhabi Guidelines, and the International Finance Corporation (IFC) standards.

The internationally recognized impact assessment and mitigation procedure is summarised in Figure .



STRATEGY FOR IMPACT PREDICTION AND MITIGATION +

The impact assessment procedure that was applied to Project is outlined as follows:

- ✓ Identification of all Project Master Plan activities, the Environmental Aspects, that could generate environmental and socioeconomic impacts
- ✓ Identification of the relevant environmental and social components, the Environmental Components (ECs)
- ✓ Determination of the potential environmental impact on each EC due to each Environmental Aspect of the Master Plan
- ✓ Evaluation of each impact
- ✓ Determination of the residual impacts that would remain after the application of necessary mitigation measures

A matrix methodology was used to correlate the Environmental Aspects with the Environmental Components as a means to identify the potential impacts during any of the development phases. The results were complemented by comparative scenarios and expert judgment.

ENVIRONMENTAL ASSESSMENT PROCEDURE

Table 5-1 Environmental Aspects Register

Development Component	Environmental Aspect
Construction	Access, roads and circulation
	Activities
	Construction (excavation, foundation, piling, etc.)
	Transport of equipment, material and vehicles
	Plant generation (power generation)
	Storage and handling of materials, equipment and vehicles
	Drilling and piling of shafts and tunnels
	Removal and relocation of existing structures
	Removal and relocation of existing infrastructure
	Removal and relocation of existing vegetation
Operation	Access, roads and circulation
	Activities
	Construction (excavation, foundation, piling, etc.)
	Transport of equipment, material and vehicles
	Plant generation (power generation)
	Storage and handling of materials, equipment and vehicles
	Drilling and piling of shafts and tunnels
	Removal and relocation of existing structures
	Removal and relocation of existing infrastructure
	Removal and relocation of existing vegetation
Decommissioning	Access, roads and circulation
	Activities
	Construction (excavation, foundation, piling, etc.)
	Transport of equipment, material and vehicles
	Plant generation (power generation)
	Storage and handling of materials, equipment and vehicles
	Drilling and piling of shafts and tunnels
	Removal and relocation of existing structures
	Removal and relocation of existing infrastructure
	Removal and relocation of existing vegetation

The results of the receiving environment study, the baseline study, provide a description of the area and the main ecological, social and economic characteristics, the ECs, that could be affected by the proposed activities, the Environmental Aspects.

The list of Environmental Aspects that were considered for this impact assessment, based on the descriptions of the Project Master Plan activities, is provided in Table 5-1 which indicates how the combination of Development Components and Environmental Aspects are understood.

ENVIRONMENTAL ASSESSMENT PROCEDURE

Category	Environmental Component	Interference
Physical	Air Emission and Odour/Smell/Gas/Fume	Impact on vegetation and wildlife
	Noise Levels and Vibration	Contribution to climate change
	Land Use	Health implications for residents surrounding industrial sites
	Geomorphology	Disturbance to water quality (surface water)
	Soil	Land form changes
	Water	Change to geomorphological processes
Biological	Surface water	Change to fishery
	Groundwater	Change to groundwater processes
	Marine water and sediments	Change to fishery
	Marine Fauna	Change to fishery
	Terrestrial Fauna	Change to fishery
	Terrestrial Flora	Change to fishery
Social	Population and Health	Change to fishery
	Economic Activities	Change to fishery
	Archaeological / Cultural Sites	Change to fishery
	Land Use	Change to fishery
	Living conditions	Change to fishery
	Health and safety conditions	Change to fishery

Environmental Components (ECs) are ecosystem and social components that are considered to be important or valuable and that merit detailed consideration in the SEA process. Once the Environmental Aspects were identified and defined, all of the ECs that could be impacted by any of the Master Plan activities were identified.

The ECs were segregated under categories of environmental and social resources based on the environmental baseline study of the area. These resources are: air and climate; land; water; ecology and biodiversity; and human environment. The importance of each EC was then determined, as listed in Table

ENVIRONMENTAL IMPACT PREDICTION AND MITIGATION

Environmental impacts that are anticipated to result from the environmental aspects of the proposed activities could affect one or more of the environmental components identified in Section 0.

Impacts can be avoided, minimized or mitigated by following a management system that includes proactive development and best practices.

These mitigation measures are described for the Construction Phase, for the Operational Phase, and for the Decommissioning Phase.

The combined, incremental effects of human activity, referred to as cumulative impacts, pose a threat to the environment.

RISK ASSESSMENT

The objective of this section is to address the risks associated with accidental impacts to the environment that could occur as a result of mishaps or failures during the construction, operation and decommissioning phases of the proposed Master Plan. The assessment serves for setting the general framework that the different industries will have to follow and the studies that will have to be taken into account during their particular environmental assessment.

The risk assessment identifies and provides a description of the following.

- Environmental hazards that could be encountered during the construction, operational and decommissioning phases of the Master Plan.
- A qualitative assessment of the level of risk associated with the identified hazards.
- Preventive measures that will be implemented to minimize the risk of the occurrence and impact of each hazard.

RISK MATRIX



Likelihood	Consequence				
	1	2	3	4	5
A Almost Certain	H	H	E	E	E
B Likely	M	H	E	E	E
C Moderate	L	M	H	E	E
D Unlikely	L	L	M	H	E
E Rare	L	L	M	H	H

Table 5-59 Tolerability Criteria

Risk Severity Rating	Action Required
E - Extreme	Immediate attention
H - High	Immediate attention
M - Moderate	Action as soon as practicable
L - Low	Low priority, possibly no action required

The Risk Matrix is used to define the tolerability of each of the hazards assessed before and after taking into account the proposed preventive measures. The matrix used to assess tolerability in this study is based on the Risk Likelihood & Consequence Guideline (CRP-0012) and was revised and accepted as appropriate for the scope and objectives of this SEA as provided in Table 5-58 with the Tolerability Criteria defined in Table.

IDENTIFICATION OF ACCIDENTAL ENVIRONMENTAL HAZARDS



A formal workshop that was conducted during several sessions was held, and the results were used to identify the accidental environmental hazards specific to the Project. The workshop was developed by Senior Environmental and Safety Risk Consultants.

This Risk Assessment found that most of the accidental hazard risks that were identified for the project will be reduced to a Tolerable Risk Level if the proposed preventive measures are implemented. In general, the risk levels before treatment are primarily Moderate or High, with two scenarios posing Extreme risk levels, which are related to chronic leaks of refined hydrocarbons or contaminated soils during decommissioning. After implementation of the preventive measures, these two would be reduced to Moderate Risk Levels.

Table 5-61 Main Hazards from the Risk Register

Code	Accidental Environmental Hazard Description	Activity Frequency Affected	Final / Main Receptor Considered Affected	Consequence	Likelihood	Risk Level before Treatment	Preventive Measures	Consequence	Likelihood	Risk Level after Treatment		
CONSTRUCTION												
130	LOC - Release of refined hydrocarbons / Fuel from storage area to soil	G	Soil / Groundwater	4	Major	D Unlikely	High	Provide adequate secondary containment for fuel storage. Use impermeable surface for transfer areas. Provide portable spill containment and clean-up equipment.	1	Insignificant	D Unlikely	Low
140	LOC - Release of refined hydrocarbons / Fuels to soil in fuel transport accident	G	Soil / Groundwater	4	Major	D Unlikely	High	Confirm that trucks have portable spill containment and clean-up equipment. Confirm that a Spill Management Plan is in place during the construction phase. Confirm that all transport comply with Transport of Hazardous Substances specifications.	2	Minor	E Rare	Low
OPERATIONS												
200	LOC - Release (catastrophic spill) toxic liquid petroleum / Fuel to drainage system	1,2,3,4,5,6,7,8,9	Surface Water	4	Major	D Unlikely	High	Confirm that areas with toxic liquid have an appropriate containment system. Confirm that equipment with toxic liquid have an appropriate detection and bonding system. Confirm that installations have an adequate drainage / water treatment system to control an accidental spill. Provide an emergency spill response and clean-up procedures to communicate accidental spills (especially to external wastewater treatment plants).	2	Minor	D Unlikely	Low
210	LOC - Release (chronic leak) of refined hydrocarbons / Fuel to soil	1,2,3,4,5,6,7,8,9	Soil / Groundwater	4	C Moderate	Extreme	Confirm that an adequate maintenance management plan is implemented for equipment that could chronically leak liquids underground equipment. Confirm that underground chronic leak detection system is in place for all critical or equipment with higher risk. Confirm that areas with refined hydrocarbons / Fuel have an appropriate wastewater assessment. Confirm that areas with refined hydrocarbons / Fuel have an appropriate drainage / containment system. Confirm that equipment with refined hydrocarbons / Fuel have an appropriate detection and bonding system. Provide portable spill containment and clean-up equipment for refined hydrocarbons / Fuel.	3	Moderate	D Unlikely	Moderate	
220	LOC - Release (catastrophic spill) refined hydrocarbons / Fuel to soil	1,2,3,4,5,6,7,8,9	Soil / Groundwater	4	Major	D Unlikely	High	Confirm that areas with refined hydrocarbons / Fuel have an appropriate drainage / containment system. Confirm that equipment with refined hydrocarbons / Fuel have an appropriate detection and bonding system. Provide portable spill containment and clean-up equipment for refined hydrocarbons / Fuel.	2	Minor	D Unlikely	Low
230	LOC - Release (catastrophic spill) refined hydrocarbons / Fuel to drainage system	1,2,3,4,5,6,7,8,9	Surface Water	4	Major	D Unlikely	High	Confirm that installations have an adequate drainage / water treatment system to control an accidental spill. Confirm that Wastewater Management Plan has a procedure to communicate accidental spills (especially to external wastewater treatment plants). Confirm that areas with refined hydrocarbons / Fuel have an appropriate containment system. Confirm that equipment with refined hydrocarbons / Fuel have an appropriate detection and bonding system.	2	Minor	D Unlikely	Low



Code	Accidental Environmental Hazard Description	Activity Potentially Affected	Final Main Environmental Receptor Considered Affected	Risk Severity before Treatment			Preventive Measures	Risk Severity after Treatment						
				Consequence	Likelihood	Risk Level before Treatment		Consequence	Likelihood	Risk Level after Treatment				
340	Runoff of the fighting water with dangerous product to drainage system	1,2,4,5,6,7,8,9	Surface Water	4	Major	D	Unlikely	High	Confirms that installations have an adequate drainage / containment system to collect fire fighting water	2	Minor	D	Unlikely	Low
470	LOC - Release (catastrophic) spill of liquid with toxic metals to drainage system	1,3,6,8	Surface Water	4	Major	D	Unlikely	High	Confirms that installations have an adequate drainage / water treatment system to control an accidental spill	2	Minor	D	Unlikely	Low
500	LOC - Release (catastrophic) spill of hazardous waste stored in storage system	1,2,4,5,6,7,8,9	Surface Water	4	Major	D	Unlikely	High	Confirms that Emergency Management Plan has a procedure to communicate the suitable spill of the fighting water originating to external wastewater treatment plants	2	Minor	D	Unlikely	Low
520	LOC - Release (catastrophic) spill of water production water to drainage system	1,2,4,5,6,8	Surface Water	4	Major	D	Unlikely	High	Confirms that installations have an adequate drainage / water treatment system to control an accidental spill	2	Minor	D	Unlikely	Low
550	LOC - Release of hazardous substances to drainage system due to accident during road transport	G	Surface Water	4	Major	D	Unlikely	High	Confirms that all transport comply with Transport of Hazardous Substances specifications	2	Minor	E	Rare	Low
580	Impact on general wastewater treatment plant due to arrival of an accidental spill (dangerous substances)	G	Surface Water	4	Major	D	Unlikely	High	Confirms that installation has an adequate basis / containment system to control an accidental spill	2	Minor	D	Unlikely	Low
DECORATION														



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