

Risk Assessment

1.1 Introduction

Risk is a potential that a chosen action or activity will lead to a loss of human or property. Risk assessment is a step for Risk Management. Risk assessment is determination of qualitative and quantitative value of risk related situation or hazard. Hazard is a situation that poses a level of threat to life health or environment. Risk assessment involves the following:

- Hazard Identification
- Vulnerability Analysis
- Risk Analysis
- Emergency Preparedness Plan
- Disaster Management Plan

A disaster is a catastrophic situation in which suddenly, people are plunged into helplessness and suffering and as a result, need protection, clothing, shelter, medical, social care and other necessities of life. Disasters can be divided into two main heads. In the first head, the disasters result from natural phenomena like earthquakes, volcanic eruptions, storm surges, cyclones, tropical storms, floods, avalanches, landslides, forest fires. The second head includes disastrous events occasioned by man, or by man's impact upon the environment. Examples are armed conflict, industrial accidents, radiation accidents, factory fires, explosions and escape of toxic gases or chemical substances, river pollution, mining or other structural collapses, air, sea, rail and road transport accidents and can reach catastrophic dimensions in terms of human loss. There is no set criteria for assessing the gravity of a disaster in the abstract since this depends to a large extent on the physical, economic and social environment in which it occurs. However, all disasters bring in their wake similar consequences that call for immediate action, whether at the local, national or international level, for the rescue and relief of the victims.

1.2 Hazard Identification

In a township project following types of hazards may takes place:

1.2.1 Natural hazard

- A. Earthquake
- B. Flooding

1.2.2 Man-made hazard-

- A. Fire & explosion
- B. Electrical
- C. Mechanical
- D. Radiation
- E. Thermal
- F. Chemical

1.3 Vulnerability Analysis

In a township project, resident, staff and visitors are vulnerable to risks. The vulnerable analysis is done on all the hazards as below:

Table 1.1: Vulnerability Analysis

	During Construction	During Operation
HAZARD IDENTIFICATION		
Natural hazard		
Earthquake For all blocks	For blocks which will be under construction	For all blocks
Flood	For immediate areas of construction	For the complete complex
Man-made hazard		
Fire & explosion	For all areas working area	For complete complex
Electrical	Same	Same
Mechanical	Cranes & Machineries	Elevator DG set room
Radiation	Within the Complex	Within the Complex

Thermal	Within the Complex	Within the Complex
Chemical	Storage area	Storage of Chemical

1.4 Risk Analysis

The risk is likelihood of harmful effect big or small due to hazard, together with severity of harm suffered. Risk also depends on number of people exposed to hazard. Risk analysis provides severity of harm from particular type of hazard. A safety plan mainly constituting the following shall be implemented during construction & Operation:

Table 1.2 Risk Analysis Safety Plan during Construction & Operational Phase

During construction Phase	During Operation Phase
<p>Safety mats would be provided at appropriate level and various shafts/ openings would be covered to prevent falls, slips, trips etc.</p> <p>Necessary safety belts, helmets and eye-masks as required would be enforced at site</p> <p>Adequate guardrails shall be provided to the staircases and common areas.</p> <p>Adequate guardrails/ fences shall be provided around the water storage spaces to prevent drowning accidents.</p> <p>Adequate protection/ fence would be provided around the excavated areas</p> <p>The machinery and the equipments would be regularly tested and maintained with the specific emphasis against accidents failures</p> <p>The deployed Safety officers would ensure that the personnel/ labour are kept at a safe distance from working machinery to avoid accidents/injuries due to toxic gases/ chemical/ noise.</p>	<p>The project is located at Seismic Zone III; structural designing will be done as per best structural engineering practices complying with all the applicable codes / standards.</p> <p>Proper designing of drainage system for domestic as well as storm water shall be provided.</p> <p>Rain water harvesting pits will have provision of storage for 15 minutes peak rainfall.</p> <p>Fire Protection system has been designed as per requirements of NFPA & National Building Code – 2005</p> <p>Proper Fire evacuation system shall be provided.</p> <p>Safety parameters as indicated under Indian Electricity Rules 1956 and ECBC shall be complied.</p> <p>Periodic replacement of critical components of</p>

<p>Moving parts of various parts of machineries/ equipments shall be properly guarded</p> <p>Required fire extinguishers would be maintained at the construction site.</p> <p>Arrangements for clean drinking water would be made.</p> <p>Rest rooms and first aid facilities would be made available for the workers</p> <p>Fire Protection system has been designed as per requirements of NFPA & National Building Code – 2005</p>	<p>elevator/ machines.</p>
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1.4.1 Earthquake

The proposed project site falls in seismic zone III as per seismic zone map of Indian Standard IS 1893, where earthquake can occur from 4.0-1.0 Richter scale.

1.4.2 Flooding

The project site is located at seismic zone III where no chances of floods and landslides. However, flooding can occur due to excess rain.

1.4.3 Fire & Explosion

In a township project chances of fire are minimal. Possibly it can occur due to electrical spark or gas leakage from kitchen. Fire caused are mainly due to carelessness, short circuits, and malfunctioning of gas regulator, tube, and such related products.

1.4.4 Electrical

The electrical current can pass to the floor & metals due to inadequate insulation or accidentally.

1.4.5 Mechanical

The mechanical fault can cause the risk & hazard which include the elevators.

1.4.6 Radiation

Due to use of wireless equipments there may be electromagnetic radiation.

1.4.7 Thermal

Thermal heat can be generated from the D.G sets and the vehicles in the Complex.

1.4.8 Chemical

Chemicals used in the Housing Complex are mainly cleaning agents.

1.5 Onsite Emergency Plans

An onsite emergency is caused by an accident or hazard that takes place within the premises and the effects are confined to the complex only. The onsite emergency plan consists of following key elements:

- Health Hazards for construction activities
- Planning as per hazard analysis
- Preventive measures
- Emergency response procedure
- Recovery procedure

1.5.1 Health Hazards from Construction Activities

- Safety meets would be provided at appropriate level and various shafts/ openings would be covered to prevent falls, slips, trips etc.
- Necessary safety belts, helmets and eye-masks as required would be enforced at site
- Adequate guardrails shall be provided to the staircases and common areas.
- Adequate guardrails/ fences shall be provided around the water storage spaces to prevent drowning accidents.
- Adequate protection/ fence would be provided around the excavated areas
- The machinery and the equipments would be regularly tested and maintained with the specific emphasis against accidents failures

- The deployed Safety officers would ensure that the personnel/ labour are kept at a safe distance from working machinery to avoid accidents/ injuries due to toxic gases/ chemical/ noise.
- Moving parts of various parts of machineries/equipments shall be properly guarded
- Required fire extinguishers would be maintained at the construction site.
- Arrangements for clean drinking water would be made.
- Rest rooms and first aid facilities would be made available for the workers

1.5.2 Planning

- Mapping of hazard vulnerable area shall be done in consultation with staff.
- There shall be Disaster Management Cell in place
- The disaster management cell have following members to share the responsibility
 - Site Controller (Administrator)
 - Incident Controller (Asstt. Administrator)
 - Personal Manager
 - Communication Officer
 - Fire Officer
 - Security Officer
 - Engineering In-charge
 - Fire pump attendant
 - First Aid Team

1.5.3 Preventive Measures

1.5.3.1 Earthquake

The project will be situated Seismic zone-III area. Special attention has been given to the structural design of foundation, elements of masonry, timber, plain concrete, reinforced concrete, pre-stressed concrete, and structural steel. All applicable guidelines will also be followed in this regard to ensure safety of the building and its staff. Structural designing shall be done as per National Building Code 2005.

1.5.3.2 Flooding

Proper designing of drainage system for domestic as well as storm water will be provided. Rain water harvesting pits will have provision of storage for 15 min rainfall. Excess water will be disposed off to sewer of the area as per discharge standards.

1.5.3.3 Fire & Explosion

Fire safety measures shall be taken as per NBC Code. In case of fire, fire extinguisher will be used. Fire extinguishers are put at the entrance of storage rooms. The Fire Extinguisher (FOG) System has been provided as per fire safety plan. The phone number of nearest fire service stations has been displayed at various points and also near the fire extinguishers. The fire-fighting system shall be designed as per NBC - 2005. The complex is proposed to be provided with fire protection arrangements such as Manual call points, Underground water storage tank, Overhead storage tank, Portable appliances, Exit signs, D. G. Set, P. A. System, staircase etc. from fire safety point view.

- Proposed Fire Safety Measures

- Fire Protection system has been designed as per requirements of NFPA & National Building Code – 2005
- Fire hydrant risers connected to the hydrant system with Hydrant landing valves with fire hose cabinet consisting of swinging hose reel, fire man's axe, 63mm dia canvas hose and nozzles.
- Externally fire hydrants will be located.
- Fire-fighting pumps of following capacity will be provided,
- Main Fire pumps for Hydrant System will be located.
- Main Fire pumps for sprinkler System will be located.
- Stand by pumps for Hydrant System will be located.
- Stand by pumps for Sprinkler System will be located.
- Jockey pumps will be provided.
- Booster pumps will be provided.
- Overhead & underground water tanks will be provided for firefighting system.

- Automatic Fire Hydrant system as per NFPA – 14 shall be provided.
- Automatic Sprinkler system as per NFPA – 13 shall be provided.
- Automatic Fire Detection and Alarm System with Voice Evacuation system & PA system as per NFPA – 72 shall be provided.
- Kitchen Hoods Fire Suppression system shall be provided.
- Portable Fire Extinguishers as per NFPA – 10 shall be provided.
- Gas Based Fire Protection System for Electrical Panels as per NFPA – 12 shall be provided.
- Gas Based Fire Protection System for IT Rooms as per NFPA – 2001 shall be provided.
- Refuge areas shall be provided as per NBC 2005 norms

Following Fire-fighting codes and standards shall be followed in the Commercial complex:

List of applicable standards for fire alarm system

- i. IS: 2189 - 1962 Code of Practice for Automatic Fire Alarm System.
- ii. IS: 2195 - 1962 Specifications for Heat sensitive Fire Detectors.
- iii. IS: 732 - 1973 Code of practice for Electrical Wiring installation
- iv. UL 168 Under writers laboratory specifications for smoke detectors.

1.5.3.4 Electrical

Planning Stage:

- Safety parameters as indicated under Indian Electricity Rules 1956 and ECBC shall be complied. The following safety measurement are considered
- Earthing system
- The earthing system shall be based on the Indian TNS system. The earthing conductors proposed to be used are Copper plate for neutral and body earth.
- The design of the system shall follow the Indian Code of Practice IS 3043: 1981.
- ELCB in Distribution Board

- One Earth Leakage Breaker sensitivity 30 mA shall be used per phase in all Distribution Boards

In addition to that, following measures shall be adopted

- There will be color coding and labeling of high voltage electrical wires
- Sand bags/ wire bucket shall be placed near the electrical control/panel
- Installation of electrical equipments shall be properly done like insulation, guarding and grounding.
- Work practices and handling of the electrical equipments shall be properly managed.
- Employees and workers shall be trained for awareness of safe work practices and systems.
- Properly maintained equipments and tools will be used.
- Service of electrical equipments shall be done under the supervision of trained personnel.
- Temporary connections made for experimental reasons shall be safe and properly insulated.
- Live electrical terminals shall be shielded.

Operation Stage:

- Have only licensed electricians install, repair and dismantle jobsite wiring.
- Check each extension cord before use.
- Do a thorough check for electrical wiring before cutting through any wall, floor or ceiling.
- Inspect power equipments on a regular basis.
- Check insulated tools for damage before each use.
- Never modify electrical plugs.
- Keep extension cords in a safe place where they won't be stepped on or driven over.
- Ensure that all electrical components stay dry.
- Use the right extension cord for the job.

Electric Hazards & Safety Measures

- Safety parameters as indicated under Indian Electricity Rules 1956 and ECBC shall be complied.
- The Contractors shall, at their own expense, arrange for safety provisions as per safety codes of Indian Standards Institution, Indian Electricity Act 1956 and such other Rules, Regulations and Laws as may be applicable and as indicated below, in respect of all labour, directly or indirectly employed in the work for performance of the Contractors' part of this agreement. The following safety measurements are considered:
 - No inflammable materials shall be stored in places other than the rooms specially constructed for this purposes in accordance with the provisions of Indian Explosives Act.
 - Protective and safety equipment such as rubber gauntlets or gloves, earthing rods, line men's belt, portable artificial respiration apparatus etc. should be provided in easily identifiable locations.
 - Necessary number of caution board such as "Man on Line, Don't switch on" should be readily available in easily identifiable locations.
 - Standard first aid boxes containing materials as prescribed by the St. John Ambulance Brigade or Indian Red Cross should be provided in easily identifiable locations and should be readily available. Periodical examination of the first aid facilities and protective and safety equipment provided shall be undertaken.
 - Charts (one in English and one in regional language) displaying methods of living artificial respiration to a recipient of electrical shock shall be prominently displayed at appropriate places.
 - A chart containing the names, addresses and telephone numbers of nearest authorized medical practitioners, hospitals, Fire Brigade and also of the officers in charge shall be displayed prominently along with the First Aid Box.
 - Steps to train supervisory and authorized persons of the Engineering staff in the First Aid Practices, including various methods of artificial respiration with the help of local authorities such as Fire Brigade, St. John's Ambulance Brigade, Indian Red Cross or other recognized institutions equipped to impart such training

shall be taken, as prompt rendering of artificial respiration can save life at time of electric shock.

- No work shall be undertaken on live installations, or on installations which could be energized unless one another person is present to immediately isolate the electric supply in case of any accident and to render first aid, if necessary.
- No work on live L.T. busbar or pedestal switchboards should be handled by a person below the rank of a Wireman and such a work should preferably be done in the presence of the Engineer-in -charge of the work. When working on or near live installations, suitably insulated tools should be used, and special care should be taken to see that those tools accidentally do not drop on live terminals causing shock or dead short.

ELCB in Distribution Board

- One Earth Leakage Breaker sensitivity 30 mA shall be used per phase in all Distribution Boards
- There will be color coding and labeling of high voltage electrical wires
- Sand bags/ wire bucket shall be placed near the electrical control/panel
- Installation of electrical equipments shall be properly done like insulation, guarding and grounding.
- Work practices and handling of the electrical equipments shall be properly managed.
- Employees and workers shall be trained for awareness of safe work practices and systems.
- Properly maintained equipments and tools will be used.
- Service of electrical equipments shall be done under the supervision of trained personnel.
- Temporary connections made for experimental reasons shall be safe and properly insulated.
- Live electrical terminals shall be shielded.

Earthing system

The earthing system shall be based on the Indian TNS system. The earthing conductors proposed to be used are Copper plate for neutral and body earth. The design of the system shall follow the Indian Code of Practice IS 3043: 1981.

1.5.3.5 Mechanical

Mechanical hazards are created by powered operation of equipment's or tools. Mechanical hazards can occur at three locations:

1. Elevators
2. DG set room, Pump & motors room.
3. Vehicular Movement

Following preventive measures shall be taken.

- Elevators shall be properly maintained with record book of maintenance.
- Periodic replacement of critical components of elevator/ machine.
- Proper training to operators of machines.
- The protective guard will be installed at fan & motors.
- There will be safe distance demarcation on heavy machines like cranes (during construction)
- Sign of danger at the hazard places.

1.5.3.6 Radiation

The radiation hazard can be of two types:

1. Ionizing Radiation (nuclear radiation)
2. Non ionizing radiation (non-nuclear radiation)

In the commercial complex, radiation hazard is non-ionizing. The radiation can be prevented in following manner:

- Shielding of radiation.

- Safe distance from radiation source.
- Sign of radiation hazard at vulnerable areas.

1.5.3.7 Thermal

Thermal hazards are objects or substances that transfer energy as heat.

- a) Typical building can have following points of thermal hazard.
 - a. Open flame
 - b. Boiling liquid
 - c. Hot machines/equipment's

The thermal hazard can cause burn of skin; following preventive measures can be taken

- The open flame area like kitchen and mess shall be restricted.
- D. G set room will have restricted entry.
- Operators in the thermal hazard area shall be provided with protective gears like gloves, goggles etc.
- For emergency first aid room will be maintained.

1.5.3.8 Chemicals

The chemical hazard includes the following:

- Causing fire, explosion, Release of harmful /toxic gas or particles.
- Splashing of hot corrosive or toxic liquid.

To prevent chemical hazard following measures shall be taken:

- Use of safer chemicals as far as possible.
- Keep material safety Data Sheet (MSDS) of all chemical.
- Storage of chemical in appropriate container (which is safer for chemical)
- Storage of chemical at defined place will spillage control system.
- Proper environment like ventilation, temperature.
- Use of chemicals by qualified and trained personals.

- Use of personal protective equipment (PPE) during handling of chemicals.

Use of emergency procedures in case of leakage like

- Fire-fighting – for fire
- Spillage treatment
- First aid
- Evacuation of area

For commercial complex projects only chemicals used are:

- Laboratory chemicals
- Cleaning agent (acid /caustic)
- Insecticides
- Medicines
- Cleaning agents can be treated by water.
- Insecticides shall be contained with specified space during sand & cotton and waste shall be sent to TSDF.
- The spray of insecticide shall be done by using gas mask.

1.5.3.9 Terrorism

All the preventive measures shall be taken as given in security plan.

1.5.3.10 Emergency Response Procedure

Even after all the preventive measures for any emergency following facilities shall be provided.

- Administrative office shall also make an Emergency Control Room.
- Assembly area shall be demarked for each type of flats
- Communication system shall be installed in the commercial complex which includes intercom and public addressing system.
- Fire alarm shall be installed at vulnerable place.
- The evacuation plan of each building shall be displayed at each floor of respective building.

- The safe zones (at the time of emergency) on map shall be displayed at different locations.
- First Aid facility shall be made available at Control room.

The emergency shall be declared in case of following:

- Fire alarm buzzing (Fire hazard)
- Vibration/Earthquake feeling (Earthquake) Water logging in the complex above 30 cm (Flood)
- Any unusual smell of gas or suffocating feeling (Chemical leakage) Security alarm from main gate. (Security risk/Terrorism)
- On declaration of emergency communication shall be made to working staff for any type of emergency
- All the working staff of the affected area shall be moved to safe zone
- The control measures shall be done as per the emergency action plan for each type of hazard.
- All the members of disaster management cell shall take charge of their respective duties.
- Outside help like fire tender, police ambulance etc. shall be called by site controller or Incident controller.

1.6 Offsite Emergency Plans

If an accident take place in the complex and its effect are felt outside the complex, the situation thus created is called an offsite emergency. In this case off site emergency is not applicable.

1.7 Security Plan

An ISO 27001 and 27002, which are the international best practice information security management standards, defining and guiding Information Security Management System (ISMS) development shall be adopted. These will provide the necessary benchmarking for individual users to know the type of cover and the responsibilities that are defined and provided by that institution for its guests. Most importantly, training, to staff needs to be regularly imparted in dealing with such situations.

1. Manual Checks: At all gates the visitors and guest shall be manually checked and asked for ID's.
2. CCTV: At all important location with a remote viewing facility and record back up. With highest resolution and picture quality. DVR being the back bone, its recording and replaying capabilities must be considered.
3. Checks at Entrances: All car entering will be checked thoroughly inclusive of Bonnets, Luggage Hold with hand held, metal detectors, mirrors and other checking stuffs.
4. Central Control Room: This will control the security system from inside.
5. Communication Systems: Proper communication system to security staff shall help them to coordinate better during emergencies.

1.1.1 Training and Security Drills (Including Surveillance System)

Disaster planning is the responsibility of all sections of the community. The police, fire brigade, civil defense, Home Guards, press, clergy, industrial groups, and community groups must participate in the pre-disaster planning. The community as a whole has the responsibility to teach first aid to groups in the community that could be utilized in disaster situations. The disaster may involve the normal communication network itself. Therefore, two-way radio systems and messenger systems must be included as backups in the event of a communication-system failure. Proper training, security drill and evacuation drill shall be conducted in a defined time period, so as to train the management people, security personnel's, senior staff and all other working staff to take control of all odds what so ever come in the way. These trainings shall be conducted for use of weapons and Arms by some trained agencies for the said trainings. The training shall be done periodically.

- Making of Standard Operating Procedures: A standard operating procedure manual shall be prepared, followed and maintained for all the eventualities due to attack by armed intruders.
- Emergency Response Team: The disaster management cell shall act as an emergency response team shall be formed in the complex which will comprise of persons from Internal Control room personnel, security staff, trainers, Police Control, Army official,

Nearest Hospital Management, Fire officer to take control of any eventuality if comes in the complex.

1.8 Evacuation Plan

Standard operating procedures will be formulated and maintained for all eventualities due to attack by armed intruders. Evacuation plan includes the evacuation due to

- fire hazard
- Armed Intrusion
- Flood
- Earthquake

During any of the above mentioned hazards, the evacuation will be as follows in order of priority:

- Inform Control Room
- Inform Concerned Agency
- Suggest Evacuation Plan
- Shifting Staff to Internal Safe Area
- First Aid
- Transport Injured To Nearest Hospital
- Transport People To Safe Place
- Call Necessary Help

Communication: The communication system is useful for rapid notification to appropriate units and expeditious implementation of relief procedures. The fire brigade and metro police units are linked through a wireless communication network. Additional channels of communication are now available through personal cell phones. Use of personal cell phones will not be restricted during disasters.

On-site crowd control and information management: Disasters usually attract crowds consisting of curious bystanders, onlookers, overenthusiastic volunteers, and self-styled advisers. In

general, this hampers rapid triage and transport. The primary responsibility for crowd management is with the police. When a call is received at any of the control rooms, the information is passed on to the local police. The police contingent which arrives on the scene has the primary responsibility for crowd control.

1.9 Social Impact Assessment

This Section describes the predicted socio-economic impacts associated with construction and operation of the Project.

1.9.1 Socio-economic Receptors

A Project's area of influence generally includes the following:

- Direct footprint of the land that will be used. This is generally the land area that will be fenced and reserved for the Project and where the public will not be allowed access;
- A physical distance around the direct footprint at a scale depending on the emissions related to a particular activity;
- A physical distance around the direct footprint at a scale depending on the indirect effects of a particular activity;

Impacts are described in the context of the effect that a Project or a Project's activities will have on a receptor. In this instance, the Project receptors are the villagers located within the area of influence that may be impacted or influenced by the Project (as a result of their proximity to the Project site and/ or Project associated infrastructure). This includes villagers located in:

- Bakkas village,
- Marhar Mau Kala village,
- Marhar Mau Khund village,
- Chuk Khajeria village,
- Hasanpen Khewli village,
- Mauzzam Nagar,
- Dalar Mau village,

- Mastimau Village,
- Hasanpen Khewli village and ,
- Dhakhawa

Table 1.3 summarizes the socio-economic impacts that were identified during the scoping study and through engagement with relevant stakeholders. By and large, many of the impacts are expected to be limited to the local villages. However, there are a few that may impact the wider region – i.e. Gosainganj town.

Table 1.3: Impacts and Receptors

Potential Impacts	Receptors and Stakeholders
Employment and Economy	
<ul style="list-style-type: none"> • Increase in local employment opportunities • Increase in business development opportunities 	<ul style="list-style-type: none"> • Local government • Local villagers • Local businesses
Community Health	
<ul style="list-style-type: none"> • Increase in communicable diseases, including vector borne diseases and sexually transmitted infections 	<ul style="list-style-type: none"> • Local villagers • Project workforce (including contractors) • Local government • Local health care providers and infrastructure
Community Safety and Security	
<ul style="list-style-type: none"> • Increased potential for traffic accidents and incidents • Increased potential for safety issues associated with the presence of new infrastructure • Increased potential for contamination, including surface and groundwater, associated with the management and disposal of hazardous materials and waste 	<ul style="list-style-type: none"> • Local villagers • Construction workers (including contractors) • Local government • Regional villages located along the transport routes
Environmental Emissions	
<ul style="list-style-type: none"> • Increase in noise leading to disruptions in community activities • Increase in vibrations impacting community infrastructure • Increase in dust leading to health implications 	<ul style="list-style-type: none"> • Local villagers • Project workforce (including contractors) • Local government
Community Infrastructure and Services	
<ul style="list-style-type: none"> • Increased pressure on community infrastructure and services 	<ul style="list-style-type: none"> • Local villagers • Project workforce (including contractors) • Local government • Local infrastructure providers
Social Networks	
<ul style="list-style-type: none"> • Increase in disposable income increasing the use of alcohol and drugs • Introduction of new people to the area leading to conflict and changes in social structures • Change in the availability of skilled workers 	<ul style="list-style-type: none"> • Local villagers • Project workforce (including contractors) • Local government • Local service providers
Cultural Heritage	
<ul style="list-style-type: none"> • Impacts on cultural heritages within the Project area • Impacts on archaeological resources 	<ul style="list-style-type: none"> • Local villagers • Project workforce (including contractors) • Local government

1.9.2 Assumption and Limitations

The Project is still in the early stages of development and hence some aspects of the Project have not yet been finalized. This includes the number of people likely to be employed during construction and operation of the Project from the local area – although indicative numbers have been provided. It is understood that employment figures will continually be refined as the Project

design is further developed and discussions are held with the prospective contractor regarding the approach to construction.

1.9.3 Assessment of Impacts

This section describes the potential impacts and consequences of interaction between Project's activities and receptors. Where significance of the impacts is assessed from moderate to major mitigation measures, management and monitoring are proposed.

Often, large scale projects result in in-migration – i.e. people moving to the Project area to capitalize on employment and business development opportunities. There are a host of impacts associated with in-migration. Rather than assessing in migration separately, where in-migration is a contributing or driving factor to an impact, this is noted in the sections below.

1.9.3.1 Impacts on Employment and Economy

Description

The Project will generate a range of employment opportunities. The number of people employed by the Project will decrease at the end of the construction phase. It is anticipated that direct employment opportunities will be created during the operation phase. In addition, the Project will require goods and services throughout its lifecycle. There are opportunities for local businesses to provide these goods and services (e.g. construction equipment, food for the accommodation camp). As a result, existing local businesses may expand or new businesses may be established locally to meet these demands – providing employment opportunities. This is referred to as indirect employment.

Potential Impact

The Project will generate skilled and unskilled positions, with the number of unskilled positions dropping substantially after the construction period. Given that much of the local population is employed in the agricultural sector, this may limit the opportunity to employ local people, particularly during the operation phase. It will be important to capitalize on the skills that are transferrable from the agricultural sector to the Project in order to maximize local employment.

In terms of indirect employment, the realization of opportunities will depend not only on the Project, but also on the initiative and business acumen of local entrepreneurs. Given the limited number of existing businesses, it is anticipated that the number of opportunities to create business development opportunities and/ or indirect employment will be limited.

The resulting impacts (e.g. increase in employment opportunities, increase in income for local people employed by the Project) were assessed as a positive – i.e. beneficial to the local villages. For this reason, the impact significance was not assessed.

Mitigation and/or Management Measures

Proposed measures to enhance the potential Project benefits include:

- Develop and implement a local content plan. As part of this, establish a local recruitment and procurement management plan. Development of the plan should involve consultation with relevant stakeholders, including government authorities and local villagers.
- Review opportunities to establish a skills training program with an aim of training interested local villagers to contribute to the Project; and
- Inform local villagers of job opportunities in a timely manner. Ensure that the advertising process is a culturally appropriate; and
- Inform local businesses of contracting opportunities in a timely manner. Ensure that the process is culturally appropriate.
- Develop and monitor an internal standard to guide labour practices and apply this to Supply Chain.

1.9.3.2 Impacts on Community Health

Description

The Project will employ a range of people during construction and operation. There is potential for the workforce to introduce and/ or increase the rate of spread of communicable diseases in the Project area. This includes the introduction of a new disease and/ or a more virulent strain of an existing disease. However, the workforce is not the only factor that may contribute to the transmission of communicable diseases. The Project is also likely to result in immigration.

Similar to the workforce, there is potential for in-migration to introduce and/ or increase the rate of spread of communicable diseases in the Project area. There are a number of communicable diseases prevalent in the Project area, for e.g. conjunctivitis.

Potential Impacts

An increase in the transmission of communicable diseases may occur as the result of the introduction of workers into the area. If left untreated communicable diseases can lead to long-term health issues and/ or in some instances death. In other words, the impact can be characterized as being long-term and in some instances permanent.

The existing local healthcare facilities have limited capacity to respond to an increase in the transmission of communicable diseases, leaving the local villagers vulnerable. This is exacerbated by the fact that few villagers recognize the symptoms – which is what drives someone to seek treatment.

To minimize the impact, a number of steps can be taken – but largely center around (1) reducing the interaction between the workforce and local villagers and (2) minimizing the creation of vector habitat. This will help to reduce the interaction between workers and local villagers.

Given the existing management measures, the local extent and scale of the impact, the impact was assessed as moderate and negative. The impact would have been assessed as minor, however, the duration (and consequence) of the impact was identified as potentially long-term – i.e. long-term health issues and in some cases death .

The workforce will be larger during construction, when compared to the operation phase. This increases the potential for the impact to occur (i.e. as there are more potential disease carriers) during the construction phase. This would typically increase the impact rating for the construction phase; however, the existing management measures (i.e. accommodating the workforce at a camp) will help reduce the potential of the impact occurring, for this reason the construction and operation phases were both assessed as moderate and negative.

Mitigation and/or Management Measures

Based on the above assessment, a community health management plan should be developed to address potential health risks. The plan should include the following elements:

- Training for all workers on the transmission routes and common symptoms of communicable diseases. This can help reduce the potential for workers to unknowingly transmit communicable diseases. This will also help to increase knowledge within the local villages – e.g. through the training of workers that have been sourced from the local villages;
- Establish amenities at the camp to that help minimize the interaction between the workforce (particularly temporary construction workers) and local villagers;
- Undertake pre-employment screening to ensure workforce fitness for work. However, it is important that the pre-screening process do not result in discrimination;
- Vector management procedures, including consideration of whether pesticides will be utilized to reduce the presence of vectors onsite;
- Provision of onsite health care, to ensure that medical attention can be sought should a worker present with the symptoms of a communicable disease; and
- Emergency management procedures, should a health issue escalate and require a rapid response. Where appropriate the community health management plan should be implemented in close coordination with government authorities and local health care providers.

The focus of the community health plan should be on managing impacts on the local villages. It is also recommended that a complementary occupational health and safety plan be developed – to focus on managing potential issues that may affect the Project workforce. The plan should include measures to protect the workforce from contracting a communicable disease. This will help reduce impacts to the workforce as well as the potential for the workforce to contract a communicable disease and subsequently introduce the disease in their home village/ community.

Significance of Residual Impact

Once management measures have been implemented, it is predicted that the impact will be reduced to minor and negative during construction and operation. However, on-going monitoring and evaluation of the management measures and community health situation will be needed. If monitoring indicates an increase in the transmission of communicable diseases, the management measures will need to be revised.

1.9.3.3 Impacts on Community Safety and Security

Description

There are a number of safety related issues that are likely to arise as a result of the Project. This includes:

- Traffic accidents. An increase in traffic can lead to an increase in congestion, leading to frustration on the part of local villagers. However, given the low level of current road use, this is unlikely to occur. Instead, the key issue is the potential for an increase in accidents or incidents, which can lead to injuries and/ or fatalities;
- Presence of new infrastructure. There are often safety issues with the establishment of new infrastructure – e.g. community members falling in unsecured trenches or interacting with unsecured equipment. This can lead to onsite accidents and injuries; and
- Management of hazardous materials and waste onsite. It is particularly important that these materials are managed appropriately so as not to contaminate the surrounding water sources, as many local villagers use groundwater for drinking and/ or other household activities. There are a number of activities that will generate hazardous waste – e.g. chemical cleaning of equipment during the pre-commissioning process.

The Project will increase the number of vehicles through the transport of workers and goods to and from the Project site. With an increase in vehicles, particularly heavy haulage vehicles, comes the increased potential for accidents and inquiries to occur. This is exacerbated by the fact that people living in the local villages typically reside immediately adjacent to roads. In addition, the Project will require security. Security personnel will be employed during construction and

operation. It is anticipated that a total of 12 people will be required during the operation phase; the number required during construction has not yet been determined.

Potential Impacts

Community safety and security impacts largely result from an increase in traffic, the establishment of onsite infrastructure and the management of hazardous materials. To a lesser extent, given the small number of security personnel required, the presence of security forces.

There are measures in place to ensure that hazardous materials are appropriately managed and disposed of by the Project. This will help minimize the potential for local water sources to be contaminated.

In addition, the Project site will be fenced, while any activities outside the main footprint (such as the buried pipeline) will be appropriately sign posted. This will help ensure that accidents associated with new infrastructure will be minimized.

Given this, the issue to which the local villagers are most vulnerable is the increase in traffic. This can lead to accidents, injuries and, in some instances, fatalities. The potential outcome of the impact is an injury and in some instances a fatality.

Due to the existing management measures, the local extent and scale of the impact, the impact was assessed as moderate and negative during construction, while minor and negative during operation. The impact would have been assessed as minor, however, the duration (and consequence) of the impact was identified as potentially long-term – i.e. the outcome of a traffic accident can have long-term implications.

The vehicle movements/ transport requirements may be greater during construction, when compared to the operation phase. This increases the potential for the impact to occur (i.e. as there are more potential disease carriers) during the construction phase and increases the impact rating.

Mitigation and/or Management Measures

Based on the above assessment, the following management measures associated with community safety and security are suggested:

- Develop and implement a traffic management plan. This should set-out the measures that will be implemented to minimize the risks associated with transporting materials and workers to and from site, including factors such as fatigue management and ensuring all employees observe recommended speed limits;
- Ensure all employees complete training prior to driving any Project vehicle. The content of the training should be tailored to the employee's role;
- Explore opportunities to work with local stakeholders to increase awareness within local villages about the hazards associated with traffic;
- Provide appropriate training for security personnel and monitor implementation of the training over time (to minimize any potential use of excessive force); and
- Develop and implement waste management plan. This should set out the procedures for managing and disposing of hazardous materials.

Residual Impacts

Assuming that the above management measures will be implemented and monitored over time, the residual impact was assessed as minor and negative. Ongoing monitoring should occur to track implementation and evaluate the management measures.

1.9.3.4 Impacts on Community Infrastructure and Services

Description

An increase in population in the local area (due to employment opportunities and immigration) is likely to place additional pressure on existing infrastructure and services (e.g. healthcare, roads). The result is often a reduction in capacity of existing infrastructure and services to meet the needs of the local villagers (as well as the additional population added by the Project). This typically means longer wait times and diminished quality of services as well as reduced access to and increased wear and tear on infrastructure. For example, an increase in road traffic can speed up the wear and tear experienced by roads, requiring roads to be fixed earlier than typically required. This creates a new cost sooner than anticipated for those involved in maintaining (and repairing) road infrastructure.

Potential Impacts

During construction, the workforce is expected to peak. It is the workers from outside the area (as well as the influx associated with in-migration) that contributes to the pressure that is experienced by community infrastructure and services.

However, during construction the workforce will be accommodated at a camp — which will have a range of on-site amenities. This will minimize the need for the workforce to utilize (or rely on) local infrastructure – i.e. minimizing the pressure that may be experienced by community infrastructure and services. However, traffic may still create an issue – particularly during construction when transport needs are higher (than during the operation phase). In terms of the operation phase, it is assumed that some of the workers will come from outside the local area (however, the breakdown in terms of the number of people from outside the local area is unknown). Given the duration of the Project, it is anticipated that these workers will bring their families with them. These workers may place some additional pressure on the local infrastructure. However, given the small workforce, it is anticipated that this additional pressure can be accommodated.

In addition, during both the construction and operation phase, the Project may place additional pressure on existing health care infrastructure – e.g. should a worker get sick, should a safety incident occur on site causing someone to get hurt. However, there is limited capacity for the existing health care infrastructure to respond to this demand (e.g. due to limited diagnostic equipment). For this reason, if health care is required, workers will likely need to utilize facilities outside the local area.

In terms of the construction phase, the key issue is the impact that road infrastructure may experience. However, this impact is expected to be local in terms of the extent and scale and occur over a short period of time. In terms of the operation phase, there is potential to impact more widely on community infrastructure (e.g. schools, community centers). This assumes that workers will be brought in from other areas and bring with them their families. This may occur, but is expected to result in only a handful of families moving into the area. As a result, the extent and scale of the impact is likely to be local and the overall impact is likely to be small. For these reasons, the impact was assessed as minor and negative.

The above impacts may be greater depending on the degree that in-migration occurs. This will need to be monitored closely – and the impact revisited should this become an issue.

Mitigation and/or Management Measures

Based on the above assessment, the following management measures are suggested:

- Provide appropriate amenities at the accommodation camp – e.g. recreational opportunities. This will help reduce the need for workers to utilize local infrastructure and services;
- Develop and implement a traffic management plan to minimize the impact experienced by road users as a result of the Project;
- Develop and implement a social investment/ corporate social responsibility plan/ program. As part of the plan, Sembcorp should explore opportunities to enhance community infrastructure and services;
- Develop and implement a site safety management plan. This plan will need to ensure appropriate and adequate health care services are provided on site and at the accommodation camp to address/ manage worker illnesses and injuries; and

Residual Impacts

Assuming that the above management measures will be implemented and monitored over time, the residual impact was assessed as negligible and negative. Ongoing monitoring should occur to track implementation and evaluate the management measures.

1.9.3.5 Impacts on Social Networks

Description

Although employment opportunities bring positive economic benefits, they also can result in social issues. These are largely associated with the following:

- The movement of skilled workers. Often large scale projects, offer better pay and benefits (when compared to local jobs). The result is a movement of workers from their existing positions to the employment opportunities offered by the Project.

- An increase in disposable income within the local villages. Although this can have positive benefits such as improvement in nutrition and education (e.g. as education outside the community becomes affordable). It often results in negative impacts, such as an increase in the use of drugs and alcohol, an increase in the price of commodities and food, and an increase in high fatty and sugary foods. (These types of foods can be introduced to an area to cater for the workforce.) The induced impacts are an increase in non communicable diseases (e.g. due to drug and alcohol consumption); The introduction of new people can also change the social structures and networks.

Potential Impacts

Although employment is a positive economic benefit, it also presents a number of potential negative social impacts. The result is a reduction in the local skills pool, an increase in disposable income and changes in social interactions. The impacts during construction will be minimized as the workforce will largely reside within the accommodation camp – reducing the interaction between the workforce and local villagers reducing the potential for community conflict. Although the impact will be reduced, some impact will still occur, as a portion of the construction workforce will be sourced from local villages. This will increase disposable income and result in a shift in skilled workers from existing industries. It is anticipated that this impact will be minor and negative. This is largely because the extent, scale and duration of the impact will be small (i.e. localized impact over a short period of time) during construction. The impact is minor instead of negligible given the vulnerability of the local villagers.

In terms of operation, although the operation phase occurs over a longer period of time, the extent and scale of the impact is still expected to be small. This is largely due to the relatively small size of the workforce. The above impacts may be greater depending on the degree that immigration occurs. This will need to be monitored closely – and the impact revisited should this become an issue.

Mitigation and/or Management Measures

Based on the above assessment, the following management measures are suggested:

- Develop and implement a workforce code of conduct that addresses issues such as anti-social behavior and drug and alcohol consumption;
- Provide an introduction for workers moving into the area – so that workers understand local culture and customs; and
- Develop and implement a local content plan. A key aspect should be providing local employment opportunities.

Residual Impacts

Assuming that the above management measures will be implemented and monitored over time, the residual impact was assessed as minor and negative. Ongoing monitoring should occur to track implementation and evaluate the management measures.