جهاز شئون البيئة

جهاز تنظيم إدارة المخلفات

Qalyoubia Sanitary Landfill and Shared C&D Treatment Facility (Qalyoubia and Cairo Governorates)

CONCEPTUAL ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Prepared by:

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Conceptual ESIA

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LIST OF ABBREVIATIONS

Abbreviation	Full Wording
A.P.E	Association for the Protection of the Environment from Pollution
BOD	Biochemical Oxygen Demand
C&D	Construction and Demolition
CAA	Civil Aviation Authority
CBOs	Community- Based Organizations
CEO	Chief Executive Officer
CoC	Code of Conduct
COD	Chemical Oxygen Demand
CTA	Cairo Transport Authority
CAPMAS	Central Agency for Public Mobilization and Statistics
CITES	Convention on International Trade in Endangered Species
DBOT	Design, Build, Operate and Transfer
EC	European Commission
EU	European Union
EGP	Egyptian Pound
EHS	Environment, Health, and Safety
EIA	Environmental Impact Assessment
EMU	Environmental Management Unit
EPA	United States Environmental Protection Agency
ESF	Environmental and Social Framework
ESS	Environmental and Social Standards
ECARU	The Egyptian Company for Solid Waste Recycling
EEAA	Egyptian Environmental Affairs Agency
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
EAPCCP	Egypt Air Pollution and Climate Change Project
FI	Financial Intermediaries
GC	Greater Cairo
GBV	Gender Based Violence
GCA	Greater Cairo Agglomeration
GCL	Geosynthetic Clay Liners
GHG	Greenhouse Gases
GRS	Grievance Redress Service

GRM	Grievance and Redress Mechanism
GWP	Global Warming Potential
HR	Human Resources
HSE	Health and Safety Executive
ID	Identity Card
IFC	International Finance Corporation
IT	Interim Target
ILO	International Labor Organization
IPCC	Intergovernmental Panel on Climate Change
ISOCARP	International Society of City and Regional Planners
LE	Egyptian Pound
LEL	Lower Explosive Limit
LFG	Landfill Gas
L&FS	Life and Fire Safety
LGU	Local Government Unit
LandGEM	Landfill Gas Emissions Model
MSW	Municipal Solid Waste
MoE	Ministry of Environment
MoT	Ministry of Transportation
MoLD	Ministry of the Local Development
MSDS	Materials Safety Data Sheets
MSMEs	Ministry of Micro, Small and Medium Enterprises
NGOs	Non-Governmental Organization
NMOC	Non-Methane Organic Carbons
OPs	Operational Policies
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PAPs	Project Affected Persons
PM	Particulate Matter
PPE	Personal Protective Equipment
SDO	Social Development Officer
SEA/SH	Sexual Exploitation and Abuse and Social Harassment
SWM	Solid Waste Management
SEPA	Scottish Environment Protection Agency
TDS	Total Dissolved Solids
TIUs	Technical Implementation Units
ToR	Terms of Reference

TSP	Total Suspended Particles
UEL	Upper Explosive Limit
UNDP	United Nations Development Programme
UNESCO	The United Nations Educational, Scientific and Cultural Organization
VES	Vertical Ground Electrostimulation
VOC	Volatile Organic Compound
WB	World Bank
WBG	World Bank Group
WHO	World Health Organization
WMRA	Waste Management Regulatory Authority

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EXECUTIVE SUMMARY

Introduction

Cairo and Qalyoubia governorates are experiencing air pollution mainly due to inadequate collection and disposal of solid waste and open burning. To address this inadequate solid waste management, the Government of Egypt, through Waste Management Regulatory Authority (WMRA) in Ministry of Environment and Cairo and Qalyoubia governorates in Ministry of Local Development initiated the design of an Integrated Waste Management Facility (IWMF) in 10th of Ramadan under the ongoing Egypt: Greater Cairo Air Pollution and Climate Change Project (GCAPCCP) supported by World Bank (WB).

Component 2 of GCAPCCP includes a combination of enabling institutional and capacity building activities for the operationalization of the SWM master plans of the governorates, as well as development and upgrading of strategically important waste management infrastructure.

The Integrated Waste Management Facility at the 10th of Ramadan (IWMF-10R) is one of the GCAPCCP interventions planned to cater treatment and disposal of different types of wastes generated in Cairo and Qalyoubia governorates for 50 years. The IWMF will include the following components:

- Sanitary landfill of Qalyoubia Governorate, treatment rejects of municipal solid waste (227.5 feddan)
- Construction and demolition waste treatment facility (23 feddan)
- Sanitary landfill of Cairo Governorate, treatment rejects of both municipal solid waste, demolition and construction (447 feddan)
- Medical waste treatment and disposal plant for Cairo and Qalyoubia governorates (16.51 feddan)
- Sanitary landfill of the Urban Communities Authority, treatment rejects of both municipal solid waste, demolition and construction (100 feddan)
- Municipal solid waste treatment plant for Cairo Governorate (composting and recycling plant) (212 feddan)
- Municipal solid waste treatment plant in Qalyoubia Governorate (composting and recycling plant) (106 feddan)

The private sector will play a significant role, through different PPP modalities, in developing and operating the different components of the IWMF-10R after developing the needed the infrastructure by the government. IWMF-10R will be developed in a phased approach using different financing modalities.

The scope of this ESIA covers the following:

- Construction of all infrastructure (external and internal roads, electricity, water supply pipelines, sewage pipelines...etc.) for the IWMF-10R Construction and operation of the first disposal cell in the sanitary Landfill for Qalyoubia

- Construction and operation of Construction and Demolition (C&D) Waste treatment facility for Cairo and Qalyoubia governorates

As part of a Public Private Partnership approach, a Private Sector investor will be required to Design, Build and Operate the proposed project. The current design of the proposed project is Conceptual and the Private Investor will develop the full design of the three components financed by the GCAPCCP. Therefore, this ESIA is considered Conceptual and a detailed ESIA will have to be developed by the Private Investor once determined.

According to the World Bank's Environmental and Social Framework (ESF), the Greater Cairo Air Pollution and Climate Change Project (GCAPCCP) is rated as High Risk. According to ESS1, the construction and operation of sanitary landfills (Component 2 of the Project) requires the development of a comprehensive Environmental and Social Impact Assessment (ESIA) study. According to national requirements, an Environmental Impact Assessment (EIA) is also required by the Egyptian Environmental law 4/1994, which classifies the landfill and the C&D waste treatment facility under Category C.

The primary objective of this ESIA is to ensure that potential environmental and social impacts associated with the construction, operation and closure of the proposed projectare identified, assessed, reduced by mitigation measures proposed and develop an environmental and social management plan to aid in managing the potential impacts appropriately.

The proposed project is state-led with funding provided from the World Bank and expected engagement of the Private Sector at different stages. The proposed project will be implemented through a partnership between the MoE and the MoLD. Execution on the ground will be through the Waste Management Regulatory Authority (WMRA); the MoLD's Central and Regional SWM Units of; Cairo governorate; and Qalyoubia Governorate. WMRA aims to organize and monitor all operations related to waste management in order to improve waste management to be environmentally safe.

Study Approach

The preparation of the Environmental and Social Impact Assessment is done according to the following approach:

- Reviewing the available information and documents regarding the project (hydrology, geophysical, geotechnical, socioeconomic conditions, geomorphic and geological studies, traffic study and ambient air quality measurements);
- Reviewing national and international legislations and regulations relevant to the project, including the required governmental permits and WB standards;
- Holding a Scoping Session (first public consultation) to engage the community and different stakeholders in the process of identifying the expected impacts;
- Assessing the potential environmental and social impacts associated with proposed project activities;

- Developing an outline for the environmental and social management plan for the mitigation of the expected negative impacts and the monitoring activities to ensure compliance with the relevant environmental laws;
- Developing public consultation and engagement outline.

Project overview

The selected site for the proposed solid waste management complex will be located in 10th of Ramadan on about 5 km south of 10th of Ramadan industrial area. It is in a vacant desert area as shown in Figure 1. Qalyoubia landfill and the C&D waste treatment facility are located within the IWMF-10R.

Figure 1 10th of Ramadan Integrated solid waste management facility location

The nearest residential areas to the IWMF are 10th of Ramadan City about 9 km, and Badr city located at around 14 km away from it as shown in

Figure 6. The nearest roads to the site are 10th of Ramadan – Badr (9.6 km away to the West) and Cairo – Ismailia desert road (7 km away to the North).

The total area of the IWMF-10R is 1226 Feddan . All land is owned by the Government[1]. The project's land is free from any economic activities or installations. The area is devoid of any facilities. The history of the project land use has been traced through satellite maps (Google

[1] A ministerial decree to allocate the land to the Waste Management Regulatory Authority WMRA is underway; according to the data received from the Ministry of Environment.

Earth) from 2010 to 2019; the maps did not show any previous works or uses of the proposed project site.

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Components of the Proposed Project

The proposed project includes the following components, as shown in figure:

1. Construction of all external and internal infrastructure for the Integrated Waste Managament Facility in 10th of Ramadan (IWMF-10R) (e.g. roads, electricity, water, sewage, fence...etc.)
2. Construction and Operation of the Sanitary landfill of Qalyoubia Governorate (Qalyoubia Landfill), treatment rejects of municipal solid waste
3. Construction and Operation of the shared (Cairo and Qalyoubeya) construction and demolition treatment facility.

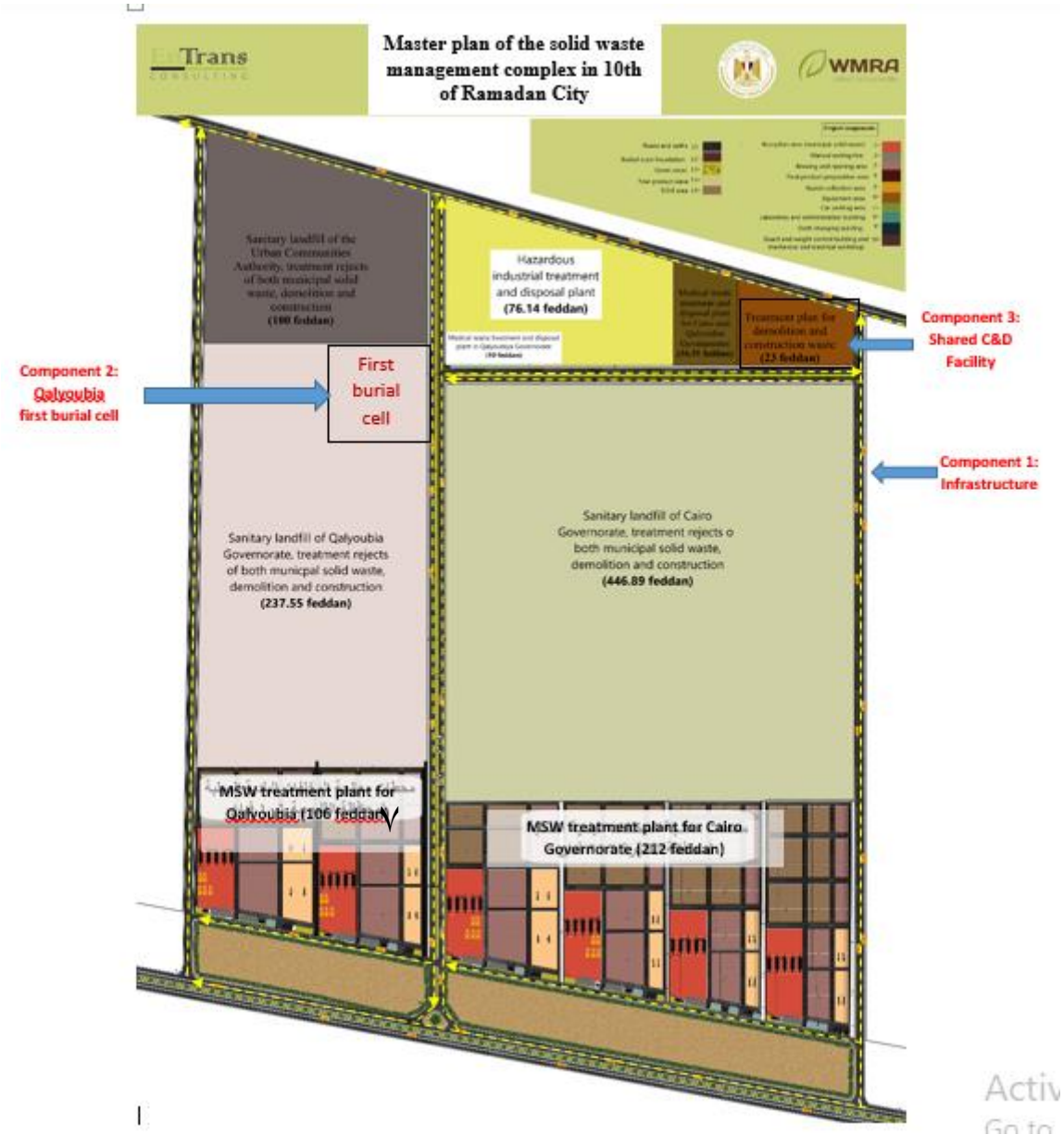


Figure 2 components of the proposed project

Capacity and Age of the Proposed Project

The expected age of the proposed project is 50 years. Conceptual study provided waste estimates over 2020–2070 period, taking into consideration increase in population. The main outcome of the Conceptual study is summarized in the following subsections.

1.1.1.1

1.1.1.1.1 MSW Generation in Qalyoubia Governorate

Qalyoubia is urban and rural governorate The rate of waste generation per capita in urban and rural areas is taken as 0.8 kg / day, 0.5 kg / day respectively[2]. The average generation rate of

municipal waste in Qalyoubia governorate during the project's life time is estimated at 4,860 tons / day (calculating the needed burial cells capacities).

The treatment site capacity is estimated based on an average reception rate of 5,100 tons / day (daily generation rate in 2053). It is expected that Qalyoubia sanitary landfill will receive an average of 1500 ton/day of treatment rejection.

1.1.1.2 MSW Composition

Based on the latest published report from the Ministry of Environment[2], the composition of MSW are shown in Figure 3.

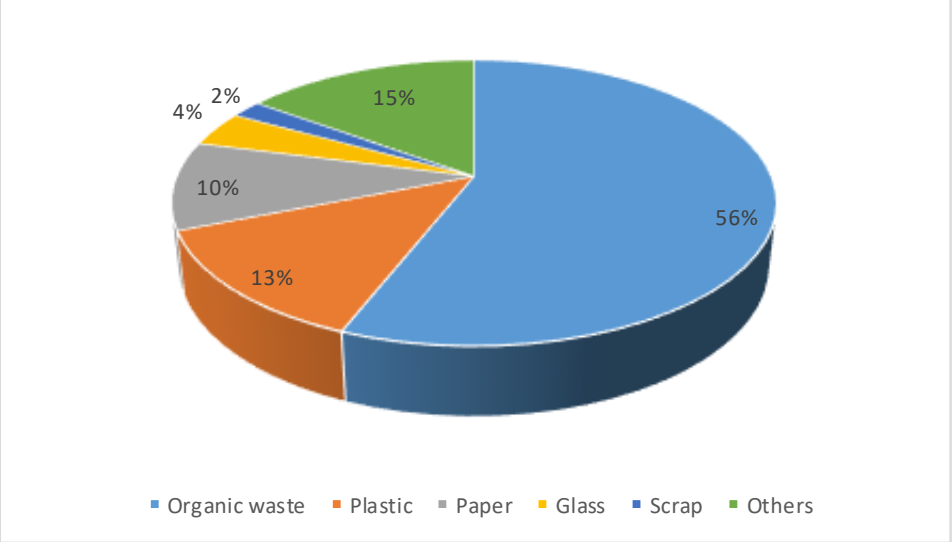
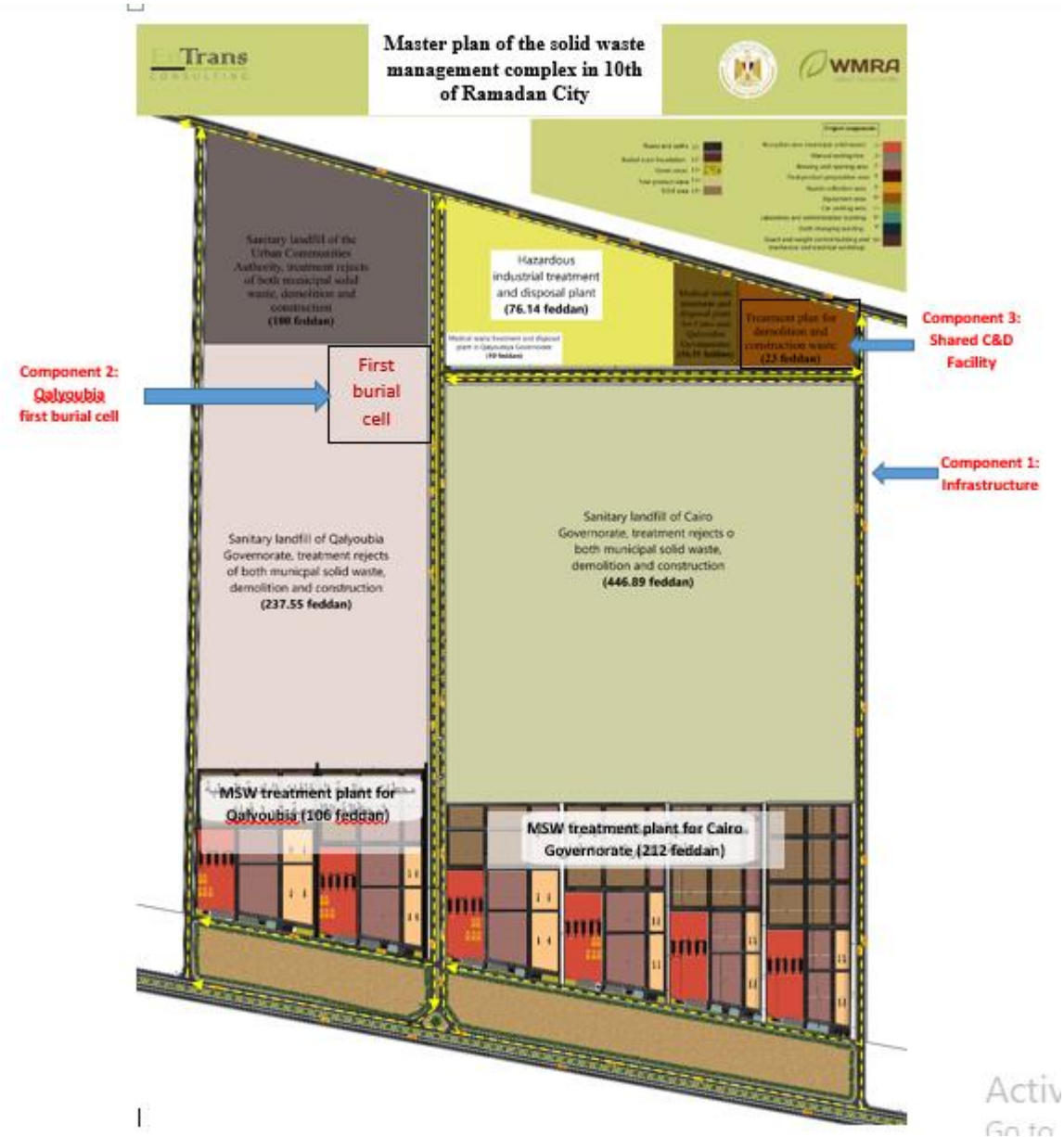


Figure 3 composition of MSW in Egypt

1.1.1.3 Construction and Demolition Waste

The per capita generation rate of construction and demolition waste is 0.03 kg / day[3]. The average value of the generation rate of demolishing and construction waste in the governorates of Cairo and Qalyoubia during the project's life span is estimated at 400 and 230 tons / day respectively. Construction and demolition waste will be treated in a shared facility (a combined site for both governorates) with a reception rate of 1,000 tons / day.

[2&3] Ministry of Environment (2017), State of Environment report for the year 2015



Legal and Regulatory Framework

The national framework includes the Egyptian Environmental Law and all its relevant subsequent amendments and executive regulations. The international framework adopted in this study is the World Bank's ESF criteria which cover key areas for environmental and social impacts to be adhered to by any of the Foundation's funded projects.

Egyptian law provides for environmental compliance procedures and emission limits, which are close to the WBG limits, if not more conservative. The proposed project componentsmust comply with international policies, which stipulate compliance with local laws. If there is a difference between local and WBG standards, the more stringent standards will be adopted.

Table 1summarizes the legal provisions applicable to the proposed project; the following paragraphs discuss the legal requirements of the proposed project. as the owner of the project under the provisions of these paragraphs in detail and include any relevant standards or specifications, implementing bodies concerned and penalties for infringement and irregularities.

Table 1 The legal framework for the project

Case	Relevant Law and legislation	Articles applicable to the project	Relevant executive regulations	Standards and specifications provided
Pollution of the terrestrial environment	Law No. 4/1994 (Environmental Law) Amended by Law No. 9 of 2009	Articles 19, 20, 21, 23, and 33 regarding the performance of environmental impact assessment Articles 22 and 23 regarding the follow-up of the environmental register	Articles 10, 11, 12, 13, 13 bis, 14, 15 and 16 regarding the performance of environmental impact assessment Articles 17 and 18 regarding the follow-up to the environmental register	Appendix 3 of the Executive Regulations of the Law: A Model for the Environmental Register
Hazardous waste management	Law No. 4/1994 (Environmental Law) Amended by Law No. 9 of 2009	Articles 29 and 30 regarding hazardous material and waste handling and management		
Law 38/1967 (Public Cleanliness Law)				
Air pollution	Law No. 4/1994 (Environmental Law) Amended by Law No. 9 of 2009	Substances 34 to 39, 42, 43 and 47 bis of the project site, emissions or leaks of air pollutants, use of engines, dumping or burning of refuse, waste and exhaust of drilling and construction works, noise and internal air quality in order	Articles 34, 35, 36, 37, 38, 41, 44, 45 of the project site and responsibilities, the permissible limits of air pollutants, exhausts of machinery and engines, open burning and disposal of waste, methods of dealing with waste and exhaust of drilling and construction, permissible noise limits, indoor air quality in order	Appendix 5: Maximum limits of external air pollutants Appendix 7, Table (3) Maximum noise levels in different areas (rural dwellings, urban dwellings, etc.)

Case	Relevant Law and legislation	Articles applicable to the project	Relevant executive regulations	Standards and specifications provided
Occupational Health and Safety	Law No. 4/1994 (Environmental Law) Amended by Law No. 9 of 2009	Articles 42, 43, 44, 45, 46 on noise, indoor air quality, temperature and humidity, ventilation and smoking.	Articles 44, 45, 46, 47, 48 on noise, indoor air quality, temperature and humidity, ventilation and smoking respectively	Appendix 7: Permissible limits for indoor and indoor noise levels Appendix 8: Maximum air pollutants within the workplace according to the quality of each industry. Appendix 8, table 4: Quantity of air required to ventilate public areas. Appendix 9: Maximum and minimum temperature and humidity
	Law No. 137 of 1981 (Labor Law) amended by Decree 12 of 2003			
	Law 203 of 2014 concerning the stimulation of electricity production from renewable energy sources	Articles 10,9,8,7,6,5,4,3,2,1 for the establishment of projects for the construction of electricity from renewable sources of energy.		
land acquisition	Law No. 10 of year 1990 and its amendments by Law No. 24 for the year 2018, and law No. 1 for the year 2015. The law describes the cases of property expropriation for public benefit,	Articles 2 (fourth paragraph), 3, 5 (second paragraph), 6 (second paragraph), 7 (first paragraph), 13, 15 (first paragraph) of Law No. 10 of 1990 regarding expropriation of real estate for the public benefit		
Public Consultation	Law 4/1994 on Environmental Protection	Paragraph 6.4.3.1 Paragraph 6.4.3.2 Paragraph 6.4.3.3 Paragraph 7	Scope of Public Consultation	

Case	Relevant Law and legislation	Articles applicable to the project	Relevant executive regulations	Standards and specifications provided
	EEAA guidelines related to the Public Consultation		Methodology of Public Consultation Documentation of the Consultation Results Requirement and Scope of the Public Disclosure	

The World Bank (WB) has 10 Environmental and Social Standards (ESSs) that should be considered in its financed projects. The following standards are applicable to the proposed projects:

- **Environmental and Social Standard 1:** Assessment and Management of Environmental and Social Risks and Impacts
- **Environmental and Social Standard 2:** Labor and Working Conditions
- **Environmental and Social Standard 3:** Resource Efficiency and Pollution Prevention and Management
- **Environmental and Social Standard 4:** Community Health and Safety
- **Environmental and Social Standard 5:** Land Acquisition, Restrictions on Land Use and Involuntary Resettlement
- **Environmental and Social Standard 10:** Stakeholder Engagement and Information Disclosure

A gap analysis was conducted between the key requirements of both the Egyptian legislations and the WB Standards and the gaps between the requirements of the two entities and the environmental limits were identified as shown in table.

Table 2: Gap analysis between national laws and World Bank ESSs

ESS	National Laws	Gap
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	• Law No. 4 of 1994 Amended by Law No. 9 of 2009 (Environment Law) and its amended Articles of Association amended by Resolution 1095 of 2011, Decree No. 710 of 2012, Decision of the Prime Minister No. 964 of 2015 and Decree No. 618 and 1963 of 2017 • Public cleanliness law 38/1967 amended by law 31/1976 and its executive regulations • Law no. 159 for the year 1953 regulates the cleanliness of fields,	• Discrepancies in air quality, water quality and noise limits between the national laws and WB standards • No national e-waste management system developed for the disposal or recycling of batteries which may be disposed with MSW directed to the landfill

ESS	National Laws	Gap
	roads and streets as well as organization of collection and transport of waste. • Law 10/2005 establishing a solid waste collection fee system on the electricity bill • Laws 106/1976 and 101/1996 allow local governments to include the management of construction and demolition waste in the permits required for construction activities • Law 140/ 1956 regarding occupation of public roads • Law 84/ 1968 regarding public roads • Law 93/1962 on Wastewater disposal into the drainage systems • Law 48/1982 on protection of Nile River Water and Egypt waterways from pollution	
ESS 2: Labor and Working Conditions	• Articles 43 - 45 of Law No. 4/1994 and articles 44 - 47 of its modified Executive Regulations by Decrees No. 1095/2011 and 710/2012 • Labor Law No. 12/2003	
ESS 3: Resource Efficiency and Pollution Prevention and Management	• Law No. 4 of 1994 Amended by Law No. 9 of 2009 (Environment Law) and its amended Articles of Association amended by Resolution 1095 of 2011, Decree No. 710 of 2012, Decision of the Prime Minister No. 964 of 2015 and Decree No. 618 and 1963 of 2017 • Public cleanliness law 38/1967 amended by law 31/1976 and its executive regulations • Law no. 159 for the year 1953 regulates the cleanliness of fields, roads and streets as well as organization of collection and transport of waste. • Law 10/2005 establishing a solid waste collection fee system on the electricity bill • Laws 106/1976 and 101/1996 allow local governments to include the management of construction and demolition waste in the permits required for construction activities	

ESS	National Laws	Gap
	• Law 140/ 1956 regarding occupation of public roads • Law 84/ 1968 regarding public roads • Law 93/1962 on Wastewater disposal into the drainage systems • Law 48/1982 on protection of Nile River Water and Egypt waterways from pollution	
ESS4: Community Health and Safety	• Law no. 94/2003, Protection of communities Human Rights Laws	
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	▪ Egyptian Constitution has preserved the right of private property, Egyptian Constitution (1971, amended in year 1980) and Egyptian Constitution (2014, articles 33 and 35) ▪ Egyptian Civil code 131/1948, Articles 802-805 for private ownership right • Law No. 10 of year 1990 and its amendments by law No. 24 for the year of 2018, and law No. 1 for the year 2015 for property expropriation for public benefit	▪ The cut-off date: The WB identifies a cut-off date in order to prevent people influx to the project area. The Egyptian laws does not set a cut-off date, particularly if the impacts are related to agricultural lands that might experience changes in crops and tenancy. ▪ Monitoring and Evaluation: Monitoring or evaluation measures are not stipulated in Egyptian regulation. ▪ Valuation of compensation: Egyptian regulations use prevailing price in the affected areas to calculate and compensate project affected people for their expropriated property. The prevailing price is assessed by a specialized committee created by the government. For crops, they are valuated according to the price lists developed by the agriculture directorate. Previous Egyptian experiences show that the full replacement principle as stated by ESS5 has not been realized by the affected group. • Income restoration (livelihoods): Egyptian law does not discuss compensation for loss of income, only land and assets.
ESS 10: Stakeholder Engagement and	• EEAA EIA guidelines related to the Public Consultation prior to the	• There are no regulations on committing the project owner to conducting stakeholder

ESS	National Laws	Gap
Information Disclosure	project construction and implementation	engagement activities as well as disclosing information regarding the environmental and social risks and impacts of the project to project-affected parties as well as to community members, throughout the project life cycle • There are no regulations on committing the project owner in establishing a grievance redress mechanism

Environmental and Social Baseline

In order to assess the environmental and social baseline in the project area, six environmental baseline elements were considered:

1. Site location
2. Ecological characteristics
3. Climate and meteorology
4. Natural characteristics (geology and soil, underground water, topography and sesminc activity)
5. Traffic
6. Ambient air quality

site-specific topographical, geological, geotechnical, hydrological and traffic studies were used in assessing the baseline conditions.

In addition, the following social baseline elements were considered:

1. Socio-economic activities
2. Basic information about the project areas
3. Administrative areas
4. Demographic characteristics
5. Human development profile
6. Infrastructure, utilities and access to basic services
7. Health profile
8. Economic characteristics
9. Transportation
10. NGO

Potential Environmental and Social Impacts and Mitigation

Environmental and Social Impact Rating Summary

Table 3 shows the environmental and social impact rating summary.

Table 3 Environmental and social impact rating summary

Phase	Impact and risk category	Impact Rating		
		Low	Medium	High
Construction	Air Quality			X
	Noise			X
	Soil, geology and hydrology		X	
	Resource efficiency and pollution prevention	X		
	Solid, construction and hazardous waste		X	
	Ecology and biodiversity (flora and fauna)	X		
	Risk of inappropriate labor and working conditions			X
	Community health and safety		X	
	Traffic			X
	Land use, landscape and visual issues	X		
	Natural disasters			X
	Risk of child labor		X	
	Temporary labor influx	X		
	Risk of gender-based violence (GBV)		X	
	Culture heritage	X		
	Land acquisition, restriction on land use and involuntary resettlement	X		
	Employment Opportunities (positive impact)		X	
Operation	Air Quality			X
	Noise		X	
	Soil, geology and hydrology			X
	Resource efficiency and pollution prevention		X	
	Solid and hazardous waste handling		X	
	Ecology and biodiversity (flora and fauna)	X		
	Risk of inappropriate labor and working conditions			X

Phase	Impact and risk category	Impact Rating		
		Low	Medium	High
	Community health and safety		X	
	Traffic		X	
	Land use, landscape and visual issues	X		
	Natural disasters			X
	Socio-economic impacts (positive impact)			X
	Risk of child labor	X		
	Temporary labor influx	X		
	Risk of gender-based violence		X	
	Culture heritage	X		
	Employment Opportunities		**X**	
	Air Quality Improvement in Cairo and Qalyoubia			**X**
Closure and post closure activities				X

Main Construction Risks and Impacts

The main risks and impacts expected during the project construction are as follows:

1. Dust emissions during the construction phase due to the on-site activities (site preparation, excavation, etc.)
2. Noise arising from the construction activities (e.g. civil works and installations)
3. Soil, geology and hydrology
4. Solid waste arising from the construction activities
5. Risk of inappropriate labor and working conditions during construction phase
6. Community health, safety and security
7. Increased traffic volume to and from the plant to transport construction materials and workers
8. Natural disaster risk
9. Socio-economic impacts (positive impact)
10. Risk of child labor
11. Temporary labor influx[3]

[3] It is likely that impacts related to labor influx will be relevant in the project due to the anticipation of large number of workers who will likely need to be accommodated in either labor camps or in residential units in the nearest location. Due to the number of workers expected in the project during the construction period is not known yet; the mitigation measures that will be applicable should be further elaborated at a later stage in case it is proven to be medium or high risk. This will be decided depending on the size of labor influx expected, where they will be accommodated, and the measures will put in place.

12. Risk of gender Based Violence (GBV)
13. Culture heritage - chance of finding antiquities during excavation
14. Land acquisition, restriction on land use and involuntary resettlement [4]

Main Operation Risks and Impacts

The main risks and impacts expected during the project operation are as follows:

1. Air emissions: vehicle emissions, emissions of dust, bio-aerosols and odors
2. Noise
3. Soil, geology and hydrology: leachate and liquid runoff
4. Risk of inappropriate labor and working conditions: working in low hygiene conditions
5. Solid waste mixed with potentially hazardous waste
6. Traffic: Increased traffic flow on roads leading to and from the Qalyoubia landfill and the C&D waste treatment facility
7. Natural disaster risk
8. Employment opportunities
9. Air Quality Improvement in Cairo and Qalyoubia
10. Community health and safety: litter, dust, noise, fire
11. Risk of gender-based violence (GBV)

Project Alternatives

No Action Alternative

The objectives of the Qalyoubia landfill and the C&D waste treatment facility is basically to enhance the quality of air through preventing the uncontrolled burning of municipal waste and also to improve the environmental and public health conditions. Therefore, it can be concluded that the "no project alternative" is not a viable alternative from the environmental and social perspective.

Project Location/land Alternatives

The selected project site is an empty unoccupied land, owned by the state, located near to an industrial area and away from residential areas or sensitive receptors. Hence, the proposed project site is considered the best available location for the construction of the Qalyoubia landfill and C&D waste treatment facility in 10th of Ramadan.

Technology Alternatives

The overall aim for solid waste management is protection of human health and the environment in a manner that is affordable, environmentally friendly and socially acceptable. To achieve that, the adoption of an integrated solid waste management system is recommended. The most important alternatives for the project were assessed:

[4] For the risk related to the land for the infrastructure, this is currently covered under the RF and further instruments could be prepared (e.g. RP) is needed.

- Waste avoidance and reduction
- Waste incineration or waste to energy
- Direct waste disposal by landfilling.

Leachate Treatment and Disposal Alternatives

Leachate treatment and disposal alternatives include recirculation of leachate through the landfill, disposal off-site to sewer for treatment, aerobic biological treatment, anaerobic biological treatment, and evaporation ponds.

From the above presented options for leachate handling it is preferred either to:

1. Send the leachate to an off-site sewage treatment plant in case of small leachate amount and the availability of a near treatment plant. Or,
2. To collect the leachate at an evaporation pond in case of area availability.

Landfill Gas Collection and Disposal Alternatives

The alternatives for gas usage alternatives in the form of Landfill gas to energy or Landfill gas bottling were studied as well as the alternative of landfill gas flaring. The temperature at the project site throughout the year is high, which leads to the decomposition of any organic matter that may be present in the rejects aerobically in the first phase of the decomposition process and the emission of CO_2 gas of biogenic origin. Thus, the amount of organic matter remaining for the anaerobic decomposition process is very small, which does not result in or may produce a very small amount of methane. Hence, the utilization of the landfill gas in power generation will not be economically feasible and it should be thermally destructed through flaring instead.

Environmental and Social Management Plan (ESMP)

Table 4 shows environmental and social management and monitoring plan during construction phase. Table 4 shows environmental and social management and monitoring plan during operation phase, and Table 6 shows environmental and social management and monitoring plan during closure and post closure activities.

Table 4 Environmental and social management and monitoring plan during construction phase

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
Risks & Negative Impacts							
Air Quality	**Dust:** • Minimizing drop heights for material transfer activities such as unloading of friable materials; • Cover truck beds with tarps during material transport • Spray water regularly when there is possibility of generating dust • Enforcement of vehicle speed limits on site to <35 km/h. • Planting of trees as wind breakers	Visual inspections and monitoring of dust and exhaust gas releases	Daily during period of dust generating activities	• Dust levels ambient PM (TSP, PM10) • Dust complaints	Border of construction site	Contractor and proponent's HSE manager (and officers)	5500/point/hour (three points per visit)
		Recording and documentation of complaint	Monthly				
		Active collection of samples and laboratory analysis	Once during the excavation of each cell				
Noise (on workers and public)	• Use of appropriate PPE • Fitting of construction equipment with silencers or mufflers • Regular maintenance and	Visual inspections Records and logs inspection (maintenance, permits to work, safety	5 hours of day-time measurements, twice per month during construction period (assumed no	Noise level below legal limits during day and night time • Regular records and logs are maintained and	At the sources; Along perimeter of construction site; At the sensitive	Contractor and proponent's HSE manager (and officers)	600/point/day (10 to 20 points) *2*12 = 14,400

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	service of building equipment and vehicles during construction works • Throttling down of noisy equipment • Reduce vehicle speeds (stick to recommended speeds; 20 km/h for heavy trucks) • Optimize transportation management to avoid needless truck drives (as part of a Traffic Management Plan) • Allow truck movements only during daylight, but not between 7 pm and 6 am • Notify population in nearby residential areas in advance about start date and duration of the overall construction	clearances, complaints) Instrumental measurement	construction works at night)	compliant with permissible limits	receptors such as the nearest road Cairo-Ismailia desert road		

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	works and of specific operations with high noise level Noise levels may not exceed the limits stipulated by the Egyptian Environmental Law/94 and its executive regulations (as stated in section 4 of this ESIA study)						
Soil, geology and hydrology	• The contractor will put in place measures aimed at minimizing soil erosion and soil contamination - To avoid soil erosion, scheduling to avoid heavy rainfall periods (i.e., during the dry season, which is most of the time of the	Visual inspection	Daily	No soil contamination from oil and/or sewage No soil erosion	Construction site	Contractor and proponent's HSE manager (and officers)	Included in construction cose

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	year in Egypt) to the extent practical. • Activities that involve fueling, lubricating or adding chemicals will not take place on-site unless it is necessary. This is to avoid soil pollution and generation of additional hazardous wastes. If such actions will necessarily take place on-site, they will be conducted over impervious surfaces and a spill kit will be made available on-site. - Containers of used chemicals and oil will be collected in specific labeled drums						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	and disposed in an approved hazardous wastes facility in coordination with the local authorities. • Construction vehicles will be restricted to designated areas to avoid unnecessary soil compaction within the project site • Until Connecting to the public sewage network , to properly store in leak-free septic tanks made of suitable material and to regularly collect and dispose of sewage at the nearest wastewater treatment plant in coordination with the Water and						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	wastewater company. • Completely prohibit uncontrolled washing of concrete mixers and random dumping of concrete remains by implementing regulated concrete washing in washing basins covered by impermeable materials where concrete wash out is left to dry and then recycled/reused or disposed of in authorized dump sites/landfills.						
Waste management	Prepare and implement a construction waste management plan which includes, but not necessarily limited to the following measures: • Completely prohibit dumping of solid	Documents and records review Site visual inspection	Regularly during construction	Maintaining valid contracts with authorized waste collection contractors Records of delivery at final disposal sites	Construction site	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	wastes generated in unauthorized dump sites. • Existing waste material at the construction site has to be segregated and stored or disposed of accordingly • Contracting authorized waste handling contractors • Store all hazardous waste in adequate storage sites (lockable, roofed, ventilated, concreted and bunded floor) • Pack all hazardous wastes securely in sealed drums or other suitable containers, clearly identify them by labels, and provide Materials Safety Data Sheets (MSDS) • Provide spill-control kits to handle any			Records of the types and quantities of waste generated and amounts diverted through salvage and reuse, and/or recycle.			

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	spills due to equipment maintenance • Recyclable waste such as scrap metal, wood, paper and cardboard, etc should be stored in a central waste storage area and sold to local recycling companies in order to divert waste from landfill to the extent possible						
Risk of inappropriate labor and working conditions	• Clear, fair hiring procedures should be put in place to ensure fair treatment, nondiscrimination and equal opportunity of project workers: • Information regarding terms and conditions of employment (including their	Inspection of training records Inspection of complaints and accident records Inspection of complaints Inspection of Human Resources Policy	Continuously during construction		Construction site	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	rights related to hours of work, wages, overtime, compensation and benefits…) should be established and communicated with the workers as per national laws and the Labor Management Plan (LMP) • Adequate periods of rest per week, annual holiday and sick, maternity and family leave should be ensured, • In case of termination of contract, project workers will receive written notice of termination of employment and details of severance payments in a timely manner	Inspection of employment contracts Inspection of attendance sheets and ID copies Inspection of insurance policies		Emergency Preparedness and Response Plan implemented No accidents No incidents regarding public health and safety Insurance coverage for everyone on site with proof of their presence on site through attendance sheets and copy of IDs.			

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• Employment of project workers will be based on the principle of equal opportunity and fair treatment, and there will be no discrimination with respect to any aspects of the employment relationship, such as recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, or disciplinary practices						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• The above is a non-exhaustive list of mitigation measures. The different types of project employers will need to follow the Labor Management Plan (LMP) • Contractual agreement with the contractor should include rigid commitments to prepare and implement an OHS Plan, which complies with WBG EHS Guidelines and OHSA requirements including but not limited to the following measures: - to appoint an accredited health and safety officer at site;						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	- The use of appropriate PPE at all time; - to ensure, that medical staff, first aid facilities, ambulance services and any other medical services specified are available at all times at the site and at any worker accommodation; - to put in place workplace processes for Contractor's Personnel to report work situations that are not safe or healthy and give them the right to remove themselves from a work situation which they believe (with						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	reasonable justification) to present an imminent and serious danger to their life or health; - To develop and adopt OHS procedures for all construction activities • . Coverage with appropriate insurance schemes (social and health insurance coverage) for all the types of workers, including casual workers hired by subcontractors and contractors. In addition, the Insurance should be covering work related accidents (injuries and fatalities), as well as						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	insurance for third party. • Anyone entering the project site will register in an attendance sheet/logbook • Records of copy of national IDs will be kept for all types of laborers, including casual laborers hired by subcontractor and contractor. • Develop HSE training plan for all workers regarding work at heights, electrical and vehicular safety, handling of hazardous materials, use of PPE, hazard avoidance and reduction measures,						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	use of first aid and rescue techniques, emergency response, and firefighting, should be submitted, reviewed and approved by the MoE/ WEMRA • Develop and Implement a well communicated and accessible grievance mechanism for workers to address any complaints • Develop and implement a Contingency Preparedness and Response Plan						
COVID-19 pandemic	• Identify a senior person acting as a focal point to deal with COVID-19 issues, and to designate at least one back-up person, in case the	Site inspection Review of documents and records Medical and routine check up	Daily	Number of trained workers Number on infected persons Number of isolated persons	Construction Site	Contractor and proponent's HSE manager (and officers)	To be estimated based on the number of workers and general context

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	focal point becomes ill • Develop and implement procedures to avoid or minimize the transmission and spread of COVID-19 that may be associated with the influx of temporary or permanent contract-related labor. • Develop COVID-19 risk-based procedures tailored to site conditions and workers characteristics, and based on guidance issued by relevant authorities, both national and	of staff and workers					

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	international (e.g. WHO). These shall include but not limited to the following measures: - *Control the entry/exit to the work site;* - *Identify any workers with underlying health issues* - *Conduct temperature checks for all workers and record details of any worker that is denied entry;* - *Ensuring general hygiene (hand washing facilities, soap, disposable paper towels and closed waste bins) are present in all key areas on site;*						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	- *Take all necessary measures for proper isolation of affected areas and workers who have been in contact with infected persons (and infected persons) for 14 days* - *Review worker accommodation and assess suitability in light of the above;* - *Conduct regular and thorough cleaning of all site facilities, including offices, accommodation, canteens, common spaces and review cleaning protocols for key construction equipment;* - *Safely dispose of any medical waste*						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	produced during the care of ill workers in designated containers or bags and treated and disposed according to relevant requirements. • The Contractor is required to convene regular meetings with the project health and safety specialists and medical staff (and where appropriate the local health authorities), and to take their advice in designing and implementing the agreed measures • Clearly communicate the measures taken to the workers, those						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	entering the site and the local community and provide daily (or weekly) briefings focusing on COVI-19 specific considerations including cough etiquette, hand hygiene and distancing measures, using demonstrations and participatory methods. • Encourage workers should to use the project grievance mechanism to report concerns relating to COVID-19						
Community Health and safety	• Information related to community health and safety to be shared regularly	General Implementation/ supervision cost Number and documentation	Annual	Number of complaints	Surrounding community	Social Development Officer	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	and systematically as per stakeholder engagement plan (SEP) • Awareness raising campaigns should be tailored in cooperation with the community-based organization • Using caution tapes that help to keep unauthorised persons away of the site • Development and implementation of a Traffic Management Plan (including routes and alternative routes, truck movements, transport of workers, and short-term closure of roads (if necessary) • The construction site to be fenced and guarded by security	of awareness raising activities and stakeholder engagement activities Interview with community members Inspection of GRM details shared		number of reported incidents with the community Community members aware of the activities conducted and the messages shared/discussed			

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	personnel in order to prevent any unauthorized access to the site • In case of transporting heavy equipment, the nearby population should be notified in advance • Develop and Implement a well communicated and accessible grievance mechanism for community members to address any complaints • Develop and apply a code of conduct (CoC) for workers to regulate worker behavior and penalize any misconduct towards communities including any forms						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	of verbal or physical assaults.						
Traffic	• Approval from the traffic department prior to construction should be obtained by the contractor prior to the construction preparation • Adopting limits for trip duration and arranging driver rosters to avoid overtiredness. • Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions. • In case of transporting heavy equipment, inform local communities in advance. • Development and implementation of a Traffic Management	Maintaining and controlling traffic on and to the site by inspection of Traffic Management Plan or traffic complaints from workers or community	Regularly during construction (especially during transport of equipment and materials)	Effectiveness/extent of implementation of traffic management plan Number of complaints received associated with traffic and time it took to resolve them Number of unresolved complaints	Surrounding roads	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	Plan (including regulations for truck movements, transport of workers, road closures, details about road use, and alternative routes in peak hours). • Review any complaints related to traffic and accidents • Clear sign surrounding construction site and the entrance / exit gate.						
Risk of Child labor	• Different types of contracts for contractors and sub-contractors should explicitly prohibit and penalize all forms of child labor in all project related activities • The contractor /subcontractor will be obliged to maintain	Verifying contracts Inspection of complaints Inspection of Human Resources Policy Inspection of employment contracts	During contract preparation Continuously during construction	No complaints from community No children on site	Procurment officer Construction site Social Development Officer	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	daily attendance sheets in order to verify the attendance of workers not include staff below 18 years' old, • Develop a monitoring plan including record keeping system for copies of IDs of laborers, daily attendance sheets in order to verify the attendance of workers not include staff below 18 • Develop ToR, contracts, and terms of employment for contractor and subcontractors prohibiting hiring minors	Inspection of attendance sheets and ID copies					
Risk of Gender Based Violence (GBV) Risk	In order to minimize impacts pertaining to labor influx the following should be	Inspection of training records Code of conduct established, disclosed and	Continuously during construction	Worker code of conduct Established	Construction site Social Development Officer	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	thoroughly implemented: • Preparation of appropriate code of conduct that stipulates the commitment of labor towards community groups and behaviors that should be avoided • All workers should be trained on the code of conduct. • Code of conduct to be developed and signed by sub-contractor. It should include prevention of sexual exploitation and abuse and sexual harassment (SEA/SH) at workplace. • Apply the full requirements related to operating the grievance mechanism	workers are trained on The monitoring of workers' compliance to the Code of Conduct when interacting with the surrounding communities to avoid behaviors such as verbal assault, sexual harassment and other forms of GBV. Inspection of complaints Inspection of training records Number and documentation of awareness raising activities and stakeholder		No complaints from community No accidents Community members aware of the activities conducted and the messages shared/discussed			

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	including anonymous channels • Dedicated grievance mechanism channels for GBV will be announced and coordination will take place with the appropriate governmental entity (e.g. National Council for Women)5 • Raising awareness of the local community about the project commitment towards communities' and the measures taken for that through public consultation and focus group discussions	engagement activities Interview with community members Inspection of drug tests and alcohol tests conducted Numbers of penalties applied					

5 The National Council for Women is running a dedicated grievance system for dealing with GBV cases. The system ensures anonymity of the complaints and ensures that specialized professional responses are offered as well as referral to existent support systems (e.g. women shelter).

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• Apply clearly articulated and strict penalization system to workers violating the code of conduct • Random drug and alcohol tests to be conducted. • If workers will be staying in rented apartments by contractor or sub-contractor, in labor camps or in any other accommodation facilities, the developed code of conduct should be complied to.						
Infrastructure and underground utilities	• Conduct surveillance activities to detect any available pipelines or networks (water or electricity) • Coordinate with the Local Governmental Units (Tenth of	Documentation of affected infrastructure and corrective procedures taken	Prior to all excavation work	No complaints received No accidents	Construction site	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	Ramadan City Authority / New Urban Communities) and the water and network companies to repair any damages. The contract should pay for this cost.						
Chance of finding antiquities	• Such chance-finds needs special care in handling so as to keep their condition that will support the cultural value it represents. • In the unlikely event of finding of such objects, construction work should stop at the respective area of the site and the Ministry of Tourism and Antiquities should be informed so as to adequately handle this object.	Supervision	During excavation	Duration Discovery of archaeological sites, historical sites, remains and objects	Construction site	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

Positive impacts[6]							
Employment opportunities	• Clear, fair hiring procedures should be put in place to ensure fair treatment, nondiscrimination and equal opportunity of project workers including fair opportunity for women and local communities. • • As part of potential integration for the informal sector, inventorying workers in the informal sector and offer vocational training programs that could allow them to benefit from the offered jobs. • Activating the role of civil society organizations NGOs in raising awareness of the local communities about the importance of the project and the importance of preserving the environment • Provide a complaint mechanism.	Inspection of recruitment strategy Inspection of employment contracts (also of subcontractors) Maintaining records of the offered jobs for the neighboring communities. Inspection of complaints Interviews with Employees Community grievance log	Prior and during r construction	Employment contracts according to national and international labor standards No complaints Training programs Awareness raising programs	Construction site	HR manager	

6 the measures in the matrix are meant to ensure that the positive impact is maximized and is reaching to the local population.

		Reviewing community consultation reports					

Table 5 Environmental and social management and monitoring plan during operation phase

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
Risks & Negative Impacts							
Air Quality	**Dust:** • Minimizing drop heights for waste transfer and unloading activities; • Cover truck beds with tarps during waste transport • Spray water regularly when there is possibility of generating dust • Enforcement of vehicle speed limits on site to <35 km/h. • Planting of trees as wind breakers	Visual inspections and monitoring of dust	Daily during period of dust generating activities	• Dust levels ambient PM (TSP, PM10) • Dust complaints	Construction site Border of site	Proponent's HSE manager (and officers)	5500/point/hour (three points per visit)
		Recording and documentation of complaint	Monthly				
		Direct measurement using meters or sample analysis	Quarterly				

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	<u>Vehicle emissions:</u> • Implement the equipment manufacturers' recommended engine maintenance, along with the mechanical maintenance for the safe operation of the vehicle /equipment, including proper tire pressure. • Any vehicle that has high smoke emissions visibly detected should be promptly repaired. • Optimize waste collection routes to minimize distance travelled and overall fuel use and emissions.	Visual inspections monitoring of exhaust gas releases	Daily	SOx, NOx, and CO and black smoke from vehicles	Construction boundary	Proponent's HSE manager (and officers)	(3500/ vehicle) *2 =7000
		Direct measurement using meters or sample analysis	Twice a year				
		Traveled distance and consumed fuel of vehicles	Monthly				
	<u>Landfill gas</u> • Ensure the availability of enough covering material on site and apply covering material and the final cover	Portable gas flow meters	Continuous monitoring with monthly collection of records	Amount of landfill gas	Near the gas vents	Proponent's HSE manager (and officers)	20,000

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	regularly following the national and World Bank codes • It is recommended to perform trials to collect the gas early during the landfill operation and before the cell is completely filled (i.e. place gas vents progressively) • Provision of a portable devise permanently working to measure the flow rate of the gases on site • Install landfill gas monitoring wells/probes to regularly monitor landfill gas migration • The lining system and final cover of the landfill should be properly maintained to avoid overloading landfill cells and allow regular evacuation/ventilation of leachate and gas. • To control GHG emissions, it is recommended to install landfill gas collection system to collect landfill gas and flare it in enclosed flare as recommended by EU directive (1999/31/EC) for the best practices of enclosed flare operation, maintenance and monitoring. • A maintenance schedule for the landfill ventilation/gas collection system should	Collection of samples and analysis of air samples	Twice a year	CH_4, CO_2, NH_3, H_2S and VOCs in ambient air Concentration of methane in the air shouldn't exceed 1.25%	Inside and outside the landfill		5000 * 2 = 10,000
		Continuous and logged basis of inlet gas to the flare and outlet of the flare	Continuous and logged basis of inlet gas The outlet stream should be measured when there is change in operating conditions of flare or when gas flow rate changes	CH_4, CO_2, O_2 and gas flow rate and temperature of the inlet stream O_2, CO, CO_2, NOx, trace elements of SO_2 of the outlet stream of flare	Landfill gas flare		50,000 for continuous monitoring system of inlet stream 4500/ measurement for the outlet stream
		Ground water analysis to make	Once a year	No carbonic acid in ground water	Groundwater		10,000/measurement

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	be prepared and followed by the project operator.	sure lining system is efficient					
	<u>Odor emissions from Landfill</u> • Maintain application of cover material (at least 15 cm) and compaction. Upgrade the rates of compaction and application of soil cover in case of receiving complaints. • Control and maintain source of odor: o Leachate generation ▪ Avoid accumulation of leachate without treatment o Landfill gas ▪ Properly vent and regularly maintain gas flare **<u>Odor emissions from composting/ recycling plant</u>** • Provide a list of the types of wastes that should be screened out from the input stream. • Ensure a process control is in place for the following: o Temperature control o Air flow control	Same as landfill gas: collection of samples and analysis of air samples and conducting air dispersion model	Twice a year	H_2S in ambient air	Inside and outside the landfill	Proponent's HSE manager (and officers)	Included in the above price
		- General site odor. - Recording and documentation of complaints	- Daily -Monthly	Complaints	Near sensitive receptors such as nearby roads and residential area		No additional cost

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
Noise (on workers and public)	• Use of appropriate PPE for all workers • Fitting equipment with silencers or mufflers • Regular maintenance and service of building equipment and vehicles • Plant wind break trees around the site borders to attenuate any possible impact.	Instrumental measurement	5 hours of day-time measurements, twice per month	Noise level maintained below 50 dB (A) during daytime and 40 dB (A) during night; Regular records and logs are maintained and compliant	At the sources; Along perimeter of site; At the sensitive receptors such as the nearest road Cairo-Ismailia desert road	Implemented by HSE officer	600/point/day (10 -20 points) *2*12 = 14,400
Soil, geology and hydrology: leachate generation and liquid run off	**<u>For landfill, composting/ recycling plant and waste receiving area</u>** • Implement preventive maintenance schedule of leachate collection system • Regular maintenance of impermeable layer (liner system in landfill, area of compost piles and waste receiving area) • Proper leachate treatment and quality measurement according to Egyptian standards and permissible limits • Maintain site drainage that will minimize the inflow of storm water into	Level measurement of the leachate pond and records of pumping station	Monthly	Depth of the leachate collection pond	Leachate collection pond	Proponent's HSE manager (and officers)	32,000

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	the site which will minimize leachate generation • Maintain landfill cell compaction, slopes and daily cover materials to reduce infiltration of rainfall into the deposited waste • Maintain covering material even on the side slopes of the landfill cells, as well as on the lateral surface to avoid soil erosion and landfill collapsing	Representative sampling and laboratory Analysis	Quarterly for COD, BOD and pH and annually for the rest	COD, BOD, pH, TDS, total N, total P and heavy metals, of leachate	Leachate collection pond		6000 *4 = 24,000
		Monitoring precipitation	In rainy months (as identified in baseline)	Average precipitation (mm/year)	The site		No additional cost needed
		Amount of collected sludge	Once after de-sludging	Records of sludge pump	Leachate collection pond		No additional cost needed
Hazardous waste mixed with solid waste	• Develop a waste acceptance criteria , and communicate it with waste collectors and transporters • Train landfill workers on waste identification and sorting • Controlled access and tracking • Ensure all workers are aware of the potential risks and use appropriate PPEs at all time.	Visual inspection	Daily	Amount of hazardous waste found Health records about occupational injuries And infectious diseases among workers	Waste sorting area	Proponent's HSE manager (and officers)	No additional cost for visual inspection
Risk of inappropria	• Clear, fair hiring procedures should be put in place to ensure fair treatment,	Inspection of complaints	Daily	Occupational health and safety Incident reports	Workers at the project location	Proponent's HSE manager (and officers)	Included in **Table 51**

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
te labor and working conditions	nondiscrimination and equal opportunity of project workers: • Information regarding their terms and conditions of employment (including their rights related to hours of work, wages, overtime, compensation and benefits…) should be established and communicated with the workers • Regular payment as per national laws and the LMP • Adequate periods of rest per week, annual holiday and sick, maternity and family leave should be ensured, • In case of termination of contract, project workers will receive written notice of termination of employment and details of severance payments in a timely manner • Employment of project workers will be based on the principle of equal opportunity and fair treatment, and there will be no discrimination with respect to any aspects of the employment	Inspection of Human Resources Policy Inspection of employment contracts Health records about occupational injuries and infectious diseases among workers Inspection of attendance sheets and ID copies Inspection of insurance policies Inspection of Training records		Medical reporting on received cases No accidents No incidents regarding public health and safety Insurance coverage for everyone on site with proof of their presence on site through attendance sheets and copy of IDs.			

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	relationship, such as recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, or disciplinary practices • The above is a non-exhaustive list of mitigation measures. The different types of project employers, employer will also need to follow the Labor Management Plan (LMP) • Training of all workers on the landfill as regards health and safety • Enforcement on the use of Personal Protective Equipment whilst on site • Recording of all accidents and investigating them for establishing root causes and instigating corrective measures • Training on fire safety and first aid for staff • Restrict unauthorized access to landfill area • Control of vermin, insects and birds by compaction of deposited waste and						

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	application of cover materials according to the waste filling plan. • All workers of the landfill, recycling and composting plants should receive adequate training on the types of hazardous waste that could be found, the type of hazards and the appropriate methods of handling. • Coverage with appropriate insurance schemes (health and social insurance coverage) for all the types of workers, including casual workers hired by subcontractors and the contractor • Anyone entering the project site will register in an attendance sheet/logbook • Records of copy of national IDs will be kept for all types of laborers, including casual laborers hired by subcontractor and contractor. • The employer must make arrangements to conduct the periodic medical examination once every six months to ensure the fitness of workers and to uncover possible upcoming risks of occupational diseases in its early stages • Develop emergency plans.						

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• A worker's complaint system must be made available to workers on the facility. •						
GBV risk	• Preparation of appropriate code of conduct that stipulates the commitment of labor towards community groups and behaviors that should be avoided • All workers should be trained on the code of conduct. • Code of conduct to be developed and signed by operator. It should include prevention of sexual exploitation and abuse and sexual harassment (SEA/SH) at workplace. • Apply the full requirements related to operating the grievance mechanism including anonymous channels • Specified grievance mechanism channels for GBV will be announced and coordination will take place with the appropriate governmental entity (e.g. National Council for Women)7	Inspection of training records The monitoring of workers' compliance to the Code of Conduct when interacting with the surrounding communities to avoid behaviors such as sexual harassment and GBV. Inspection of complaints Inspection of training records	Continuous	Worker code of conduct Established No complaints from community No incident Community members aware of the activities conducted and the messages shared/discussed	Qalyoubia landfill and the C&D waste treatment facility	Proponent's HSE Manager Social Development Officer of the MoE	Covered in Operation fees

7 The National Council for Women is running a dedicated grievance system for dealing with GBV cases. The system ensures anonymity of the complaints and ensures that specialized professional responses are offered as well as referral to existent support systems (e.g. women shelter).

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• Raising awareness of the local community about the project commitment towards communities' and the measures taken for that through public consultation and focus group discussions • Apply penalties to workers violating the code of conduct • Random drug and alcohol tests to be conducted. • If workers will be staying in rented apartments by contractor or sub-contractor, in labor camps or in any other accommodation facilities, the developed code of conduct should be complied to	Number and documentation of awareness raising activities and stakeholder engagement activities Interview with community members					
Risk related to community Health and safety/ community dissatisfaction with the operation of the Qalyoubia landfill and	• Follow the mitigation measures mentioned in sections (Air Quality, Noise) same as mentioned above to reduce the risk of odurs, Noise, Fire, and to ensure that operational impacts are minimized and that community satisfaction is maintained, • Provide a complaint mechanism for the community. • Regular consultation as well as information sharing with surrounding communities to ensure the sustainable operation of the project	Community grievance log Reviewing community consultation reports Interview with community members	Monthly	number of reported complaints from the community Community members aware of the activities conducted and the messages shared/discussed (through the beneficiary	Site	Social development officer in collaboration with other relevant officers (OHS and environment)	Included in the operation cost

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
the C&D waste treatment facility impacts (e.g. odur)				feedback survey)			
	Fire • Provide sufficient firefighting equipment onsite and train workers on using them • Design the facility for access by firefighting equipment, including clear aisles among windrows and access to an adequate water supply • Post emergency telephone numbers in clearly visible points • Establish fire prevention and control plan • For sanitary landfills: - Maintain the application of cover material and waste compaction - Develop regular maintenance and monitoring of gas venting - The availability of foam and surfactants for firefighting in	Recording temperature and moisture content of the compost pile (identification board)	Monitoring the operation of the composting plant daily	Temperature below 60 ºC	Composting/ recycling plant	HSE officer	Included in Table 51 + 250,000 annually for temperature and gas composition monitoring
		Monitor temperature of landfill at depth through monitoring wells in and around suspected fire zones	Monthly	<55 ºC: Normal landfill temperature 55 – 60 ºC: Elevated biological activity 60 - 70 ºC: Abnormal elevated biological activity >70 ºC: likelihood of landfill fire	Sanitary landfill		

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	landfill to avoid having leachate problem in case water is used	Monitor gas composition (methane, oxygen and carbon monoxide) at depth through the same monitoring wells for temperature monitoring mentioned above	Monthly	CO concentration above 25 ppm indicated possible fire in the area Oxygen percent above 1% indicates oxygen seeping and poor efficiency of cover material Methane percent higher than 40% indicates consumption of oxygen and favorable anaerobic conditions are taking place			
	Infestation by flies and vermin • Incoming fresh waste and separated organic should not be stored on site for more than 24 hours • Install wheel washing facility at entry and exit points to the site	Visual inspection	Daily	Absence of flies and vermin	Sanitary landfill	HSE officer	Included in operation cost

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• Perform daily cleaning for the facility and storage areas • Maintaining the application of daily cover of thickness 10-15 cm has proved to be effective in controlling rats and other vermin such as feral animals						
	Control of litter • Facilities are to be cleaned daily • All vehicles entering the site should have their containers covered • Compact and cover waste promptly after discharge from the vehicle delivering the waste • Provide perimeter planting, landscaping, or fences to reduce wind	Visual inspection and cleaning daily checklist	Daily	Absence of litter and tidy site	The site	HSE officer	Included in operation cost
Traffic	• A traffic plan should be developed to provide the maximum safety to the population. Which should include: - Coordination with traffic department (ministry of interior) for vehicles route and movement. - Time management for vehicles movement; especially avoiding the peak hours and use of the route with less traffic intensity.	Vehicle maintenance inspection records Reported complaints	Monthly	Number of recorded complaints	The site	HSE officer	No additional cost needed

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions. • Use of traffic signs during operations • Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. • Adhere to speed limit (40 km/hr) Add complaint number on the vehicles back to report any complaints from the driver						
Positive Impacts							
Employment opportunities	• Clear, fair hiring procedures should be put in place to ensure fair treatment, nondiscrimination and equal opportunity of project workers including fair opportunity for women and local communities. • As part of potential integration for the informal sector, inventorying workers in the informal sector and offer vocational training programs that could allow them to benefit from the offered jobs.	Inspection of recruitment strategy Inspection of employment contracts (also of subcontractors) Inspection of complaints Interviews with Employees	3 times; prior, during, and after construction	Employment contracts according to national and international labor standards No complaints Training programs PAPs lists	Construction site	HR manager	

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• Activating the role of civil society organizations NGOs in raising awareness of the local communities about the importance of the project and the importance of preserving the environment • Provide a complaint mechanism.	Community grievance log Reviewing community consultation reports		Awareness raising programs			

Table 6 Environmental and social management and monitoring plan during closure and post closure activities

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost
Air quality	**Landfill gas:** • Assign the responsibility for monitoring landfill gas to the same trained personnel who were responsible during the operation phase • In case the monitoring indicated gas leak the reason for the leak should be identified and adequately handled	Gas flow meters	Continuous monitoring with monthly collection of records	Amount of landfill gas	Near the gas vents	WMRA under ministry of environment and governorates officials	33,000
		Collection of samples and analysis of air samples	Annual	CH_4, CO_2, NH_3, H_2S and VOCs in ambient air	Site border		16,500
	Odor emissions • Put a final soil top cover and vegetate into a public park • Continue collection of leachates with treatment and discharge • Continue collection of landfill gas and flaring	Same as landfill gas: collection of samples and analysis of air samples and conducting air dispersion model	Twice a year	H_2S in ambient air	Site border	WMRA under ministry of environment and governorates officials	Included in the above price
		Recording and documentation of complaints	Monthly	Complaints	Near sensitive receptors such as nearby roads and residential area		

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost
Soil, geology and hydrology: leachate generation and liquid run off	**<u>For landfill, and waste receiving area</u>** • Continue maintaining leachate collection system until no more leachate is generated • Apply final cover according to World bank landfill standards (slope and thickness, etc.)	Level measurement of the leachate pond and records of pumping station	Twice a year	Depth of the leachate collection pond	Leachate collection pond	WMRA under ministry of environment and governorates officials	53,000
		Representative sampling and laboratory Analysis	Quarterly for COD, BOD and pH and annually for the rest	COD, BOD, pH, TDS, total N, total P and heavy metals, of leachate	Leachate collection pond		40,000
		Amount of collected sludge	Once after de-sludging	Records of sludge pump	Leachate collection pond		No additional cost needed
Visual impacts	• Plantation of adequate plants over the final cover of the landfill and maintain it	Green areas planted over final cover	Annual	Visual estimation of the green cover % of the completed cells	Landfill completed cells	WMRA under ministry of environment and governorates officials	No additional cost needed

Public Consultation and Engagement

Public consultation activities have been implemented during the preparation of the site-specific studies. The public consultation activities scheduled are the following:

- Consultation activities were conducted in February and March 2020 with relevant government entities
- A public consultation session was conducted on 15th of March 2020 in Cairo Governorate
- A public consultation session will be conducted in Cairo Governorate in April to present the findings of the ESIAs and get the stakeholders feedback to incorporate whatever is relevant to the findings of the ESIA and/or the design of the project. Annex 9 of this study includes initial listing for the identified relevant stakeholders related to this component of the project. The Stakeholders Engagement Plan (SEP) that will be developed for the whole project will include further elaborated and more comprehensive listing for the project stakeholders.

Defining Relevant Stakeholders

The first step in the process of stakeholder engagement is stakeholder identification; that is, determining who the project stakeholders are and what they should be grouped under. According to the World Bank's Standard 10, a stakeholder refers to "individuals or groups who: (a) are affected or likely to be affected by the project (project-affected parties); and (b) may have an interest in the project (other interested parties)".[8] Most importantly, identifying stakeholder representatives is key to carrying out consultations seamlessly. These representatives do not only inform the project with their valuable information, but they also serve as a communication channel to disseminate information to large numbers of stakeholders and receive information from them. For more details see Annex 9 represents all potential project stakeholders.

Scoping Consultation Event

A scoping consultation session was conducted, as part of the process of preparing the ESIA in line with the national legislative requirements and the World Bank standards. This session was held prior to preparing the ESIA draft. The session was held in Cairo House "Bait El-Kahera" in Cairo, which is affiliated to the Ministry of Environment on 15th March 2020. the key comments and concerns raised during the scoping session were taken into consideration while conducting this study.

Participants were invited through mails, faxes, emails, and phone calls. However, there was poor attendance in the scoping session, in terms of the number of attendees. This is due to

[8] World Bank ESS 10. Available at: http://documents.worldbank.org/curated/en/476161530217390609/ESF-Guidance-Note-10-Stakeholder-Engagement-and-Information-Disclosure-English.pdf

extremely bad weather conditions across the country caused by the "Dragon Storm". Moreover, the scoping session was convened during the global Coronavirus "COVID-19".

A total of 25 persons attended the scoping session in addition to the WB auditor and the ESIA consultant staff. About 20% of the attendees were females and 80% were males.

The following topics were presented during the scoping consultation session:

- The goal of the consultation session
- The current status of solid waste in Egypt
- The current status of solid waste - Cairo Governorate
- The current status of solid waste - Qalyoubia Governorate
- Describe the main components of the project
- Environmental and social impact assessment methodology
- The general structure of the ESIA study

Most attendees participated actively in the session and brought up fruitful ideas for discussion. It is worth noting that many of the received comments are classified as not directly linked to this component of the project. The most common and repeated of these comments is the one related to the importance of the integration of the waste informal sector and the risk of them losing their livelihoods. Despite the close linkage and relevance of the comment to the project at large, it is not one of the potential risk anticipated under this specific sub-component. During the consultation, reference was made to the ESMF currently under preparation and the fact that this element is included under its scope. The RF also is covering the groups that could be at risk of loss of livelihoods (e.g. as a result of closing dumpsites). The SEP will also establish systematic engagement protocol for engaging with diverse stakeholders including the informal sector.

1.1.1.4 Institutional Responsibility for Handling Grievances

The entity responsible for handling grievances will mainly be the Environmental Affair Department within the relevant Technical Implementation Unit (MoE/EEAA/WMRA). The Social Development Officer (SDO) in the Technical Implementation Units (TIUs) in cooperation with the contractor should address all grievances raised by community members, particularly the ones related to resettlement activities.

1.1.1.5 Registration of GRM

All grievances should be registered and acknowledged within 6 working days and responded to within one month. Registration of grievances will be done via a categorization system to be able to analyze complaints received and provide appropriate and timely response. The project management will keep a grievance log and report on grievance management, as part of annual project progress reports, which will be available for the purposes of monitoring and follow-up.

1.1.1.6 Grievance Channels

Comments and concerns regarding the project can be submitted verbally or in writing to the relevant TIUs (MoE/ EEAA/WMRA) through the following channels:

- Hot line: 19808
- Telephone: 0225256470
- WhatsApp: 01222693333
- Fax: 0225256495
- Bypost or hand delivered to: 30 Misr Helwan Agricultural Road - Maadi
- E-Mail: citiserv.eeaa@gmail.com

In addition to the complaints channels of the Ministry of Environment, complaints can be submitted through the unified Government Complaints portal in the Council of Ministers (E-Government Portal):

- Hot line: 16528
- Website: https://www.shakwa.eg

Confidentiality: Individuals have the right to submit their grievance anonymously if they wish to do so, and in case they agree to include their name they have the right for their names to be kept confidential.

1.1.1.7 Response to Grievances

Responses to grievances will be conducted through the following channels:

- Response should be conducted using the same channel for submitting the grievance. Written grievances must be replied in written format. Grievances submitted via the website should be replied by email. In cases of phone calls call back to inform them of the resolution.

- Grievances should be responded to within the identified time limit, to give the community the sense of responsibility towards their concerns and taking effective measures to solve arising issues.

The complaints are documented and followed up by the Environmental Complaints Department in MoE within a period not exceeding 21 days (Calendar days)

1.1.1.8 Monitoring of Grievances

All grievance activities should be monitored in order to verify the process. The following indicators should guide the monitoring process:

- Number of received grievances per month (Channel, gender, age, basic economic status of the complainants should be included)
- Type of grievance received (according to the topic of the complaint)
- Number of grievances solved
- Level of satisfaction with grievance resolutions
- Documentation efficiency
- Dissemination activities done
- Efficiency of response to grievance provided (efficiency in time and action taken)

1.1.1.9 Disclosure of Grievances

All grievances and communications will be registered, and the actions taken/responses given will be disseminated through the MoT/ WMRA website. Considering the anonymity of grievances all disclosed grievances should be kept anonymous and/or only an analysis of the grievance report should be disclosed. Frequently asked questions can be added to the website which would include responses to recurrent grievances and methods for handling them. Disclosure of the mentioned documents will go through the website of the MoT/ WMRA.

Conclusion

Considering the thorough analysis of collected data during the study including through consultation with diverse range of stakeholders, the following main points are concluded:

- The project is vital for the improvement of the sanitary conditions in Cairo and Qalyoubia governorates to give every resident the right of a better quality of life and valorize waste instead of making it a burden.
- The positive environmental impacts outweigh the negative ones; the latter can be contained by adhering to the proposed ESMP.
- The proposed project is located in a desert area complying with the initial plan of 10th of Ramadan city away from sensitive receptors and will not compromise the well-being of the neighboring community, ecology or any other conditions if all the proposed mitigation measures are implemented.
- This component of the project does not have any impacts related to land and assets expropriation nor it will have any negative impact on the livelihoods of any group.

1 INTRODUCTION

1.1 Background and Context

The Egypt Air Pollution and Climate Change Project (GCAPCCP) comprises five components with the objective of improving the air quality by reducing air pollutants and GHGs resulting from open burning of solid waste and vehicle emissions, which are two major contributors to air pollution in Greater Cairo (GC). The GCAPCCP will be implemented in the geographical zone of GC, which covers Cairo Governorate, the urban areas of Giza Governorate and Qalyoubia Governorate.

The five components of GCAPCCP are:

1. Enhancing the air quality decision support system
2. Support the operationalization of SWM master plan in GC
3. Vehicle emissions reduction
4. Stakeholders engagement and communication
5. Project management and monitoring and evaluation

Component 2 of GCAPCCP includes a combination of enabling institutional and capacity building activities for the operationalization of the SWM master plans of the governorates, as well as development and upgrading of strategically important waste management infrastructure including:

- An Integrated Waste Management Facility at the 10th of Ramadan
- Closing and rehabilitation/containment of priority dumpsites
- A Hazardous waste treatment and final disposal facility
- Construction of environmentally controlled transfer stations

The Integrated Waste Management Facility at the 10th of Ramadan (IWMF-10R) is planned to cater treatment and disposal of different types of wastes generated in Cairo and Qalyoubia governorates for 50 years. The IWMF-10R comprises the following components as shown in Figure 4.

- Sanitary landfill of Qalyoubia Governorate (Qalyoubia Landfill), treatment rejects of municipal solid waste (227.5 feddan)
- Construction and demolition waste treatment facility (23 feddan)
- Sanitary landfill of Cairo Governorate, treatment rejects of both municipal solid waste, demolition and construction (447 feddan)
- Medical waste treatment and disposal plant for Cairo and Qalyoubia governorates (16.51 feddan)
- Sanitary landfill of the Urban Communities Authority, treatment rejects of both municipal solid waste, demolition and construction (100 feddan)
- Municipal solid waste treatment plant for Cairo Governorate (composting and recycling plant) (212 feddan)

- Municipal solid waste treatment plant in Qalyoubia Governorate (composting and recycling plant) (106 feddan)

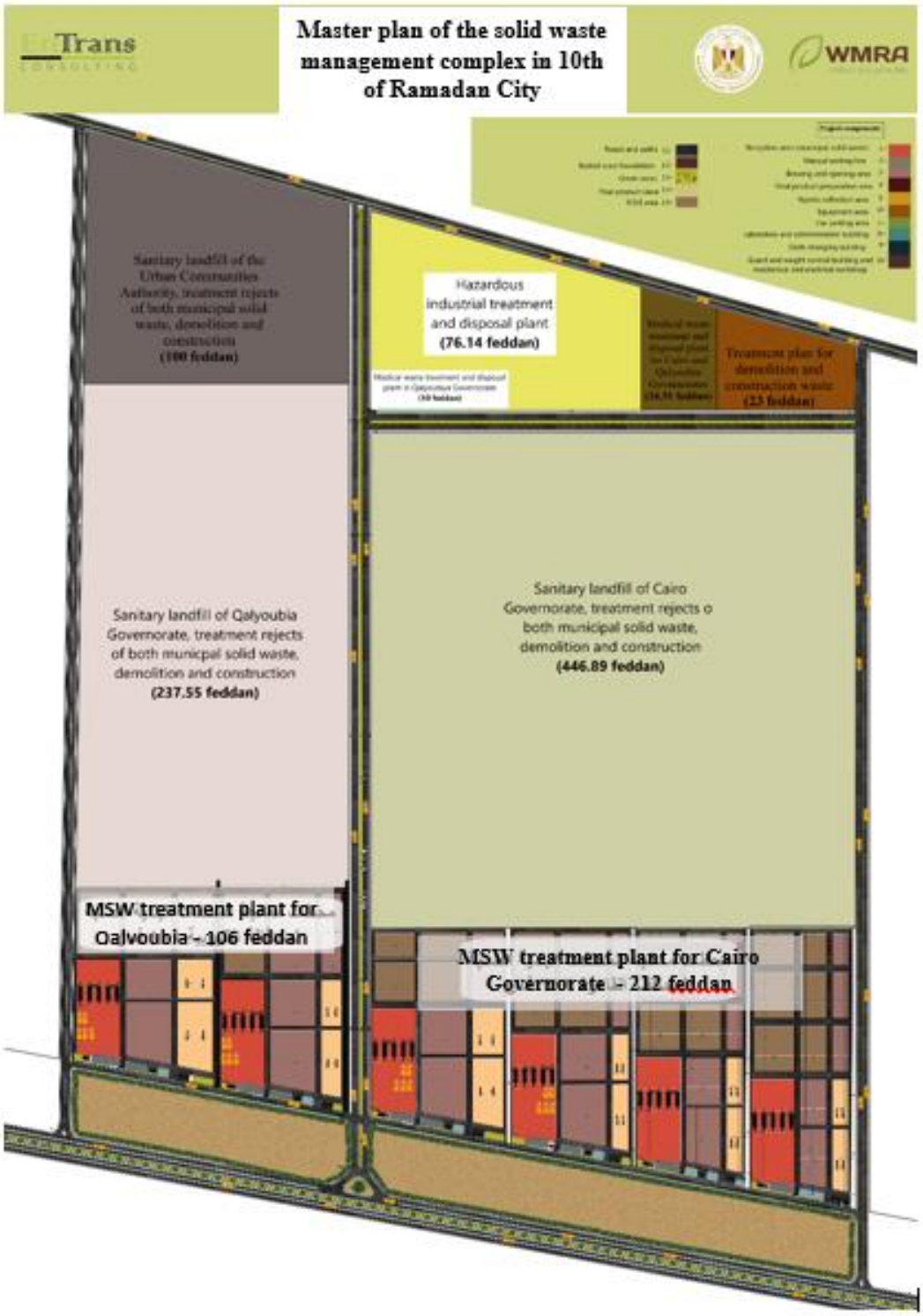


Figure 4: Components of the Integrated Waste Management Facility in 10th of Ramdan

The private sector will play a significant role, through different PPP modalities, in developing and operating the different components of the IWMF-10R after developing the needed the

infrastructure by the government. GCAPCCP is aiming at creating the enabling environment for enhancing the role of the private sector in financing the capital investments and the operations and maintenance costs of same elements of the value chain. Table 7 povides an overview of IWMF-10R main components and highlights the components which will be financed by GCAPCCP:

Table 7: Components to be financed by GCAPCCP

Item #	Component	Developed by	Phasing	Source of Fund
1	**Infrastructure in the facility and the main axes, serving both Cairo Governorate and Qalyubia Governorate. This includes (main road around the IWMF-10R, main internal axis roads, fences, water and wastewater connections and electricity connections from the utilities to the facility**	**Government taking into account private sector requirements.**	**The infrastructure needed for the operation of the IWMF-10R will be developed in the first year of the project**	**GCAPCCP**
2	Municipal Waste Treatment facilities for Qalyoubia governorate	Private sector through a Design, Build and Operate (DBO) modality	First year- Estimated capacity for the first 5 years is around 2000 ton/day	Government fund
3	Municipal Waste Treatment facilities for Cairo governorate	Private sector through a Design, Build and Operate (DBO) modality	First or second year Estimated capacity for the first 5 years is around 3000 ton/day	Government fund
4	**Sanitary Landfill for Qalyoubia governorate** (Qlayoubia Landfill)	**Private sector through a Design, Build and Operate (DBO) modality**	**First year- Estimated capacity for the first 5 years (first cell) is around 7 million tons**	**GCAPCCP**
5	Sanitary Landfill for Cairo governorate	Private sector through a Design, Build and Operate (DBO) modality	First or second year Estimated capacity for the first 5 years is around 14 million tons	Government fund
6	Medical waste treatment and disposal facility for Cairo and	Private sector through a Design, Build and	This will be developed by year 2 or 3 subject to feasibility study to	GCAPCCP

Item #	Component	Developed by	Phasing	Source of Fund
	Qalyoubia governorates	Operate (DBO) modality	determine the capacity and technology	
7	**Construction and Demolition Waste treatment facility for Cairo and Qalyoubia governorates**	**Private sector through a Design, Build and Operate (DBO) modality**	**Estimated capacity of the facility is 100 ton/day**	**GCAPCCP**
8	Industrial Hazardous treatment and disposal Facility for Cairo, Qalyoubia and other governorates	Private sector through a Design, Build and Operate (DBO) modality	Second or Third year- subject to feasibility study to determine the location, technology and capacity	GCAPCCP

IWMF-10R will be developed in a phased approach using different financing modalities. Therefore, a number of Environmental and social impact assessment studies will be prepared for the different components in the IWMF-10R as per the GCAPCCP ESMF. ***The scope of this ESIA study is covering items number 1, 4 and 7, hereafter referred to as "the proposed project".***

Thus this Conceptual ESIA covers only:

1. Construction of all external and internal infrastructure for the Integrated Waste Management Facility in 10th of Ramadan (IWMF-10R) (e.g. roads, electricity, water, sewage, fence...etc.)
2. Construction and Operation of the Sanitary landfill of Qalyoubia Governorate (Qalyoubia Landfill) for treatment of rejects of municipal solid waste
3. Construction and Operation of the shared (Cairo and Qalyoubeya) construction and demolition treatment facility.

The rest of the components of the IWMF-10R will be studied separately at later stages.

1.2 Project Proponent

The proposed project is state-led with funding provided from the World Bank and expected engagement of the Private Sector at different stages. The proposed project will be implemented through a partnership between the MoE and the MoLD. Execution on the ground will be through the Waste Management Regulatory Authority (WMRA); the MoLD's Central and Regional SWM Units of; Cairo governorate; and Qalyoubia Governorate. WMRA aims to organize and monitor all operations related to waste management in order to improve waste management to be environmentally safe. It recommends taking the necessary legal measures to attract investments and make international and regional agreements related to waste management.

1.3 Status of Solid Waste Management in Egypt

Egypt faces various challenges in the areas of solid waste management such as:

- Increasing population and changing consumption patterns in cities and villages resulting in generating more quantities of solid wastes;
- The accumulation of large quantities of waste in cities and densely populated places over the past years. According to the State of Environment report, the amount of waste accumulation was estimated at 18.4 million m^3 in 2016. It has become source of environmental pollution and imposing great risk on human health and the environment;
- Lack of public awareness and poor handling of solid waste such as uncontrolled open burning of accumulated wastes;
- Limited capacity of many municipalities in terms of securing financial resources for waste management, applying appropriate waste management technology and overall weak institutional capabilities;
- Previous experience with engagement of private sector participation in the waste collection and disposal faced several challenges made its performance unsatisfactory.

According to the State of Environment report 2016, solid waste generation rate is 88 million tons / year. The solid waste collection efficiency is only 60% in all governorates of Egypt of which: about 12% are recycled through the informal sector, about 81% are disposed of in public and random landfills and about 7% are disposed of in safe and controlled landfills.

The composition of the solid waste generated in Egypt is presented in Figure 5.

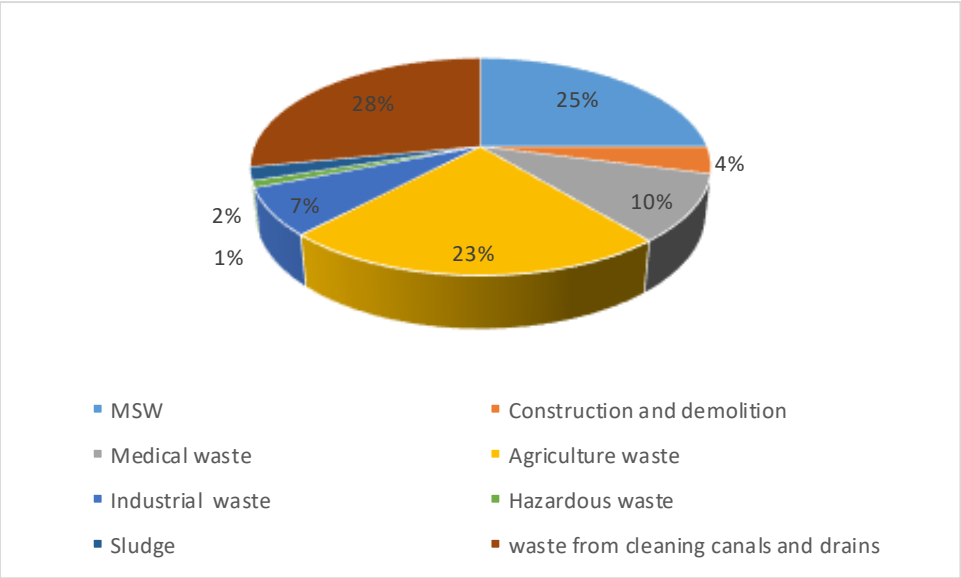


Figure 5 Composition of solid waste generated in Egypt

1.3.1 Status of Solid Waste Management in Cairo Governorate

Cairo is divided administratively into 4 regions (North - East - West - South), South is divided into two regions, South A and South B, and it includes 38 districts. The amount of solid waste (domestic - commercial - industrial - medical) generated is estimated at 16,550 tons / day.

Latest updates related to sanitary landfills to manage solid waste in Cairo governorate are as follow:

- Old landfills such as Al-Wafaa w Al-Amal, Al-Salam, and Katameya were closed.
- Expansion of the sanitary landfill and treatment and disposal project in 15th of May City to continue working for a period of 10 years
- Municipal landfill in El-Obour:
    - It is located on an area of 125 feddan, started operating in September 2018; and is used equally between the governorate of Qalyoubia and the eastern region of Cairo Governorate
    - It was established as a result of closing Al-Salam waste dumpsite that caused environmental and cultural problems
    - It faced a lot of public opposition and protests from several residents of the city of El-Obour claiming that it would destroy the aesthetic view of the city and cause a lot of nuisance to the public
    - It is working temporarily for two years only until the establishment of the 10th of Ramadan sanitary landfill (the proposed project of this ESIA)

1.3.2 Status of Solid Waste Management in Qalyoubia Governorate

Qalyoubia governorate consists of 7 administrative centers, each center has a capital city for the center with the same name. The amount of solid waste generated is estimated at 4,515 tons / day. Latest updates related to sanitary landfills to manage solid waste in the governorate are as follow:

- Al Khankah Municipal Waste Recycling Factory started operating since 2014. It produces waste-derived fuel, compost and recycling material
- There are intermediate waste collection stations in Khsous - Tookh - Qaha - Qalyoubia - Mostorod
- Abu Zabal Municipal landfill
    - It receives most of the waste generated in Qalyoubia governorate
    - Located on an area of 100 feddan
    - The nearest populated area is Arab Al Olayakat, some 1 km away
    - It has caused various environmental problems such as:
        - Landfill gas emission resulting from the anaerobic decomposition of organic waste in the landfill
        - The generated leachate caused contamination to the soil and surrounding water bodies
        - Insects and rodents are attracted to the waste, which may lead to spread of diseases throughout the surrounding area
        - The workers and waste pickers in the governorate are rarely protected from direct contact with the waste
        - Joint disposal of hazardous and medical waste with municipal solid waste poses a serious health threat at the governorate level
        - Open burning practices affect public health in the governorate

1.4 Scope of the Conceptual ESIA

As part of a Public Private Partnership approach, a Private Sector investor will be required to Design, Build and Operate the proposed project. The current design of the proposed project is Conceptual and the Private Investor will develop the full design of the three components financed by the GCAPCCP. Therefore, this ESIA is considered Conceptual and a detailed ESIA will have to be developed by the Private Investor once determined. The scope of this ESIA covers the following:

- Construction of all infrastructure (external and internal roads, electricity, water supply pipelines, sewage pipelines...etc.) for the 10th of Ramadan Integrated Waste Management Facility.Construction and operation of the first disposal cell in the sanitary Landfill for Qalyoubia
- Construction and operation of Construction and Demolition (C&D) Waste treatment facility for Cairo and Qalyoubia governorates

The ESIA is prepared in accordance with the legal requirements of the Environment Law and with the relevant World Bank (WB) Environmental World Bank Environmental and Social Framework.

1.5 Objective of the ESIA Study

The objective of the ESIA is to identify and assess the potential environmental and social impacts of the proposed project, evaluate alternatives, and design appropriate mitigation, management, and monitoring measures.

1.6 Methodology of the study

The preparation of the Conceptual Environmental and Social Impact Assessment is done according to the following methodology:

- Reviewing the available information and documents regarding the project (hydrology, geophysical, geotechnical, geomorphic and geological studies, traffic study and ambient air quality measurements);
- Reviewing national and international legislations and regulations relevant to the project, including the required governmental permits and WB standards;
- Holding a Scoping Session (first public consultation) to engage the community and different stakeholders in the process of identifying the expected impacts;
- Assessing the potential environmental and social impacts associated with proposed project activities;
- Developing an outline for the Conceptual environmental and social management plan for the mitigation of the expected negative impacts and the monitoring activities to ensure compliance with the relevant environmental laws;
- Carrying out public consultations and integrating their outcomes into the mitigation and monitoring plans.

2 PROJECT DESCRIPTION

2.1 Project Location

The selected site for the IWMF-10R is located near to 10th of Ramadan city about 5 km south of 10th of Ramadan industrial area a vacant desert area. Table 8 shows the coordinates of the IWMF location. Qalyoubia landfill and the C&D waste treatment facility are located within the IWMF-10R.

Table 8 coordinates of the IWMF-10R location

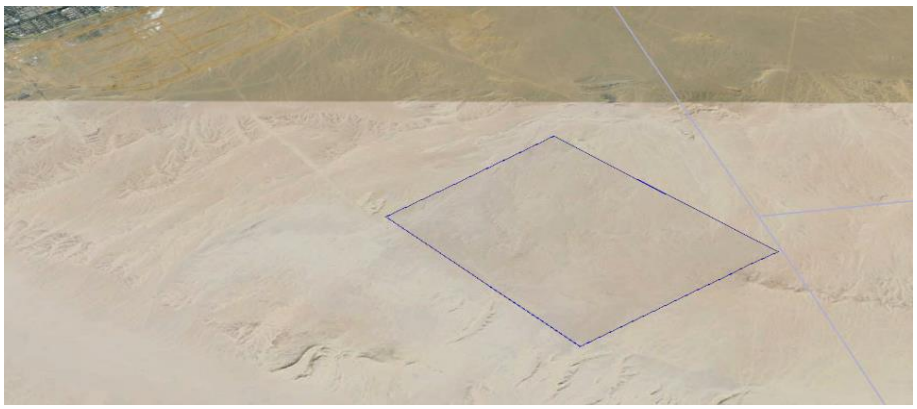
Point	Easting	Northing
1	٣٨٩٢٥٩,٠٠ m	3347603.00 m
2	387616.00 m	٣٣٤٦٣٢٦,٠٠ m
3	389337.00 m	3344708.00 m
4	391193.00 m	3345828.00 m

The nearest residential areas to the project site are 10th of Ramadan City about 9 km, and Badr city located at around 14 km away from it as shown in

Figure 6. The nearest roads to the project are 10th of Ramadan – Badr (9.6 km away to the West) and Cairo – Ismailia desert road (7 km away to the North).

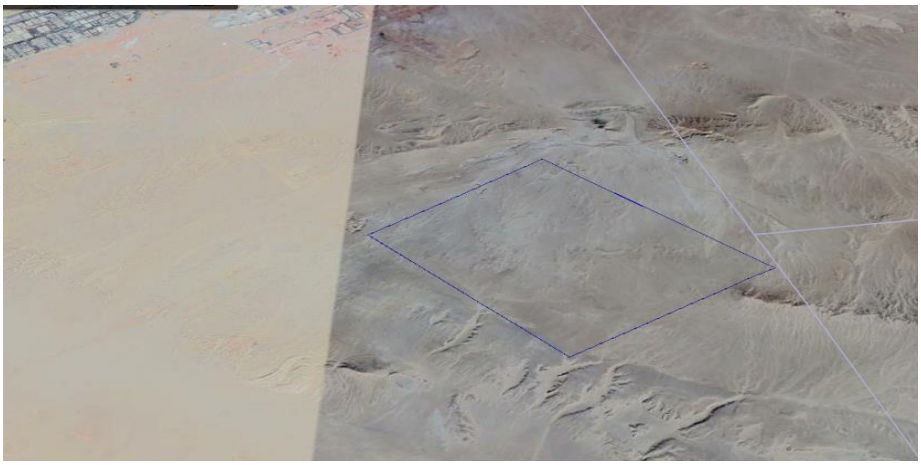
Figure 6 Project location and surrounding activities

The total area of the IWMF-10R is 1226 Feddan and all the land is owned by the Government[9]. The project's land is free from any economic activities or installations. The area is devoid of any facilities. The history of the project land use has been traced through satellite maps (Google Earth) from 2010 to 2019; the maps did not show any previous works or uses of the proposed project site.

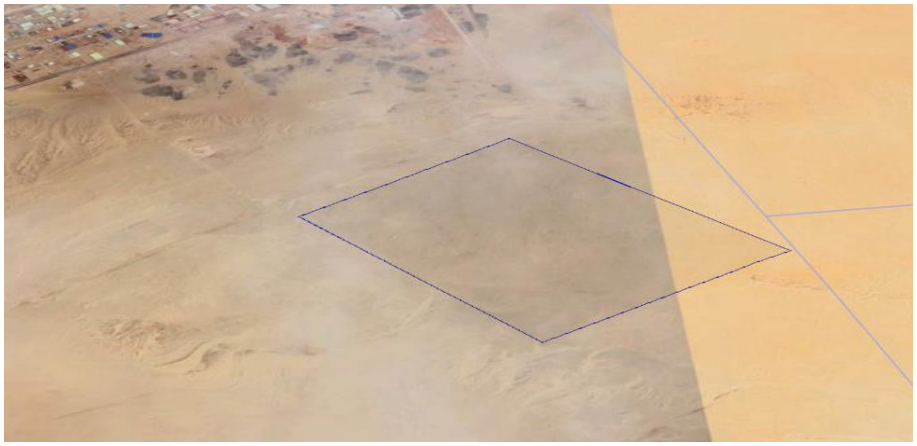


2010

[9] A ministerial decree to allocate the land to the Waste Management Regulatory Authority WMRA is underway; according to the data received from the Ministry of Environment.



2015



2019

Figure 7: Google images for the project site from 2010 to 2019

2.2 Components of the Proposed Project

The proposed project includes the following components:

1. Construction of all external and internal infrastructure for the IWMF-10R (e.g. roads, electricity, water, sewage, fence...etc.)
2. Construction and Operation of the Sanitary landfill of Qalyoubia Governorate (Qalyoubia Landfill), treatment rejects of municipal solid waste
3. Construction and Operation of the shared (Cairo and Qalyoubeya) construction and demolition treatment facility.

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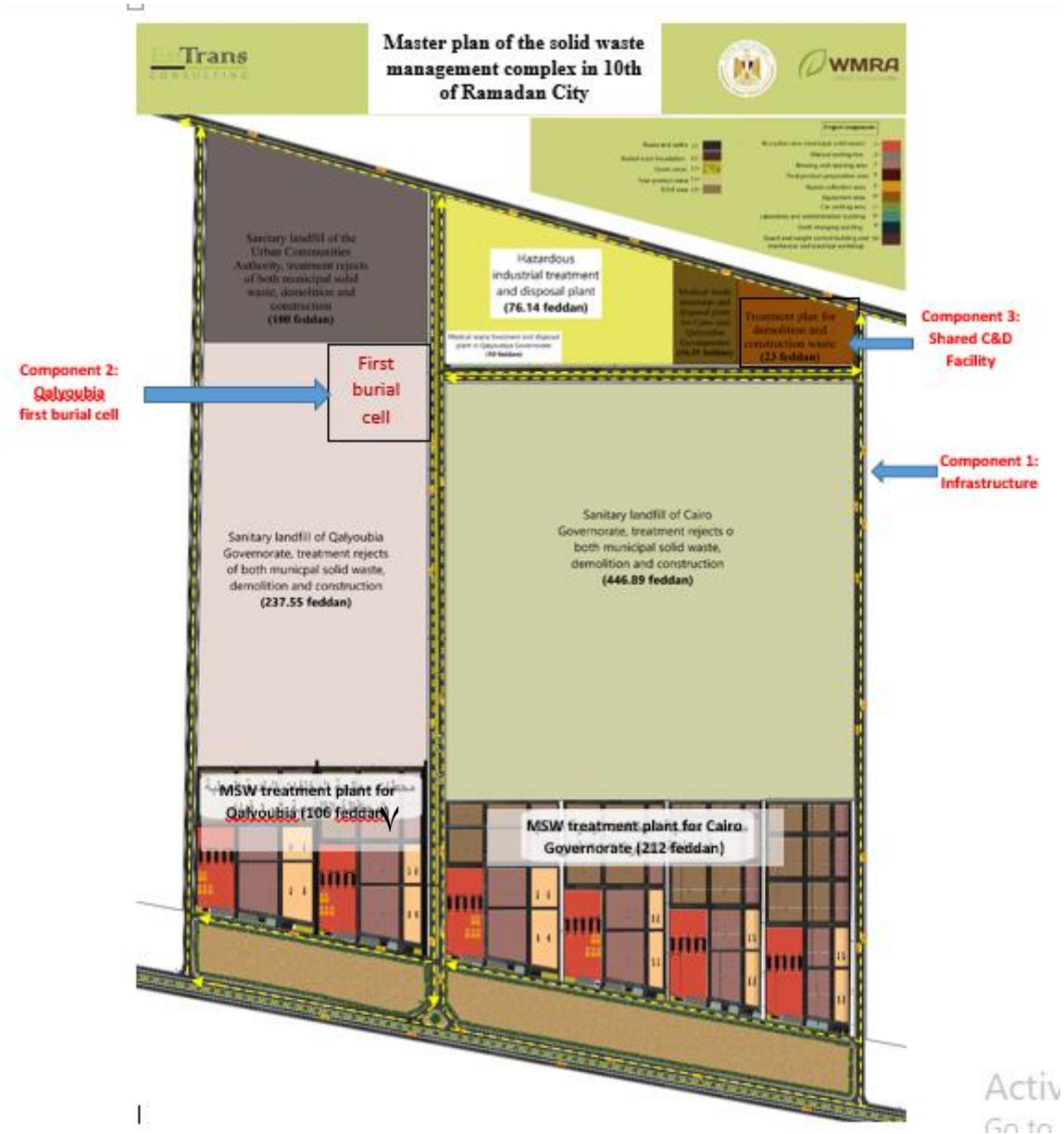


Figure 8 Components of the proposed project in the IWMF-10R

2.2.1 Capacity and Age of the Proposed Project

The expected age of the proposed project is 50 years. Conceptual study provided waste estimates over 2020–2070 period, taking into consideration increase in population.

2.2.1.1.1 MSW Generation in Qalyoubia Governorate

According to the population census from 2003 to 2018, the annual rate of increase ranged between 0.97% in 2018 to 8.02% in 2007. The average annual rate of increase is 2.82%. The percentage of both urban and rural in the governorate is 42.7% and 57.3% respectively. The average annual rate of increase is 1%, given the limited land in the governorate, the criminalization of the state's infringement of agricultural lands, and the expansion of new cities in the greater Cairo area. Since Qalyoubia is urban and rural governorate. The rate of waste generation per capita in urban and rural areas is taken as 0.8 kg / day, 0.5 kg / day respectively[2].

The average generation rate of municipal waste in Qalyoubia governorate during the project's life time is estimated at 4,860 tons / day (calculating the needed burial cells capacities).

The treatment site capacity is estimated based on an average reception rate of 5,100 tons / day (daily generation rate in 2053).

It is expected that Qalyoubia sanitary landfill will receive an average of 1500 ton/day of treatment rejection.

2.2.1.2 MSW Composition

Based on the latest published report from the Ministry of Environment[10], the composition of MSW are shown in Figure 9.

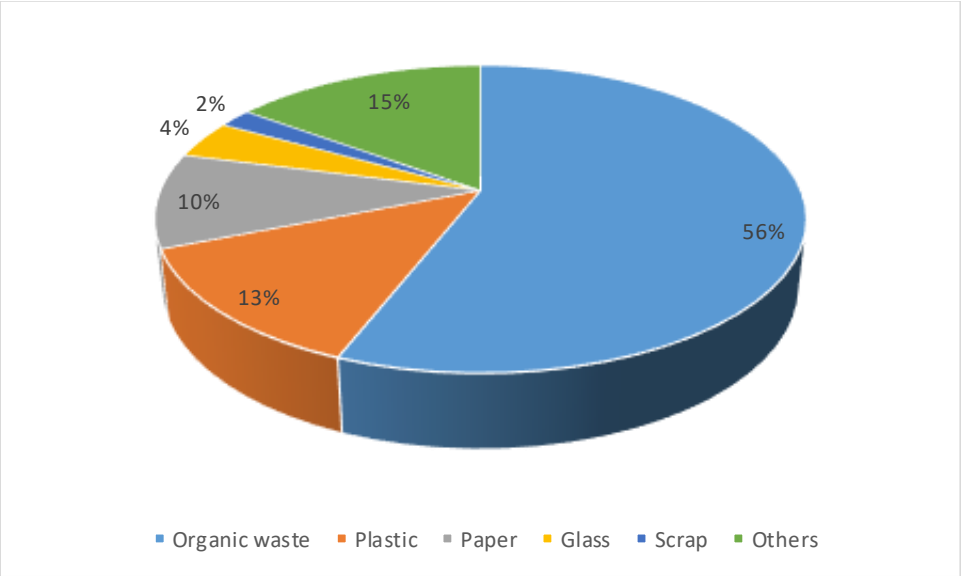


Figure 9 Composition of MSW in Egypt

2.2.1.3 Construction and Demolition Waste

The per capita generation rate of construction and demolition waste is 0.03 kg / day[3]. The average value of the generation rate of demolishing and construction waste in the governorates of both Cairo and Qalyoubia during the project's life span is estimated at 400 and 230 tons / day respectively. The demolition and construction waste will be treated in a a combined site for both governorates with a reception rate of 1,000 tons / day.

2.3 Construction and Operation Activities

It is important to note that the proposed project is still in the concept design phase. In addition, the construction and operation of the proposed project will be issued as a tender to the private sector, which hasn't been determined yet till the date of this Conceptual ESIA study.

10&3 Ministry of Environment (2017), State of Environment report for the year 2015

The following subsections present the concept for the construction and operation of the project components within the scope of the proposed project.

2.3.1 Entrance of the IWMF-10R

There are two gates that serve the vehicles collecting waste from different districts in governorates Cairo and Qalyoubia. One gate is for vehicles collecting waste from Cairo and the second gate for Qalyoubia. The gate to Qalyoubia landfill will have weighing bridge (truck scale) to determine the load of the vehicle. The weighing process takes 2.5 minutes, allowing the weighing bridge to service 24 vehicles per hour.

The site will be surrounded by perimeter security fencing, a gate, and equipped with a crew of security personnel, as only the authorized personnel will be allowed to enter.

2.3.2 Access to Infrastructure

The exact routes of the access roads and other infrastructure (e.g. water, electricity and sewage networks) are not yet determined at the time of preparation of this ESIA. The private investor who will prepare the final design of the landfill shall prepare a detailed ESIA which should include exact information about access to infrastructure.

The following infrastructure activities will take place:

- Construction of access roads, from Badr – 10th of Ramadan highway, and from Cairo – Ismailia highway, to the IWMF-10R (as shown in Figure 5).
- Connection to the nearest fresh water, sewage and electricity networks via pipelines and underground cables.
- Construction of internal roads and networks (water, sewage and electricity)
- Construction of a security fence around the IWMF-10R
- Construction of administration building

2.3.3 Qalyoubia Sanitary Landfill and First Burial Cell

There are several parameters that make up the landfill, presented as follows:

2.3.3.1 Initial Layout of Burial Cells;

The land was divided into a number of cells, each with an area of 20 feddan. It should be noted that the lifetime of each cell depends on several factors. The available space for each cell is measured annually. Figure 10 shows the initial layout of the cells.

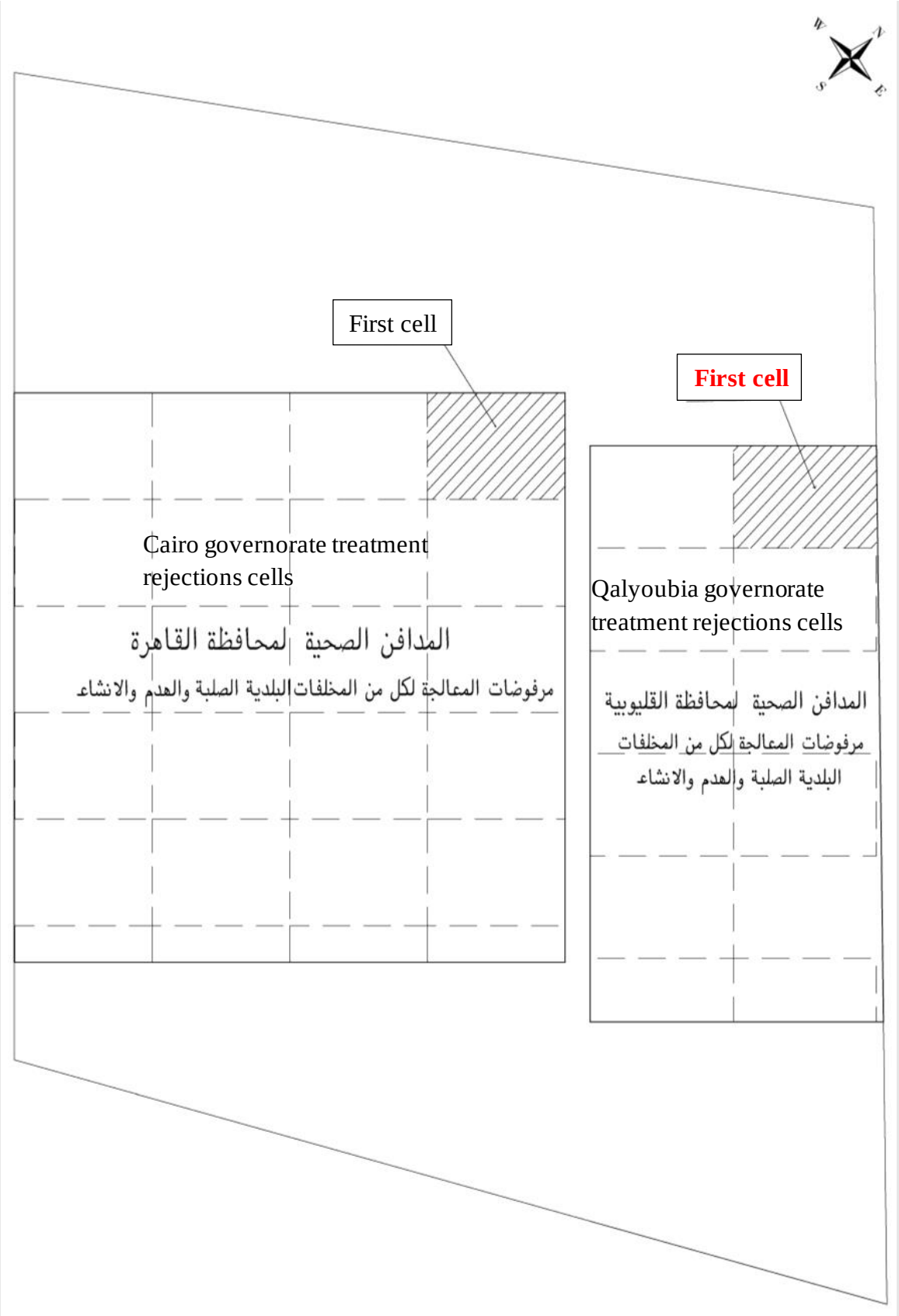


Figure 10 Initial layout of the burial cells
(Only Qalyoubia first Cell will be funded by the Project and covered in this ESIA)

Table 9 shows the dimension of the cell based on the expected amount of waste generated and the amount of MSW and C&D treatment rejection for Qalyoubia Governorate.

Table 9 Dimension of the cell

Parameter	value
The amount of municipal solid waste generated within five years (2020-2024)	6,840,830 ton
Treatment rejection amount	2,394,291 tons (including cover material)
The required area of the cell	20 feddan

2.3.3.2 Cover Material

The daily covering of the waste and the final covering of the sanitary landfill is of vital importance. It carries out the following functions:

- Minimize the presence and spread of flies and birds
- Prevent the entry and spread of rodents
- Prevent fires and smoke
- Reduce bad odors
- Reduce the intake of rainwater into the waste
- Direct gases toward the vents to evacuate them from the sanitary landfill
- Have an aesthetically acceptable appearance
- Serve as a basis for internal access roads
- Allow the growth of vegetation

The cover material will consist of either construction debris or compost residuals. After waste compaction, the daily cover material of thickness 15 cm will be applied and at a rate of 800 – 850 kg/m^3. Good compaction of the base material is essential, to avoid uneven settling of the overlying leachate collection pipe network.

2.3.3.3 Base Lining System

The landfill will be mainly intended to receive rejections of waste treatment processes. This means that the proportion of organic matter will be very weak due to its separation in the waste treatment work that will take place. Accordingly, the base lining system will comprise a layer of natural yellow shale, which is characterized by the presence of Bentonite element with very weak permeability. The thickness of the lining layer will be around a meter thickness to line the bottom of the cell. This was proposed taking into account that groundwater depth (20 m below the surface of earth) and low organic material content.

In case the landfill will receive more mixed waste with higher organic content, the base lining system will differ. Bottom lining will comprise a synthetic clay layer (GCL) followed by a layer of HDPE, then a geotextile layer.

2.3.3.3.1 Leachate generation

Leachate in the burial cells is generated through the percolation of rainwater through the waste and during the percolation the water gets polluted by contact with the solid waste layers. Generation of leachate is commonly reduced by covering the waste surface with suitable low-

permeable material, both with daily cover, intermediate cover and eventually the final cover including an impermeable sealing layer will be applied. In addition, the project is located in an arid area with average rainfall of 8 mm/year. Therefore, leachate generated from rain percolation is expected to be very small, if cover material is applied following Egyptian and WB standards.

Since the treatment processes such as composting remove large part of the organic material, which is the main source of leachate generation, the amount of leachate generated from the burial cells is expected to be small (refer to annex 1 for leachate generation estimation from sanitary landfill).

The concept design hasn't determined the method of leachate treatment. Different alternatives for leachate treatment and the recommended option are discussed in chapter 7 of the study.

The proposed leachate treatment will include the following flows:

- Leachate from the landfill as a result of rain percolation and the liquid that exists as part of waste;
- Leachate collected in the waste delivery trucks;
- Surface run-off water, including polluted and non-polluted waters, from the sorting area. Activities at this area will initially include temporary storage and manual sorting at the composting plants.

All other non-polluted surface run-off is assumed to be collected and discharged separately through drainage system, thus will not reach the leachate treatment system.

2.3.3.4 Leachate Collection and Treatment

The landfill liner and the leachate collection network need to be properly sloped (about 2% slope) to enable gravity flow of contaminated waters to treatment ponds. With the natural inclination of the cell bottom, there will be sloping paths towards two corners of the cell where there will be two collecting chambers of the leachate. The leachate will be pumped out of the cell by submersible pumps in a tube that runs from the collecting chamber vertically upward to where the collecting tank or the evaporation pond will be.

The concept design hasn't determined the method of leachate treatment. Different alternatives for leachate treatment and the recommended option are discussed in chapter 6 of the study.

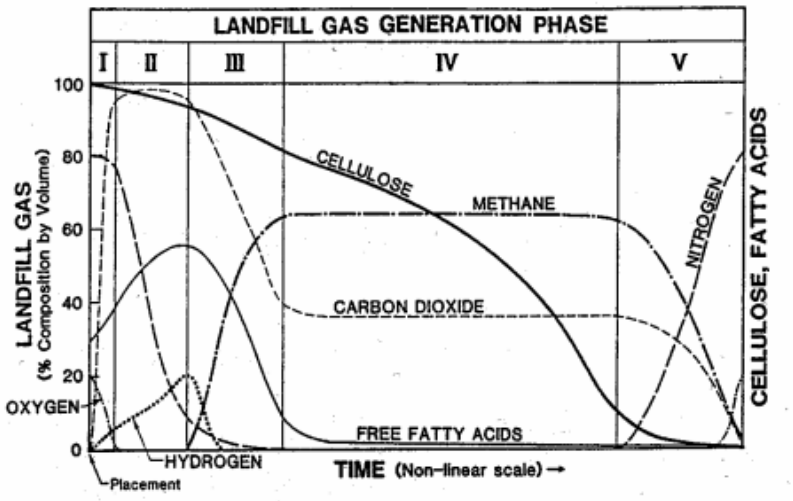
2.3.3.5 Landfill Gas

2.3.3.5.1 Landfill Gas Collection

In the composting plant, there will be sorting activities in which the recyclables material is separated from the organic material. The recyclables will be pressed in the form of bales to be sold. The organic material will be collected and there will be portion of the waste that will be rejected from the composting plant and sent to the sanitary landfill. Accordingly, the portion of the rejected waste will have small amount of entrained or traces of organic material. In addition, the temperature at the site throughout the year is high, which leads to the decomposition of any organic matter that may be present in the rejects aerobically in the first phase of the decomposition process and the emission of CO_2 gas. Thus, the amount of organic matter

remaining for the anaerobic decomposition process is very small, which does not result in or may produce a very small amount of landfill gas (refer to annex 2 for landfill gas estimation).

As shown in Figure 11, the biodegradation of organic waste will be over a wide span ranging from less than a year to more than 100 years. The main degradation products are CO_2, water and heat for the aerobic process and CH_4 and CO_2 for the anaerobic process.



Phase I :	Oxygen- and nitrate-reducing phase – Duration range: Hours – 1 week
Phase II:	Acidic phase – Duration range: 1 – 6 months
Phase III:	Instable methane generating phase – Duration range: 3 months – 3 years
Phase IV:	Long term stable methane generating phase – Duration range: 5 – 50 years
Phase V:	Humus-generating and/or sulphide oxidation phase – Duration: 1 – min. 40 years
TOTAL	Duration range: 10 – min. 90 years

Figure 11 composition of landfill gas in different phases of the decomposition process[11]

During the first years of landfill operations the amount of landfill gas will be minor; however, towards the last 10 years of operation (from 2060 to 2070) the gas generation rate will reach its peak. For quantifying the amount of gas that will be produced annually the Landfill Gas Emissions Model (LandGEM) was run assuming a methane generating factor (k) of 0.02. LandGEM is a tool developed by EPA in 2005. The results of the LandGEM run is shown below in Figure 12 and Figure 13 below, while the expected yearly emissions of sanitary landfill gas are presented in Annex 2.

[11] IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories CH_4 Emissions

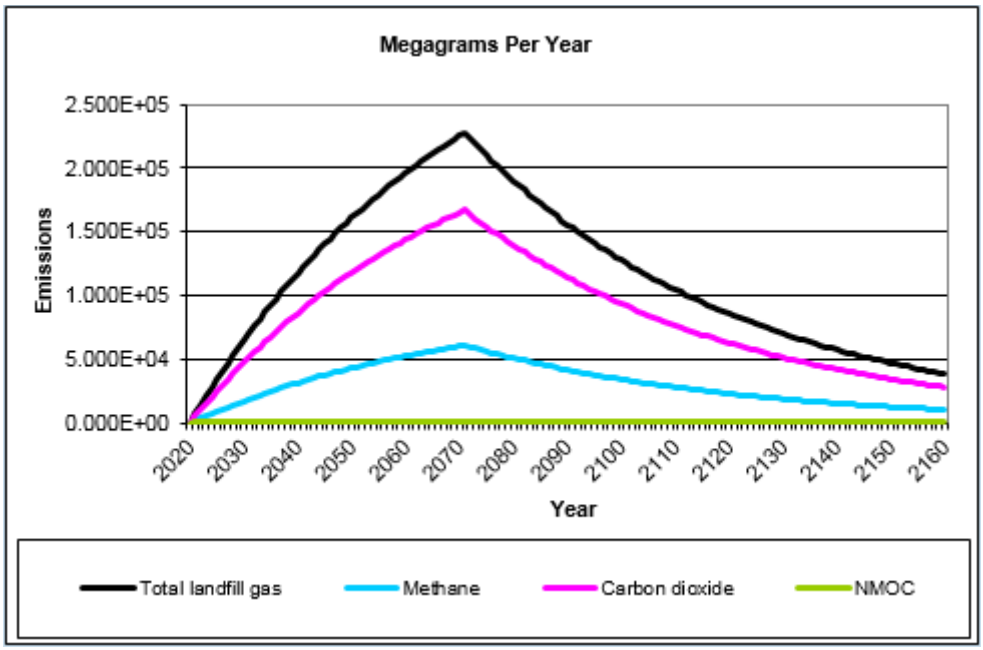


Figure 12 generation of landfill gas in the proposed project (ton/yr)

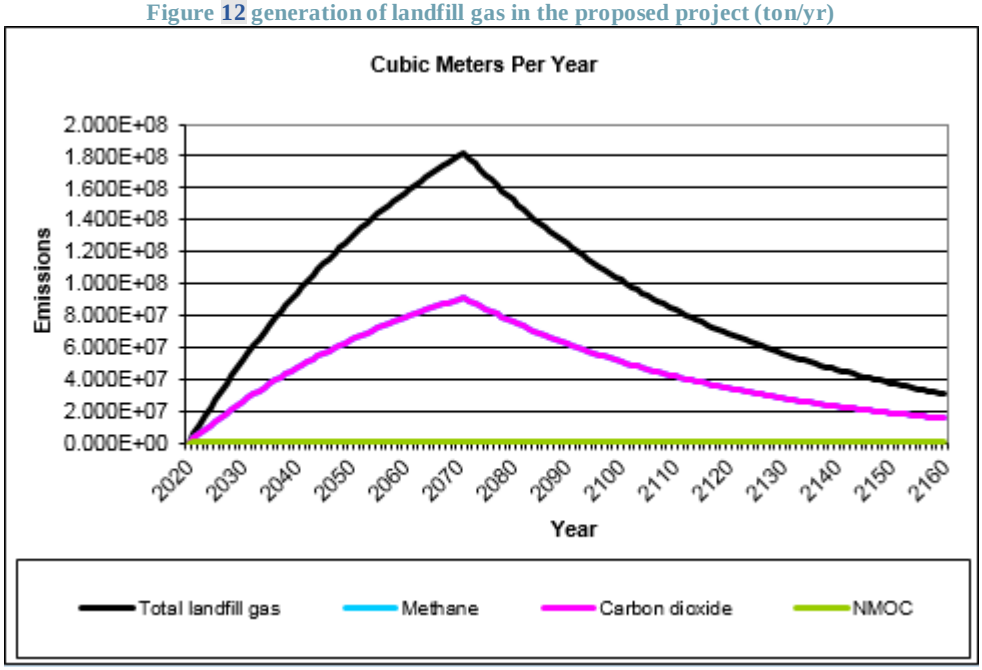


Figure 13 generation of landfill gas in the proposed project (m^3/yr)

As shown in the above graphs, the generation of the landfill gas will be in small quantities at the beginning of the operation, and it will reach the peak between about year 2060 to 2070 then it will be gradually reduced until the year 2160. The estimated peak amount of landfill gas is 224,969 tons in 2070.

2.3.3.5.2 Landfill gas collection

There are two types of LFG collection systems, active and passive. Passive systems rely on the natural pressure gradient between the waste mass and the atmosphere to move gas to collection systems. Most passive systems intercept LFG migration and the collected gas is vented to the atmosphere. Active systems use mechanical blowers or compressors to create a vacuum that optimizes LFG collection.

For active gas collection systems, the collection efficiency depends primarily upon the design and maintenance of the collection system and the type of materials used to cover the landfill. A typical collection efficiency range of 50% to 95% is given with a suggested average of 75%[12].

An active landfill gas extraction system shall be installed at a proper time (3-5 years after start of operation) after full height has been reached in the active cell and an intermediate cover has been applied for the relevant part of the landfill, thus the risk for oxygen intrusion is avoided. The design of the gas system shall be in accordance with Best Available Technique and the operation of the system shall fulfill demands in gas safety regulations. The installation of the gas extraction system is a part of the project and investment budget.

The main components of the gas extraction system are (Figure 14, Principles for a gas extraction system):

- gas wells;
- gas collection pipes;
- gas regulation station;
- gas pumping station;
- condensate traps;
- gas motors;
- torch.

The basic concept is that perforated gas wells are installed into the waste pile after the corresponding area has been sealed with an impermeable intermediate cover. A sub-pressure to extract the gas will be arranged by blowing machines in the gas pumping station.

[12] EPA (2011), AVAILABLE AND EMERGING TECHNOLOGIES FOR REDUCING GREENHOUSE GAS EMISSIONS FROM MUNICIPAL SOLID WASTE LANDFILLS https://www.epa.gov/sites/production/files/2015-12/documents/landfills.pdf

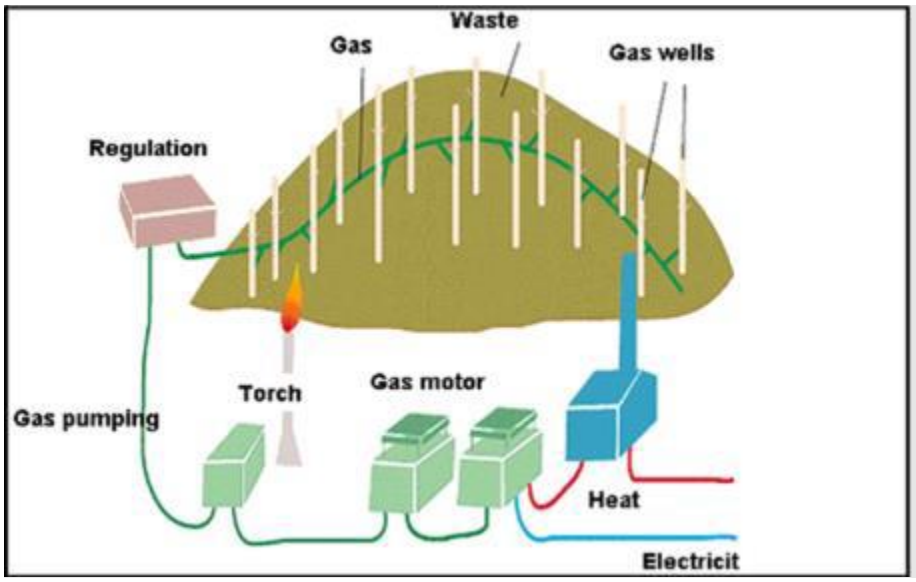


Figure 14 principles for a gas extraction system

2.3.3.5.3 Landfill Gas Treatment

For the concept design, since the sanitary landfill is not expected to generate large amount of landfill gas to effectively recover it, it is expected that it will be flared.

In case of flaring the gas, there will be emissions of CO_2, CO, NO_x, PM among other trace gases, these emissions will be proportional with the rate of collected gas and, hence, will be minimum during the first years of landfill operation and will gradually increase until it reaches the maximum then it will gradually decrease.

There are different types of flares, namely open and enclosed. Retention time and temperature necessary to achieve highly efficient combustion of landfill gas ranges from 0.6-1.0 seconds at 850 C to 0.3 seconds at 1000 C in enclosed flares. International best practices (1999/31/EC) recommends using enclosed flare based on. To ensure that flare systems are operating correctly, they should not exceed the following emission concentrations when referred to normal temperature and pressure (NTP = 0°C and 1,013 mbar) and 3% oxygen:

- Carbon monoxide (CO) – 50 mg/Nm^3
- Nitrogen oxides (NO_x) – 150 mg/Nm^3
- Unburned hydrocarbons – 10 mg/Nm^3

2.3.3.5.4 Control of Landfill Gas Migration

Compaction is done on the sides of the cell slope with a layer of no more than 30 cm of impermeable clay or a thin flexible synthetic membrane to restrain lateral migration of the gases. This will minimize the lateral migration of landfill gas beside flaring and venting.

The proposed lining system and the covering material of waste are considered a good engineering control process for minimizing the migration of landfill gas to the atmosphere or through the soil to the groundwater. In addition, flaring landfill gas minimizes its global warming potential (GWP). Flaring landfill gas will also minimize the risk of fire and explosion posed by escaping.

2.3.4 Shared C&D Waste Treatment Facility

C&D waste was generally defined as a mixture of inert and non-inert materials arising from construction, excavation, renovation, refurbishment, demolition, roadwork and other construction-related activities. Inert materials can be comprised of whether soft inert materials such as soil, earth and slurry or hard inert materials of rocks and broken concrete. Non-inert materials have also included wastes of metals, timber, plastics and packaging.

The aim of construction C&D waste management is waste minimization and appropriate disposal, both of which help to reduce negative environmental impacts.

Management of C&D will be by recycling or reusing for material recovery. There will be a crusher to minimize the volume of the reject material till its final disposal or to make it suitable to be used as a cover material for the sanitary landfill.

The components of the C&D waste management are presented as follows:

2.3.4.1 Surface scale for truck weight

A truck surface scale is installed with an electronic system to record truck weights

2.3.4.2 Waste reception area

An area designated for the storage of incoming waste is provided to the demolition and construction waste recycling plant. It consists of several areas according to the type of waste received (excavation waste, demolition waste, finishing waste), in addition to separating other waste mixed with it.

2.3.4.3 Equipment in the plant

General components of a construction and demolition waste recycling plant are presented as follows (more technical specs are provided in annex 9):

- M Series Single Motion Jaw Crusher
- Hydraulic retractable feed hopper
- Vibratory feeding screen
- Two-way flip side doorways to control the direction of solid
- Concave conveyor belt with fixed end
- Sprinkler holes mounted on the crusher nozzle, product conveyor feeder and discharge points.

It is expected that the investor will advance with other equipment, provided that this equipment is technologically advanced, and environmentally friendly. The Egyptian Building Code must be adhered to, and the relevant supervisory bodies must ensure the investor's commitment.

The Figure 15 and Figure 16 show the vertical and horizontal side view of the equipment layout.

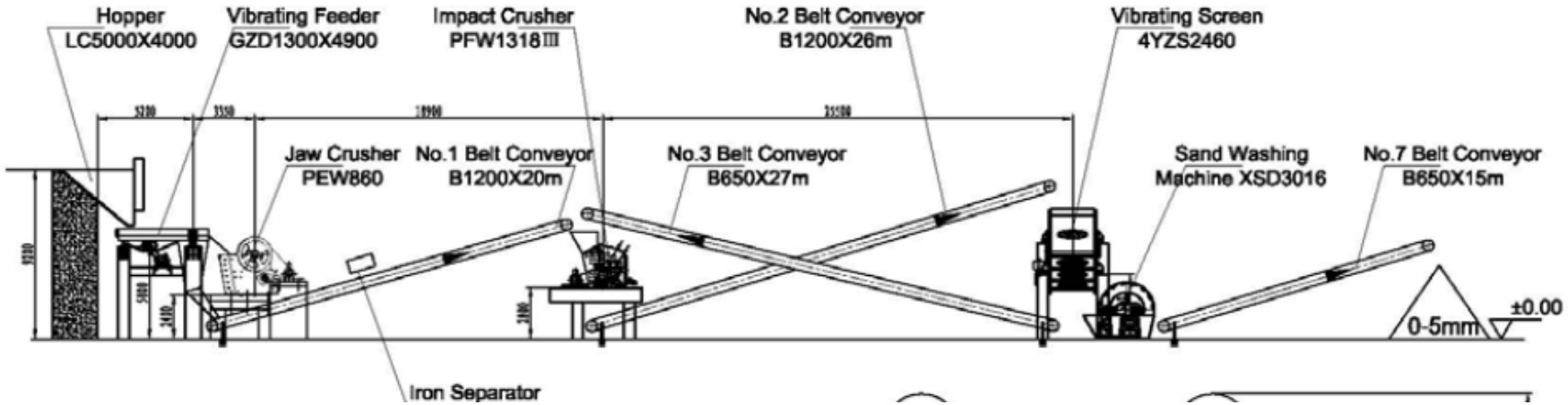


Figure 15 side view of equipment layout in a typical C&D plant

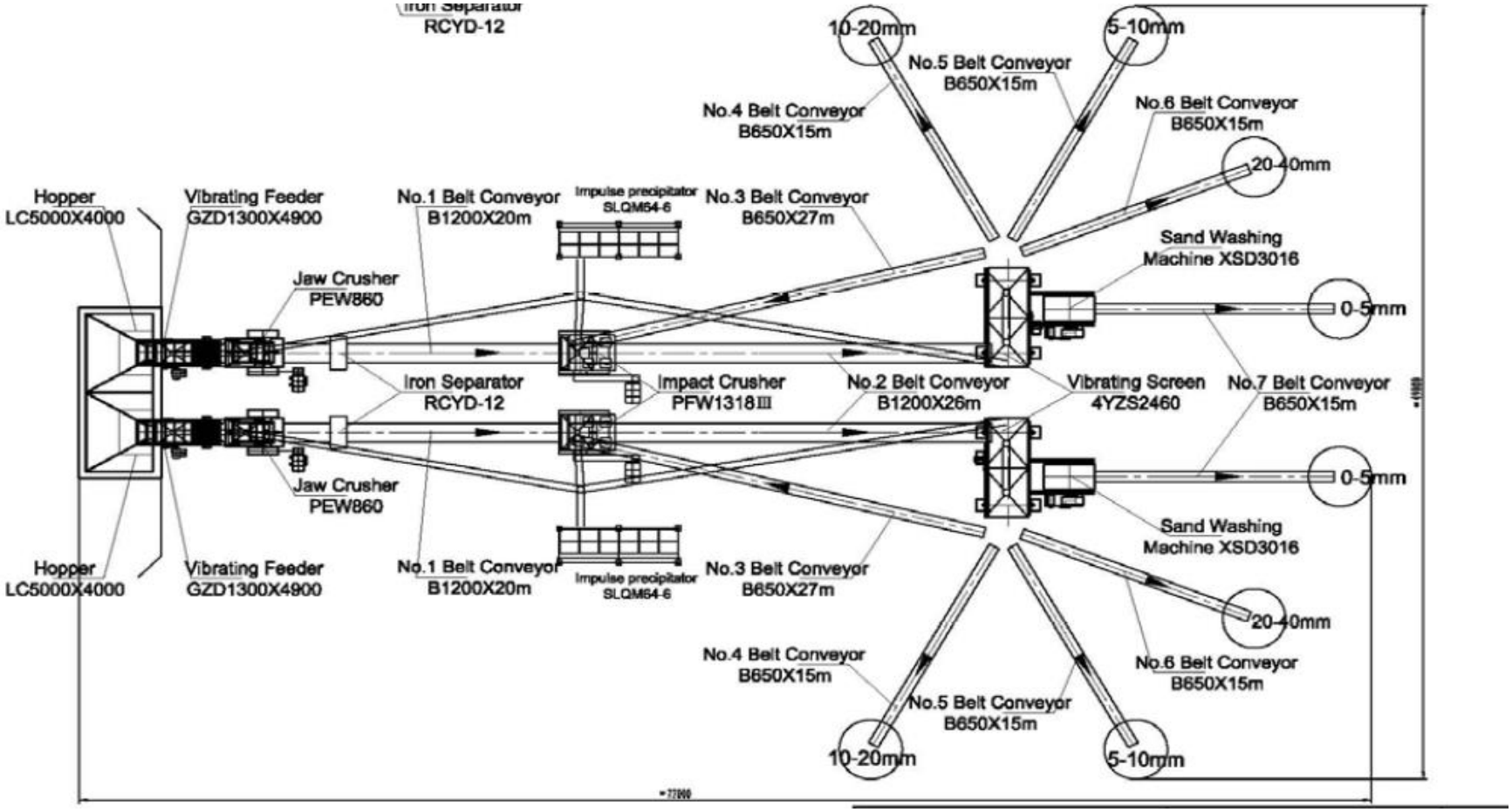


Figure 16 top view of the equipment layout in a typical C&D plant

2.3.4.4 Waste Reduction Machine for Large Size Waste

It is expected that the excavation waste or demolition waste will contain bricks / ceramics or large rocks etc., which requires reducing its size "the crushing process" to suit the design of production lines. The waste of unacceptable size will be directed via belt conveyors to another crushing machine for smaller size waste.

After resizing process according to the design of the production line, these wastes are moved to the main production line.

2.3.4.5 Technical specifications of the crusher

The crusher must be characterized by strong crushing strength, high productivity and withstand high temperatures during operations. The following specifications must be met:

- Production capacity not less than 100 tons per hour.
- The metal frame should be made of heavy duty material.
- Durable hopper for wear resistance.
- Graduated feed sieve with self-cleaning mechanism.
- Manual control system with hydraulic pump running manually.
- Full wrapped product conveyor belt.
- Sub-screen and inclined tube.
- hydraulic retractable hopper.
- Dust extraction device.
- Easy installation and maintenance.

The specs of the crusher are presented in Table 10.

Table 10 specs of the crusher

Standard	Specification
Total weight	27200 kg
Length	13.12 m
Width	2.4 m
Height	2.3 m
Type of crusher	Single Motion Jaw Crusher, 900mm x 600mm Feed Slot
Power	Not less than 187 horse power

2.3.4.6 Environmental conditions

All equipment and tools will comply with environmental conditions and specifications during all stages of construction or operation in addition to adhering to the following standards: -

1. The noise resulting from the equipment must be in conformity with the national and international standards.
2. Dust control, through water spray.
3. All equipment must comply with national and international environmental standards at all stages.

2.3.4.7 Services provided in the plant

The plant will provide the necessary services to the operating staff of technicians and workers, as well as taking into account the places of storage of incoming waste, as well as storage of production for a sufficient period to ensure the effective operation of the factory and all its components. Parking spaces for private vehicles and trucks will be provided during the waste delivery process and during the shipment of products.

3 LEGAL AND INSTITUTIONAL FRAMEWORK

Several national and international laws and policies provide the legal framework for the investigate project. The national framework includes the Egyptian Environmental Law and all its relevant subsequent amendments and executive regulations. The international framework adopted in this study is the World Bank's ESF criteria which cover key areas for environmental and social impacts to be adhered to by any of the Foundation's funded projects. This section reviews both national and international policies and their applicability to the project.

Egyptian law provides for environmental compliance procedures and emission limits, which are close to the WBG limits, if not more conservative. The proposed project componentsmust comply with international policies, which stipulate compliance with local laws. If there is a difference between local and WBG standards, the more stringent standards will be adopted.

3.1 National Legal Framework

The following is a brief explanation of the various national laws, regulations and framework related to environmental and social impact assessment studies.

3.1.1 The Egyptian Environmental Law No.4 of Year 1994

The main legal framework for environmental issues is Law No. 4 of 1994 and amended by Law No. 9 of 2009 and Law 105 of 2015 and its implementing regulations amended by Resolution 1095 of 2011 and then Resolution 710 of 2012 and Resolution 964 of 2015 known as the Environmental Protection Law. The Egyptian Environmental Affairs Agency (EEAA) was established by Prime Minister Decree No. 631 of 1982 to be the administrative body responsible for environmental affairs in Egypt. Law 4/1994 states that EEAA is the body responsible for environmental affairs.

In accordance with Article 19 of Law 4 of 1994, the entity responsible for a particular project must undertake an environmental impact assessment study for any new project and for extensions and renovations of existing projects to assess the impacts of the project on the natural and social environment prior to project implementation. The results of this assessment are submitted for review by the EEAA before other government agencies issue licenses Project execution. The law considers the ESIA as a main condition for licensing and thus the project that does not prepare an ESIA or does not abide by the ESIA conditions could be subjected to its license revoke (Articles 10, 12 and 19 of the executive regulations of Law 4/1994, modified by the decree 1741/2005.

The articles (19, 20, 21, 22, 23, 34, 70, 71, and 73) of Law no. 4 of 1994 stipulate measures and procedures related to the preparation of the ESIA. These are further clarified by the

provisions of articles no. (10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 34, 57, 59, and 60) of the Executive Regulations issued by the Prime Minister's Decree No. 338 of 1995, modified by decree no 1741/2005. Decisions of the ministerial committee no 18/06/0503 dated 26/6/2005 and no. 3/12/05/3 dated 5/12/2005 prohibit the development of industrial facilities outside the ratified designated industrial areas in Egypt.

The Egyptian Environmental Affairs Agency (EEAA) is the governmental entity responsible for the management of environmental issues. The Egyptian law defines three main roles of EEAA:

- Organizing and coordinating most activities in addition to the executive role in the management of nature reserves and pilot projects
- The Authority is responsible for formulating the environmental management policy, developing the implementation plans necessary to preserve the environment, and following up its implementation in cooperation with the competent administrative authorities
- Reviewing and approving environmental and social impact assessment studies

The Environmental Management Unit at Governorate and District level (EMU) is responsible for the environmental performance of all projects/facilities within the governorate's premises. The governorate has established environmental management units at both the governorate and city/district level. The EMU is responsible for the protection of the environment within the governorate boundaries and are mandated to undertake both environmental planning and operation-oriented activities. The environmental management unit is mandated to:

- Follow-up on the environmental performance of the projects within the governorate during both construction and operation phases to ensure that the project abides by laws and regulations as well as mitigation measures included in its ESIA approval
- Investigate any environmental complaint filed against projects within the governorate
- The EMU are affiliated administratively to the governorate yet are technically affiliated to EEAA
- The governorate has a solid waste management unit at the governorate and district level. The units are responsible for the supervision of solid waste management contracts

The Civil Aviation Authority (CAA) is the entity responsible for issuing licenses for projects construction and operation. The ESIA is considered one of the requirements of licensing. The CAAs is thus responsible for receiving the ESIA forms of studies, check the information included in the documents concerning the location, suitability of the location to the project activity and ensure that the activity does not contradict with the surrounding activities and that the location does not contradict with the ministerial decrees related to

the activity. The CAA forwards the documents to EEAA for review. They are the main interface with the project proponents in the ESIA system. The CAA is mandated to:

- Provide technical assistance to Project Proponents
- Ensure the approval of the Project Site
- Receive ESIA Documents and forward it to EEAA
- Follow-up the implementation of the ESIA requirements during post construction field investigation (before the operation license)

The Waste Management Regulatory Authority (WMRA) is the entity authorized to plan and enforce regulations of different solid waste management activities in Egypt, to achieve sustainable development as per Egypt's agenda 21. The WMRA is mandated to:

- Regulate and determine the roles and responsibilities of all stakeholders in the IWMF-10R
- Provide technical support and propose economic solutions for integrated waste management
- Develop controls, standards and guiding forms for all contracting phases
- Develop performance indicators for monitoring and evaluating waste management activities

After submission of an ESIA for review, the EEAA may request revisions in the ESIA report within 30 days, including additional mitigation measures, before issuing the approval of the report. The project proponent will have the right to issue an appeal within 30 days from its receipt of the EEAA's decision. It should be noted that once the ESIA has been approved, the ESMP as will be presented in the report, will be considered an integral part of the project; and the proponent will be legally responsible for the implementation of that plan, depending on their involvement in construction or operation. It is therefore worth mentioning that the Qalyoubia landfill and the C&D waste treatment facility developer/operator must ensure that all mitigation measures and environmental requirements described in the ESMP have been clearly referred to in the tender documents for the construction works, the construction contracts, and have been respected. The developer/operator will follow-up on the construction contractor to ensure that the ESMP is adequately implemented in the construction phase.

3.1.1.1 Environmental and Social Impact Assessment (ESIA)

The EEAA issued, in 2009, sector-specific Guidelines for ESIA preparation. The objective of the guidelines is to:

- Describe the objective of the ESIA process and its legal requirements
- Identify the projects for which ESIAs are required
- Indicate the criteria for classification and the different levels of assessment

- Describe the requirements for ESIA of different categories
- Describe the requirements for public consultation

In accordance with these guidelines, the projects are classified according to three categories according to the severity of the potential environmental impacts and place of residence of the establishment and its proximity to the residential areas:

Category (A): Projects with low environmental impacts, category (B): projects with potentially negative environmental impacts but less than category (C) and category (C): projects with significant negative impacts and this category is required to prepare a full ESIA study.

Based on these categories, the Qalyoubia landfill and the C&D waste treatment facility is classified as category "C" defined by Egyptian requirements. The following procedures will be followed to fulfil the requirements of the study:

- The developer/operator shall submit a letter to the competent administrative authority or to the licensing authority explaining the nature and activity of the proposed project, which has been classified as a "Class C" project. The developer will also attach three printed copies and one electronic copy of the ESIA study on the project in accordance with the General Principles and Guidelines by EEAA
- The competent administrative authority shall record the documents and verify whether the classification is correct and whether the information contained in the ESIA conforms to the information required in accordance with relevant sector guidelines
- The competent administrative authority shall examine the documents and submit the application formally to the EEAA for review and evaluation
- EEAA shall evaluate the documents and submit to the competent administrative authority its opinion and possible proposals for measures to be taken to ensure the protection of the environment within 30 days of the EEAA receiving the ESIA study. Failure to do so is considered as approval of the evaluation
- EEAA records documents, proposals and records its opinion on ESIA
- The competent administrative authority shall formally notify the developer (the project owner) of the result of the evaluation with a registered letter with acknowledgment of receipt

The Environmental Management Unit at the governorate and district level is responsible for the environmental performance of all projects and facilities within the governorate boundaries. Environmental management units have been established at the governorate, city or district level. These units are responsible for environmental protection within the governorate boundaries and are responsible for environmental planning and follow-up of operational activities. The unit is responsible for the following:

- Monitoring the environmental performance of the projects in the governorate during the construction and operation stages to ensure that the project complies with the laws and regulations in addition to the mitigation measures mentioned in the approval of environmental and social impact assessment
- Investigate any environmental complaint against projects in the province
- Environmental management is administratively managed by the province but is technically subordinate to EEAA
- The governorate has a solid waste management unit at the governorate and district levels. The responsibility of these units is to supervise solid waste management contracts

The competent administrative authorities are responsible for receiving the study and reviewing the data contained therein regarding the site and its suitability to the nature of the project and its commitment to the ministerial decision on the activity and ensuring that the activity does not conflict with neighboring activities. Then the administrative entity is to send the study to the Environmental Affairs Agency for review. The administrative entity, which is responsible for dealing with the sponsors of the project, is charged with the following:

- Provide technical support to project providers
- Ensure the approval of the project site
- Receive environmental and social impact assessment studies and send them to EEAA
- Follow up the implementation of environmental and social impact requirements through field visits during the construction phase and before the operating license

After the ESIA study is submitted for review, the EEAA may request amendments to the study within a period of 30 days, including additional mitigation measures, before the final approval of the report is issued. The applicant can submit an appeal within 30 days of obtaining the EEAA decision. Once the environmental and social impact assessment has been approved, the environmental and social monitoring plan presented in the report is considered an integral part of the project and the project-based company is committed to implementing this plan, depending on its involvement in the construction and operation phases. It is worth noting that the developer/operator will ensure that the mitigation procedures and environmental requirements are included as part of the tender documents and contracts for the construction work. The company will monitor the construction contractor to ensure that the environmental management plan is implemented properly during the construction phase.

3.1.1.2 Environmental Register

In accordance with Articles 22 and 23 of Law 4/1994, the developer/operator, as the owner of the project, will keep a written record of the impact of the project activity on the

environment (environmental register) according to the model set forth in Annex 3 of the executive regulations of the law. Articles 17 and 18 of the Implementing Regulations that define the rules for the preparation of the environmental register as well as the time frame of the obligation of the entity to maintain it and the data to be entered therein.

- Emissions from or discharged from the facility
- Output specifications after treatment and treatment units used
- Safety procedures and environmental monitoring applied in the facility
- Tests, periodic measurements, number of samples, timing and place of withdrawal, measurements, analysis and results
- Appoint a person responsible for review and follow-up

In accordance with the provisions of Articles 34 to 40, 42, 43 and 47 bis in Law 4/1994, amended by Law 9/2009, Article 42 and Annex 5 and 6 of the Implementing Regulations.

3.1.1.3.1 Air Emissions

The location of the project should be determined so that during the construction and operation phases of the proposed project, emissions in the area (including the proposed project) will not exceed the maximum allowable limits of ambient air pollutants as shown in Table 11.

Table 11 Maximum Limits of Outdoor Air Pollutants (Annex 5 of the Executive Regulations amended in 2012)

Pollutant	Location Area	Maximum Limit [µg/m^3]			
		1hour	8hours	24hours	1Year
Sulphur Dioxide	Urban Industrial	300 350		125 150	50 60
Carbon Monoxide	Urban Industrial	30 mg/m^3	10 mg/m^3	- -	- -
Nitrogen Dioxide	Urban Industrial	300 300	- -	150 150	60 80
Ozone	Urban Industrial	180 180	120 120	- -	- -
Total Suspended Particles (TSP)	Urban Industrial	- -	- -	230 230	125 125
Particulate Matter less than 10 µm (PM_{10})	Urban Industrial	- -	- -	150 150	70 70
Particulate Matter less than 25 µm ($PM_{2.5}$)	Urban Industrial	- -	- -	80 80	50 50
Suspended Particles Measured as Black Smokes	Urban Industrial	- -	- -	150 150	60 60
Lead	Urban Industrial	- -	- -	- -	0.5 1.0
Ammonia (NH_3)	Urban	-	-	120	-

Pollutant	Location Area	Maximum Limit [µg/m³]			
		1hour	8hours	24hours	1Year
	Industrial	-	-	120	-

Appendix (6) of the amended executive regulations includes the following decisions: 1095 for 2011, 710 for 2012 and 964 for the year 2015 on the permissible limits for emissions of air pollutants from different sources.

Table 12 Maximum allowable emissions from vehicles that operate using gasoline fuel (Table 23 of Annex 6 of the Executive Regulations amended in 2012)

	Before the year 2003		From 2003 to 2009		Year 2010 and later	
Pollutants	**Hydrocarbons HC (ppm)**	**CO%**	**HC (ppm)**	**CO%**	**HC (ppm)**	**CO%**
Maximum allowable Limit	600	4	300	1.5	200	1.2

Measurements should be done at the idle speed from 600 to 900 rpm.

Table 13 Maximum allowable emissions from vehicles that operate using diesel fuel (Table 24 of Annex 6 of the Executive Regulations amended in 2012)

Manufacturing Year (model)	Before the year 2003	From 2003 and later
Smoke density factor K (m^{-1})	2.8	2.65

Measurements are done in accordance with the ISO-11614 international standard.

According to Article 43 of the Law, the owner of an establishment is held to take all precautions and procedures necessary to prevent the leakage or emission of air pollutants inside the work premises except within the permissible limits as defined by the executive regulations of this Law, whether they result from the nature of the establishment activities or from malfunctioning equipment. Table 14 provides the maximum (permissible) limits for air pollutants inside workplaces per industry types.

Table 14 Maximum permissible limits for air pollutants

Measurement parameter (unit)	SO_2 (ppm)	H_2S (ppm)	NO_x (ppm)	CO (ppm)	CO_2 (ppm)	Smoke (µg/m³)
Max. Permissible Limit inside the working environment	2	10	3	25	5000	-
Max. Permissible Limit in the ambient air (1 hour)	300 µg/m³	-	300 µg/m³	30 µg/m³	-	150 µg/m³ (24-hour)

3.1.1.3.2 Noise

Article 42 of the environmental law states that during the construction and operation phases of the project, the resulting noise levels must not exceed the sound intensity levels given by Table 3 of Appendix 7 of the Executive Regulations when carrying out production, service or other activities, particularly when operating machinery and equipment or using sirens and loudspeakers. The table lists the maximum permissible noise level limits according to area type as per the following designation:

- Sensitive areas to noise exposure
- Residential suburbs with low traffic flow
- Commercial and administrative areas in city center
- Residential areas with some workshops, administrative activities, or recreational and entertainment activities overlooking public roads less than 12 meters
- Areas overlooking public roads more than or equal 12 meters, or industrial areas with light industries
- Industrial Zone with heavy industries

The applicable maximum noise level for the project activities are shown in Table 15.

Table 15 Maximum permissible noise level limits for the project area (from Annex 7 of the Executive Regulations, Table 3)

AREA TYPE	MAXIMUM PERMISSIBLE EQUIVALENT NOISE LEVEL [dB(A_{eq})]	
	Day	Night
	7 AM – 10 PM	10 PM – 7 AM
Areas overlooking public roads more than or equal 12 meters, or industrial areas with light industries	70	60

3.1.2 Other Egyptian Environmental and Social Laws Applicable

Egyptian environmental law covers many aspects, such as air quality, water quality, noise, solid waste management and occupational safety and health. Each of these aspects and permissible limits will be discussed according to their applicability to the project. The governing laws applicable to the scope of this evaluation are:

Environmental framework:

1. Law No. 4 of 1994 Amended by Law No. 9 of 2009 (Environment Law) and its amended Articles of Association amended by Resolution 1095 of 2011, Decree No. 710 of 2012, Decision of the Prime Minister No. 964 of 2015 and Decree No. 618 of 2017
2. Law No. 38 of 1967 (the Public Cleanliness Law) and its executive regulations issued by the Ministry of Housing dealing with solid waste

3. Law No. 48 of year 1982 on the Nile River, waterways and its executive amendment
4. Law No. 93 of 1962 on industrial wastewater disposal on domestic wastewater network and its implementing regulations
5. Law No. 102 of 1983 regarding the nature reserves, and its complementary decrees in preservation of rare and endangered wild animals

Social framework:

1. Law No. 137 of 1981 (Labor Law) amended by Decree 12 of 2003 and known as the Unified Labor Law
2. Procurement Law No.89/1998
3. Law No 119 of year 2009 regarding building and housing
4. Law No. 117 of 1983 Amended by Law No. 12 of 1991 for the Protection of Archaeological Areas and Cultural Heritage

All laws regulating land acquisition will not be applicable to this project's scope of work since it is considered part of a larger pre-developed area with existing land leases.

3.1.3 Waste Management Regulations

The collection, transportation and safe disposal of solid wastes from houses, public places, commercial and industrial establishments is regulated through the public cleanliness law 38/1967 amended by law 31/1976 and its executive regulations issued by Minister of Housing Decree Number 134 of 1968, the environmental law 4/1994 and its executive regulations, as well as the prime minister decree no. 338 of 1995 and the national waste management strategy issued in 2018. Additionally, law no. 159 for the year 1953 regulates the cleanliness of fields, roads and streets as well as organization of collection and transport of waste. Other laws that might be pertinent to waste management in Egypt are:

- Law 59 of 1979 regarding the establishment of new urban communities
- Law 10/2005 establishing a solid waste collection fee system
- Laws 106/1976 and 101/1996 allow local governments to include the management of construction and demolition waste in the permits required for construction activities
- Law 140 of 1956 regarding occupation of public roads
- Law 84 of 1968 regarding public roads
- Law 317/2016 and 717/2019 regarding the application of design principles and implementation conditions for municipal solid waste management systems

3.1.3.1 Egyptian Code of Design Principal and Implementation Conditions for Municipal Solid Waste Management Systems Number 717/2019

The Housing and Building National Research Center has prepared this Solid Waste Management Code (the "Code") to provide an authoritative reference to the design requirements and specifications of the implementation of solid waste management systems.

The Code aims to support the design and implementation of a modern, economical system that is effective and efficient in dealing with municipal solid waste, thus preserving and enhancing the public health and environment of the different population groups.

Responsible for implementing this Code are:

- Governorates' municipal councils and the waste management units responsible for preparing Terms of Reference (ToR) of waste management services, monitoring and evaluating the performance of service providers, contractors and companies working in the waste management sector
- Consultants who prepare the waste management plans and design the components of the waste management systems per the given ToRs

This Code complements the legislative regime, including Law No. 4 of 1994 and its amendments, Law No. 10 of 2005 and Law No. 38 of 1967 and amended by Decree Law No. 47 of 2014 and No. 6 of 2012.

The Code is based on the following principles underlying the strategic directions for solid waste management (SWM) issued in November 2014 by the Ministry of Environment:

- Solid waste management is a public service: SWM is a basic public service that will benefit all members of society. It is essential that all public institutions apply the governing principles. These principles must ensure that the SWM services are available to, and provided to everyone
- Implementation of projects and programs in the SWM sector based on master plans developed by governorates. These plans include all sources and types of solid waste generated within the area covered by the master plan. Therefore, SWM planning should include all activities relating to production, collection, treatment and disposal
- Providing job opportunities through the development of the solid waste recycling sector as an important occupational sector of the local economy, and a key source of skilled, intermediate or unskilled labor
- Polluter pays principle: The polluter is responsible for the costs associated with proper management of solid waste, including the costs of solid waste collection, transport, treatment and disposal
- Cost recovery by establishing a fee structure that is appropriate for the method of collection within the Governorate, area, and district. The fee structure will be applied to households and commercial facilities in order to finance the costs of

effective SWM. These fees will be used for SWM services, and not for any other purposes

- Identify the requirement for additional financial support to cover any shortfalls between the required funding for effective management of solid waste and the locally generated fees, thereby creating a permanent need for government regulation to achieve financial sustainability (funding) to provide and maintain services
- Effective procedures for sequencing SWM should include:
    - Reduction of solid waste generation
    - Solid waste reuse
    - Solid waste recycling
    - Solid waste recovery
    - Solid waste treatment
    - Safe disposal of solid waste
- Implementing the proximity principle: Solid waste management and disposal facilities should be located as close to waste generation sources as far as practicable to minimize transport costs and reduce pollution
- Identifying the criteria for selecting appropriate technologies: Appropriate technologies should be specific to local needs and requirements when planning and designing solid waste management systems. There shall be no "one solution fits all" approach
- Community participation: Community members should play a role in overcoming the relevant challenges and contribute to the development of an effective, successful and sustainable system for solid waste management
- The principle of extended product liability: The producer must bear fair financial and legal responsibility during the product life cycle, including waste management resulting from the production process
- Changing consumer behavior: Providing consumers with accurate and valid information as to how changing habits and practices can lead to cleaner production techniques, increased recycling and waste reduction at source
- Set a target of waste recycling by not less than 80% of the generated waste
- Implementing the principle of private-sector participation by identifying suitable projects that can be implemented by the private sector, based on size and location. Based on the principle of design, build, operate and transfer (DBOT) of ownership, which can help remove the burden from the Government
- Implementing the principle of decentralization in management and decision-making. Expanding capacities, authorities and responsibilities in managing the solid waste in the governorates. This includes preparation of detailed Terms of Reference, Tender Evaluation and ongoing monitoring

3.1.3.2 Public Cleanliness Law Number 38/1967

Law 38 for the year 1967 amended by law 31/1976 and its Executive Regulations issued by decree 134/1968 prohibit the dumping of solid wastes in any location other than those designated by the municipal authorities. This includes solid waste treatment and disposal, in addition to the temporary storage in undesignated containers. Article 1 of the Ministry of Housing and Utilities decree 134/1968 defines solid waste as any waste generated by persons, residential units, non-residential constructions such as commercial establishments, camps, animal cages, slaughterhouses, markets, public spaces, parks, and transportation methods.

The Public Cleanliness Law and its Executive Regulations requires the municipal authority responsible for public cleanliness or the contracted entity assigned by it for the collection, transportation, and disposal of solid wastes, to carry out these processes in accordance with the specifications stipulated in the Executive Regulations and any other regulations by the municipal authority.

3.1.3.3 Environmental Law 4/1994

In general, the law prohibits the disposal of any solid wastes except in areas designated for this purpose through article 37, and articles 38, 39 and 41 of the executive regulations which require that during excavation, construction or demolition activities, the entity undertaking the work must take the necessary precautions to safely store and transport the resulting wastes in accordance with the set procedure.

Regarding the hazardous wastes, and in accordance with the provisions of articles 29 to 33 of law 4/1994 which is equivalent to law 9/2009 and articles 28, 31 and 33 of the executive regulations, the entity producing hazardous wastes in gaseous, liquid or solid form is committed to collect and transport the generated waste to designated disposal sites which are predetermined by the local authorities, the competent administrative authorities and the Egyptian Environmental Affairs Agency.

The hazardous waste should be collected in specific locations with clear warning signs and oral or written instructions for safety conditions that prevent the occurrence of any damage generally or to people who get exposed to it. Additionally, the workers should be trained on proper handling procedure.

The transportation vehicles used to transport hazardous waste should belong to licensed entities that manage hazardous waste and follows the guidelines included in the executive regulations.

3.1.4 Water and Wastewater Management Regulations

3.1.4.1 Industrial Wastewater Disposal Law 93/1962

The industrial wastewater disposal into the drainage systems is regulated by law 93/1962 and its executive regulations amended by decree 44/2000. The law prohibits the disposal of domestic, industrial and commercial wastewater, treated or untreated, in public drainage system without obtaining a prior approval.

Article 14 of the executive regulations set the parameters required regarding the quality of the wastewater discharged to the public sewage network.

3.1.4.2 Protection of Nile River Water Law 48/1982

The protection of the Nile River and water was law number 48 for the year 1982 defines the water ways to which this law is applicable as Fresh water and non-fresh water sources. The fresh water sources are the river Nile and its branches and bays, as well as the branches and canals of all sizes and the non-fresh water sources are: all types of open type drainages, lakes, ponds and enclosed water bodies and underground water reservoirs.

The law states that for all the stated water ways, it is prohibited to dispose or dump any solid, liquid or gaseous waste from all residential, commercial and industrial activities as well as waste water unless an approval is obtained from the Ministry of Water Resources and Irrigation according to the regulations issued in this regard.

3.1.5 Work Environment and Occupational Health and Safety

Several laws and decrees tackle occupational health and safety provisions at the workplace, in addition to Articles 43 – 45 of Law 4/1994, which address air quality, noise, heat stress, and the provision of protective measures to workers. These laws and decrees apply to the work crew that will be involved in construction activities.

Law 12/2003 on Labor and Workforce Safety and Book V on Occupational Safety and Health (OSH) and assurance of the adequacy of the working environment. The law also deals with the provision of protective equipment to workers and firefighting/emergency response plans. Moreover, the following laws and decrees should be considered:

- Minister of Labor Decree 48/1967
- Minister of Labor Decree 55/1983
- Minister of Industry Decree 91/1985
- Minister of Labor Decree 116/1991

The environmental aspects that must be taken in consideration for the workplace are noise, ventilation, temperature, and health and safety, which are as follows:

3.1.5.1 Noise

Annex 7 of the Executive Regulations amended in 2012 stipulates the permissible limits for sound intensity and safe exposure times that must be observed by the operators for the work areas and places within the proposed project.

Table 16 Permissible noise levels inside sites of productive activities (Table 1, Annex 7 of the Executive Regulations)

No.	TYPE OF PLACE AND ACTIVITY	MAXIMUM PERMISSIBLE EQUIVALENT NOISE LEVEL [dB(A)]	Exposure Duration
1.	a) Workplaces (workshops and industries) with up to 8-hour shifts (licensed before 2014)	90	8
	b) Workplaces (workshops and industries) with up to 8-hour shifts (licensed since 2014)	85	8

For the first item (a, b) the exposure duration shall be decreased by half if the noise level increases by 3 dB (A) combined with using ear plugs. This is to avoid any impacts on the sense of hearing.

The instantaneous noise level shall not exceed 135 dB (A) during working period.

The noise level is measured inside working areas and closed areas in L_{Aeq} according to the international guidelines (Parts 1&2) ISO 9612/ ISO 1996 or the Egyptian Specifications No. 2836 part 1 & 2 and No. 5525 concerning this matter.

Equivalent noise level L_{Aeq} is the average acoustic pressure at the level of measurement (A) during a specific time period and expressed in dB.

Table 17 Maximum Permissible Exposure to Heavy Hammers (Table 2, Annex 7 of Executive Regulations)

Peak Noise Intensity Level [dB(A)] L_{cPeak}	135	130	125	120	115
Number of Allowable Strikes during Working Hours	300	1000	3000	10000	30000

The intermittent noise exposure depends on the noise level intensity presented in the previous table (number of strikes per shift).

The hammer strikes are considered intermittent if the duration between strikes 1 second or more. If the duration is less than 1 second, the strikes are considered continuous and the noise level shall comply with Table 1 of Annex 7 of the executive regulations.

3.1.5.2 Ambient Air Quality

Annex 8 of the Regulations lists the maximum allowable limits for air contaminants within the working environment.

Boundary limits (threshold limits) of air pollutants in the workplace according to the quality of each industry: Boundary limits are concentrations of chemicals in the air that can be exposed to daily workers without health damage and are divided into three types:

a) Threshold limits - 8 hours: The average pollutant concentration in a normal working day (8 hours), which the worker can be exposed to in 5 days a week throughout his/her work without causing health damage.

For total particulates that causes only discomfort and has no significant health effects, the threshold is 10 mg / m3 and for inhalable particles 3 mg / m3 (inhalable soil 2.5 micron to 10 microns).

b) Threshold limits - 15 minutes: Pollutant concentration that worker can be exposed to continuously for a short period. For a period of 15 minutes, which may not be exceeded in any case during the working period and that is not repeated more than 4 times per day and the period of 60 minutes should be between each short exposure.
c) The ceiling is the limit that cannot be reached even for a moment and when the absorption by the skin is a factor in the increase of exposure is marked (+ skin) in front of the threshold limit, and for simple gases that have little toxic effects is measured oxygen concentration in the air, which may not To be less than (18%).

Considering the provisions of the Labor Law 12 of 2003 and its ministerial decrees, the emission limits of different chemicals in the working environment shall not exceed the limits set out in Table 1. The employer or his authorized representative shall also provide identification cards for the chemicals used or produced within the facility in the Arabic language, provided that they are placed in a file in a visible place in the facility so that they can be accessed, considering the following:

1. Name of chemical, scientific and commercial material, name, address and telephone number of manufacturer and distributor of this material
2. Any hazardous components in the substance, as well as the safe concentration of this component, which can be exposed for 8 hours a day without harm
3. Potential human health risks from exposure to a higher concentration than the safe concentration of the substance, as well as the way the substance is absorbed by the skin, breathing, swallowing, etc., as well as the human organs targeted by this substance
4. First-aid measures to be followed in the event of injury to this substance
5. How the substance can be ignited, as well as the fire extinguishers to be used to extinguish the fires (in the case of flammable substances)
6. The method of preventing accidents and injuries that are expected to occur in the event of leakage or spillage of this substance on the ground or the emission of large

quantities of evaporation to the working environment as well as how to contain this leakage and health methods to clean the workplace and follow all safety precautions
7. Information on how to handle the substance and how to correctly store it
8. Personal Protective Equipment (PPEs) that should be used when handling substances to prevent injury
9. Physical and chemical properties of the substances such as: (color - state - odor - solubility - steam pressure - boiling point - freezing - density ...etc.)
10. How the substance becomes hazardous as a result of its interaction with other substances, and the extent of the stability of the material as well as the non-compatible substances that are required to be distant from it
11. The toxicity of the substance and the results of the tests conducted to determine it
12. The effect of the material on the environment and the environmental life around it such as aquatic life, plants, animals and birds, as well as the duration of the material in which it remains dangerous
13. Information on safe and correct ways to dispose of the substance
14. Information on the precautions to be taken when transporting this material by different means of transportation
15. Information on classification of material severity according to specifications and requirements of international organizations
16. Any other information about the material

Table 4 from Annex 8 of the Executive Regulations states the amount of air needed to ventilate the public places.

Table 18 Amount of air needed to ventilate the public places

No.	Type of location and activity	Occupancy rate (Person/100m^2)	Minimum external air regeneration rate
	•		
1	Administrative buildings • Office • Reception • Meeting room • Conference room • Banks	 5 30 50 50 10	 10 5.5 8 8 8.5

3.1.5.3 Temperature and Humidity

Article 44 of Law 4/1994 and Article 46 of its amended regulation 710/2012 stipulate conditions and requirements for temperature and humidity in the workplace. Annex 9 to the Regulations sets out the major and minor limits for temperature and humidity, exposure periods and safety precautions.

Table 19 Thermal exposure limits (heat stress) allowed in the work environment according to the work system (Table 2, Annex 9 of the Executive Regulations)

Work and break system	Thermal Temperature: Temperature of the Wet Globe Temperature (° C) Average Temperature Exposure in Intermittent Working Condition		
	Non labor intensive	Average labor intensive	Labor intensive
Continuous work	30 ◦C	27.8 ◦C	25.8 ◦C
75% work, 25% break	30.58 ◦C	28.8 ◦C	26.8 ◦C
50% work, 50% break	31.58 ◦C	29.58 ◦C	28.8 ◦C
25% work, 75% break	32.8 ◦C	31.8 ◦C	30.8 ◦C

3.1.5.4 Ventilation

Table 4 from Annex 8 of the Executive Regulations states the amount of air needed to ventilate the public places.

Table 20 Amount of air needed to ventilate the public places

No.	Type of location and activity	Occupancy rate (Person/100m^2)	Minimum external air regeneration rate
2	Administrative buildings • Office • Reception • Meeting room • Conference room • Banks	 5 30 50 50 10	 10 5.5 8 8 8.5

3.1.5.5 Municipal Solid Waste

Annex 11 of the Regulations sets forth the characteristics and rules of collection and transport methods of municipal solid waste and recycling methods, as well as the methods and means of final disposal of such wastes.

3.1.6 Laws Related to Traffic

The laws applicable to traffic and road work are governed by Traffic Law No. 66 of 1973, as amended by Law No. 121 of 2008. The law is concerned with traffic planning during the construction of projects. Law No. 140 of 1956 concerning the use and occupation of public roads, and Law No. 84 of 1968 concerning public roads, including highways, main roads and regional road.

The laws require that no actions affect the flow of traffic without prior authorization, and the laws specify that the competent administrative authority can use public roads for a fee. The executive regulations of Law No. 140 of 1956 specify the requirements for the

management of construction and demolition. In general, vehicle drivers are prohibited from causing any pollution by dumping waste on the road, construction waste or any other materials.

3.1.7 EEAA EIA Guidelines Related to the Public Consultation

- Conduct a public consultation as part of the ESIA study according to the EEAA guidelines methodology. The involvement of the public and concerned entities in the EIA planning and implementation phases is mandatory for Category C projects through the public consultation process with concerned parties.
- Preparation of the Public Consultation Plan before starting the consultation activities in the EIA scoping phase, the project proponent prepares a plan indicating the methodology of the public consultation to be adopted in the two public consultation phases (EIA scoping phase and consultation on the draft EIA). The plan should indicate the concerned parties that will be consulted, method of consultation and other points.
- An individual chapter in the EIA will be prepared for public consultation
- Disclosure of relevant material is an important process and should be undertaken in a timely manner for all Category C projects. This process permits meaningful consultations between the project proponent and project-affected groups and local NGOs is required to take place. Before the public consultation on the draft EIA, the draft technical summary in Arabic should be disclosed to all concerned parties.
- Paragraph 6.4.3.1: Scope of Public Consultation
- Paragraph 6.4.3.2: Methodology of Public Consultation
- Paragraph 6.4.3.3: Documentation of the Consultation Results
- Paragraph 7: Requirement and Scope of the Public Disclosure

3.1.8 Cultural Heritage

Archaeological and cultural heritage is protected by the following laws:

- Law 117 of 1983 on the protection of monuments and cultural heritage, amended by Law 12 of 1991

3.1.9 Land Acquisition Laws

The Egyptian Constitution has preserved the right of private property, Egyptian Constitution (1971, amended in year 1980) and Egyptian Constitution (2014, articles 33 and 35). The Egyptian Civil code 131/1948, articles 802-805 recognize private ownership right and stipulates that the owner of a certain property has the sole right of using and/or disposing his property.

Property expropriation for public benefit is indicated by Law No. 10 of year 1990 and its amendments by Law No. 24 for the year 2018, and law No. 1 for the year 2015. The law describes the cases of property expropriation for public benefit, considering waste management facilities projects as public benefit activities. Land acquisition procedures according to this law are as follows:

The land acquisition procedures start with declaring the project for public interest. Afterwards a presidential decree is issued accompanied with a memorandum specifying the plots required for the project as well as a complete plan for the project and its structures (Law 59/1979 & Law 3/1982 stipulated that the Prime Minister may issue the Expropriation decree).
The decree and the accompanying memorandum must be published in the official newspapers; a copy for the affected communities must be placed at the main offices of the concerned Local Government unit.

This law has specified, through Article 6, the formation of the "Compensation Valuation Commission". This Article states that the commission is established at the Governorate level and consists of a delegate from the relevant Ministry's Surveying Body (as President), a representative of the Agricultural Directorate, a representative of the Housing and Utilities Directorate, and a representative of the Real Estate Taxes Directorate in the Governorate. The compensation shall be estimated according to the prevailing market prices at the time of the issuance of the Decree for Expropriation. Amendments of the law in 2015 has specified the period allowed for submitting a grievance to be 15 days and allowed additional 30 days to submit all relevant documents.

3.1.10 Legal Framework Summary

Table 21 summarizes the legal provisions applicable to the proposed project; the following paragraphs discuss the legal requirements of the proposed project as the owner of the project under the provisions of these paragraphs in detail and include any relevant standards or specifications, implementing bodies concerned and penalties for infringement and irregularities.

Table 21 The legal framework for the project

Case	Relevant Law and legislation	Articles applicable to the project	Relevant executive regulations	Standards and specifications provided
Pollution of the terrestrial environment	Law No. 4/1994 (Environmental Law) Amended by Law No. 9 of 2009	Articles 19, 20, 21, 23, and 33 regarding the performance of environmental impact assessment Articles 22 and 23 regarding the	Articles 10, 11, 12, 13, 13 bis, 14, 15 and 16 regarding the performance of environmental impact assessment	Appendix 3 of the Executive Regulations of the Law: A Model for the Environmental Register

Case	Relevant Law and legislation	Articles applicable to the project	Relevant executive regulations	Standards and specifications provided
		follow-up of the environmental register	Articles 17 and 18 regarding the follow-up to the environmental register	
Hazardous waste management	Law No. 4/1994 (Environmental Law) Amended by Law No. 9 of 2009	Articles 29 and 30 regarding hazardous material and waste handling and management		
Law 38/1967 (Public Cleanliness Law)				
Air pollution	Law No. 4/1994 (Environmental Law) Amended by Law No. 9 of 2009	Substances 34 to 39, 42, 43 and 47 bis of the project site, emissions or leaks of air pollutants, use of engines, dumping or burning of refuse, waste and exhaust of drilling and construction works, noise and internal air quality in order	Articles 34, 35, 36, 37, 38, 41, 44, 45 of the project site and responsibilities, the permissible limits of air pollutants, exhausts of machinery and engines, open burning and disposal of waste, methods of dealing with waste and exhaust of drilling and construction, permissible noise limits, indoor air quality in order	Appendix 5: Maximum limits of external air pollutants Appendix 7, Table (3) Maximum noise levels in different areas (rural dwellings, urban dwellings, etc.)
Occupational Health and Safety	Law No. 4/1994 (Environmental Law) Amended by Law No. 9 of 2009	Articles 42, 43, 44, 45, 46 on noise, indoor air quality, temperature and humidity, ventilation and smoking.	Articles 44, 45, 46, 47, 48 on noise, indoor air quality, temperature and humidity, ventilation and smoking respectively	Appendix 7: Permissible limits for indoor and indoor noise levels Appendix 8: Maximum air pollutants within the

Case	Relevant Law and legislation	Articles applicable to the project	Relevant executive regulations	Standards and specifications provided
				workplace according to the quality of each industry. Appendix 8, table 4: Quantity of air required to ventilate public areas. Appendix 9: Maximum and minimum temperature and humidity
	Law No. 137 of 1981 (Labor Law) amended by Decree 12 of 2003			
	Law 203 of 2014 concerning the stimulation of electricity production from renewable energy sources	Articles 10,9,8,7,6,5,4,3,2,1 for the establishment of projects for the construction of electricity from renewable sources of energy.		
land acquisition	Law No. 10 of year 1990 and its amendments by Law No. 24 for the year 2018, and law No. 1 for the year 2015. The law describes the cases of property expropriation for public benefit,	Articles 2 (fourth paragraph), 3, 5 (second paragraph), 6 (second paragraph), 7 (first paragraph), 13, 15 (first paragraph) of Law No. 10 of 1990 regarding expropriation of real estate for the public benefit		
Public Consultation	Law 4/1994 on Environmental Protection EEAA guidelines related to the	Paragraph 6.4.3.1 Paragraph 6.4.3.2 Paragraph 6.4.3.3 Paragraph 7	Scope of Public Consultation Methodology of Public Consultation	

Case	Relevant Law and legislation	Articles applicable to the project	Relevant executive regulations	Standards and specifications provided
	Public Consultation		Documentation of the Consultation Results Requirement and Scope of the Public Disclosure	

3.1.11 Egyptian Law Enforcement Authorities

The staff of EEAA and its branches in the governorates, to be determined by a decision of the Minister of Justice in agreement with the minister concerned with environmental affairs, shall have the status of judicial control officers in proving the crimes committed in violation of the provisions of the law and the decisions executed therefor, Which gives the authority to prove the commission of offenses in violation of the provisions of Law 4/1994 or the decisions issued in implementation thereof.

Traffic Law Enforcement Authority 121/2008 is the traffic police of the Ministry of Interior.

The enforcement authority for Law 93/1962 regarding the discharge of wastewater to the public sewerage system is the Ministry of Housing, in cooperation with the sanitation authorities.

The enforcement authority for Law 48/1982 on the protection of water bodies from pollution is the Ministry of Irrigation.

3.1.12 The Relevant International Treaties Signed by Egypt

Egypt has signed and ratified a number of international conventions that oblige the country to preserve environmental resources.

- International Plant Protection Convention (Rome, 1951)
- African Convention for the Conservation of Nature and Natural Resources (Algeria, 1968)
- UNESCO Convention for the Protection of the World Cultural and Natural Heritage (Paris, 16 November 1972)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Washington, 1973)
- United Nations Convention on Climate Change (New York 1992). The Convention covers measures to control greenhouse gas emissions from various sources, including transportation

- United Nations Framework Convention on Climate Change and the Kyoto Protocol (Kyoto, 1997)
- Convention on Biological Diversity (Rio de Janeiro, 1992), covering the conservation of plant and animal species and their habitat, and biological diversity
- Convention on the Protection of the Ozone Layer (Vienna 1985)
- Convention on the Prevention and Control of Occupational Hazards caused by Carcinogenic Substances (Geneva, 1974)
- Convention on the Protection of Workers from Occupational Hazards in the Work Environment due to Air Pollution, Noise and Vibration (Geneva 1977)
- ILO: Basic labor standards to be followed during project implementation. Egypt has been a member of the International Labor Organization (ILO) since 1936 and has signed 64 conventions that regulate labor standards and working conditions. In 1988 Egypt ratified the Occupational Safety and Health Convention of 1979 (No. 152)
- Cultural Heritage: Respect for cultural heritage and non-financing of projects that threaten the safety of sites with a high level of protection for reasons of cultural heritage, for example UNESCO World Heritage Sites
- Consultation, participation and public disclosure: Aarhus regulation promotes transparency of environmental information and involvement of project stakeholders. The consultation identifies and manages any public concern at an early stage. The Regulations include provisions for public disclosure of key project information: such as non-technical summary and environmental impact assessment

3.1.13 Penalties

3.1.13.1 Violations of Law 4/1994, Amended by Law 9/2009

Chapter 4 (articles 84 to 101) defines the penalties provided for violations of the provisions of the various articles of law.

Article 84: Without prejudice to any more severe punishment provided for in another law, whoever contravenes the provisions of Article (28) of this Law shall be subject to imprisonment and / or fined not less than five thousand pounds and not more than fifty thousand pounds. In all cases, the court shall order the confiscation of seized birds, animals, living organisms, plants and fossils, as well as machinery, weapons, equipment and means of transport used in the commission of the crime.

Article (84): Penalties for violation of the provisions of Articles 22 (Environmental Register), 37 (item A) (open burning of waste), 69 (discharge of untreated waste or liquids) of this law shall be imprisonment for not more than one year and / with a fine of not less than five thousand pounds and not more than one hundred thousand pounds.

Any person who contravenes the provisions of Articles 19 and 23 (environmental declarations for expansions and renewals of an existing establishment) shall be punished by a fine of not less than fifty thousand pounds and not more than one million pounds.

In the event of a return to the offense, the minimum and maximum amount of the fine is doubled, and the maximum period of imprisonment doubled.

In addition to the previous original penalties, there may be penalties for closing the facility, revoking the issued license or suspending the infringing activity.

Article 86: Violation of the provisions of Article 36 (equipment / machinery exceeding permissible air emissions levels) shall be punishable by a fine of not less than 200 pounds and not exceeding 300 pounds. For violations of the provisions of Article 39 of Law 4/1994 and its amendments in Law 9/2009 (Construction and Demolition Activities), the penalty shall be a fine of not less than LE 500 and not more than LE 1000. The court may order a suspension of the license for at least one week and not more than six months. If the offense is returned, the court may revoke the license.

Article 87: Any person who contravenes the provisions of Article 42 by using the loudspeaker with a volume exceeding the permitted levels of sound intensity. He shall be punished by a fine of not less than LE 500 and not more than 2000 LE. The machines and equipment used in the violation shall be confiscated. Violators are subject to the provisions of Articles 35, 37, 40, 43, 44, 45, or 46 to fines not less than 1000 pounds and not more than 20,000 pounds. In the event of a return to the contrary, the fine provided for in the preceding paragraphs shall be doubled.

Article 95: A deliberate violation of the provisions of Law 4/1994 and its amendments in Law 9/2009 shall be punishable by imprisonment for a term not exceeding 10 years if this violation causes permanent disability to an incurable individual. The penalty shall be imprisonment if an offense results in the disability of three or more persons. If the consequences of the offense are the death of a person, the penalty shall be temporary hard labor, and if it results in the death of three or more persons, the penalty shall be permanent hard labor.

3.2 International Standards and Guidelines

The aim of following international guidelines and standards is to ensure that all issues are considered and managed in line with international good practice. This section describes the most relevant international guidelines and standards aimed at ensuring that all environmental and social issues are considered and managed in line with good international practices. Where standards and guidelines do not exist in Egyptian law or are more stringent than similar industrial guidelines, compliance will be with the more stringent guidelines.

3.2.1 World Bank Requirements

The project components shall comply with the WB Environmental and Social Framework, ESSs and guidelines. The standards help to ensure the environmental and social soundness and sustainability of investment projects. They also support integration of environmental and social aspects of projects into the decision-making process. In addition, the ESF promotes sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats and the environment.

3.2.1.1 World Bank Environmental and Social Standards (ESSs)

The World Bank (WB) has identified 10 environmental and social standards that should be considered in its financed projects. These standards are:

- **Environmental and Social Standard 1:** Assessment and Management of Environmental and Social Risks and Impacts
- **Environmental and Social Standard 2:** Labor and Working Conditions
- **Environmental and Social Standard 3:** Resource Efficiency and Pollution Prevention and Management
- **Environmental and Social Standard 4:** Community Health and Safety
- **Environmental and Social Standard 5:** Land Acquisition, Restrictions on Land Use and Involuntary Resettlement
- **Environmental and Social Standard 6:** Biodiversity Conservation and Sustainable Management of Living Natural Resources
- **Environmental and Social Standard 7:** Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities
- **Environmental and Social Standard 8:** Cultural Heritage
- **Environmental and Social Standard 9:** Financial Intermediaries
- **Environmental and Social Standard 10:** Stakeholder Engagement and Information Disclosure

3.2.1.1.1 ESS 1: Assessment and Management of Environmental and Social Risks and Impacts

This ESS highlights the importance of managing environmental and social performance, including the ESIA studies. There are some main objectives of this performance standard, which target the high standard of performing the ESIA in order to comply with the international standards. These main objectives are:

- To identify and evaluate environmental and social risks and impacts of the project
- To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, affected communities, and the environment

- To promote improved environmental and social performance of clients through the effective use of management systems
- To ensure that grievances from affected communities and external communications from other stakeholders are responded to and managed appropriately
- To promote and provide means for adequate engagement with affected communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated

Project activities will impact environmental receptors including air quality, noise levels, and soil. The project activities will include generation and handling of hazardous types of waste. If not managed properly, activities will negatively impact environmental receptors.

Project activities involve a significant social component due to planned locations of activities in urban areas or near communities, and potential implications of the projects on livelihood of communities (informal waste collectors)

ESS1 is relevant to this project due to the environmental and social risks and impacts associated with the activities.

3.2.1.1.2 ESS 2: Labor and Working Conditions

This ESS discusses the worker-management relationship. It aims to promote the fair treatment and equal opportunities of workers without any discrimination in order to comply with the national employment and labor laws to protect workers (including vulnerable categories such as children, workers engaged via third party and workers in the supply chain) and to avoid the use of forced labor in order to promote safe working conditions.

Project activities will involve employment of labor. The nature of activities will involve general construction and associated health and safety risks and hazards. The project will involve specialized activities involving generation and handling of hazardous wastes and associated safety hazards and risks including fire hazards and explosions due to methane pockets. The scale of the project is expected to require employment of various types of workers including direct, contracted, and primary suppliers.

ESS2 is relevant to this proposed project due to the need for workers and health and safety impacts associated with the nature of project activities as well as the other risk related to the hiring procedures and the labor working conditions which are all adressed under the developed LMP.

3.2.1.1.3 ESS 3: Resource Efficiency and Pollution Prevention and Management

This ESS aims to protect the human health and protect the environment by minimizing the pollution that occurs from different project activities. This can be achieved by promoting

the use of sustainable resources of energy and water; and reducing the air pollutants and GHG emissions.

Project activities will involve generation of polluted wastewater in the form of leachate, emissions of gases and dust, etc. Project activities will also involve resource consumption in the form of water, electricity etc.

ESS3 is relevant to this project due to activities involving consumption of resources and generation of pollution.

3.2.1.1.4 ESS4: Community Health and Safety

This ESS aims at avoiding the negative impacts on health and safety of the affected communities throughout the whole project cycle. This has to be done in accordance with relevant human rights principles in order to avoid or minimize any harmful effects or risks that may occur affecting the affected communities.

Project activities involving infrastructural physical interventions, transportation of wastes along roads. The operation of the project will involve management of hazardous wastes, road safety, handling of electricity with possible risks on the community health and safety also including from the risk related to labor influx and potential GBV if not managed properly.

ESS4 is relevant to the project due to possible risks and impacts on the community health and safety from project activities.

3.2.1.1.5 ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement

This ESS discusses the resettlement techniques (physical or economic) that cannot be avoided and need to be done as a result of any land acquisition or restrictions on land use that occur during the project life cycle. The standard aims to avoid, or minimize if avoidance is not possible, the adverse social and economic impact of land acquisition but providing compensation for loss of assets at replacement cost and ensure the resettlement activities are implemented with appropriate information, consultation and informed participation of the affected personnel.

ESS5 was determined to be relevant to the entire project of GCAPCC. For this specific component and particularly in relation to the Qalyoubia landfill and the C&D waste treatment facility construction and operation, there is limited concern about involuntary resettlement impacts since the land designated is state-owned vacant land that had no occupiers or precedent utilization by any users. The necessary retroactive review in this regard has been conducted as referred to above. For the land related to the infrastructure outside the IWMF-10R, the land (including routes for the roads and power lines) has not been determined yet and accordingly it is not possible at this stage to determine if any

involuntary resettlement impacts will be encountered. This has been covered under the Resettlement Framework (RF) and relevant instruments (e.g. resettlement plan or livelihoods restoration plan) could be prepared once the land needed for the infrastructure is determined.

The consultant conducted retroactive review as part of due diligence to confirm that the project's land is free from any economic activities or installations, and the area is devoid of any facilities. The history of the project land use has been traced through satellite maps (Google Earth) from 2010 to 2019; the maps did not show any previous works or uses of the proposed project site; as previously mentioned in section 2.1.

ESS5 is relevant to this project since the land required for the infrastructure outside the IWMF-10R has not been determined yet.

3.2.1.1.6 ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

This ESS aims to protect and conserve the biodiversity and adopting the practices that integrate conservation needs and development priorities in order to promote the sustainable management of living natural resources.

Project activities are planned in a desert area in 10th of Ramadan city, where a preliminary assessment of baseline conditions reveals no biodiversity. .

ESS6 is not relevant to this project due to the poor nature of the site from a biodiversity perspective..

3.2.1.1.7 ESS 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities

ESS 7 aims to ensure that the development process maintains full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of indigenous people issue. It aims to establish an on-going relationship based on Informed Consultation and Participation (ICP) with the local communities that may be affected by a project.

Project activities are planned in urban areas of 10th of Ramdan, where there are no indigenous people.

ESS7 is not relevant to this project.

3.2.1.1.8 ESS 8: Cultural Heritage

This ESS aims to protect the cultural heritage from any impacts that may occur during the project life cycle. It promotes the equal sharing of benefits from use of cultural heritage.

Project activities will involve excavation works in the 10th of Ramdan area.The area is not known to contain archeological sites, therefore, there are no risks of finding tangible physical cultural heritage.

ESS8 is not relevant to the project.

3.2.1.1.9 ESS 9: Financial Intermediaries (FI)

ESS 9 aims to set out guidelines for the FI for the assessment and management of environmental and social risks and impacts resulted from the financed subprojects. It also seeks to promote good environmental and social management practices as well as sound human resources management in the financed subprojects.

Project activities do not include financial intermediaries.

ESS9 is not relevant to the project.

3.2.1.1.10 ESS 10: Stakeholder Engagement and Information Disclosure

This ESS discusses the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective engagement of stakeholders can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation.

Project activities involve the SWM, which is a complex sector in Egypt involving various stakeholders both formal and informal. Stakeholder engagement activities will be conducted throughout the lifetime of the project cycle. This will apply to the stakeholders related to this component of the project as well as the remaining components. A Stakeholder Engagement Plan (SEP) will be prepared as part of the project preparation and should be carefully applied throughout project implementation.

For this specific component of the project, range of consultation sessions will be conducted as part of the more detailed site specific ESIA which will be conducted when the Qalyoubia landfill and the C&D waste treatment facility and the infrastructure design are ready. Consultations will be also conducted as part of the RPs that could be developed as needed. Related information disclosure will be done using the appropriate modalities for each group of the stakeholders as per the SEP.

ESS10 is relevant to the project due to the involvement of various stakeholders and complex implications of the project.

3.2.2 World Bank Environmental, Health and Safety (EHS) Guidelines

The general World Bank Environmental, Health, and Safety Guidelines will be followed to ensure that all the project components and subcomponents comply with the Environmental

Health and Safety standards and requirements of the WB during the different phases of the project. Environmental health and safety guidelines are organized to identify common themes applied to any industrial sector or project (Table 22). These guidelines are based on good international industrial practices and the achievable levels of performance in new facilities at reasonable costs through existing technology. It is important to note that if national regulations differ from the levels and measures contained in the environmental health and safety guidance, the project developer is expected to achieve the most stringent.

Table 22 Themes of the WB EHS guidelines

1. Environmental	a. Air Emissions and Ambient Air Quality b. Energy Conservation c. Wastewater and Ambient Water Quality d. Water Conservation e. Hazardous Materials Management f. Waste Management g. Noise h. Contaminated Land
2. Occupational Health and Safety	a. General Facility Design and Operation b. Communication and Training c. Physical Hazards d. Chemical Hazards e. Biological Hazards f. Radiological Hazards g. Personal Protective Equipment (PPE) h. Special Hazard Environments i. Monitoring
3. Community Health and Safety	a. Water Quality and Availability b. Structural Safety of Project Infrastructure c. Life and Fire Safety (L&FS) d. Traffic Safety e. Transport of Hazardous Materials f. Disease Prevention g. Emergency Preparedness and Response
4. Construction and Decommissioning	a. Environment b. Occupational Health and Safety c. Community Health and Safety

3.3 Gap Analysis for Key Egyptian and WB Environmental and Social Standards

This section outlines the key requirements of both the Egyptian legislations and the WB ESSs and the gaps between the requirements of the two entities.

3.3.1 Gap Analysis for ESSs and National Laws

Table 23 shows the gaps between the WB ESSs and national laws.

Table 23 Gap analysis between ESSs and national laws

ESS	National Laws	Gap
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	• Law No. 4 of 1994 Amended by Law No. 9 of 2009 (Environment Law) and its amended Articles of Association amended by Resolution 1095 of 2011, Decree No. 710 of 2012, Decision of the Prime Minister No. 964 of 2015 and Decree No. 618 and 1963 of 2017 • Public cleanliness law 38/1967 amended by law 31/1976 and its executive regulations • Law no. 159 for the year 1953 regulates the cleanliness of fields, roads and streets as well as organization of collection and transport of waste. • Law 10/2005 establishing a solid waste collection fee system on the electricity bill • Laws 106/1976 and 101/1996 allow local governments to include the management of construction and demolition waste in the permits required for construction activities • Law 140/ 1956 regarding occupation of public roads • Law 84/ 1968 regarding public roads • Law 93/1962 on Wastewater disposal into the drainage systems • Law 48/1982 on protection of Nile River Water and Egypt waterways from pollution	• Discrepancies in air quality, water quality and noise limits between the national laws and WB standards • No national e-waste management system developed for the disposal or recycling of batteries which may be disposed with MSW directed to the landfill
ESS 2: Labor and Working Conditions	• Articles 43 - 45 of Law No. 4/1994 and articles 44 - 47 of its modified Executive Regulations by Decrees No. 1095/2011 and 710/2012 • Labor Law No. 12/2003	
ESS 3: Resource Efficiency and Pollution Prevention and Management	• Law No. 4 of 1994 Amended by Law No. 9 of 2009 (Environment Law) and its amended Articles of Association amended by Resolution 1095 of 2011, Decree No. 710 of 2012, Decision of the	

ESS	National Laws	Gap
	Prime Minister No. 964 of 2015 and Decree No. 618 and 1963 of 2017 • Public cleanliness law 38/1967 amended by law 31/1976 and its executive regulations • Law no. 159 for the year 1953 regulates the cleanliness of fields, roads and streets as well as organization of collection and transport of waste. • Law 10/2005 establishing a solid waste collection fee system on the electricity bill • Laws 106/1976 and 101/1996 allow local governments to include the management of construction and demolition waste in the permits required for construction activities • Law 140/ 1956 regarding occupation of public roads • Law 84/ 1968 regarding public roads • Law 93/1962 on Wastewater disposal into the drainage systems • Law 48/1982 on protection of Nile River Water and Egypt waterways from pollution	
ESS4: Community Health and Safety	• Law no. 94/2003, Protection of communities Human Rights Laws	
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	▪ Egyptian Constitution has preserved the right of private property, Egyptian Constitution (1971, amended in year 1980) and Egyptian Constitution (2014, articles 33 and 35) ▪ Egyptian Civil code 131/1948, Articles 802-805 for private ownership right • Law No. 10 of year 1990 and its amendments by law No. 24 for the year of 2018, and law No. 1 for the year 2015 for property expropriation for public benefit	▪ The cut-off date: The WB identifies a cut-off date in order to prevent people influx to the project area. The Egyptian laws does not set a cut-off date, particularly if the impacts are related to agricultural lands that might experience changes in crops and tenancy. ▪ Monitoring and Evaluation: Monitoring or evaluation measures are not stipulated in Egyptian regulation. ▪ Valuation of compensation: Egyptian regulations use

ESS	National Laws	Gap
		prevailing price in the affected areas to calculate and compensate project affected people for their expropriated property. The prevailing price is assessed by a specialized committee created by the government. For crops, they are valuated according to the price lists developed by the agriculture directorate. Previous Egyptian experiences show that the full replacement principle as stated by ESS5 has not been realized by the affected group. • Income restoration (livelihoods): Egyptian law does not discuss compensation for loss of income, only land and assets.
ESS 10: Stakeholder Engagement and Information Disclosure	• EEAA EIA guidelines related to the Public Consultation prior to the project construction and implementation	• There are no regulations on committing the project owner to conducting stakeholder engagement activities as well as disclosing information regarding the environmental and social risks and impacts of the project to project-affected parties as well as to community members, throughout the project life cycle • There are no regulations on committing the project owner in establishing a grievance redress mechanism

3.3.2 Gap Analysis for Key Egyptian and WB Environmental Quality Limits

This section outlines the key environmental requirements of both the Egyptian Legislations and the World Bank policies and the gaps between both.

3.3.2.1 Air Quality

Table 24 shows Ambient Air Quality limits in the Egyptian legislations and WB/IFC standards.

Table 24 Ambient Air Quality limits in the Egyptian legislations and WB/IFC standards

	Requirements of Egyptian Legislation				**Requirements of WB/IFC**			
	Outdoor Air Pollutants (in urban and industrial areas) as per Article 34 of law 4/1994 amended by law 9/2009 and Annex 5 of the Executive Regulations amended by Decree 710/2012.				**Ambient Air Quality** as per OP 4.01 IFC General EHS Guidelines (Table 1.1.1 [13] [14])			
Exposure Period	1 hr	8 hr	24 hr	1 year	1 hr	8 hr	24 hr	1 year
Carbon monoxide CO ($\mu g/m^3$)	30 (urban and indus.)	10 (urban and indus.)	N/A	N/A	N/A	N/A	N/A	N/A
Sulphur dioxide SO_2 ($\mu g/m^3$)	300 (urban) 350 (indus.)	N/A	125 (urban) 150 (indus.)	50 (urban) 60 (indus.)	N/A	N/A	125 (IT-1) 50 (IT-2) 20 (guideline)	N/A
Nitrogen Oxides NOx ($\mu g/m^3$)	300 (urban) 300 (indus.)	N/A	150 (urban) 150 (indus.)	60 (urban) 80 (indus.)	200 (guideline)	N/A	N/A	40 (guideline)
Particulates PM_{10} ($\mu g/m^3$)	N/A	N/A	150 (urban) 150 (indus.)	70 (urban) 70 (indus.)	N/A	N/A	150 (IT-1) 100 (IT-2) 75 (IT-3) 50 (guideline)	70 (IT-1) 50 (IT-2) 30 (IT-3) 20 (guideline)
Particulates $PM_{2.5}$ ($\mu g/m^3$)	N/A	N/A	80 (urban) 80 (indus.)	50 (urban) 50 (indus.)	N/A	N/A	75 (IT-1) 50 (IT-2) 37.5 (IT-3) 25 (guideline)	35 (IT-1) 25 (IT-2) 15 (IT-3) 10 (guideline)
Total suspended particles TSP ($\mu g/m^3$)	N/A	N/A	230 (urban) 230 (indus.)	125 (urban) 125 (indus.)	N/A	N/A	N/A	N/A
Ozone O_3 ($\mu g/m^3$)	180 (urban) 180 (indus.)	120 (urban) 120 (indus.)	N/A	N/A	N/A	160 (IT-1) 100 (guideline)	N/A	N/A

[13] World Health Organization (WHO). Air Quality Guidelines Global Update, 2005.

[14] IT stands for Interim Target, which are the increment values that should be targeted by an organization during the implementation of a project leading to the recommended guideline values.

In case of any discrepancy between the requirements of Egyptian legislations and the requirements of the WB/IFC, the requirements of the WB/IFC will be applied. However, the Egyptian limits will be applied for the following cases:

- Carbon monoxide limits
- Sulfur dioxide limits for 1 hour, and 1 year
- Nitrogen oxide limits for 24 hours
- Total suspended particulates limits
- Ozone limits for 1 hour

3.3.2.2 Water Quality

Table 25 shows Egyptian legislations and WB/IFC standards concerning Water Quality.

Table 25 Egyptian legislations and WB/IFC standards concerning Water Quality

Requirements of Egyptian Legislations		**Requirements of WB/IFC**	
Reference	Requirements	Reference	Requirements
Executive Regulations issued by decree 92/2013 of Law 48/1982 (Article 49)	States the standards and specifications of fresh waterways quality to which industrial water can be discharged	OP 4.01 IFC General EHS Guidelines: Environmental	Projects with the potential to generate process wastewater, sanitary (domestic) sewage, or storm water should incorporate the necessary precautions to avoid, minimize, and control adverse impacts to human health, safety, or the environment.
Ministerial Decree No. 44/2000 of law 93/1962	Includes the quality of industrial wastewater discharged to the sewage network. The decree also states the entity should acquire the wastewater discharge licenses from the concerned authorities during the construction and operation phase	OP 4.01 IFC General EHS Guidelines: Environmental	Includes in Table 1.3.1 the indicative values for treated sanitary sewage discharges

Table 26 Limits for discharge of liquid effluent into sewer system

Parameter/Pollutant	Effluent threshold (ER 44/2000 of law 93/1962	Effluent threshold (WB/IFC requirements)
pH	6-9.5	6-9
BOD (mg/l)	600	30
COD (mg/l)	1100	125
Total nitrogen (mg/l)	100	10
Total Phosphorous (mg/l)	25	2
Oil and grease (mg/l)	100	10
Total suspended solids (mg/l)	800	50
Total Coliform Bacteria (Most Probable Number/100 ml)	N/A	400

In case of any discrepancy between the requirements of Egyptian legislations and the requirements of the WB/IFC, the requirements of the WB/IFC will be applied.

3.3.2.3 Noise

Table 27 Egyptian legislations and WB/IFC standards concerning Ambient Noise

Requirements of Egyptian Legislations		Requirements of WB/IFC	
Reference	Requirements	Reference	Requirements
Law 4/1994 amended by law 9/2009 and its ERs amended by decree 1095/2011 and 710/2012	Maximum allowable limit for ambient noise intensity	OP 4.01 IFC General Guidelines: Environmental Table 1.7.1	Limit of noise beyond the property boundary of the facilities.
Law 4/1994 amended by law 9/2009 and its ERs amended by decree 1095/2011 and 710/2012	Maximum noise limits in work environment	IFC General Guidelines: Occupational Health and Safety Table 2.3.1	Limit of noise exposure inside the work environment

Table 28 Limits for ambient noise as per Egyptian and WB/IFC requirements

Egyptian Law Permissible noise level			WB/IFC Permissible noise levels		
Area type	**Maximum permissible equivalent noise level [dB(A_{eq})]**		**Receptor**	**One hour L_{Aeq} (dB_A)**	
	Day	Night		Daytime	Night
	7 AM – 10 PM	10 PM – 7 AM		7:00 – 22:00	22:00 – 7:00
Sensitive areas to noise exposure	50	40	Residential	55	45

Egyptian Law Permissible noise level			WB/IFC Permissible noise levels		
Residential suburbs with low traffic flow	55	45	Industrial	70	70
Commercial and administrative areas in city center	60	50			
Residential areas with some workshops, administrative activities, or recreational and entertainment activities overlooking public roads less than 12 meters	65	55			
Areas overlooking public roads more than or equal 12 meters, or industrial areas with light industries	70	60			
Industrial Zone with heavy industries	70	70			

Table 29 Limits noise exposure in Work environments as per Egyptian and WB/IFC requirements

Egyptian Law Permissible noise level			WB/IFC Permissible noise levels		
Type of place and activity	**Maximum permissible equivalent noise level [dB(A)]**	**Exposure duration**	**Location/ activity**	**Equivalent Level, L_{Aeq}, 8 hrs**	**Maximum LAmax, fast**
a) Workplaces (workshops and industries) with up to 8-hour shifts (licensed before 2014)	90	8	**Heavy Industry (no demand for oral communication)**	85 dB(A)	110 dB(A)
b) Workplaces (workshops and industries) with up to 8-hour shifts (licensed since 2014)	85	8	**Light industry (decreasing demand for oral communication)**	50-65 dB(A)	110 db(A)

In case of any discrepancy between the requirements of Egyptian legislations and the requirements of the World Bank, the more stringent requirements will be adopted.

4 ENVIRONMENTAL AND SOCIAL BASELINE

This study assesses the environmental and social impacts of the proposed project. In addition, it helps to put in place appropriate mitigation measures for potential negative impacts and highlights the potential positive impacts of the project. This requires that baseline conditions be examined prior to such an assessment.

As part of the proposed project, five environmental baseline elements will be considered:

1. Site location
2. Ecological characteristics
3. Climate and meteorology
4. Natural characteristics
5. Ambient air quality

In addition, the following social baseline elements will be considered:

1. Socio-economic activities
2. Basic information about the project areas
3. Administrative areas
4. Demographic characteristics
5. Human development profile
6. Infrastructure, utilities and access to basic services
7. Health profile
8. Economic characteristics
9. Transportation
10. NGO

4.1 10th of Ramdan Location

The IWMF-10R, which hosts the proposed project, is located 5 km south of South East of 10th of Ramadan City which is located south of Sharqia Governorate. 10th of Ramadan is a city located 30.306503°N 31.741455°E of Sharqia Governorate on the Cairo-Ismailia desert highway, 46 km (29 mi) from Cairo and 20 km (12 mi) from the city Belbeis as shown in Figure 17.


Rasheed
رشيد
Damietta
دمياط
Alexandria
الإسكندرية
Port Said
بور سعيد
40
Damanhour
دمنهور
Desouk
دسوق
Mansoura
المنصورة
El-Mahalla
El-Kubra
المحلة الكبرى
Tanta
طنطا
75
Faqus
فاقوس
Sharqia
Governorate
Zagazig
الزقازيق
Ismailia
الإسماعيلية
Banha
بنها
10th of
Ramadan City
مدينة العاشر
من رمضان
Nile
Cairo
القاهرة
Madinaty
مدينتي
50
Suez
السويس
6th of
October City
مدينة السادس
من أكتوبر
New
Cairo City
مدينة القاهرة
الجديدة
Google
Ain Sokhna
العين السخنة

Figure 17 Location of 10th of Ramdan City

4.2 Ecological Characteristics of 10th of Ramadan

4.2.1 Natural Reserves and Protectorates

No natural reserves or protected areas are within or near the project site within at least 70 kilometers.

4.3 Climate and Meteorology in 10th of Ramadan City

4.3.1 Temperature

The 10th of Ramadan City is characterized by a moderate climate throughout the year. Figure 18 shows Meteoblue's temperature chart throughout 2019, with the highest summer temperature reaching above 40° C near May to June and then starting to moderate. In winter, the lowest temperature reached 5° C in January.

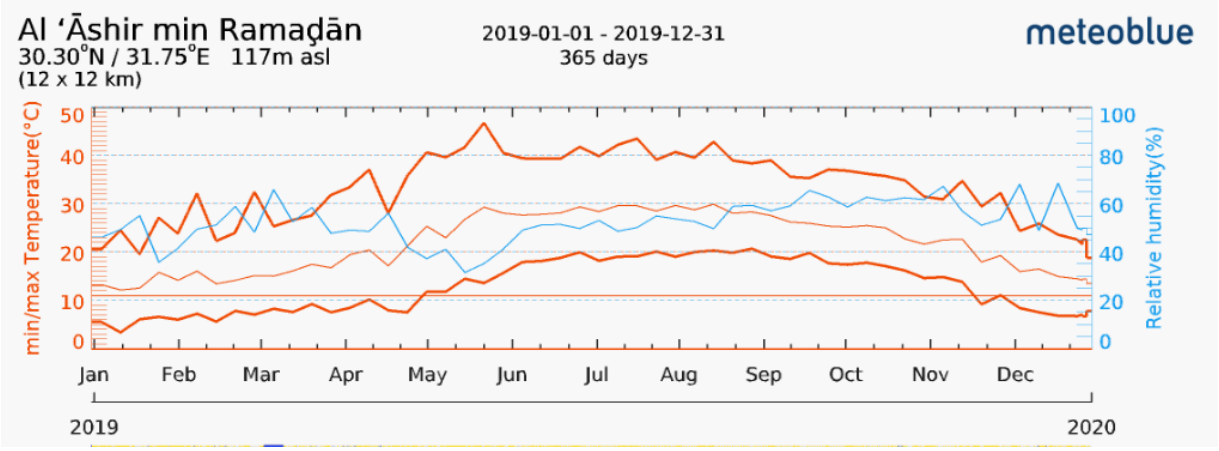


Figure 18 Temperature throughout the year 2019 in the 10th of Ramadan City (Source: Meteoblue)

4.3.2 Wind

Based on the meteorological data collected by Meteoblue for an average of 30 years (since 1985) using an hourly simulation model, a wind rose chart for the 10th of Ramadan City was modelled (shown in Figure 19). The wind rose shows the number of hours per year in which the wind blows from the specified direction. The northern direction prevails therefore the location of the IWMF-10R is located south east of 10th of Ramadan city (downwind) .

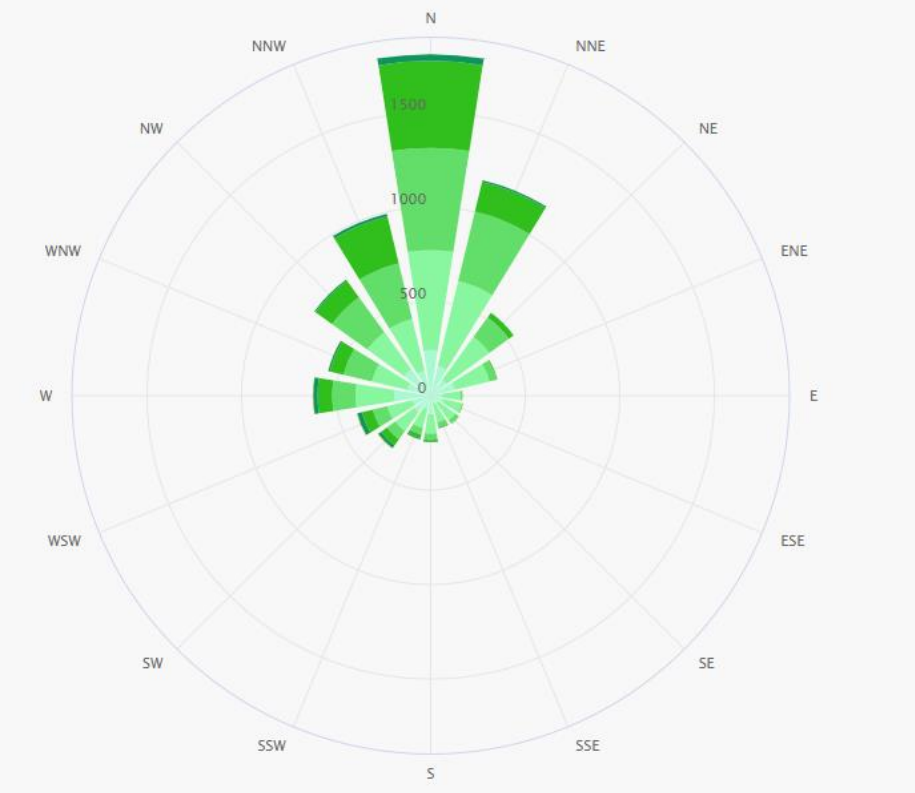


Figure 19 Wind rose in the 10th of Ramadan City (Source: Meteoblue)

Figure 20 shows wind speeds distributed by the number of days during each month, with an average wind speed of 19 km/ h.

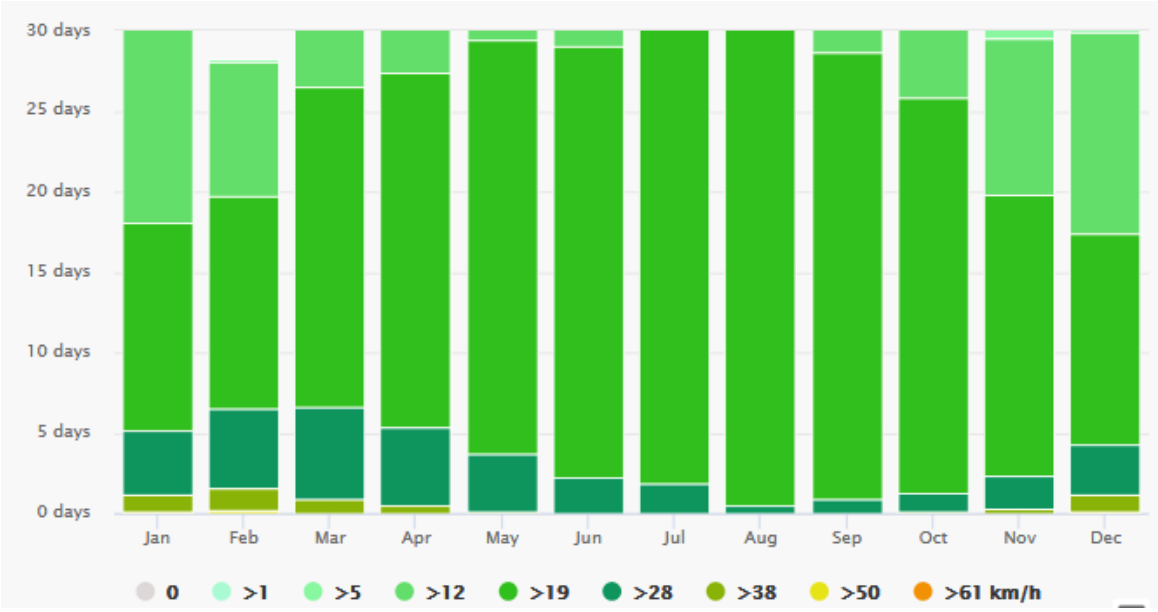


Figure 20 Wind speed distributed on days of the months in the 10th of Ramadan City (Source: Meteoblue)

4.4 Natural Characteristics of the Project Location

4.4.1 Proposed Project site Location

The proposed project will be in the 10th of Ramadan City south of Sharqia governorate in an unoccupied land of 1226 feddans. The location is about 46 km away from Cairo and about 20 km away from the city Belbeis. **Error! Reference source not found.** shows a map of the site location.

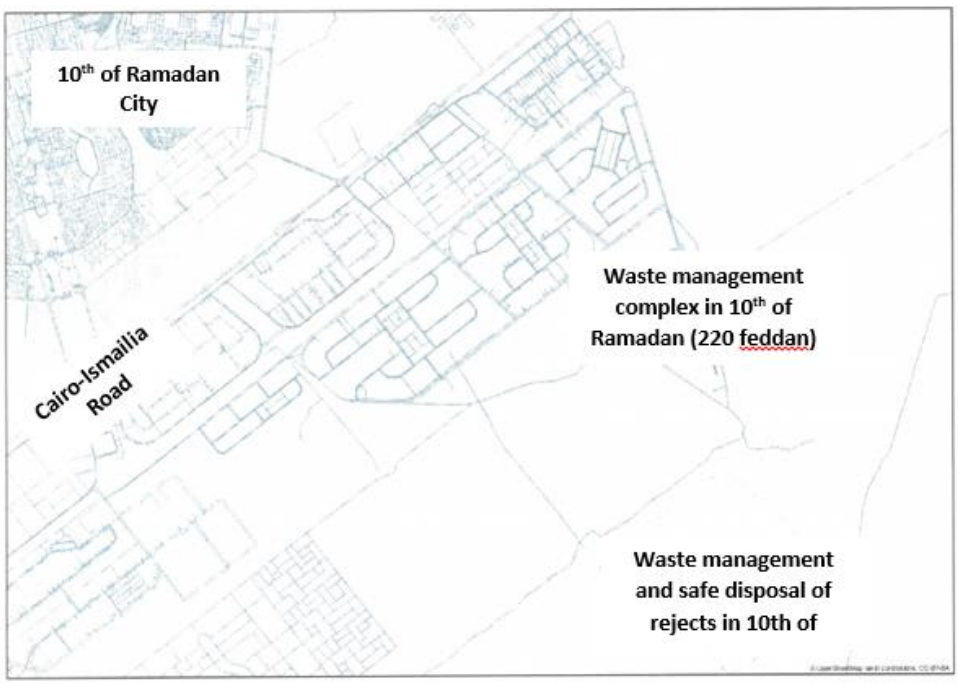


Figure 21 Proposed project location (Source: site-specific study)

The proposed project is located at the coordinates of longitude 31°50'0" and latitude 30°15'0". It is located very near to the industrial zone in the 10th of Ramadan City 5 km, and 9 km away from Badr City (Industrial Robiky), and can be accessed from Cairo via Cairo - Ismailia Desert highway.

The nearest residential area is located about 9 km away from the proposed project site (10th of Ramadan city). Figure 22 shows the project location on Google Earth.

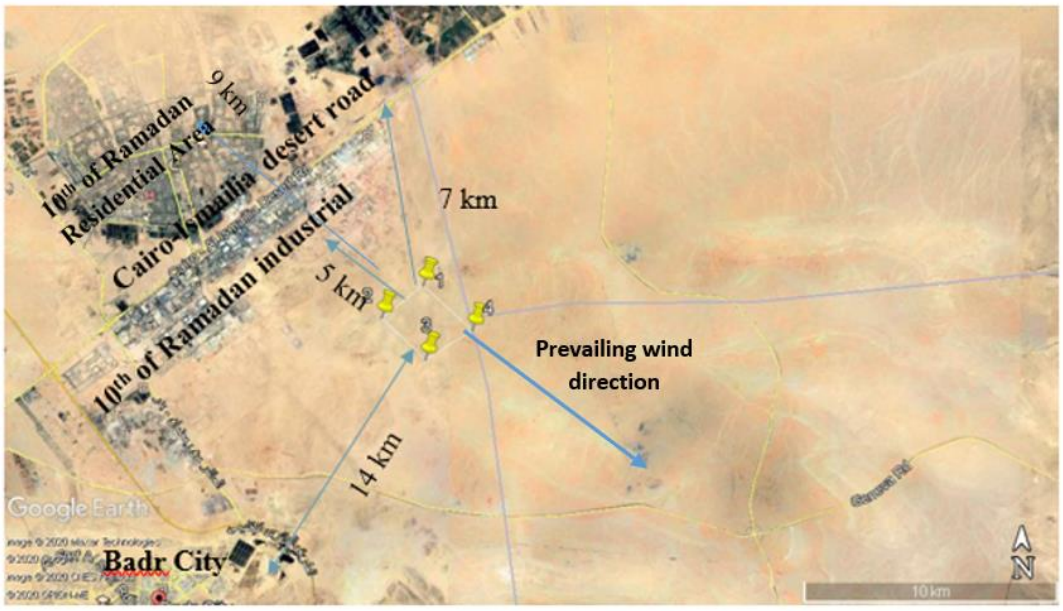


Figure 22 Proposed project location on Google Earth

4.4.2 Topography

The topographical site-specific study conducted by EnTrans Consulting on the 2nd of January 2020, showed that the land allocated for the project is located in the 10th of Ramadan City and within walking distance of the industrial zone of the10th of Ramadan City and Badr City (the Industrial Rubiky). It is characterized by its ease of flatness, where the weathering factors have a role in slaughtering sand levels and settling them over thousands of years, unlike water weathering during the rainy ages and the weathering of winds during droughts. There are some hills of medium altitude on the eastern border, as well as low fossil places west and south of the site, and they are topographic factors due to human activity.

4.4.3 Geology and Soil

The geological study of the project area is of great importance in order to determine the types of rocks and topsoil that will affect the engineering installations to be erected. The field geological study was prepared based on the published references and maps (Figure 23), in addition to field visits to the site to cover all its borders and studying the geological properties of the rocks. The sites of the ancient quarries were visited around the site boundaries, which revealed reveals of fine, sandy, sand deposits to rough, which were dominated by disintegration and incoherence, which are used in construction work in this region.

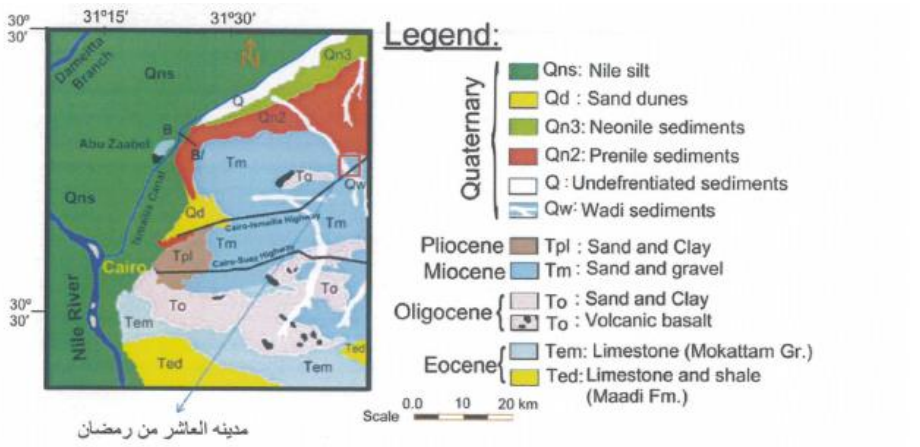


Figure 23 Geological map of the 10th of Ramadan City where it consists mostly of sand and some gravel and mud layers (Source: Site-specific study)

The geophysical electrical study aims at determining the rock sequence and the level of groundwater at the waste treatment site in the 10th of Ramadan City, "using geophysical electrical methods", as traditional electrical bouts are limited to a depth of 20 meters below the surface of the earth.

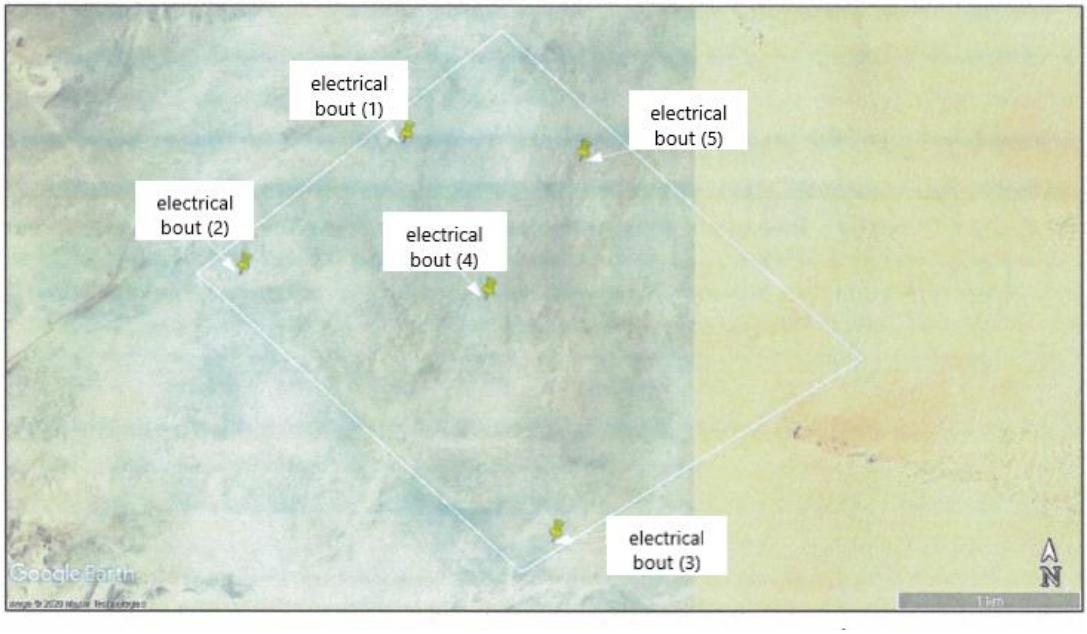


Figure 24 shows the locations of the electrical probes on the site.

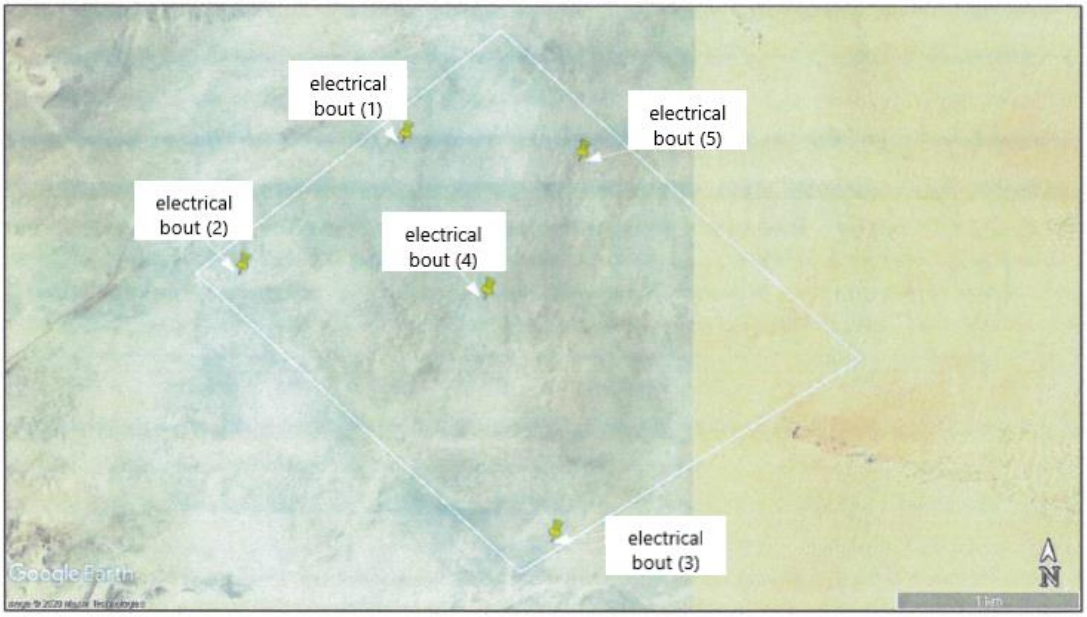


Figure 24 Electrical bouts locations in the project site (Source: Site-specific study)

Ground electrophysiological methods were used to make one-dimensional vertical ground electrostimulation (VES vertical electrical sounding) to determine the rock sequence and groundwater level in the area. This method is based on discovering the discrepancy between the layers beneath the Earth's surface based on the resistance received by an electric current of one ampere when it passes through a wire of material one meter in length and the area crossed by the unit. If an electric current pass through the water, the resistance is low, whereas if it passes through cavities or cavities, the resistance is high. This asymmetry, and the evidence it reflects, gives a rough idea of what is underground.

The inferred layers were bound together to make emulation and create a two-dimensional sector to clarify the continuation of the horizontal layers continuously or their disappearance or change, which explains the difference in the sedimentation environment or the sedimentation basins where the topographic situation during the deposition of the layers is not the current situation and this is due to climatic changes over time as shown in Figure 25.

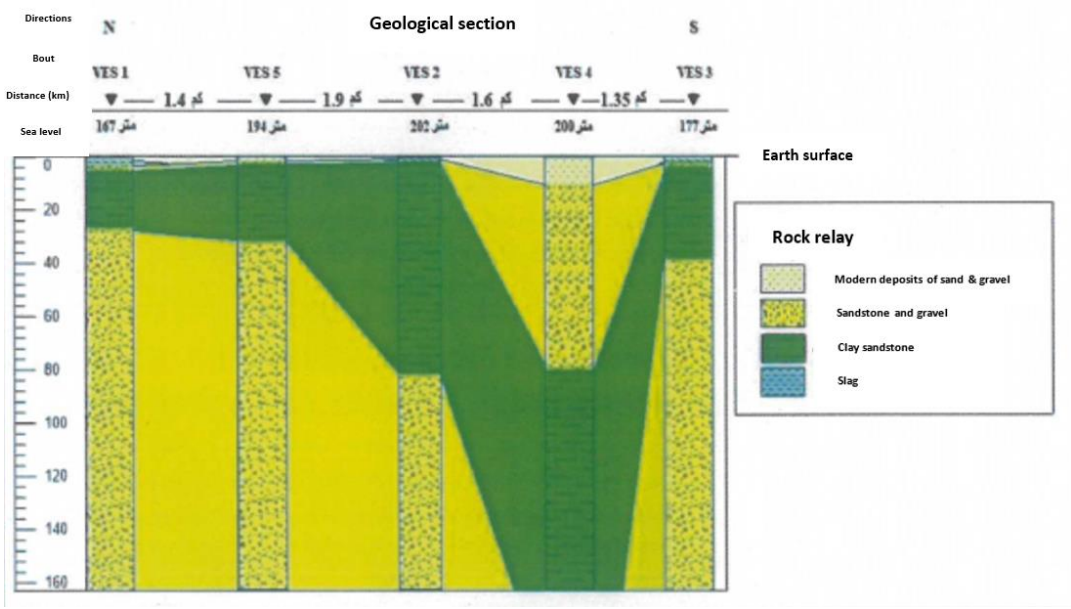


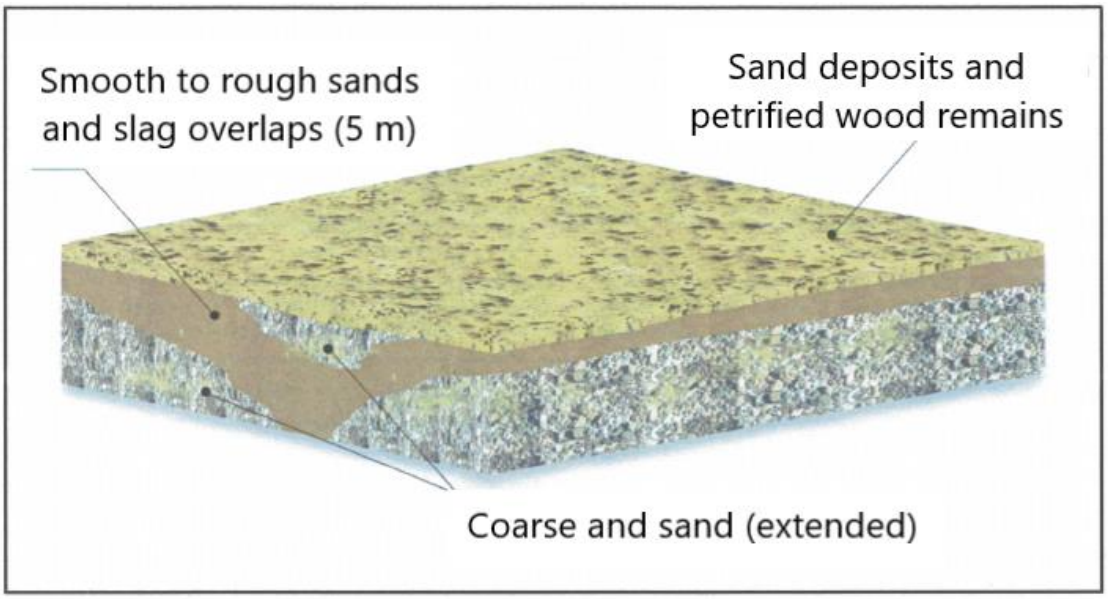
Figure 25 Cross section showing the thickness of the layers from the northern borders (electrical bout 1) to the southern borders (electrical bout 3) (Source: Site-specific study)

The geotechnical study aims to study the nature and properties of the soil at the project site. The study included electrical bout sounding and extraction and analysis of soil samples necessary to determine its natural and mechanical properties and to give suggestions and initial recommendations for the properties of the layers. The installations to be erected on the site are buildings of no more than four floors height, in addition to some metal trusses and fixed and mobile equipment.

The geological and geophysical site-specific study conducted by EnTrans Consulting on the 2nd of January 2020, showed that the region is geologically poor, as there is no diversity of rocks and surface soil up to 200 meters and its components are mostly made from coarse sands, sand, and some separations of small-thickened clay, with varying proportions of light brown silt. This geological homogeneity has increased the site's suitability for engineering and infrastructural work, especially since drilling soils can be used as backfill. The two studies also showed the scarcity of groundwater in the area, as the depth of the groundwater reaches beyond 150 meters below the surface and that the water in the underground reservoir is of high salinity and that its quantity is not large, flowing, or renewable, as it is considered one of the lowest production reservoirs. The geotechnical study conducted on November 2019, came in line with the results of the geological study, where it was found that the nature of the soil at the site consists of 3 main configurations which are sandy soil, which consist of graded sand from fine sand to medium sand mixed with gravel and some silt, then clay soils, which consist of clay silt to clay interference. And then the coherent soil, which consists of sandstone, with sand and silt brown sand overlays, starting from the current natural surface level to the end of the depth of the

excavation, where these formations overlapped with each other at different depths in the sixteen planks that were made for the site at a depth of 20 meters.

A complete analysis of the geological, geophysical and geotechnical study is attached in Annex 3. Based on the results achieved from the geological, geophysical and geotechnical studies, a three-dimensional model of the structure of soil layers on site was built (shown in Figure 26).



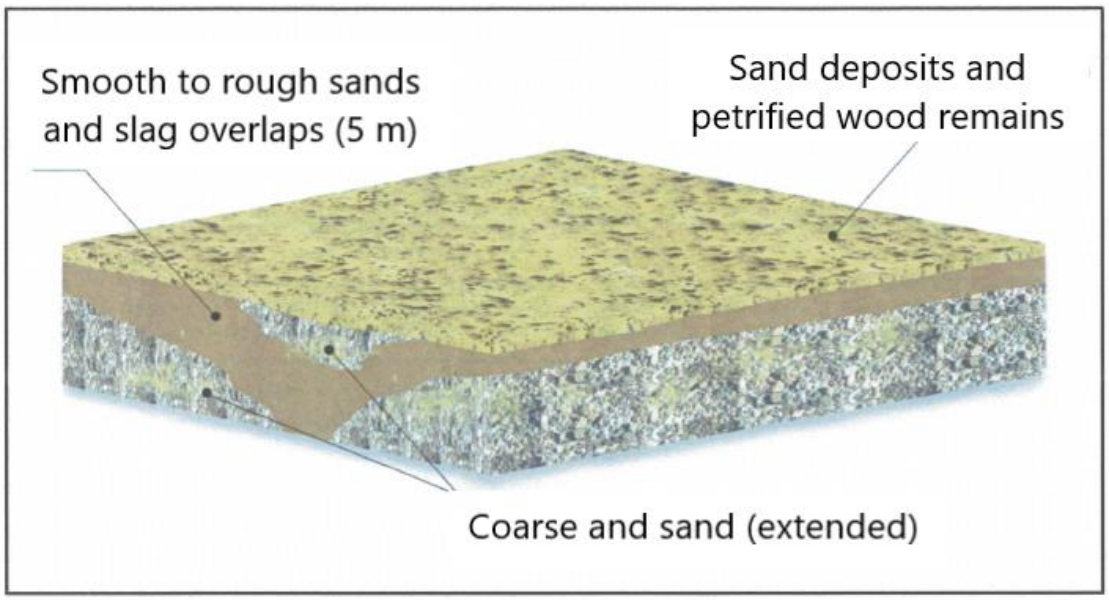


Figure 26 A three-dimensional model of the structure of soil layers on site (Source: site-specific study)

4.4.4 Seismic Activity

Seismic geology is intended to study the types of deformations in the earth's crust, such as faults or cracks and folds. One of the reasons for faults is the forces of pressure and tensile forces that cause stress on the rocks of the rough crust and cause it to break. Seismic activity and seismic risk assessments are critical to ensure the structural safety of facilities and installations.

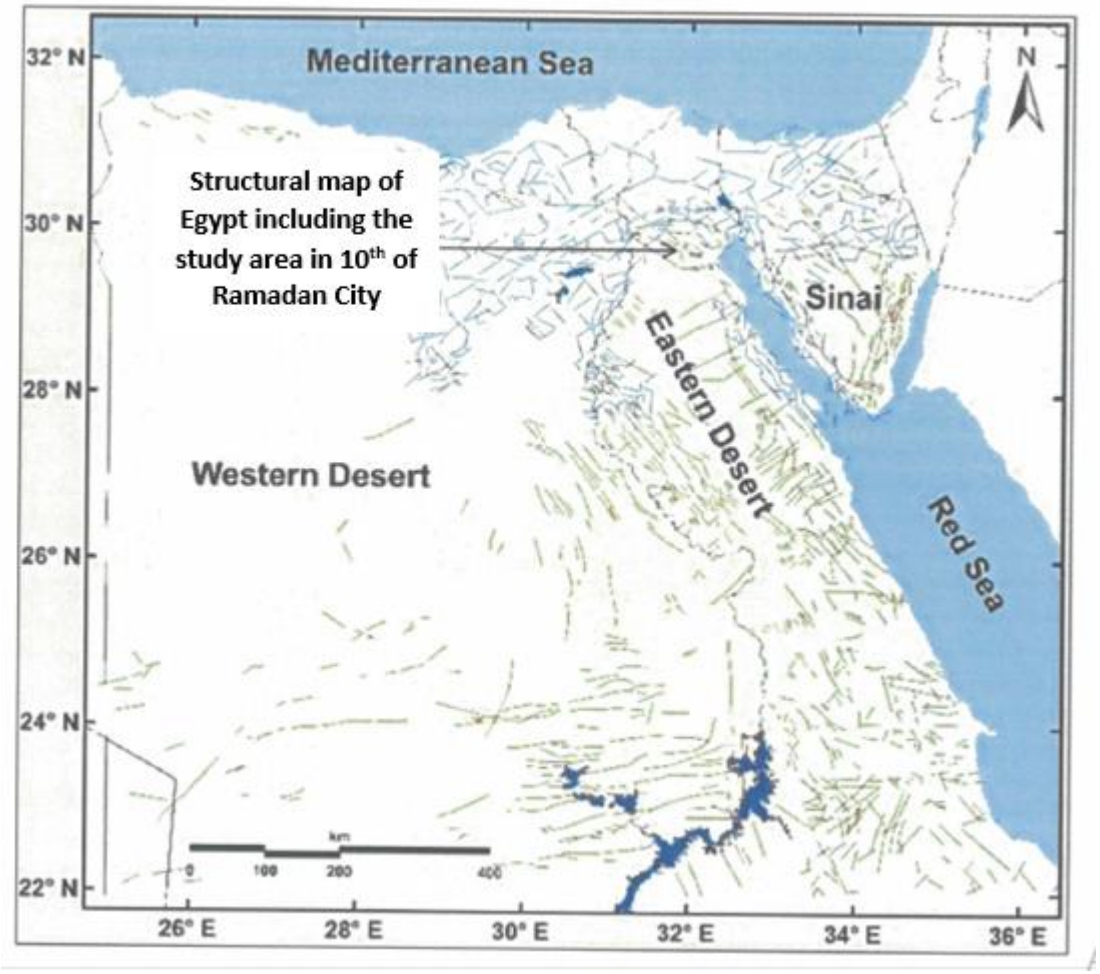


Figure 27 shows the synthetic map of the Arab Republic of Egypt.

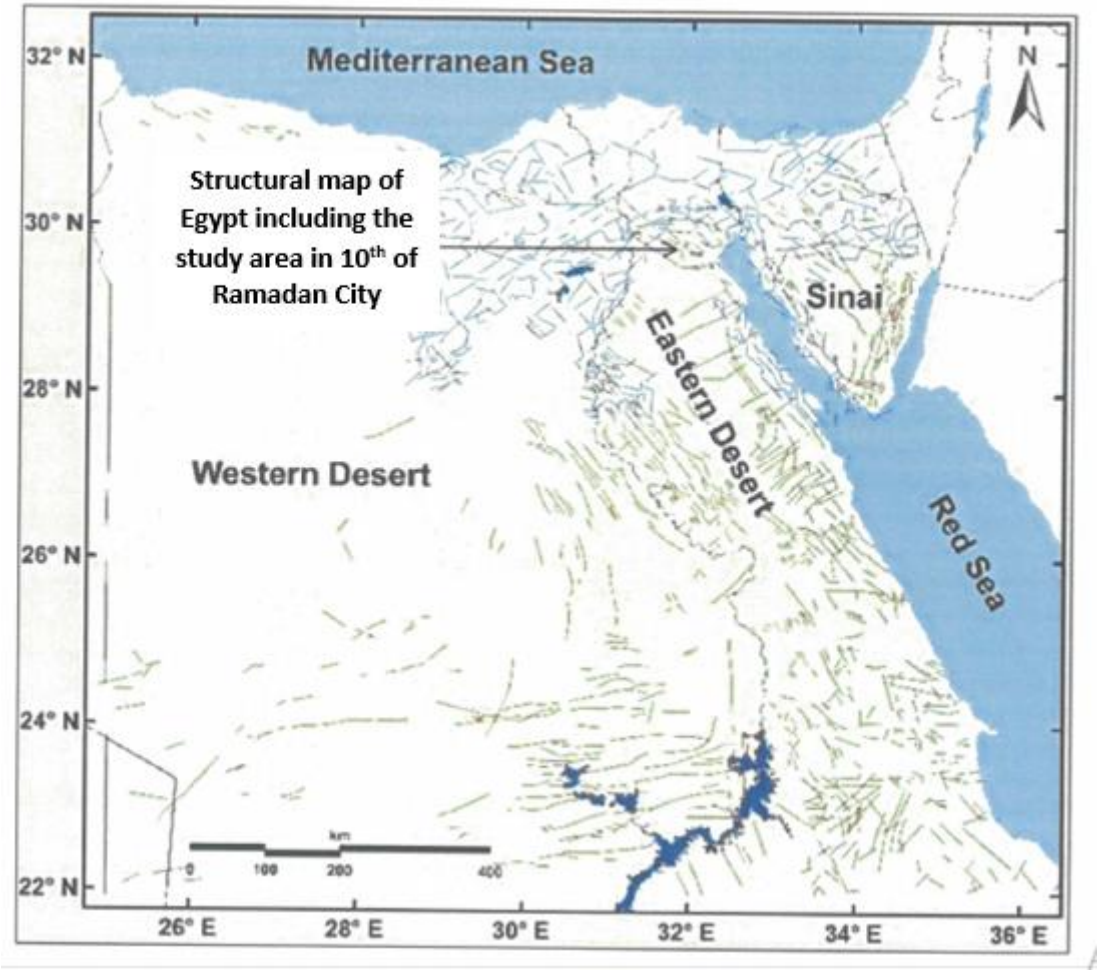


Figure 27 The seismic map for Egypt including the project location (Source: Site-specific study)

The site-specific seismic study conducted by EnTrans Consulting on the 2nd of January 2020, showed that the proposed site is seismically stable as it is far from the areas that are considered active in Egypt, and **therefore the chances of the site being exposed to earthquakes are weak.**

A complete analysis of the seismic study is attached in Annex 4.

4.5 Traffic

Traffic studies are one of the important requirements to know the impact of the waste treatment site and the safe disposal of treatment rejections to be created on the surrounding traffic network; these studies help in making decisions regarding land uses, as they provide sufficient information for decision-makers regarding the impact of each of the different land uses on traffic and traffic liquidity. In the area surrounding the project to be

constructed, the studies also help decision-makers in determining the quality and size of the development required for the type and size of development required for the road network based on the volume of traffic expected in the future. Traffic studies also give an assessment of the current situation as well as the future status of the network. Traffic study is one of the important requirements for obtaining licenses for all kinds of establishments according to the law in the Arab Republic of Egypt. Figure 28 shows the different roads networks in the project location.

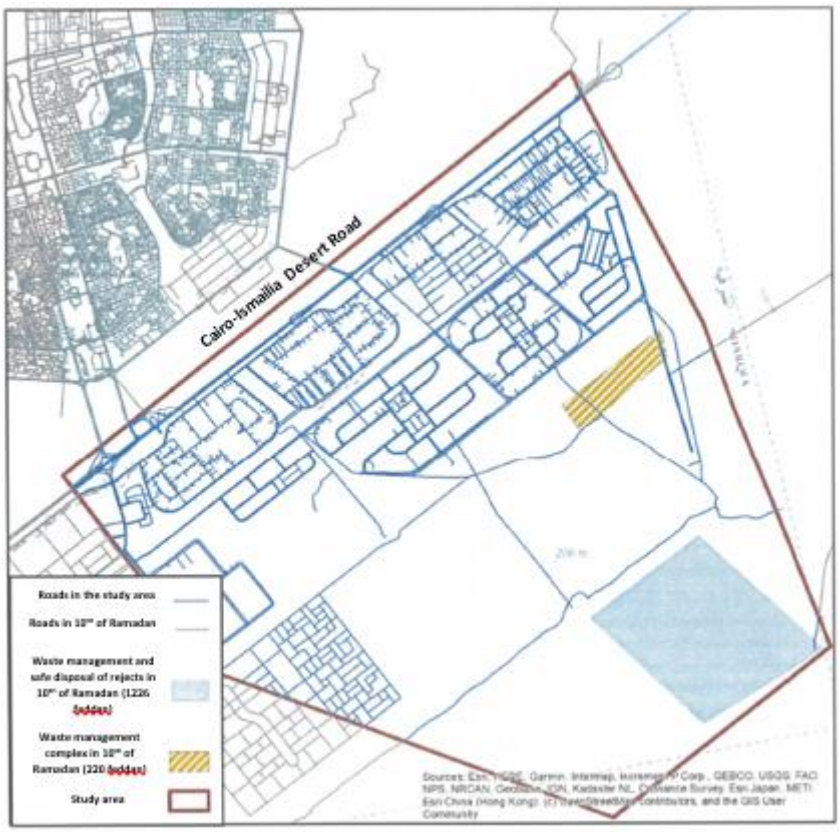


Figure 28 The different roads networks in the project location

This study aims to:

1. Evaluate the project's impact on traffic characteristics and the level of service on the road network and the streets surrounding the site for the current and future situation
2. Study intersections around the site to find out the level of service for the current and the future situation
3. Estimate the size of the expected fleet of transport vehicles to cover the governorates of Cairo and Qalyoubia to determine the volume of traffic at intersections in the project site for the current and future situation

4. Propose solutions and deal with challenges that may arise in the current and future situation

The study is based on the following methodology:

1. Description of the road network surrounding the proposed site
2. Calculating the traffic volumes in the network in the current situation during the morning peak times and the evening
3. Calculating the generation of trips to the waste treatment site and the safe disposal of treatment rejections and their impact on the road network in the future situation in the morning and evening peak times
4. Evaluating the level of service in the road network in both the current and future conditions in the morning and evening peak times
5. Calculating the number of vehicles expected after entering from the site gate and before the weighing process in front of the entry scale based on several scenarios and counting several time periods until the capacity of the parking lot is determined

The 10th of Ramadan City which follows Sharqia Governorate administratively is located in the north-eastern side of Greater Cairo, 55 km from Cairo and 30 km from Belbeis City, at 46 km on the Cairo-Ismailia Desert Road and is connected to the provinces of East and Central Delta, the Canal and Sinai by a network of highways, in addition to its proximity from Cairo International Airport. The city has two entrances on the Cairo / Ismailia Desert Road, the first is at 51 km and the second is at 56 km. Figure 29 shows the functional classification of the roads around the project location.

Figure 29 The functional classification of the roads around the project location

According to the pilot study conducted to calculate the traffic volumes in the network in the current situation, it has been concluded that morning peak times are (6:00 AM – 10:00 AM) and that the evening peak times are (3:00 PM-7:00 PM). Below Figure 30 shows 3 intersections that have been restricted to traffic, as well as each intersection separately and the traffic that was recorded on it.

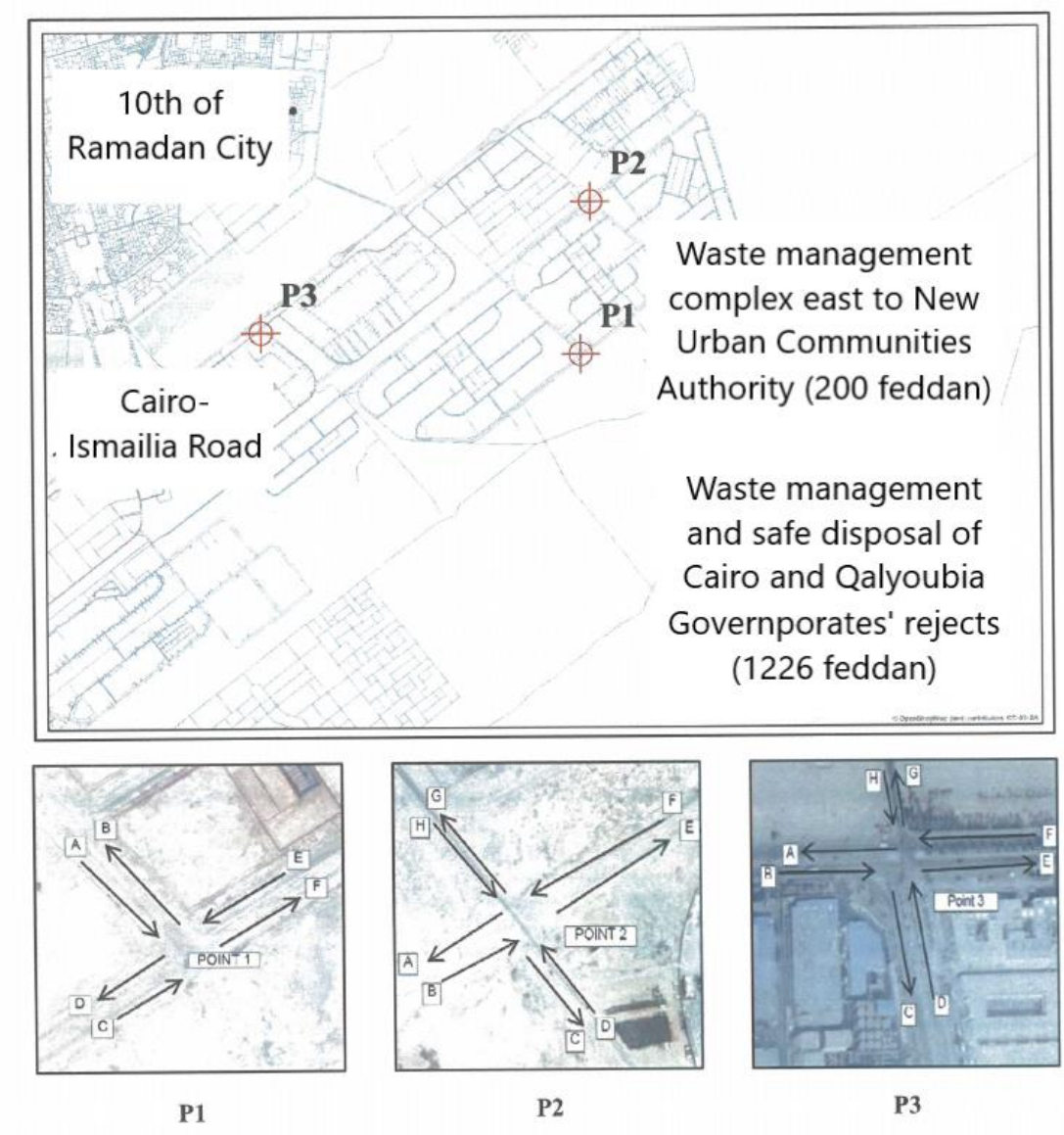


Figure 30: Traffic in the project location

During the field survey, it was also noted that the volume of traffic on some of the roads is very small, and consequently, the minimum traffic size on the network is assumed to be 10 vehicles / hour. Figure 31 shows the inventory data was analyzed and the presence ratios for each type of vehicle were calculated at rush hour.

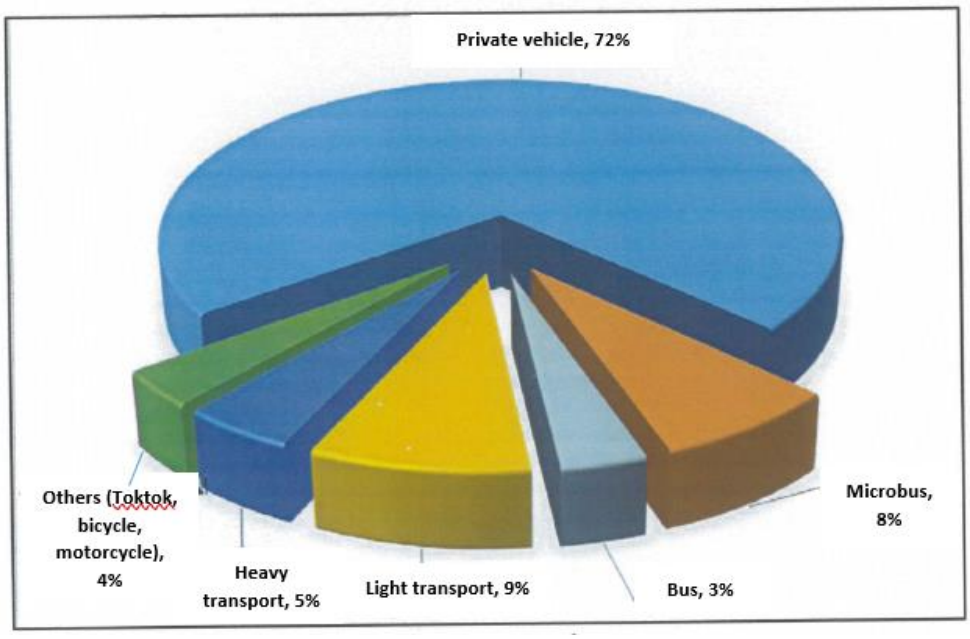


Figure 31: Vehicle types in the project area

In conclusion, the traffic site-specific study conducted by EnTrans Consulting on the 9th of January 2020, showed the following:

- Current situation: The service level for all intersections and turns is "excellent"
- Year of commencement of operation: The service level for all intersections and turns is "excellent"
- Five years from start-up: The service level for all intersections and turns is "excellent"
- Twenty-five years from the start of operation: The service level for all intersections and turns is “acceptable”, except for one intersection where the service level is “bad”. But given that the evaluation is done for twenty-five years, the level of service in general is considered “acceptable”
- The number of vehicles awaited after entering was obtained from the main portal of the site and before the weighing process in front of the entry scale based on several scenarios and for different time periods, so that the capacity of the parking lot is determined based on the design period and operating scenarios

A complete analysis of the traffic study is attached in Annex 5.

4.6 Ambient Air Quality in the Project Location

The general objectives of the study of ambient air quality are:

- Defining the baseline for air quality, which helps in estimating the project's impact on the natural, biological environment of the surrounding area
- Ensure compliance with local regulatory limits for ambient air quality

4.6.1 Air Quality Assessment

The ambient air quality site-specific study was conducted by EnTrans Consulting for six locations (shown in Figure 32) from October 19, 2019 to November 5. 2019. Tables (23-25) demonstrate air quality results for the prevailing wind direction in the project site.

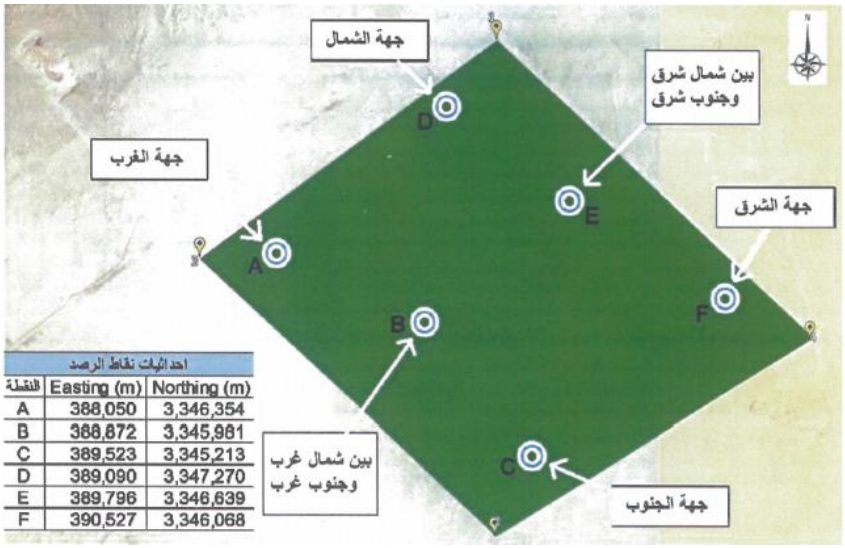


Figure 32 Six measurement locations on the project site (Source: Site-specific study)

Table 30 Total suspended solids measurements for the North direction (over 24 hours)

Location	Concentration (µg/m^3)
North	28
Permissible limits of Law 4/1994 for Environmental Protection and its amendments according to Law No. 9/2009 and the executive regulations issued in 1995 and its amendments No. 710 in 2012 and 964 in 2015.	230

Table 31 Heavy metals in the total suspended solids measurements for the North direction (over 24 hours)

Element	Cr	Si	Fe	Mn	Ni	CU	AL
Concentration (mg/m^3)	0	0.05	0.05	0.1	0.01	0.003	0
Permissible limits of Law 4/1994 for Environmental Protection and its amendments in October 2005.	5	20	5	5	1	20	1

Table 32 Gaseous emissions concentration in the North direction (over 24 hours)

24-h of Measurement	NO_x	CO	SO_2	O_3
Concentration (PPM)	0.008	-	0.013	-
Permissible limits of Law 4/1994 for Environmental Protection	150	-	125	-

In conclusion, the ambient air quality study showed that the suspended particles, heavy metals, nitrogen oxide (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO) and ozone (O_3) measured from all four directions of the project (North-South-East-West) over 24 hours of the monitoring program are in accordance with the maximum permissible limits of Law 4/1994 for Environmental Protection and its amendments according to Law No. 9/2009 and the executive regulations issued in 1995 and its amendments No. 710 in 2012 and 964 in 2015. The emissions are also complying with the World Bank emission standards.

A complete analysis of the ambient air quality study is attached in Annex 6.

4.6.2 Rainfall

The purpose of the hydrology study is to present the work of hydrological and hydraulic studies of the site. It includes the work of visiting the site, identifying the rainwater collection basins that affect the project location, and analyzing the rain data and hydrological calculations necessary to estimate the maximum behaviors resulting from the collection basins. It also includes specifying the engineering foundations, design standards and applicable specifications that will be adopted in preparing the hydraulic design for the required drainage facilities to ensure the safety of the site.

The paths of the valleys affecting the project location were determined by using the digital height model DEM (90x90 m). Figure 33 shows the digital height model used to simulate the natural land in the project location and the slope of the natural land within the site from the south to the north where the southern border of the site is located on a high region that descends to the north. Determining the assembly basins and the paths of the valleys affecting the project study is a major part of the hydrological study; it was audited around the intersection by using surveying and field visits.

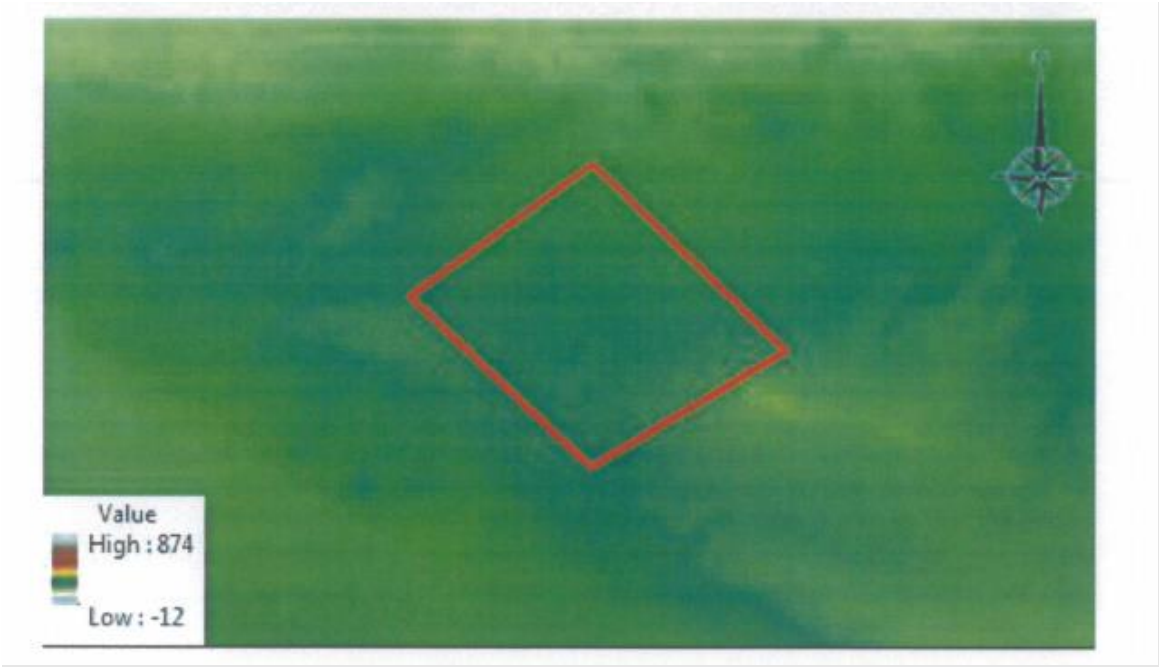


Figure 33 DEM model for the project location (Source: Site-specific study)

The effective valleys are produced internally from the site and dealt with during the site's internal planning. It is worth noting that the valleys' paths and their aggregate areas must be audited to ensure their intersection with the project location, as well as the characteristics and limits of the aggregate area of each valley. This audit was done based on satellite imagery, topographic maps, and surveying along the borders and inside the site, in addition to field visits. Figure 34 shows the paths of the valleys inside the project site.

Figure 34 The paths of the valleys inside the project site (Source; Site-specific study)

The hydrological site-specific study conducted by EnTrans Consulting on the 9th of January 2020, showed that the site is characterized by its easy geographical nature, without mountains or hills, with its height proportions and the absence of any field evidence of the

existence of valleys (as shown in

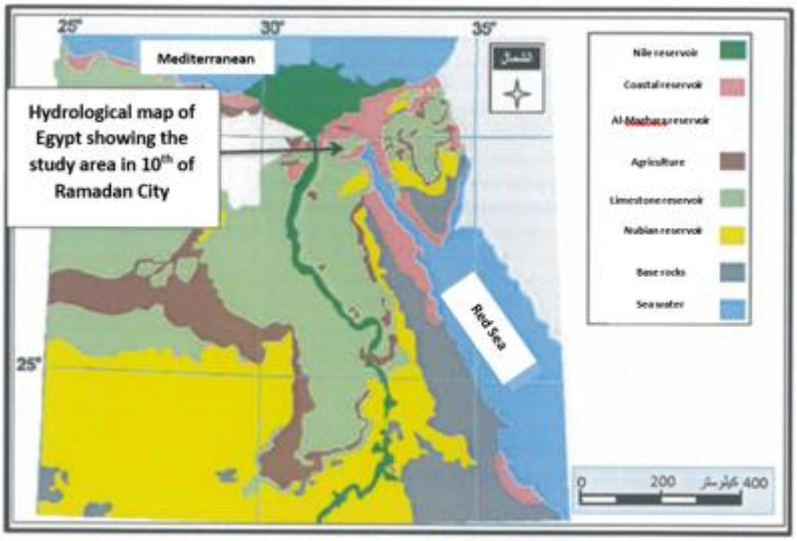


Figure 35). Therefore, it was found that there is no need to implement actions to ward off external flood hazards. As for rainwater that rains inside the site, it is dealt with through the internal planning of the site to drain the rainwater.

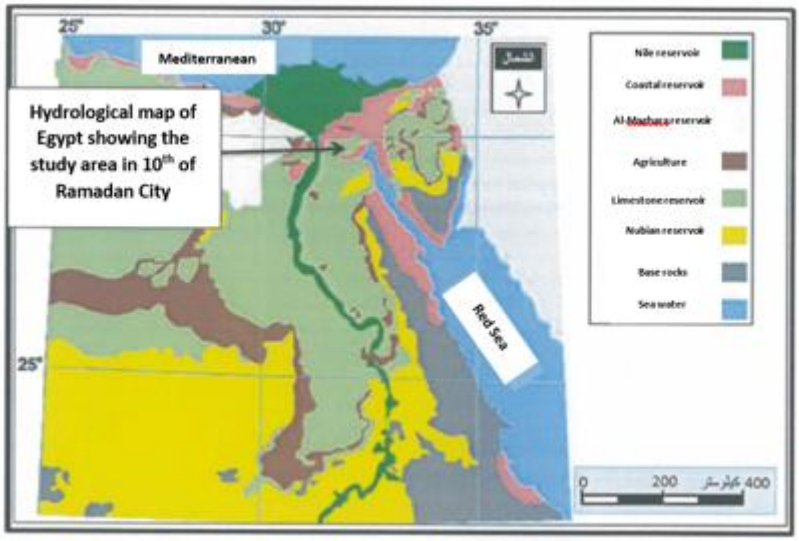


Figure 35 The hydrological map of Egypt including the project location (Source: Site-specific study)

The rainfall site-specific study conducted by EnTrans Consulting on the 9th of January 2020, showed that for 18 years, the highest value was 10.4 mm while the lowest value was 1.4 mm.

A complete analysis of the hydrological study is attached in Annex 7.

4.7 Socio-Economic Baseline

This section includes a description of the baseline socio-cultural characteristics of the social environment at the proposed project areas. It will highlight the following: basic information about the project areas, administrative areas, demographic characteristics, human development profile, access to basic services, health profile, economic characteristics, transportation, services, and NGOs.

4.7.1 General Background

The proposed project site is located in the southeast 10th of Ramadan city in an uninhabited desert area, behind the industrial areas, South of Sharqia Governorate. The nearest residential areas to the project site are the residential area in 10th of Ramadan City about 9 km, and Badr city located at around 14 km away.

The social baseline data focuses on the 10th of Ramadan City, as it is the closest residential area to the project site.

4.7.2 SharqiaSharqiaSharqia Administrative Divisions

10th of Ramadan city is administratively attached to the Urban Communities Authority, and it is considered one of the cities of the first generation (new cities). It was implemented in 1980 in order to mitigate the population pressure within Cairo governorate and within the urban areas, and to create job opportunities for youth, as it is the largest industrial zone in Egypt. The area of 10th of Ramadan reaches about 398 km^2 which equivalent to 95 thousand Feddan,[15] Table 33 shows the administrative division of the city in accordance with its strategic planning in 10th of Ramadan City Authority.

Table 33 Administrative Division of project areas

Division	Area	
Residential	12768 Feddans	53.63 km^2
Industrial	26193 Feddans	110 km^2
Services and tourism	11222 Feddans	47.13 km^2
Green belt and agricultural lands	41357 Feddans	173.7 km^2
Regional Roads	3221.9 Feddans	13.53 km^2

[15] A feddan (Arabic: فدّان, faddān) is a unit of area. It is used in Egypt, Sudan, Syria and the Sultanate of Oman. In Egypt the feddan is the only non-metric unit which remained in use following the switch to the metric system. A feddan is divided into 24 kirat (Arabic: قيراط, qīrāt) which equals 175 square meters.

Source: Database of 10th of Ramadan City Information Centre, 2017

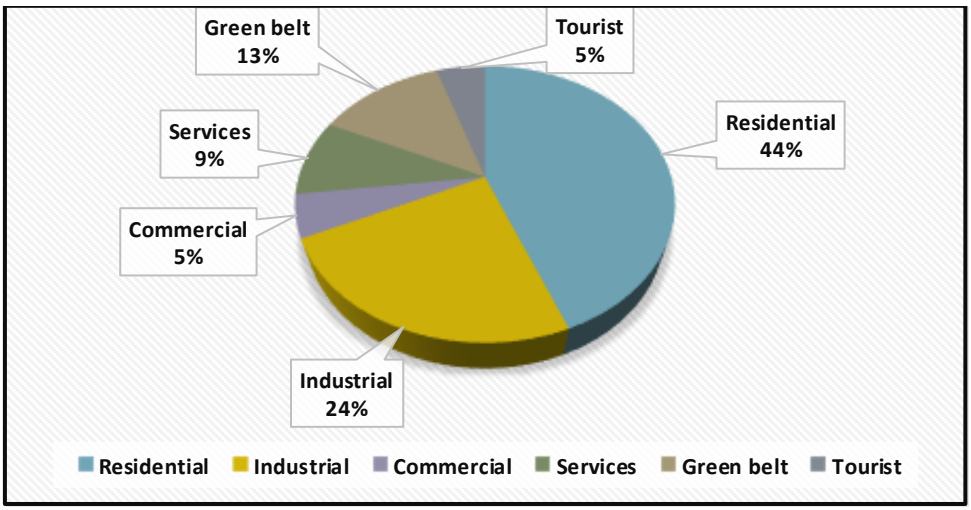


Figure 36 Percentages of land use distribution

Source: 10th of Ramadan City Information Center

10th of Ramadan City is located 55 km away from Cairo, passing through El Obour and El Shorouq cities. It is connected to Delta region via Sharqia Governorate, and to the Canal cities via Rubiky, passing through Badr city and Ismailia desert road. It is about 65 km away from Ismailia city and 45 km away from Al Zakazek city, passing through Belbees city. The population of 10th of Ramadan city reaches 650,000, in addition to 150,000 visitors, and it is expected to reach 2.1 million in 2032[16].

4.7.3 Land Use and Distribution in the Project Area

The land of the project is located is located in southeast 10th of Ramadan city, behind the industrial areas. The project site is 9 km away from 10th of Ramadan agency, and about 5km from the industrial zone.

The land surrounding the project site is desert lands devoid of structures, residential blocks and farmlands. The geographical boundaries, and surroundings land use of the project site will be described as below:

- The project land is located in the desert back in the strategic planning of Southern area of 10th of Ramadan City. The project's land is free from any economic activities or installations. The area is devoid of any facilities. The history of the project land use has been traced through satellite maps (Google Earth) from 2010 to 2019; the maps did not show any previous works or uses of the proposed project site
- The nearest facilities to the project site are in the north and west (the industrial areas of the city), about 5 km away

[16] 10th of Ramadan City Information Center, 2017

- The nearest residential block to the project site is located in the north and it is about 9km away from the project site, the area represents the center of the city and the main services area
- There is an agricultural reclamation area 12 km from the project site in the northeast direction
- The project area is surrounded by a network of main roads; Cairo-Ismailia Desert Road about 6.3 km, Regional Ring Road about 12 km, and 10th of Ramadan Belbeis Road about 10 km away

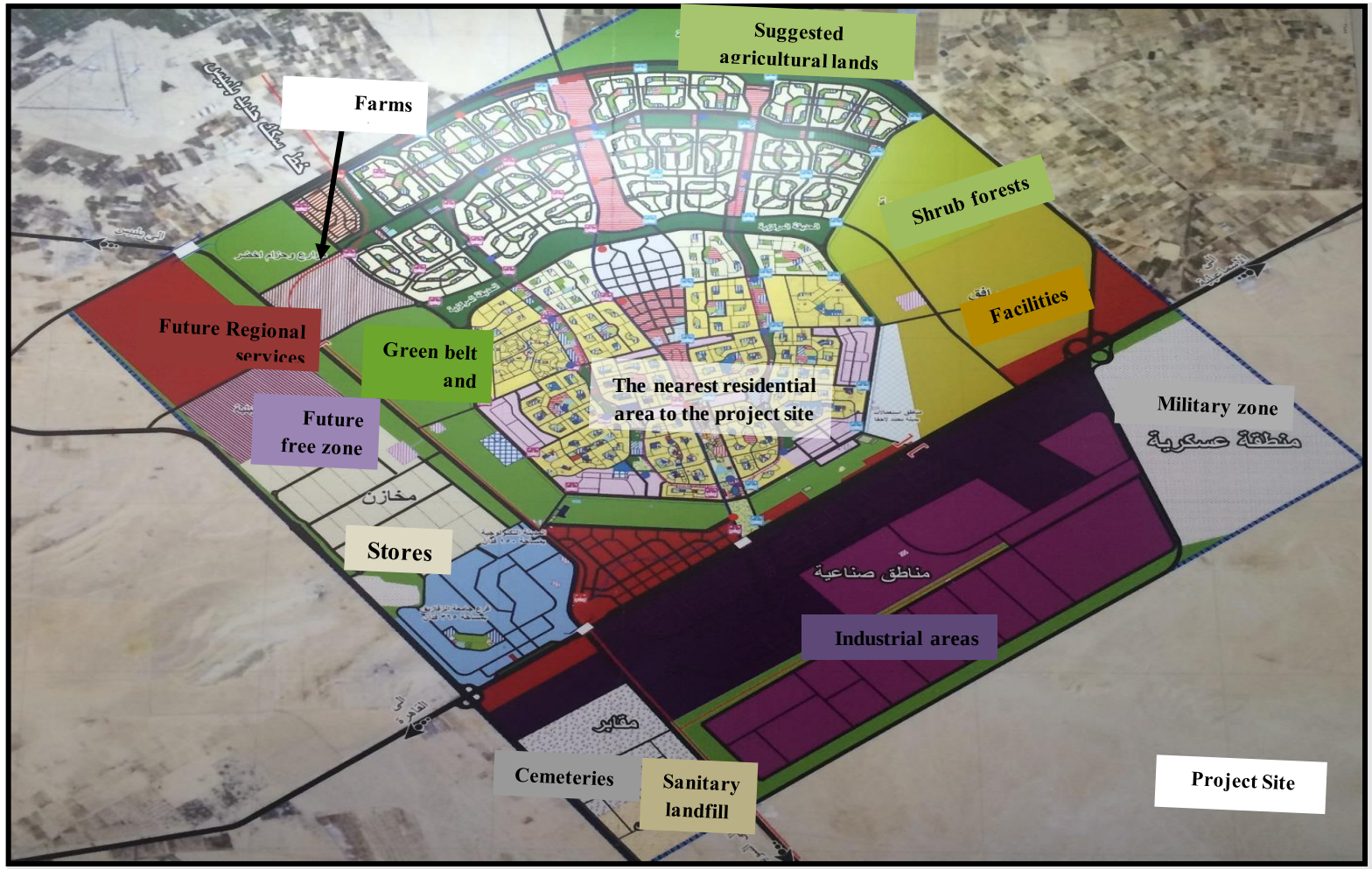


Figure 37: Strategic Plan for 10th of Ramadan City

Source: 10th of Ramadan City Information Center

4.7.3.1 Land Uses in 10th of Ramadan City According to Strategic Planning

The data of the 10th of Ramadan City Authority indicates the percentages of land use distribution.

4.7.3.2 The 10th of Ramadan City Location of Nearby Ports and Airports

- The new administrative capital is about 35 km
- Cairo International Airport is about 45 km
- Port Said port is about 140 km
- Suez port is about 90 km
- The port of Ain Sokhna is about 135 km

4.7.4 Demographic Profile

4.7.4.1 Population

The population of Sharqia Governorate reached about 8,000,000 in 2019 (CAPMAS 2019), which represents 8% of the total national population. About 77% of the total population lives in rural areas, 23% living in urban areas in 2019, with total population growth rate for both that reaches 3%[17]. Further information about the population in the project area is presented in Table 34.

Table 34 The Number of Population and Households in the Project Area

Area	Households	Population		Total Population
		Male	Female	
Sharqia Governorate	1,904,170	4,168,973	3,831,027	8,000,000
10th of Ramadan	162,213	360,000	290,000	650,000

Source: Sharqia Governorate official website, 2019, 10th of Ramadan City Information Center, 2018

4.7.5 Social Services Profile

4.7.5.1 Education

According to 10th of Ramadan City Information Center 2017, there are (65) government, private, and Azhar schools in 10th of Ramadan city, and (66090) students at all academic levels.

(5) Schools of basic education, (1) experiment school, and (1) secondary school for girls are under implementation.

For university education, there are Higher Technological Institute which includes (Engineering – Administration - Computing Science and Information Systems)

[17] Sharqia Governorate official website, 2019.

departments, and (14230) students. In addition to Hayat Abu Ghaly University (Azhar) which includes (Islamic studies – languages) departments, and (2230) students.

There is a branch of Al Zakazek University under implementation in 10th of Ramadan city, the land of the university had been developed in Al- Maarefa village.

Table 35 Number of educational structures available in 10th of Ramadan

Area	Number of Educational Structures				
	Primary	Secondary	Technical Education	Al-Azhar Education	Private High Education
10th of Ramadan	28	4	14	14	5

Source: New Urban Communities Authority, 2018.

4.7.6 Infrastructure, Utilities and Services

4.7.6.1 Access to Electricity

10th of Ramadan City, 45,000 km of electricity networks have been implemented in the city. Nine power stations with a total capacity of 905 MVA have been implemented (according to New Urban Communities Authority).

Currently, 10th of Ramadan City is supplied by (2) stations with a capacity of 220 MW and 500 MW per station, this supplies 9 stations with capacity of 16/11. In view of the expansions of the city, lands were allocated for the construction of 8 stations to meet expansions, as well as (3) stations with capacity of 220/60, which required the strengthening of the existing network

4.7.6.2 Access to Potable Water and Sanitation

The 10 of Ramadan city is supplied by potable water from two water purification stations numbers (1 and 2) with capacity of 570 m3/ day and 20 m3/ day wells station, according to New Urban Communities Authority.

4.7.6.3 Commercial Services

According to 10th of Ramadan City Information Center 2017, there are (85) malls including shops and administrative units, in addition to (400) shops with various activities, other than the commercial services within real estate investment projects.

4.7.6.4 Transportation

External Transportation

10th of Ramadan city is connected to Belbes - Al Zakazek – Cairo cities and the capitals of the surrounding governorates by (35) buses of East Delta buses and (654) private microbuses.

Internal Transportation

There are 11 lines for transportation inside the city with total (580) bus, in addition to (625) taxi. A regional bus stop is under implementation (Source: 10th of Ramadan City Information Center).

4.7.6.5 Various Services

Table 36 shows other services available in the 10th of Ramadan City

Table 36 Various service structures in 10th of Ramadan

Area	Number of structures							
	Bakeries	Youth center	Clubs	Department of Social Affairs	Social Units	Traffic Unit	Fire station	Police station
10th of Ramadan	22	1	3	1	5	1	12	2

Source: New Urban Communities Authority, 2018.

4.7.7 Health

Table 37 shows the health services available in 10th of Ramadan.

Table 37 Health services available in 10th of Ramadan

Area	Number of health structures			
	Private hospital	Health centers	Health Insurance Hospital	Ambulance
10th of Ramadan	13	11	1	16

Source: New Urban Communities Authority

4.7.8 NGOs

There are 72 associations working in social work in 10th of Ramadan city as shown in Table 38.

Table 38 Distribution of NGOs in 10th of Ramadan city according to work areas

Work area	Number
Local and industrial development	29
Family and childhood care	27
charitable works	32
Investment	1

Environment	1

The above table shows the intensity of the civil work in 10th of Ramadan City and the diversity of the work fields, which works on supporting the social work in the city and promoting the well-being of all sectors of the population and workers of the city, which would bring benefits to all the population of the city.

4.7.9 The informal sector for solid waste collection

The ESMF social baseline data indicates the presence of the informal sector of solid waste collection in Greater Cairo Governorates. This sector plays a vital role in the solid waste management system in these governorates.

The informal sector for solid waste collection in Greater Cairo consists of two main categories, namely:

1. **The Traditional Garbage collectors**: This is the classical "Zabbaleen" group that currently also includes contractors and workers in the field of garbage collection, sorting and utilization. They depend on collecting solid waste from houses and shops, then selling recovered recyclables to factories and workshops after sorting and separating organic waste which is predominantly used in feeding to their livestock (Pigs).Garbage collectors' work depends on the family business, and roles are distributed within the family according to age and gender. Women and girls heavily engaged this field through participation the family business particularly in the recyclables recovering and sorting.
2. **Other Non-traditional Informal Groups:**

a. **Street Containers Waste Pickers (*Al Nabashin*):** Those are the groups of waste pickers who roam around predominantly in urban area and try to salvages reusable or recyclable materials thrown away by others to sell or to use for personal consumption. Although there is difficulty to have a clear inventory of this groups due to their part time on and off nature of business, observations are suggesting that they represent the lowest percentage in the informal sector for solid waste management. They work individually (less likely on family business mode) and waste picking in most of the cases is only a partial source of livelihoods for them.

b. **Donkey-carts and Tricycle Operators:** This group operates in full time mode in **Donkey-carts and Tricycle Operators:** Members of group likely own donkey carts and/or tricycle that they are using to roam around the street waste piles to recover recyclable materials and/or to pass by households and collect they waste bags. The consultation conducted in Qalyubia Governorate clearly revealed that this group role is not very much appreciated by the Governorate and they are predominantly seen as a group that is outlaw (unlicensed) and that does not care about the public health and interest by creating a mess in the street to pick the recyclable materials. They are still operating in Qalyubia Governorate, and the table below presnts their distribution according to gender and area of operation. They are around 130 males and females of different age groups.

c. **Disposal Sites Full-timer Waste Pickers**; This groups operates in full time mode in final disposal locations. Waste picker in Abu Zabaal location are the most relevant to this project. They are around 35 males of different age groups. They operate full time in the dumpsite with also some connection to existing street piles and containers. Although it is not very clear at this stage how the closure of the dumpsite will take place in terms of selection of this dumpsite among other, phasing of work, technology and closure options…etc, it is very likely that this group is among the most vulnerable to the planned closure activity due to the anticipated risk of losing their livelihoods.

The 10th of Ramadan is a relatively new city, and its solid waste management system depends on the formal sector, the informal sector does not contribute to this system.In spite of this, the proposed project could have potential impacts during operation on a category of the informal sector present in the Qalyubia Governorate; they are the Disposal Sites Full-timer Waste Pickers.

5 POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION

This section presents assessment of the potential risks and impacts of the proposed project (Qalyoubia landfill and the C&D waste treatment facility). Impact assessment seeks to establish the potential environmental and socio-economic effects of the proposed project and assess these effects against the current baseline. Using a systematic and evidence-based approaches, this section evaluates the impacts of the project activities on sensitive physical, biological and human aspects presented as follows:

1. Air quality
2. Noise
3. Soil, geology and hydrology
4. Resource efficiency and pollution prevention
5. Solid and hazardous waste
6. Ecology and Biodiversity (flora and fauna)
7. Risk of inappropriate labor and working conditions
8. COVID-19 pandemic
9. Community health and safety
10. Traffic
11. Land use, landscape and visual issues
12. Natural disaster risk
13. Risk of child labor
14. Temporary labor influx
15. Risk of gender-based violence (GBV)
16. Culture heritage
17. Land acquisition
18. Employment Opportunities
19. Air Quality improvements in Cairo and Qalyoubia

The methodology used in assessing the impacts draws upon a number of guidance documents, including:

- Egypt's principles and procedures for environmental impact assessment, 2009
- IFC environmental, health and safety guidelines on waste management facilities
- Sanitary Landfill Design and Siting Criteria Guidance published by World Bank as an urban infrastructure note updated in 2004
- Egyptian code of Design Principal and Implementation Conditions for Municipal Solid Waste Management Systems

The legislative context of the assessments undertaken are provided in section 4.

Several environmental impacts (positive and negative) associated with the proposed project were identified through field visit, desktop analysis and the use of experts' judgment. The project's impact assessment is developed using the following steps:

- Characterizing the baseline conditions
- Describing the project's components and activities throughout the construction and operation phases
- Evaluating the project's alternatives to assess if an impact can be reduced
- Conceptual identification of the impacts resulting from the proposed project during the construction and operation phases
    - Describing the studied aspect, its potential impact, its source and Conceptual assessment (negative or positive, short, medium or long-term, low impact or high)
- Rating the impacts using evaluation matrix that follows rating method for severity and frequency of impacts
- Identifying mitigation and enhancement measures to address the impact

5.1 Overview of the Environmental and Social Aspects

The proposed project will result in positive and negative impacts. The following subsections present a Conceptual assessment of the impacts resulting from the proposed project during construction and operation phases and closure and post closure activities.

5.1.1 Construction Phase

Table 39 Conceptual identification of the environmental and social impacts resulting from the proposed project during construction phase shows Conceptual identification of the environmental and social impacts resulting from the proposed project during construction phase.

Table 39 Conceptual identification of the environmental and social impacts resulting from the proposed project during construction phase

Aspect	Description	Possible impacts	Source	Conceptual assessment
Risks & Negative Impacts				
Air quality	**Gaseous emissions:** Emissions from machinery used for construction (e.g. excavator and wheel loader); Emissions (e.g. CO, NOx and SO_2) from the exhausts of vehicles used to transport workers, construction materials and basic equipment.	**Gaseous emissions:** Impacts on ambient air quality are expected. However, the vehicles and machinery present point sources. Accordingly, under normal conditions any effects witnessed on a local-scale will be of a temporary nature and restricted to the immediate point of exhaust emission	Construction work, vehicles and machinery	Negative Low Short term
	Dust emissions: Dust emissions are expected to occur during the construction phase due to the on-site construction activities such as land preparation and excavation also in addition to the movement of the construction vehicles can generate some fugitive dust.	**Dust emissions:** Adverse health impact on the respiratory system of the workers	Construction work, vehicles and machinery	Negative High Short-term
	Odor Emissions: Minimal odor emissions are expected to occur during the construction phase from chemicals, oils and paints used during the construction.	**Odor emissions:** No significant impacts are expected to occur.	Construction work, vehicles and machinery	Negative Low Short-term

Aspect	Description	Possible impacts	Source	Conceptual assessment
Noise	Activities such as site preparation, civil works, construction and installation could potentially lead to an increase of noise and vibration levels. The main receptors for noise and vibration will be workers and nearby projects.	Health effects on the hearing system of workers and nearby receptors. The site is located in a desert area in 10th of Ramadan. It is located at around 7 km away from the nearest road (Cairo – Ismailia Desert road), around 5 km from the industrial area and around 14 km from Badr City. Accordingly, the noise impacts are not expected to be major, as most of the machinery noise will be effectively attenuated by this distance. In addition, construction activities will not be operational during the late hours; therefore, the impact on evening averages of ambient noise will be minor.	Construction activities, which are expected to be carried out throughout the day time.	Negative High Short-term

Aspect	Description	Possible impacts	Source	Conceptual assessment
Soil, geology and hydrology	The construction of landfill cells will involve major excavations to reach the design depth. Movement of heavy trucks would loosen the soil by pressure from the wheels and expose them for easy erosion by wind. The heavy machinery, vehicles and equipment will require repairs and maintenance including washing. This may lead to spillage of oil during changing and repairs, generation of waste like engine filters, grease, and scrap materials may lead to soil contamination at the project site.	• Effects on topographical features. Hence, changes in the water drainage properties may occur and lead to diversion of surface water to undesired places. • Soil erosion may be caused by exposure of soil surfaces to rain and wind during site clearing, earth moving, and excavation activities. Soil erosion may lead to increased dust emissions. • Soil storage area may block the landscape view at the site. • Soil storage to be used as covering material, if accumulated in a stock pile, it needs to be protected from being swept away by rain and also not to cause dust emissions.	Construction activities (mainly excavations of cells). Machinery and equipment.	Negative Medium Short-term

Aspect	Description	Possible impacts	Source	Conceptual assessment
Resource Efficiency and pollution prevention	There will be an increase in energy consumption during the construction phase as a result of the transportation of materials and construction equipment to the project site as well as the equipment used to prepare the site (e.g. trucks), and there will be an increase in overall resource consumption of water, equipment and raw materials during construction phase.	Air pollution and the negative health effects of exhaust emissions from construction equipment and vehicles. However, emissions are not likely to be significant. The amounts of fuel combustion, consumption of raw material for construction such as concrete and water consumption are not specified. However, the project is not expected to significantly use water and construction raw material. Efficient use of energy in terms of controlling running vehicles and equipment should be in place.	**Energy consumption** There will be an increase in energy consumption as a result of increased construction equipment. **Water Consumption** The water will be used for construction work, as well as the workers consumption of water at the site	Negative Low Short-term

Aspect	Description	Possible impacts	Source	Conceptual assessment
Solid and hazardous waste:	Other than the excavated soil described earlier, construction activities may potentially generate solid waste that consists of municipal waste, construction waste and some hazardous waste from project activities. Waste is expected to include the following categories: <u>Hazardous Wastes.</u> • Used oils & Insulation materials, if any • Empty containers, such as paints. <u>Non - hazardous solid waste</u> • Construction debris (concrete, bricks, sand and gravel) • Packaging materials • Damaged products • Inert construction / demolition materials; • Refuse, such as metal scrap, wood and empty containers • Sewage from workers <u>Municipal waste</u> From workers in site	Negative effects on the environment in case of improper disposal of solid on the surrounding community and its associated impacts of visual disturbance, odor and even open burning. The hazardous waste streams should be properly handled and safely stored and disposed of. Otherwise, it will increase traffic when moving waste to designated landfills / disposal sites or taking up and requiring more areas in landfill to host the waste generated in case no proper waste management practice is in place (reduce, reuse and recycle). Sewage could be pumped out and discharged in the adjacent wastewater treatment plant otherwise it can cause contamination to soil.	Construction waste from the project site	Negative Medium Short-term

Aspect	Description	Possible impacts	Source	Conceptual assessment
Ecology and Biodiversity (flora and fauna)	Natural habitats in the area can be affected by construction and installation activities.	As biodiversity in the project location is limited (desert area), minimal impacts is expected on diversity environmental and biological.	Construction activities	Negative Low Long term

Risk of inappropriate labor and working conditions	The construction and the operation phases of the project will entail the deployment of large number of workers with different technical background. Workers will be exposed to health and safety risks from site construction activities. Construction activities are among the most dangerous and exposed to accidents in any work environment. Exposure to construction site hazards can expose workers to injuries. In the meantime, there is a risk that the hiring conditions of the labor might entail any discriminatory or unfair treatment. According to standards, each worker must have accurate information about their vulnerability to hazards or injuries in the workplace.	Listed below are the main six construction site hazards identified by the Occupational Safety and Health Administration (OSHA), all of which will be encountered during the construction of the different components of the project 1. **Excavation and Trenching** – OSHA has recognized excavation and trenching as the most hazardous construction site operation. 2. **Fall** - falling from scaffolding more than 6 feet or a steady ladder at a distance of more than 20 feet are among the most serious hazards at the site of construction and the most common. 3. **Stable and mobile stairs** - Fixed and mobile stairs are important causes of injuries and disasters among construction workers. 4. **Scaffolding** - The most likely hazards are due to the movement of the scaffold components, their collapse due to damage to their component, loss of load, suspension of a suspended material, electric shock or malfunction.	Construction activities	Negative High Long -term

Aspect	Description	Possible impacts	Source	Conceptual assessment
		5. **Heavy construction equipment**. The main causes of such accidents include the injury of workers when the equipment is returning reverse or when the direction of the equipment is changed or when the brakes do not work properly. 6. **Electricity** - electricity is a major risk to people both at home and at work. Electricity line workers, electricity technicians and electricity engineers are constantly exposed to electricity and face daily risks. In addition to the health and safety risks, workers may encounter inappropriate working conditions or risk of complaints that are not appropriately addressed…etc. In the meantime, certain groups of workers might be running the risk of discriminatory procedures in hiring under the project (e.g. women, persons with disability)		

Aspect	Description	Possible impacts	Source	Conceptual assessment
COVID-19 pandemic	The projects involves a large work force and there will also be regular flow of parties entering and exiting the site. Given the complexity and the concentrated number of workers, the potential for the spread of infectious disease in the project is extremely serious, as are the implications of such a spread. The project must also exercise appropriate precautions against introducing the infection to local communities.	Transmission and spread of COVID-19 resulting in a large number of the work force becoming ill Project may become a threat and introduce infection to local communities Project's progress is slowed down	Construction activities	Negative High Long -term
Community Health, Safety, and Security	Possible impacts on community health, safety and security including from the construction related work as well as the risk of labor influx	The project is located in a desert area with limited community and surrounding activities. In addition, site access will be restricted by security personnel. Traffic, noise and waste control can affect the surrounding community if not handled properly.	Construction activities	Negative Medium Short-term
Traffic	Increased traffic flow on roads leading to and from the construction site	Traffic jams and increased exposure of travelers and road users to exhaust and associated noise and possible accidents.	Movement of trucks while transporting materials and workers to and from the site	Negative High Short-term

Aspect	Description	Possible impacts	Source	Conceptual assessment
Land Use, Landscape and Visual Issues	Construction activities effects such as concrete, excavations, building material. Infrastructure and underground utilities: Due to excavations of cells, possible damages to existing infrastructure such as underground gas pipeline and electricity lines.	Land use on site. Effects of construction activities on landscape character. Visual impact of construction activities. Possible damage to existing infrastructure during excavation.	Construction activities	Negative Low Short-term
Natural disaster risk	Earthquakes Flooding	Negatively impact the time schedule of the construction activities and may cause injuries or fatalities to the workers.	Natural causes	Negative High Short-term
Risk of child labor	Child labor is a common practice in Egypt that is prohibited by law yet is practiced in many sectors including construction, predominantly by sub-contractors.	Child labor is a common practice in Egypt. According to Egyptian Labor Law No.12/2003, child labor is prohibited especially in dangerous works. Children below 18 are favorable labor as they receive low salaries and they are less demanding. There is a risk that this common practice is used in the project. This risk should is carefully handled in the ESMP and monitoring should be applied to ensure contractors adherence	Construction activities	Negative, Medium, short-term

Aspect	Description	Possible impacts	Source	Conceptual assessment
Temporary Labor Influx[18]	having large workers in small cities or villages might result in unfavorable impacts on the project areas	Generally speaking, having large workers in small cities or villages might result in unfavorable impacts on the project areas in terms of: • Overconsumption of community resources • Influx of additional population, Increased pressure on accommodation and rents • Increased risk of communicable diseases and burden on local health services • Increased risk of illicit behavior and crime It is likely that impacts related to labor influx will be relevant in the project due to the anticipation of large number of workers who will likely need to be accommodated in either labor camps or in residential units in the nearest location. .	Construction activities	Negative, Low short-term

[18] The number of workers expected in the project during the construction period is not known yet; the mitigation measures that will be applicable should be further elaborated at a later stage in case it is proven to be medium or high risk. This will be decided depending on the size of labor influx expected,

Aspect	Description	Possible impacts	Source	Conceptual assessment
Risk of Gender Based Violence (GBV)	This risk is related to the risk of labor influx as mentioned above. With the anticipated labor influx, the project can lead to an increased risk of Gender Based Violence, with women and girls are particularly vulnerable to this risk.	As per the WB 2016 Labor Influx Guidance Note, the scale of labor influx and the absorptive capacity of the local community indicate the significance of the anticipated risk of GBV. The project can lead to an increased risk of Gender Based Violence, as women are particularly vulnerable within the context of construction projects. Gender based violence can be manifested through multiple behaviors including: • Sexual harassment of women and girls, • Exploitative sexual relations.	Construction activities	Negative, Medium, short-term
Culture heritage	Possible impacts on culture heritage or finding antiquity objects during excavation.	The project is located in a desert area with no designation of culture heritage. Although the landfill site does not have any nearby antiquities or cultural heritage sites, the extensive excavation that will be carried out could lead to finding any antiquity or culturally valuable object. However, the possibilities for such chance-finds are not high.	Construction activities	Negative Low Short-term
Indigenous people	Possible impacts on indigenous people	The project is located in a desert area and there is no reported indigenous people.	Construction activities	Not applicable

Aspect	Description	Possible impacts	Source	Conceptual assessment
Land acquisition, restriction on land use and involuntary resettlement	The land of the IWMF-10R was a vacant land owned by the Government and the allocation of this land did not result in any risk related to involuntary resettlement or loss of livelihoods. Yet, the land needed for the infrastructure is now yet determined and there is a potential risk that this will result in assets expropriation or impacts on livelihoods.	The land is a state-owned property. Accordingly, there will be no impacts related to land acquisition or impacts related to physical displacement. There are no encroachments and individuals making livelihoods out of the project land. For the risk related to the land for the infrastructure, this is currently covered under the RF and further instruments could be prepared (e.g. RP) is needed.	Project implementation.	Negative, low, short-term
Positive Impacts				

Aspect	Description	Possible impacts	Source	Conceptual assessment
Employment Opportunities	It is not known yet the number of workers expected in the project during the construction period; However, this type of project is expected to provide a large number of job opportunities to skilled and semi-skilled	• Improve the living conditions of a number of individuals by creating new jobs. • •Many variables affect the number and type of workers needed at a specific time during the construction phase, including project component, nature of work required, and time plan, amongst others. • The project is expected to result in the creation of job opportunities. The local community could theoretically provide a proportion • This temporary labor force dependent on skills needed and the strategies of the individual contractors in sourcing their workforce. • Direct job opportunities to skilled and semi-skilled laborers • Indirect job opportunities (e.g. Increased economic activity in project through security personnel)	Creating new jobs during the project construction phase	Positive Medium Short-term

5.1.2 Operation Phase

Table 40 Conceptual identification of the environmental impacts resulting from the proposed project during operation phase shows Conceptual identification of the environmental impacts resulting from the proposed project during operation phase.

Table 40 Conceptual identification of the environmental impacts resulting from the proposed project during operation phase

Aspect	Description	Possible impacts	Source	Conceptual assessment
Negative Impacts				
Air quality	**Gaseous and dust emissions** Air emissions from waste delivery trucks as well as the emissions of dust, bio-aerosols and odors. Exhaust and dust emissions from the crusher in C&D waste handling. For the composting plant: Stack and fugitive emissions from biological processes may include PM, bio-aerosols, ammonia, amines, VOCs, sulphides, and odors. Gaseous emissions from medical waste incinerators, including steam, carbon monoxide, particulate matter and toxic substances (e.g. metals and halogenic acids)	**Gaseous and dust emissions** Air pollution and respiratory problems to the surrounding community	**Gaseous and dust emissions** Vehicles transporting waste into the site Crusher from C&D handling Compost plants Medical waste incinerators	Negative High Long-term
	Landfill gas Landfill gas results from the decomposition of organic solid waste due to the anaerobic environment of the landfill. This reaction starts	**Landfill gas** The lower explosive limit (LEL) and upper explosive limit (UEL) are volume % of gas in the air. At concentrations below its LEL and above its UEL, a gas	**Landfill gas** The anaerobic environment of the landfill.	Negative High Long-term

	gradually after the placement of the waste and is proportional to the moisture content of the waste body. The components of the landfill gas change over time according to the maturation of the stabilization process of the organic matter. It is mainly composed of gases such as methane (45-60%), carbon dioxide (40-60%) and other minor constituents including Non-Methane Organic Carbons (NMOC) (<1%) or Volatile Organic Carbons (VOC), ammonia and hydrogen sulfide.	is not explosive. However, an explosion hazard may exist if a gas is present in the air between the LEL and UEL and an ignition source is present. For methane, the LEL and UEL are 5% and 15%respectively[19]. The explosion risk in the landfill is low because of limited oxygen and high concentration of methane >15%. The risk is higher if the gas migrated and confined to the explosive limits. Both methane and carbon dioxide are greenhouse gases where methane has much more global warming potential than carbon dioxide (28-36 times in 100 years lifetime)[20] Once gases are produced under the landfill surface, they tend to expand and migrate through the limited pore spaces within the refuse and covering material of the landfill. Methane is lighter than air, hence moves upward or migrates horizontally. Carbon dioxide is denser than air and will collect in subsurface areas. Accordingly, it can reach groundwater causing its acidification by forming carbonic acid (due to reaction with water). However, the depth of		

19 https://www.atsdr.cdc.gov/HAC/landfill/html/ch3.html (retrieved on 17/02/2020)

20 Intergovernmental Panel on Climate Change (IPCC) assessment report (AR5)

		groundwater at 20 m below the surface, which is a long distance to be traveled by the gas given the expected low generation of landfill gas as well and the presence of lining system, this impact is expected to be low. The flaring/combustion of landfill gas causes air emissions of CO_2, CO, NOx, PM and trace gases. The impacts of these emissions on the ambient air quality could be quantifiably assessed using air dispersion modeling. However, due to the presence of the proposed project in desert area and to the expected small amount of landfill gas, the impact on the ambient air quality is expected to be insignificant.		
	<u>Odor emissions</u> Due to the nature of landfills, the odors produced can potentially be quite powerful and mainly contains a complex mixture of ammonia and hydrogen sulphide	**<u>Odor emissions</u>** Odor impacts could be the cause of public opposition to the proposed landfill site and can cause respiratory diseases. However, the site is located in a desert area in 10th of Ramadan. It is located at around 7 km away from the nearest road (Cairo – Ismailia Desert road), around 5 km from the industrial area and around 9 km from 10th of Ramadan. The application of the daily cover in the landfill operations can reduce its intensity to a great level.	**<u>Odor emissions</u>** the main sources of odor at the landfill site will be: • Aerobic decomposition of organic wastes moved around the site and freshly disposed of in both the landfill and the composting/recycling station. • Anaerobic decomposition of	Negative High Long-term

			disposed of wastes over extended time periods. This will generate landfill gas which contains malodorous trace components. • Landfill leachate collected and discharged to the leachate pond or to treatment before disposal to sewers.	
Noise	Noise and vibrations will be generated by vehicle transporting waste on the site. In addition, the operation of some equipment such as stand-by generator, convey belts in the recycling plants, loaders and windrows moving machine in the composting plant. Compaction and application of daily cover material on waste can also be a source of noise. Crusher in the C&D waste handling.	Health effects are harmful to the hearing system of workers	Equipment such as stand-by generator, convey belts in recycling plant, loaders and windrows moving machine in the composting plant. Compacting and covering the waste daily activities. Crusher in C&D waste handling	Negative Medium Short-term
Soil, geology and hydrology and leachate generation	Solid waste operation generates leachate, which can contaminate soil and groundwater.	Leachate is generally characterized by its strong organic load, containing heavy metals and toxic hydrocarbons, its acidic nature and offensive smell. The potential impact of leachate on the reservoir would be felt in terms of eutrophication (nutrient loadings) and	Leachate generation from: -the liquid that exists as part of waste -as a result of rainwater entering the landfill -due to the natural decomposition of organic	Negative High Short-term

		eco-toxication of heavy metals. If the leachate is not properly collected from the landfill body it could form stress on the base lining system, and raise the risk for loss of containment. The design has proposed technical solutions to ensure protection of receptors from contamination.	material along with other liquids and chemicals that have been discarded.	
Resource efficiency and pollution prevention	The project contributes in promoting resource efficiency in terms of recycling and reusing of waste material and avoiding the bad practices of open burning of waste. However, there will be increased emissions due to fuel combustion and exhaust emissions from waste trucks and medical waste incinerators, crusher of C&D waste and landfill gas emissions	• Increased energy consumption due to landfill operation, transportation and use of materials and equipment • Increased consumption of water (onsite consumption) • Air pollution and GHG emissions and their associated climate change impacts	Operation of Qalyoubia landfill and the C&D waste treatment facility	Negative Medium Short-term
Solid waste and hazardous waste	There are different types of hazardous wastes that are currently mixed with domestic waste; the most common are batteries and hazardous construction waste (e.g. paint containers)	Co-mixing hazardous waste with MSW and/or disposing of hazardous waste at the landfill site can cause different risks to workers on the site The risk of can be summarized as follows: • Waste sorting workers at the recycling plant could get injured by infectious sharps mixed with municipal and possibly infected by blood transmitted diseases	Commingled waste	Negative Medium Short-term

		• End product of the composting plant may have some hazardous components, such as broken glass, that could be difficult to separate and could cause injuries to packing workers and end users • -Some hazardous chemicals could be corrosive and could cause health risks to landfill workers if exposed to these chemicals through skin contact, eye contact or breathing		
Ecology and biodiversity	Possible impacts on flora and fauna	Since the project is in a desert area, there is no reported significance of flora and fauna.	Operation of the Qalyoubia landfill and the C&D waste treatment facility	Negative Low Long-term
Risk of inappropriate labor and working conditions	Beside the risk of being exposed to hazardous waste discussed in the previous point, potential impacts on the health and hygiene of both the general public and on-site workers exists as a result of the nature of the waste. It could entail potential risks of inappropriate labor management procedures injuries that may lead to death; Risk of fires, explosions, subsidence, spills and accidents as discussed in the previous aspect dealing with hazardous	The main impacts associated with the project arise from the following: • Low hygiene conditions • Vermin attracted to the site (birds, rodents and insects) which can act as disease vectors. Risk of fires, explosions, subsidence, spills and accidents	Operation of the Qalyoubia landfill and the C&D waste treatment facility	Negative High Long-term
Community health and safety	Risk related to community health and safety/ community dissatisfaction with the operation of the Qalyoubia	Litter can be spread beyond the waste management facilities boundaries by the effect of wind, vermin and vehicles can	Operation of Qalyoubia landfill and	Negative Medium Long-term

	landfill and the C&D waste treatment facility due to operation related impacts (e.g. odur, Noise, Litter, Fire, Physical, chemical, and biological hazards) The project will decrease open burning of waste, which is one of the top two contributors to air pollution.	spread diseases or attract rats, which will disturb the community. Noise from waste processing, vehicles moving in and out of the site bringing waste and materials. Dust and odors can be nuisance to the surrounding community. communities' unacceptability for the SWM infrastructure during operation and also the potential associated health impacts if the operation of the facilities is not done in a very hygienic way. Fire can be caused from the sanitary landfill, and from the medical waste autoclaving / incineration system.	the C&D waste treatment facility	
Risk of Gender Based Violence (GBV) risk	The project can lead to an increased risk of Gender Based Violence, as working in the Qalyoubia landfill and the C&D waste treatment facility is likely to be male dominated and female workers might encounter the risk of different forms of GBV.	The operation of the Qalyoubia landfill and the C&D waste treatment facility is expected to be male dominated. This could mean for female employees a risk of GBV in the workplace. Therefore, GBV risk in the workplace needs to be carefully mitigated. Gender based violence can be manifested through multiple behaviors including: • Sexual harassment of women and girls, • Exploitative sexual relations.	Operation of the Qalyoubia landfill and the C&D waste treatment facility	Negative Medium Long-term

Traffic	Increased traffic flow on roads leading to and from the Qalyoubia landfill and the C&D waste treatment facility	Traffic jams and increased exposure of travelers and road users to exhaust and associated noise and possible accidents. From the traffic study, based on waste generation in Cairo, the number of vehicles is estimated to be 258 of the 32-ton capacity and 72 km average distance over 9 districts. Similarly, for Qalyoubia, it will be 116 vehicles over 10 districts. The study includes assessment of the level of road services after one year, 5 years 25 years and 50 years from the project implementation, the number of vehicles that will transport the amount of waste generated and how long they will be waiting to be weighed at the site depending on the capacity of the truck. The study indicates that the project will not have significant impact on the traffic around the site. After 5 years of project implementation, the road service level is A, which is the best level. The road service level is ratio between the width of the road and number of vehicles.	Movement of trucks while transporting waste to the site	Negative Medium Long-term
Land use and landscape	The solid waste accumulation is an unfavorable seen for landfill, composting and recycling plants.	The operation of landfills, and composting/recycling plants is also associated with litter dispersion by wind which adds to the negative visual impacts. The operation of landfill equipment and generated dust from the earthworks also adds to the bad scene at the site. The site is located in a desert	Operation of Qalyoubia landfill and the C&D waste treatment facility	Negative Low Long-term

		area and the nearest city is located 14 km away. The road users are not going to see the low aesthetic value of the area. Accordingly, no significant impact is expected to arise.		
Natural disaster risk	Earthquakes Flooding	May cause injuries or fatalities to the workers.	Natural causes	Negative High Long-term
Risk of Child labor	Child labor is a common practice in Egypt.	Given the fact that the project will not recruit anyone that does not have an ID. Therefore, it will be easy to detect child labor. All children below 18 should not be recruited.	Operation of the Qalyoubia landfill and the C&D waste treatment facility	Insignificant
Labor Influx	Having large workers in small cities or villages might result in unfavorable impacts on the project areas	The number of workers will be very limited	Operation of the Qalyoubia landfill and the C&D waste treatment facility	Insignificant
Positive Impacts				
Air Quality Improvement in Cairo and Qalyoubia	The project will ensure proper waste management	The project will help minimize open burning of waste, which is one of the top two contributors to air pollution. Hence, improving the quality of air and life of the community in Cairo and Qalyoubia.	Operation of the Qalyoubia landfill and the C&D waste treatment facility	Positive High Long-term
Employment Opportunities	Job opportunities	It is not known yet the number of workers expected in the project during operation for individuals and private sector companies, However The project will result in number of job opportunities during the operation phase	Operation of the Qalyoubia landfill and the C&D waste treatment facility	Positive Medium Long-term

5.1.3 Closure and Post Closure Activities

Table 41 Conceptual identification of the environmental impacts resulting from the proposed project for closure and post closure activities shows Conceptual identification of the environmental impacts resulting from the proposed project during operation phase.

Table 41 Conceptual identification of the environmental impacts resulting from the proposed project for closure and post closure activities

Aspect	Description	Possible Impacts	Source	Conceptual Assessment
Closure and post closure activities	**After landfill closure impacts** Application of final cover, control of landfill gas and leachate generation**.**	Closure ad post closure activities should be planned early on the project cycle to incorporate them in the financial and technical planning.	Closure of the Qalyoubia landfill	Negative High Short term

5.2 Risk and Impact Assessment

5.2.1 Evaluation Matrix

A simple rating method will be applied to identify the significance of the impacts. Each impact will be given a rank for severity (S) and frequency of occurrence (F). Ranks are given on a scale from 1 to 5, as shown in Table 42.

Table 42 Scale used in Severity and Frequency Ranking of Impacts

1	2	3	4	5
Very low	Low	Medium	High	Very high

An impact is considered significant if its severity is ranked 4 or higher, or if the product of the severity and frequency rating is equal to 12 or higher.

To determine the severity rank, four parameters are considered, as follows:

1. Scale: How wide-spread will the impact be? Considerations can include e.g. area affected by land pollution impact, number of people affected by health impact, etc.
2. Difficulty in changing the impact: How difficult will it be to reverse or mitigate the impact? Considerations can include e.g. availability of technology to change impact, level of complexity of available technology, capacity to apply available technology, existence of constraints to change impact, etc.
3. Cost of changing the impact: How much will it cost to change the impact? cost in relation to the means of change considered in the above parameter
4. Effect on public image: To what degree does the impact affect the public image of the enterprise (positively for positive impacts and negatively for negative impacts)?

Similarly, for the frequency rank, two parameters are considered:

1. Probability: What is the probability of occurrence of the impact?
2. Duration: How long will the impact last?

Equation 1- Formula used to determine aspect significance ranking:

$$S = AVERAGE\left(R_{scale}, R_{difficulty}, R_{cost}, R_{image}\right)$$

$$F = AVERAGE\left(R_{probability}, R_{duration}\right)$$

$$R = S \times F = significantif(S \times F) \geq 12 \text{ OR } S \geq 4$$

This analysis is conducted for both the construction and operation phases of the project.

5.2.1.1 Determination of Significant Risks and Impacts during Project Construction Stage

In this section, the rating system discussed above is applied to the environmental impacts resulting from the various aspect of the project construction stage which were summarized in Table 43.

Table 43 Evaluation of environmental impacts during the construction phase

Aspect	Description	Impact	Severity Ranking (S)	Frequency Ranking (F)	$S \times F$	Significance
Negative Impacts						
Air Quality	Dust emissions during the construction phase due to the on-site activities (site preparation, excavation, etc.) and movement of vehicles on unpaved roads.	Adverse health impact on the respiratory system of the workers.	4	3	12	✓
	Gaseous emissions due to exhaust of vehicle and machinery use. (e.g. CO, NOx and SO_2)	Impacts on ambient air quality are expected. However, the vehicles and machinery present point sources. Accordingly, under normal conditions any effects witnessed on a local-scale will be of a temporary nature and restricted to the immediate point of exhaust emission	2	3	6	-
	Odor Emissions: Minimal odor emissions are expected to occur during the construction phase from chemicals, oils and paints used during the construction phase.	No significant impacts are expected to occur.	2	2	4	-
Noise	Noise and vibration levels arising from the construction activities (e.g. civil works, construction and installations)	Adverse health impacts on the hearing of workers and problems with speech communication	4	2	8	✓

Aspect	Description	Impact	Severity Ranking (S)	Frequency Ranking (F)	$S \times F$	Significance
Soil, geology and hydrology	Excavations of cells. Movement of heavy trucks would loosen the soil by pressure from the wheels and expose the soil for easy erosion by wind. The construction activities may include leaks of oil from the machinery which may affect the land in the project site.	• Effects on topographical features. Hence, changes in the water drainage properties may occur and lead to diversion of surface water to undesired places. • Soil erosion may be caused by exposure of soil surfaces to rain and wind during site clearing, earth moving, and excavation activities. Soil erosion may lead to increased dust emissions. • Soil storage to be used as covering material, if accumulated in a stock pile, it needs to be protected from being swept away by rain and also not to cause dust emissions	3	4	12	✓

Aspect	Description	Impact	Severity Ranking (S)	Frequency Ranking (F)	$S \times F$	Significance
Resource Efficiency and pollution prevention	Increase in the energy consumption for operation of the construction equipment	Air pollution and the negative health effects of exhaust emissions from construction equipment and vehicles. However, emissions are not likely to be significant. the project is not expected to significantly use water and construction raw material. Efficient use of energy in terms of controlling running vehicles and equipment should be in place.	2	3	6	-

Solid and Liquid Waste Management	Solid waste consists of construction waste including some hazardous wastes. Waste is expected to include the following categories: <u>Hazardous Wastes.</u> • Wasted oils, empty containers for insulation materials used and paints. <u>Non - hazardous solid and liquid waste</u> • Soil (excavated or surplus) • Packaging materials • Damaged products • Inert construction / demolition materials; • Refuse, such as metal scrap and empty containers • Construction debris (concrete, bricks, sand and gravel) • Sewage from workers <u>Municipal waste</u> • From workers on site	Negative effects on the environment from improper disposal of solid waste on the surrounding community and its associated impacts of visual disturbance, odor and even open burning. Increased traffic when transporting waste to designated landfills / disposal sites or taking up and requiring more areas in landfill to host the waste generated in case no proper waste management practice is in place (reduce, reuse and recycle). Health and hygiene problems (water borne diseases) in case of improper disposal of sewage.	3	4	12	✓

Aspect	Description	Impact	Severity Ranking (S)	Frequency Ranking (F)	$S \times F$	Significance
Ecology and Biodiversity (flora and fauna)	Natural habitats in the area can be affected by construction and installation activities.	No areas protected for their conservation value are located on or in the vicinity of the project area. Low ecological impacts will occur in the construction phase as the project is located in a desert area with no significant flora nor fauna.	2	2	4	-
Risk of inappropriate labor and working conditions	Health and safety hazards during the construction phase from the on-site construction activities.	Adverse impacts on occupational health & safety of the workers such as accidents, health risks, and safety risks.	4	3	12	✓
Community health, safety and security	Impacts on the surrounding community in terms of structural safety, traffic, noise, air emissions, waste handling,	the site is located in a desert area in 10th of Ramadan. It is located at around 7 km away from the nearest road (Cairo – Ismailia Desert road), around 5 km from the industrial area and around 9 km from 10th Ramadan city and around 14 km from Badr City(The nearest residential area to the project site). Minimum impacts are expected. However, structure safety, traffic, noise and waste control can affect the surrounding community if not handled properly.	4	1	4	✓

Aspect	Description	Impact	Severity Ranking (S)	Frequency Ranking (F)	$S \times F$	Significance
Traffic	Transportation and delivery of construction materials and equipment to the project site.	Traffic accidents and minimizing injuries suffered by project personnel and the public. The greatest potential for traffic impacts in terms of congestion arises during a short period at peak construction and so it is insignificant. Mitigation measures will be put in place to reduce the potential for impacts to arise	4	3	12	✓
Land Use, Landscape and Visual Issues	Effects of construction activities on landscape character. Visual impact of construction activities.	Land use on site. Effects of construction activities on landscape character. Visual impact of construction activities. Minimal impacts are expected to occur because the project is located in a desert area. Possible damage to existing infrastructure during excavations.	2	3	6	-

Aspect	Description	Impact	Severity Ranking (S)	Frequency Ranking (F)	$S \times F$	Significance
Natural Disaster risk	Earthquakes and flooding	Negatively impact the time schedule of the construction activities and may cause injuries or fatalities to the workers. However, from the baseline assessment, the project location is in an area of no earthquake activities. No significant flood risk impacts are anticipated because according to hydrology study, the project is located in dry area characterized by low rainfall range; the maximum rainfall recorded was 10.4 mm in 2017	4	1	4	✓

Aspect	Description	Impact	Severity Ranking (S)	Frequency Ranking (F)	$S \times F$	Significance
Risk of Child labor	Child labor is a common practice in Egypt.	Child labor is a common practice in Egypt. According to Egyptian Labor Law No.12/2003, child labor should be prohibited especially in dangerous works. Children below 18 are favorable labor as they receive low salaries and they are less demanding. There is a risk that this common practice is used in the project. This risk should be carefully handled in the ESMP and monitoring should be applied in the contractor obligations	4	2	8	✓
Temporary Labor Influx	Having large number of workers in small cities or villages might result in unfavorable impacts on the project areas	• Overconsumption of community resources • Influx of additional population, Increased pressure on accommodation and rents • Increased risk of communicable diseases and burden on local health services • Increased risk of illicit behavior and crime	4	1	4	✓

Aspect	Description	Impact	Severity Ranking (S)	Frequency Ranking (F)	$S \times F$	Significance
Risk of Gender Based Violence (GBV)	The project can lead to an increased risk of Gender Based Violence, as women are particularly vulnerable within the context of construction projects	As per the WB 2016 Labor Influx Guidance Note, the scale of labor influx and the absorptive capacity of the local community indicate the significance of the anticipated risk of GBV. The project can lead to an increased risk of Gender Based Violence, as women are particularly vulnerable within the context of construction projects. Gender based violence can be manifested through multiple behaviors including: • Sexual harassment of women and girls, • Exploitative sexual relations.	4	2	8	✓
Culture heritage	Possible impacts on culture heritage or finding antiquity objects during excavation.	The project is located in a desert area with no designation of culture heritage or nearby antiquities.	4	1	4	-

Aspect	Description	Impact	Severity Ranking (S)	Frequency Ranking (F)	$S \times F$	Significance
Land acquisition	The land of the IWMF-10R was a vacant land owned by the Government and the allocation of this land did not result in any risk related to involuntary resettlement or loss of livelihoods.	The land is a state-owned property. Accordingly, there will be no impacts related to land acquisition or impacts related to physical displacement. There are no encroachments and individuals making livelihoods out of the project land. For the risk related to the land for the infrastructure, this is currently covered under the RF and further instruments could be prepared (e.g. RP) is needed.	4	1	4	-
Positive Impacts						
Employment Opportunities	Creation of job opportunities during the construction phase.	Positive impact will arise from the project activity as a result of creating new job opportunities for workers and engineers.	3	4	12	✓

As seen in the previous table, applying the impact ranking method discussed in the beginning of this section yields 13 significant negative impacts and 1 positive impact during the construction stage:

1. Dust emissions during the construction phase due to the on-site activities (site preparation, excavation, etc.)
2. Noise arising from the construction activities (e.g. civil works and installations)
3. Soil, geology and hydrology
4. Solid and liquid waste arising from the construction activities
5. Labor and working conditions during construction phase
6. COVID-19 pandemic
7. Community health, safety and security
8. Increased traffic volume to and from the plant to transport construction materials and workers
9. Natural disaster risk
10. Risk of Child labor
11. Temporary labor influx
12. Risk of Gender Based Violence (GBV)
13. Culture heritage - chance of finding antiquities during excavation
1. Employment Opportunities (positive impact)

Mitigation measures for these significant impacts are discussed in the following section.

5.2.1.2 Determination of Significant Impacts during Project Operation Stage

In this section, the rating system discussed above is applied to the environmental impacts resulting from the various aspect of the project operation stage which were summarized in Table 44

Table 44 Impact assessment for operation stage environmental aspects

Aspect	Description	Impact	Severity Ranking (S)	Frequency Ranking (F)	$S \times F$	Significance
Negative Impacts						

Air Quality	**<u>Gaseous emissions:</u>** Air emissions from waste delivery trucks as well as the emissions of dust, bio-aerosols and odors. Emissions of landfill gas gradually due to the anaerobic environment. Exhaust and dust emissions from the crusher in C&D waste handling. For the composting plant: Emissions from biological processes may include PM, bio-aerosols, ammonia, amines, VOCs, sulphides, and odors. Gaseous emissions from medical waste incinerators, including steam, carbon monoxide, particulate matter and toxic substances (e.g. metals and halogenic acids)	• Respiratory problems to the surrounding community along the vehicles routes. • Methane may cause explosion • Greenhouse gas emissions (CH_4 and CO_2) and their climate change impact • Acidification of groundwater as a result of CO_2 migration	4	3	12	✓

	<u>Odor emissions</u> Due to the nature of landfills, the odors produced can potentially be quite powerful and mainly contains a complex mixture of ammonia and hydrogen sulphide.	Odor impacts could be the cause of public opposition to the proposed Qalyoubia landfill and the C&D waste treatment facility and can cause respiratory diseases. The nearest road is 7km away and the nearest industrial area is 5 km away, which will relatively reduce the significance of the impact Odor impacts could be a casue of concern for the other users of the facility users (i.e. Medical waste and construction & demolition waste treatment units)	4	3	12	✓
Noise	Noise and vibrations will be generated by vehicle transporting waste on the site. In addition, the operation of some equipment such as stand-by generator, convey belts in the recycling plants, loaders and windrows moving machine in the composting plant. Compaction and application of daily cover material on waste can also be a source of noise.	The site is located in a desert area in 10th of Ramadan. It is located at around 7 km away from the nearest road (Cairo – Ismailia Desert road), around 5 km from the industrial area and around 9 km from 10th of Ramadan residential City and 14 km away from Badr City.	3	4	12	✓

Soil, geology and hydrology and leachate generation	Waste piles, which contain liquid content or those exposed to rainfall events, may cause contaminated runoff, which may contaminate soil. and groundwater..	Improper handling of leachate can cause soil and groundwater contamination. The possibility of hazardous components in organic waste may cause significant impacts on the leachate and runoff of waste stored/treated at the composting facility. Municipal waste may include animal and human faecal matter, and animal carcasses that may include diseases, viruses, parasites and bacteria. These types of micro-organisms are not eliminated during biological treatments. Their leachate and runoff may significantly affect soil and water receptors.	4	3	12	✓

Resource efficiency	The project contributes in promoting resource efficiency in terms of recycling and reusing of waste material and avoiding the bad practices of open burning of waste. However, the project will entail the use of fuel and water , which will result in GHG emissions. a	• Increased energy consumption due to landfill operation, transportation and use of materials and equipment. The impacts of energy consumptions due to transport activities are addressed under the traffic aspect. • Increased consumption of water (onsite consumption). However, it is not expected for the project to have significant impact because the project doesn't require the use of a lot of water. • GHG emissions and their associated climate change impacts.	3	3	9	-

Co-mixing Municipal Solid Waste and Hazardous Waste	There are different types of hazardous wastes which could be found mixed with domestic waste; the most common are healthcare waste (e.g. syringe), hazardous construction waste (e.g. paint and chemicals containers), WEEE, etc	Co-mixing hazardous waste with MSW and/or disposing of hazardous waste at the landfill site can cause different risks to workers on the site. The risk of can be summarized as follows: • Waste sorters at the recycling and plant could get injured by infectious sharps mixed with municipal and possibly infected by blood transmitted diseases • End product of the composting plant may have some hazardous components, such as broken glass, that could be difficult to separate and could cause injuries to packing workers and end users • Some hazardous chemicals could be corrosive and could cause health risks to landfill workers if exposed to these chemicals through	4	3	12	✓

		skin contact, eye contact or breathing The proposed project aims to receive municipal solid waste collected only from residential, commercial and institutional locations. The probability of encountering hazardous should not be high.				
Ecology and Biodiversity (flora and fauna)	Possible impacts on flora and fauna	Since the project is in a desert area, there is no reported significance of flora and fauna.	2	2	4	-

Risk of inappropriate labor and working conditions	Beside the risk of being exposed to hazardous waste including chemical and biological toxins discussed in the previous point, potential impacts on the health, safety and hygiene of the on-site workers exists as a result of the nature of the site activities and waste being handled.	The main health and safety impacts associated with the project arise from the following: • Low hygiene conditions causing risks of developing skin conditions (rashes), respiratory, and gastrointestinal diseases • Continuous sorting of the waste for prolonged hours and proximity to mechanical equipment, which could possibly cause physical injury and musculoskeletal pain • Possible injury from handling waste containing broken glass or sharp objects. • Vermin attracted to the site (birds, rodents and insects) which can act as disease vectors. • Risk of fires, explosions, subsidence, spills and accidents as discussed in the previous aspect dealing with hazardous	4	4	16	✓

		waste that is commixed with domestic waste.				

Community health and safety	• General environmental health issues associated with waste scavenging • Physical, chemical, and biological hazards • Litter • Noise • Dust and odors	Safety risks at site for trespassers and waste pickers. Litter spread as a result of: wind, vehicles brining waste and materials in and out of the facility and waiting to be weighed and vermin can cause spread of diseases and hazards to surrounding community. Noise from waste management processing and vehicles traffic. Dust and odors from unloading waste can cause nuisance to surrounding community. Fire due to the combustible nature of biodegradable waste and the fact that aerobic degradation is an exothermal process, the spontaneous combustion of waste may cause fire. Public health impacts and possible contamination of food chain and soil resulting from the use of compost for agricultural use, which might	4	2	8	✓

		contain hazardous components , broken glass and micro-organisms				
Risk of Gender Based Violence (GBV) Risk	The project can lead to an increased risk of Gender Based Violence, as working in Qalyoubia landfill and the C&D waste treatment facility is likely to be male dominated.	The operation of the Qalyoubia landfill and the C&D waste treatment facility is expected to be male dominated. This could mean for female employees a risk of GBV in the workplace. Therefore, GBV risk in the workplace needs to be carefully mitigated. Gender based violence can be manifested through multiple behaviors including: • Sexual harassment of women and girls, • Exploitative sexual relations.	4	2	8	✓

Traffic	Increased traffic flow on roads leading to and from the Qalyoubia landfill and the C&D waste treatment facility	Traffic jams and increased exposure of travelers and road users to exhaust and associated noise and possible accidents. From the traffic study, based on waste generation in Cairo, the number of vehicles is estimated to be 258 of the 32 tons capacity and 72 km average distance over 9 districts. Similarly, for Qalyoubia, it will be 116 vehicles over 10 districts. The study includes assessment of the level of road services after one year, 5 years 25 years and 50 years from the project implementation, the number of vehicles that will transport the amount of waste generated and how long they will be waiting to be weighed at the site depending on the capacity of the truck. The study indicates that the project will not have significant impact on the traffic around the site. After 5	3	4	12	✓

		years of project implementation, the road service level is A, which is the best level. The road service level is ratio between the width of the road and number of vehicles.				
Land use and landscape	The solid waste accumulation is an unfavorable seen for landfill and Qalyoubia landfill and the C&D waste treatment facility	The operation of landfills, is associated with litter dispersion by wind which adds to the negative visual impacts. The operation of landfill equipment and generated dust from the earthworks also adds to the unfavorable scene at the site. The site is located in a desert area and the nearest city is located 9 km away. The road users are not going to see the low aesthetic value of the area.	2	2	4	-
Natural disaster	Earthquakes and flooding	From the baseline assessment, the project location is in an area of very low earthquake activities, the impact is foreseen to be insignificant. The site is in dry climate area with low flooding risks.	4	1	4	✓

Positive Impacts						
Air quality improvement in Cairo and Qalyoubia	The project will ensure proper waste management for waste generated in Cairo and Qalyoubia governorates. .	The project will help minimize open burning of waste, which is one of the top two contributors to air pollution. Hence, improving the quality of air and life of the community in Cairo and Qalyoubia.	4	3	12	✓
Employment Opportunities	Direct job opportunities in the Qalyoubia landfill and the C&D waste treatment facility	Creation of job opportunities (till now there are 21 sorting agents on each sorting line)	4	3	12	✓

The significant environmental impacts resulting from the operation of the proposed project are listed below:

1. Air emissions: vehicle emissions, emissions of dust, bio-aerosols and odors
2. Noise
3. Soil, geology and hydrology: leachate and liquid runoff
4. Labor and working conditions: working in low hygiene conditions
5. Community health and safety: litter, dust, noise, fire
6. Solid waste mixed with potentially hazardous waste
7. Risk of Gender Based Violence (GBV) risk
8. Traffic: Increased traffic flow on roads leading to and from the Qalyoubia landfill and the C&D waste treatment facility
9. Natural disaster risk
10. Employment opportunities (positive impacts)
11. Air quality improvement in Cairo and Qalyoubia (positive impacts)
12.

5.2.1.3 Determination of Significant Impacts during Closure and Post Closure Activities

In this section, the rating system discussed above is applied to the environmental impacts resulting from the various aspect of the project closure and post closure activities, which were summarized in Table 45.

Table 45 Impact assessment for closure and post closure activities environmental aspects

Aspect	Description	Impact	Severity Ranking (S)	Frequency Ranking (F)	$S \times F$	Significance
Closure and post closure activities	Closure ad post closure activities should be planned early on the project cycle to incorporate them in the financial and technical planning.	Application of final cover, control of landfill gas and leachate generation. Otherwise, the site can have aesthetic problem and the same negative impacts of landfill gas and leachate generation can take place.	4	1	4	✓

5.3 Mitigation Measures for the Potential Environmental and Social Impacts

As discussed above, 13 important implications were identified for the construction phase and 9 for the operation phase of the proposed project. In this section, possible means of mitigating or enhancing these effects are discussed. These proposed methods constitute the basis of the proposed environmental management plan, which will be explained in Chapter 8 (Environmental and Social Management Plan).

Negative or positive mitigation techniques are discussed in detail in the following sections.

5.3.1 Mitigation Measures for Significant Impacts During the Project Construction Stage

5.3.1.1 Dust Emissions during the Construction Phase

During construction phase, dust emissions are expected from on-site activities (preparation, excavation, etc.) as well as the equipment movement on unpaved roads. An assigned HSE supervisor will ensure the implementation of good site practices, which include:

- Appropriate sitting and cover the stockpiles of friable materials with a suitable; cover in addition to regularly spraying water so as to minimize dust blow
- Minimizing drop heights for material handling activities such as unloading of friable materials
- Keeping the roads damped via watering spraying to minimize dust from spraying as a result of vehicles moving
- Ensuring that vehicles travel on paved routes wherever possible
- Sheeting of lorries transporting friable construction materials
- Enforcing speed limits on unpaved roads to be <35 km/hr

5.3.1.2 Noise

Construction activities will cause higher levels of ambient noise from vehicles and machines used for drilling and construction purposes. However, this effect is temporary and fades away at the end of the construction phase. The following mitigation measures will be applied to reduce the impact of noise during the construction phase:

- Reduces workers' exposure times to noise, so that they do not exceed the safety limits stipulated in the Egyptian environmental law in addition to occupational safety and health standards
- Provide workers in areas of activities with high noise levels with earplugs
- The contractor must train all workers before starting construction work on the danger of noise and how to avoid them
- Avoid construction work in the evening
- Restricting the movement of lorry cars to prevent noise in the early morning and late evening periods

- All machines and vehicles must be stopped when not in use

5.3.1.3 Soil, Geology and Hydrology

The proposed mitigation measures to minimize impacts from construction phase on soil, geology and hydrology are as follows:

- The contractor will put in place measures aimed at minimizing soil erosion and soil contamination
    - To avoid soil erosion, scheduling to avoid heavy rainfall periods (i.e., during the dry season, which is most of the time of the year in Egypt) to the extent practical
- Activities that involve fueling, lubricating or adding chemicals will not take place on-site unless it is necessary. This is to avoid soil pollution and generation of additional hazardous wastes. If such actions will necessarily take place on-site, they will be conducted over impervious surfaces and a spill kit will be made available on-site
    - Containers of used chemicals and oil will be collected in specific labeled drums and disposed in an approved hazardous wastes facility in coordination with the local authorities
- Construction vehicles will be restricted to designated areas to avoid soil compaction within the project site

5.3.1.4 Solid, Construction and Hazardous Waste Arising from Construction Activities

The proposed mitigation measures for the safe disposal of construction waste are as follows:

- The contractor will obtain official permits from the local authorities for the disposal of wastes (construction wastes landfills, hazardous wastes landfills, etc.) prior to the commencement of construction activities
- Wastes will be segregated and temporarily stored safely in the allocated areas for waste storage on the premises of the construction site in a way that doesn't cause further traffic disruption
- Wastes will be covered to avoid the pollution of the ambient air by dust dispersion
- Adequate trucks will be used for wastes transportation and the trucks will not be overloaded with waste volumes
- Consignments for waste disposal will be recorded in terms of weight, destination and responsible person
- Waste collection should occur daily and it should be transported to the approved and safe disposal locations via adequately equipped trucks. The supervisor has to make sure that this process occurs without any hazards or problems

Non-hazardous (domestic) waste disposal

The proposed mitigation measures for the safe disposal of domestic waste are as follows:

- The non-hazardous wastes (paper, garbage, wood and plastics) will be segregated and transported to the local disposal sites by the mean of the approved contractor

- The non-hazardous wastes will be transported off-site for recycling or final disposal by a licensed contractor and supervisor will be responsible for the disposal procedure and the conditions of the trucks

Hazardous waste generation

Hazardous waste is limited to lubricating oil, empty paint cans. The proposed measures for the safe disposal of hazardous waste are as follows:

- According to Article 33 of Law 4/1994, the contractor is required to keep up records and manifests in a register for the methods of waste disposal and the agencies contracted to receive such wastes
- Training to employees should incorporate information from Material Safety Data Sheets (MSDSs) for hazardous materials being handled. MSDSs should be readily accessible to employees in their local language
- Description of response activities in the event of a spill, release, or other chemical emergency should be incorporated

In general, hazard assessment should be performed by specialized professionals using internationally-accepted methodologies.

5.3.1.5 Labor and Working Conditions

During construction workers are subject to potential hazards such as slips and fall, work from height, confined spaces, struck by object, moving machinery and dust. These risks may result in injuries or fatalities. The following are recommendations to ensure occupational health and safety are in place and avoid such hazards:

- Hi
- Clear, fair hiring procedures should be put in place to ensure fair treatment, nondiscrimination and equal opportunity of project workers:
  - Information regarding their terms and conditions of employment (including their rights related to hours of work, wages, overtime, compensation and benefits…) should be established and communicated with the workers

- Regular payment as per national laws and the LMP
- Adequate periods of rest per week, annual holiday and sick, maternity and family leave should be ensured,
- In case of termination of contract, project workers will receive written notice of termination of employment and details of severance payments in a timely manner
- Employment of project workers will be based on the principle of equal opportunity and fair treatment, and there will be no discrimination with respect to any aspects of the employment relationship, such as recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, or disciplinary practices

- The above is a non-exhaustive list of mitigation measures. The different types of project employers, employer will also need to follow the LMPLabor Management Plan (LMP)

- Ensure the adequate implementation of occupational health and safety provisions on-site such as providing the personal protective equipment (PPE) to the workers. Main PPE that must be available at the site include: hard hats, reflective safety vests, ear plugs and protective footwear, such as steel toed boots with slip-resistant tread.
- The site should be provided by all the protective and safety requirements stipulated by national labor law and occupational health.
- Communication and training programs to prepare workers to recognize and respond to workplace hazards. Programs should include aspects of hazard identification, safe operating and materials handling procedures, safe work practices, basic emergency procedures, and special hazards unique to their jobs.
- Coverage with appropriate insurance schemes (social and health insurance coverage) for all the types of workers, including casual workers hired by subcontractors and contractors. In addition, the Insurance should be covering work related accidents (injuries and fatalities), as well as insurance for third party.
- Anyone entering the project site will register in an attendance sheet/logbook
- Records of copy of national IDs will be kept for all types of laborers, including casual laborers hired by subcontractor and contractor.
- Monitoring and record-keeping activities, including audit procedures designed to verify and record the effectiveness of prevention and control of exposure to occupational hazards, and maintaining accident and incident investigation reports on file for a period of at least five years
- Contractors: The plan should include procedures to ensure that:
    - The contractor is provided with safety performance procedures and safety and hazard information
    - Contractors observe safety practices
    - Verify that the contractor acts responsibly
- Develop and Implement a well communicated and accessible grievance mechanism for workers to address any complaints

5.3.1.6 Community Health and Safety

The proposed mitigation measures are as follows:

- Information related to community health and safety to be shared regularly and systematically as per stakeholder engagement plan (SEP)
- Awareness raising campaigns should be tailored in cooperation with the community-based organization
- Using caution tapes that help to keep people away of the site
- Development and implementation of a Traffic Management Plan (including routes and alternative routes, truck movements, transport of workers, and short-term closure of roads (if necessary)

- The construction site to be fenced and guarded by security personnel in order to prevent any unauthorized access to the site
- In case of transporting heavy equipment, the nearby population should be notified in advance
- Develop and Implement a well communicated and accessible grievance mechanism for community members to address any complaints

5.3.1.7 Traffic

The contractor requires to have a time management plan to manage and schedule the traffic movement for the construction materials, equipment in addition to transporting the debris to the landfill. In addition, the notification to the traffic department should be obtained and the time management plan should be approved prior to the construction activities.

It is estimated that the overall additional traffic would have insignificant impacts on the level of service on the road.

During transportation of the equipment, raw materials as well as equipment, it is anticipated that one lane will be used by the trolleys and the movement of one trip will not last more than 8 hours (during the midnight – morning). Therefore, the impact significant on traffic is considered short term, during the specific time duration and low to medium impact.

In addition, there is sufficient storage area in the site, that the raw material can be placed, as well as the standby equipment, it is expected that the main road will not be impacted.

The following point present mitigation measures for the traffic impact:

1. Informational signs should be posted at the construction zones before the commencement of any construction activities to inform drivers and ensure the safety of the roads
2. The contractors and the site supervisor should choose a location for temporary storage of construction materials, equipment, tools, wastes and machinery before construction so as not to cause further traffic disruptions due to routes blockages
3. Minimizing pedestrian interaction with construction vehicles. Pedestrian crossings can be provided if necessary
4. Construction work should be avoided at the traffic peak times whenever possible.
5. Uncontrolled off-road driving will be prohibited
6. Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions
7. Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
8. Using locally sourced materials, whenever possible, to minimize transport distances. Locating associated facilities
9. Improving driving skills and requiring licensing of drivers
10. Adopting limits for trip duration and arranging driver rosters to avoid overtiredness
11. Avoiding dangerous routes and times of day to reduce the risk of accidents

12. Use of speed control devices (governors) on trucks, and remote monitoring of driver actions, if possible
13. Approval from the traffic department prior to construction should be obtained by the contractor prior to the construction preparation
14. The contractors should make sure that the employed drivers of construction machinery (such as trucks and loaders) have received sensitization/training on safety utilization of their machines in order to minimize accidents risks
15. Unusual traffic delays or accident caused during construction or any complaints received should be reported in the monthly report prepared by the construction supervisor

5.3.1.8 Natural Disaster Risk

From the baseline assessment, the project location is in an area of no earthquake activities. No significant flood risk impacts are anticipated because according to hydrology study, the project is located in dry area characterized by low rainfall range. However, the contractor shall provide the emergency preparedness and response plan that he follows to address such risk. Training of all personnel shall be conducted on using the emergency preparedness and response plan to respond to such risks.

5.3.1.9 Risk of child Labor

The proposed mitigation measures are as follows:

- The contractor /subcontractor will be obliged to maintain daily attendance sheets in order to verify the attendance of workers not include staff below 18 years' old,
- Develop a monitoring plan including record keeping system for copies of IDs of laborers, daily attendance sheets in order to verify the attendance of workers not include staff below 18
- Develop ToR, contracts, and terms of employment for contractor and subcontractors prohibiting hiring minors

5.3.1.10 Temporary labor influx

In order to minimize impacts pertaining to labor influx the following should be thoroughly implemented:

- It is likely that impacts related to labor influx will be relevant in the project due to the anticipation of large number of workers who will likely need to be accommodated in either labor camps or in residential units in the nearest location. Due to the number of workers expected in the project during the construction period is not known yet; the mitigation measures that will be applicable should be further elaborated at a later stage in case it is proven to be medium or high risk. This will be decided depending on the size of labor influx expected, where they will be accommodated, and the measures will put in place.

- Apply the full requirements related to operating the grievance mechanism including anonymous channels

5.3.1.11 Risk of Gender Based Violence (GBV)

In order to minimize impacts pertaining to labor influx the following should be thoroughly implemented:

- Preparation of appropriate code of conduct that stipulates the commitment of labor towards community groups and behaviors that should be avoided
- All workers should be trained on the code of conduct
- Code of conduct to be developed and signed by sub-contractor. It should include prevention of sexual exploitation and abuse and sexual harassment (SEA/SH) at workplace
- Apply the full requirements related to operating the grievance mechanism including anonymous channels
- Raising awareness of the local community about the project commitment towards communities' and the measures taken for that through public consultation and focus group discussions
- **Specified grievance mechanism channels for GBV will be announced and coordination will take place with the appropriate governmental entity (e.g. National Council for Women)**[21]
- Apply penalties to workers violating the code of conduct
- Random drug and alcohol tests to be conducted.
- If workers will be staying in rented apartments by contractor or sub-contractor, in labor camps or in any other accommodation facilities, the developed code of conduct should be complied to

5.3.1.12 Culture Heritage - Chance of Finding Antiquities

The proposed mitigation measures are as follows:

- Such chance-finds needs special care in handling so as to keep their condition that will support the cultural value it represents
- In the unlikely event of finding of such objects, the Ministry of Tourism and Antiquities should be informed so as to adequately handle this object

21 The National Council for Women is running a dedicated grievance system for dealing with GBV cases. The system ensures anonymity of the complaints and ensures that specialized professional responses are offered as well as referral to existent support systems (e.g. women shelter).

Positive impacts

5.3.1.13 Employment Opportunities

Provide direct job opportunities to skilled and semi-skilled laborers

The project is expected to result in the creation of job opportunities, both directly and indirectly. The local community could theoretically provide a proportion of this labor force dependent on skills needed and the strategies of the individual contractors in sourcing their workforce.
In order to maximize employment opportunities in the local communities it is anticipated that training will be required for currently unskilled workers. On-the-job training will also supplement opportunities for the local workforce for both temporary construction roles also for long-term operations phase position, where these are available.

Create indirect opportunities

Increased economic activity in project through the following supply chain:

- Implementation of works and provision of supplies related to construction, operation and closure of the site and ancillary facilities
- Provision of food supplies, catering
- Provision of building and auxiliary materials and accessories, engineering, installation and maintenance
- Security personnel

The following measures are proposed:

- Developing recruitment strategy to creating new job opportunities for workers and engineers
- Prioritize employment of local people for construction works
- Discuss potential barriers for local employment with labor or training offices in order to overcome them and to reduce collision with local communities (stakeholder engagement)

5.3.2 Mitigation Measures for Significant Impacts During the Project Operation Stage

5.3.2.1 Air Quality

5.3.2.1.1 Gaseous Emissions

The proposed mitigation actions to control vehicle emissions (i.e. carbon dioxide, carbon monoxide, nitrogen oxides and volatile organic compounds generated from waste delivery trucks) are as follows:

- Waste collection and transport vehicle owners and operators should implement the equipment manufacturers' recommended engine maintenance, along with the mechanical maintenance for the safe operation of the vehicle /equipment, including proper tire pressure
- Any vehicle that has high smoke emissions visibly detected should be promptly repaired
- Drivers should be instructed on the benefits of driving practices and trained to reduce both the risk of accidents and fuel consumption, including driving within safe speed limits
- Equipment operator(s) should be instructed on the benefits of applying best practices operation methods and trained on visual inspection of the equipment condition to reduce equipment failure and/or defect
- Optimize waste collection routes to minimize distance travelled and overall fuel use and emissions

The proposed mitigation actions to minimize air emissions from composting plant are as follows:

- Use mist spray to keep down dusts, especially during and prior to loading or other handling procedures
- Use compost pile turning equipment that is specially designed to minimize air emissions

For medical waste handling, the mitigation measure are as follows:

- Design and operate facilities in accordance with applicable national requirements and internationally accepted standards
- Regular maintenance of pollution abatement measures such filters for the absorption of particulate matter and scrubbers
- Control air emissions to be within the limit of the Egyptian environmental law 4/1994

5.3.2.1.2 Dust, Bio-aerosols, and Odors

There are two main sources of dust emissions: the crusher in C&D waste handling and the movement of vehicles transporting waste. The proposed mitigation measures to control dust, bio-aerosols and odors are as follows:

- Use water spray for dust control
- For the crusher, reduce wind speed by working close to ground level
- Crusher must have dust extraction system and bag filter
- Limit the creation of dust by ensuring that hard surfaces or paving are used for all haul routes and reducing vehicle speed in unpaved roads
- Implement a washing checklist for waste collection vehicles on a daily basis to ensure cleanliness and prevent the transfer of diseases and epidemics
- Promote the use of bags to reduce the odors from soiling of waste collection and transport equipment
- Use odor-neutralizing sprays where necessary
- Sweep waste management areas and roads frequently
- Restrict tipping activities during periods of adverse weather (e.g., wind toward sensitive receptors)

5.3.2.1.3 Landfill Gas

As mentioned in section 2.3.3.5, the amount of landfill gas is expected to be small. In addition, the proposed lining system and the covering material of waste are considered a good engineering control process for minimizing the migration of landfill gas to the atmosphere or through the soil to the groundwater. In addition, flaring landfill gas minimizes its global warming potential (GWP). Flaring landfill gas will also minimize the risk of fire and explosion posed by escaping methane. Accordingly, the proposed mitigation measures to control landfill gas are as follows:

- It is recommended to perform trials to collect the gas early during the landfill operation and before the cell is completely filled (i.e. place gas vents progressively)
- Provision of a portable devise permanently working to measure the concentration of the gases on site
- Install landfill gas monitoring wells to regularly measure landfill gas emissions
- The lining system and final cover of the landfill should be properly maintained to avoid overloading landfill cells and allow regular evacuation/ventilation of leachate and gas.
- To control GHG emissions, it is recommended to install landfill gas collection system to collect landfill gas and flare it in enclosed flare as recommended by EU directive (1999/31/EC) for the best practices of enclosed flare operation, maintenance and monitoring
- A maintenance schedule for the landfill ventilation/gas collection system should be prepared and followed by the project operator

5.3.2.1.4 Odor Emissions

The site is located in a desert area in 10th of Ramadan. It is located at around 7 km away from the nearest road (Cairo – Ismailia Desert road), around 5 km from the industrial area and around 9 km from 10th of Ramdan residential area and 14 km away from Badr City. Based on the prevailing wind direction (north west), the odor will be moved towards desert area. Accordingly, the impact is considered insignificant.

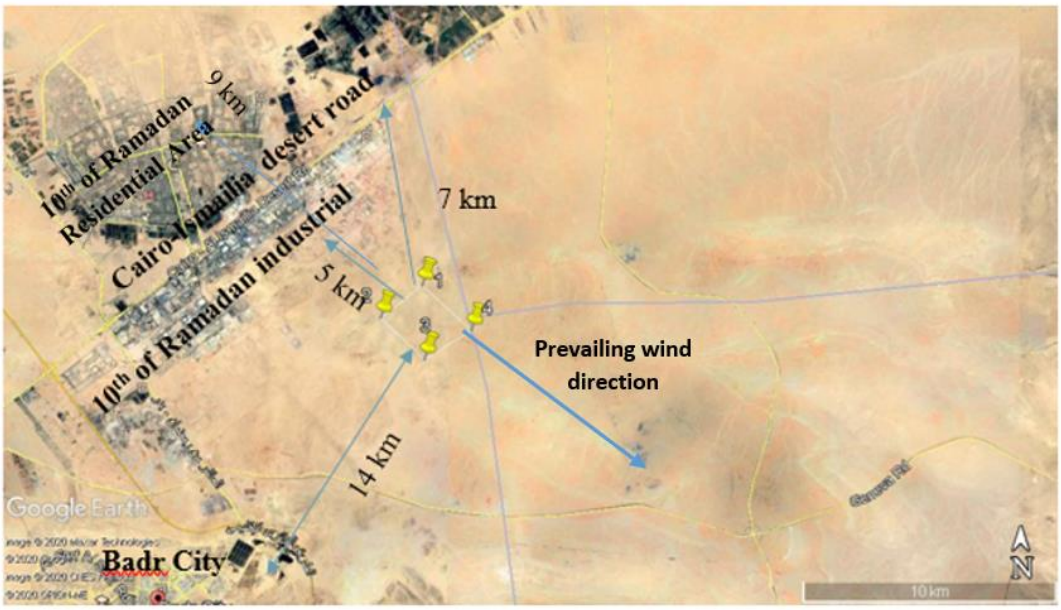


Figure 38 Location of the proposed project

Odor from sanitary landfill operation

Although the placement of daily cover does not provide a completely sealed surface, it has shown to be an effective control on odor. When combined with a proper cell development sequence, the use of thicker intermediate cover layers and a positive gas venting system, daily cover provides a vital and effective odor control measure

In addition, controlling landfill gas and leachate generation, which are the main source of odor in the landfill, will result in better odor management. Flaring landfill gas will minimize odor impact. Minimizing the leachate head over the bottom liner of the landfill and removing leachate routinely as it accumulates is an important control to avoid leachate head build-up and hence, avoid the increased risk of surface leachate breakouts and surface seeps.

Odor from composting plant operation

In composting plants, if aerobic conditions are not maintained, anaerobic (low oxygen) decomposition will take place, and foul odors will be generated. With appropriate management practices, odors can be greatly reduced and even eliminated.

There are five key factors that can be controlled to promote aerobic conditions and reduce odors are:

1. Nutrient balance should have typical carbon: nitrogen ratio of 30:1
2. Temperature in compost windrows should range from 32°C to 60°C
3. Moisture content in the composting mix ideally should be 50-60%
4. Maintain aeration (Particle / pile size) or turning of the compost piles
5. Maintain pH level between 6 to 8

In addition, other mitigation measures include:

- Maintain the identification board of the compost pile regularly updated to facilitate operation control in favor of aerobic decomposition.

5.3.2.2 Noise

The following mitigation measures are proposed:

- Use of appropriate PPE for all workers
- Fitting equipment with silencers or mufflers
- Regular maintenance and service of building equipment and vehicles
- Plant wind break trees around the site borders to attenuate any possible impact

5.3.2.3 Soil, Geology and Hydrology: Leachate and Liquid Runoff

The concept design proposed technical solutions to ensure protection of receptors from contamination such as:

- Impermeable lower layer that prevents the leakage and infiltration of leachate
- Drainage systems that will channel leachates in a controlled manner from the cells to the treatment system
- landfill cell compaction, slopes and daily cover materials to reduce infiltration of rainfall into the deposited waste
- Site drainage that will minimize the inflow of storm water into the site which will minimize leachate generation

In order to mitigate soil and groundwater contamination from leachate generation, the proposed mitigation measures are as follows:

- Install impermeable layer and drainage underneath the processing area to provide adequate leachate drainage from composting organics or an adsorbent material can be incorporated in the compost and at the base of the pile
- All leachate generated from sanitary landfill, composting plant and waste receipt and unloading area (from waste collection trucks) should be treated to meet applicable environmental standards before discharge to municipal sewage system or stored in a lined earthen basin or in aboveground storage tanks for passive evaporation using aeration in holding ponds
- Provide regular maintenance of impermeable liner and leachate collection/conveyance systems. This serves to reduce leachate movement outside the waste mass and to enable leachate to be extracted. The leachate can then be stored or pumped for proper handling

and subsequent treatment with the most appropriate leachate treatment option(s) being a very site-specific decision

- Selection of the most appropriate option at a particular site will depend on a range of factors including:
    - Site location relative to sewage works
    - Volume and strength of leachate generated
    - Climatic conditions
    - Nature of the waste
    - Availability of land for on-site treatment
    - Capital and operating cost considerations
- The leachate collection pumping station and correspondent piping network should be adequately maintained to ensure smooth operation. The design should include a preventive maintenance schedule which should be followed by the project operator
- Regular maintenance shall always be planned during the non-rainy period. Spare pumps shall be available at the site to be used in the event of accidental breakdown of the operating pumps. A system must be designed to repair any blockage that may occur in the leachate drainage system by backwashing
- Regular inspection of site and make sure it is free from leachate spots
- Regular inspection of quantities of leachate collected for any unusual drop indicates leakage from the system
- Regular inspection of site drainage to avoid run-off/run-on build up and increase amount of leachate
- Ensure that rain water is not accumulating in the disposal area by maintaining slopes to drainage channels
- Make sure the cover is placed with the right slope
- The final cover layer to be applied upon any area reaches design height
- The composting piles and waste reception areas should be covered to prevent contamination of the run-off from these areas. The same applies to recycling areas

Regarding soil stability, the following mitigation measure is recommended:

- Side slopes of the landfill should not be more than 2.5:1 (horizontal: vertical), otherwise erosion and loss of cover material could occur. It is important that cover material exist even on the side slopes of the landfill cells, as well as on the lateral surface. This is important to avoid underground fires in case air is contacted with landfill gas. Underground fires can cause cavities within the solid waste and the surface of the landfill could collapse causing serious accidents
- Regularly consider the stresses applied on the soil during excavation and cell progression and compaction so as not to cause instability of the landfill during different stages of the

operation and after closure of the landfill. The heights, slopes and protection measures should take instability into consideration

5.3.2.4 Solid and Hazardous Waste

The proposed mitigation measures for controlling solid waste loading and processing in the site are as follow:

- Safe disposal of waste products and residues containing hazardous material by authorized contractor
- Solid waste should be inspected at the entrance gate of the site and after the solid waste transport vehicles are unloaded
- All unauthorized waste detected during the examination will be recorded, and included in the monthly report
- Trucks to be directed to active cell through clear and limited routes
- The loads are inspected and weighed before being directed to the working area. The number and load of each truck, hour and date of entry
- Analyze suspected hazardous materials before acceptance so that they are segregated relative to compatibility and so that they can be adequately treated and disposed of

5.3.2.5 Labor and Working Conditions

In the Qalyoubia landfill and the C&D waste treatment facility, workers are exposed to different hazards including: accidents (involving trucks and fire) and exposure to pathogens and vectors. In order to ensure occupational health and safety for workers, general health and safety recommendations include:

- Clear, fair hiring procedures should be put in place to ensure fair treatment, nondiscrimination and equal opportunity of project workers:
    - Information regarding terms and conditions of employment (including their rights related to hours of work, wages, overtime, compensation and benefits…) should be established and communicated with the workers as per national laws and the LMP
    - Adequate periods of rest per week, annual holiday and sick, maternity and family leave should be ensured,
    - In case of termination of contract, project workers will receive written notice of termination of employment and details of severance payments in a timely manner
    - Employment of project workers will be based on the principle of equal opportunity and fair treatment, and there will be no discrimination with respect to any aspects of the employment relationship, such as recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, or disciplinary practices
    - The above is a non-exhaustive list of mitigation measures. The different types of project employers will need to follow the LMP

- Equipping facilities with fire detectors, alarm systems, and fire-fighting equipment. The equipment should be maintained in good working order and be readily accessible with guideline on how to use them
- Adequate supplies of potable drinking water and clean eating area, washing basins and changing rooms should be provided to all employees
- Adequate temperature and lighting are important because of the rough conditions of the desert
- Qualified first-aid should be provided at all time
- Training should consist of basic hazard awareness, site-specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate
- Active use of PPEs that offer adequate protection and their regular maintenance (e.g. anti-puncture gloves, steel-toe shoes, overalls and masks). Strict supervision on the compliance of hand sorters to this should be practiced
- Prepare a documented emergency response plan to any fires, explosions, leachate emergencies, gas emergencies, medical emergencies, non-conforming waste, contingency plan, waste vehicle accidents, geotechnical instability emergency trainings, etc
- Restrict unauthorized access to landfill area
- Control of vermin, insects and birds by compaction of deposited waste and application of cover materials according to the waste filling plan
- All workers of the landfill, recycling and composting plants should receive adequate training on the types of hazardous waste that could be found, the type of hazards and the appropriate methods of handling
- Coverage with appropriate insurance schemes (social and health insurance coverage) for all the types of workers, including casual workers hired by subcontractors and contractors. In addition, the Insurance should be covering work related accidents (injuries and fatalities), as well as insurance for third party.
- Anyone entering the project site will register in an attendance sheet/logbook
- Records of copy of national IDs will be kept for all types of laborers, including casual laborers hired by subcontractor and contractor.
- Develop and Implement a well communicated and accessible grievance mechanism for workers to address any complaints

There will be a mechanism for receiving, investigating and working on complaints coming from the employees, within the framework of the labor law.

5.3.2.6 Community Health and Safety

It is recommended to plant wind break trees around the site borders to attenuate any possible impact. The site will be surrounded by perimeter fencing, a gate, and equipped with a crew of security personnel, as only the authorized personnel will be allowed to enter. In addition, the

site is located in a desert area and the impacts on the surrounding community is expected to be low after applying the following mitigation measures for control of litter, fire and odor.

For establishing a grievance redress mechanism (GRM) accessible to community, there will be an office dedicated to receiving complaints from the surrounding community. The complaints will be recorded in complaints record, in which the content of the complaint is detailed - the procedure that was carried out to address the complaints - the date and time the complaint was received - the time to address the complaint - the person receiving the complaint - the person who addresses the complaint.

The proposed mitigation measures are as follows:

- Follow the mitigation measures mentioned in sections (Air Quality, Noise) mentioned above
- Prevent access to site, manage use of equipment and machinery in compliance with permissible emissions, noise limits
- Provide a complaint mechanism for the community
- Regular consultation with surrounding communities to ensure the sustainable operation of the project
- Launching awareness raising campaigns for community
- Develop a communication strategy to raise awareness of the community members on health and safety measures

5.3.2.6.1 Risk of Gender Based Violence (GBV)

The proposed mitigation to mitigate the risk of GBV are as follows:

- Preparation of appropriate code of conduct that stipulates the commitment of labor towards community groups and behaviors that should be avoided
- All workers should be trained on the code of conduct.
- Code of conduct to be developed and signed by operator. It should include prevention of sexual exploitation and abuse and sexual harassment (SEA/SH) at workplace.
- Apply the full requirements related to operating the grievance mechanism including anonymous channels
- Specified grievance mechanism channels for GBV will be announced and coordination will take place with the appropriate governmental entity (e.g. National Council for Women)22
- Raising awareness of the local community about the project commitment towards communities' and the measures taken for that through public consultation and focus group discussions
- Apply penalties to workers violating the code of conduct
- Random drug and alcohol tests to be conducted.
- If workers will be staying in rented apartments by contractor or sub-contractor, in labor camps or in any other accommodation facilities, the developed code of conduct should be complied to

5.3.2.6.2 Fire

The proposed mitigation measures to control fire in the Qalyoubia landfill and the C&D waste treatment facility are as follows:

- Provide a fire alarm system, including temperature sensors in the waste being treated
- Design the facility for access by firefighting equipment, including clear aisles among windrows and access to an adequate water supply
- For landfill, daily cover isolates the waste from the surface and reduces the potential for accidental or deliberate fires being started

In the composting plant, aerobic degradation can produce sufficient heat to cause spontaneous combustion in certain circumstances.

- For composting, avoid conditions that can lead to spontaneous combustion (e.g., moisture between 25 – 45 percent and temperatures above about 93ºC. This can be

22 The National Council for Women is running a dedicated grievance system for dealing with GBV cases. The system ensures anonymity of the complaints and ensures that specialized professional responses are offered as well as referral to existent support systems (e.g. women shelter).

achieved for example by keeping windrows less than about 3m high and turning them when the temperature exceeds 60ºC)

5.3.2.6.3 Infestation by Flies and Vermin

The proposed mitigation measures to control infestation by flies and vermin are as follows:

- Incoming fresh waste and separated organic should not be stored on site for more than 24 hours
- Install wheel washing facility at entry and exit points to the site
- Perform daily cleaning for the facility and storage areas
- Maintaining the application of daily cover of thickness 10-15 cm has proved to be effective in controlling rats and other vermin such as feral animals as over a period of time. It simply makes accessing the food source too difficult to be attractive to animals and flies

5.3.2.6.4 Control of Litter

The proposed mitigation measures to control litter are as follows:

- Facilities are to be cleaned daily
- All vehicles entering the site should have their containers covered
- Compact and cover waste promptly after discharge from the vehicle delivering the waste
- Provide perimeter planting, landscaping, or fences to reduce wind

5.3.2.7 Traffic

The traffic study assumed that the project will be operating after a year from starting construction. The annual rate of increase in traffic volume was assumed to be 1%. Accordingly, the traffic volume after adding the waste vehicles that will work for the project was added and the traffic volume was estimated.

It was assumed that the waste collected from transfer stations around Cairo happens over 4 cycles. The vehicles will use 3 main roads. Table 46 shows the main roads and the number of vehicles on each road used to transfer waste generated in Cairo governorate to 10th of Ramadan landfill.

Table 46 The main roads and the number of vehicles on each road for Cairo governorate

Road	Number of daily collection cycles using 30-ton vehicle	Number of daily collection cycles using 45-ton vehicle
Cairo – Ismailia	245	168
Cairo – Suez	7	5
10th of Ramadan – Badr	18	12

Similarly, for Qalyoubia governorate, it was assumed that the waste collected from transfer stations around Qalyoubia happens over 4 cycles. The vehicles will use 3 main roads. Table 47 shows the main roads and the number of vehicles on each road to transfer waste generated in Qalyoubia governorate to 10th of Ramadan landfill.

Table 47 The main roads and the number of vehicles on each road for Qalyoubia governorate

Road	Number of daily collection cycles using 30-ton vehicle	Number of daily collection cycles using 45-ton vehicle
Belbis – 10th of Ramadan	16	10
Minya ElKamh – Belbis – 10th of Ramadan	11	7
Cairo – Ismailia desert road	95	63

From the traffic study (annex 5), based on waste generation in Cairo, the number of vehicles is estimated to be 258 of the 32 tons capacity and 72 km average distance over 9 districts. Similarly, for Qalyoubia, it will be 116 vehicles over 10 districts.

The study includes assessment of the level of road services after one year, 5 years 25 years and 50 years from the project implementation, the number of vehicles that will transport the amount of waste generated and how long they will be waiting to be weighed at the site depending on the capacity of the truck.

Synchro simulation program was used to simulate the traffic volume on the affected roads from the proposed project and during morning and evening rush hours. The study indicates that the project will not have significant impact on the traffic around the site. After 1 year and 5 years of project implementation, the road service level is A, which is the best level. The road service level is ratio between the width of the road and number of vehicles. After 25 and 50 years is a long time and roads may change, that's why it can be inaccurate. However, the simulation results indicate that the road service is level D and E, which are considered acceptable levels.

The traffic study presented three scenarios to determine queuing of vehicles at the entrance to be weighed in the first year of the operation of the Qalyoubia landfill and the C&D waste treatment facility. This will help in determining the best scenario to minimize the time of queuing of vehicles at the entrance and hence minimize emissions. There are two gates that serve the vehicles collecting waste from different districts in governorates Cairo and Qalyoubia. One gate is for vehicles collecting waste from Cairo and the second gate for Qalyoubia. Each gate has weighing bridge to determine the capacity of the vehicle. The weighing process takes 2.5 minutes, allowing the weighing bridge to service 24 vehicles per hour.

The amount of waste generated from Cairo and Qalyoubia governorates was estimated. Accordingly, the number of vehicles required to collect them was estimated, taking into consideration number of working hours. By using statistical and probability analysis the average number of wastes collecting vehicles that will be waiting and queuing to be weighed was estimated based on three scenarios as presented in Tables (43-45) for first year of operation, after 5 years and after 50 years of operation.

Table 48 Vehicles waiting data for first year of operation

Governorate	Scenario	Vehicle capacity (ton)	Number of weigh bridges	Number of working hours per day	Average number of vehicles waiting to be weighed	Average waiting time per vehicle (min)
Cairo	1	30	1	12	15	40
	2	45	1	12	2	7
	3	30	2	12	1	2.5
Qalyoubia	1	30	1	6	6	16
	2	45	1	6	2	6
	3	30	2	6	1	2.2

Table 49 Vehicles waiting data after 5 years of operation

Governorate	Scenario	Vehicle capacity (ton)	Number of weigh bridges	Number of working hours per day	Average number of vehicles waiting to be weighed	Average waiting time per vehicle (min)
Cairo	1	30	1	18	3	8
	2	45	1	12	3	9
	3	30	2	12	1	2.6
Qalyoubia	1	30	1	6	8	23
	2	45	1	6	2	6
	3	30	2	6	1	2.25

Table 50 Vehicles waiting data after 50 years of operation

Governorate	Scenario	Vehicle capacity (ton)	Number of weigh bridges	Number of working hours per day	Average number of vehicles waiting to be weighed	Average waiting time per vehicle (min)
Cairo	1	30	1	20	17	43
	2	45	1	18	3	9
	3	30	2	12	4	5.8
Qalyoubia	1	30	1	12	3	8
	2	45	1	6	12	33
	3	30	2	6	3	4.2

The traffic study recommendations are as follows:

- Employing waste collection vehicles of capacity not less than 45 tons to reduce the number of vehicles and avoid traffic congestions on the roads and at the gates of the proposed project

- Using electronic system to enter the gates to minimize the time for inspection before entering and prevent any possible queuing congestion
- Using of two weighing bridges at the Cairo governorate waste receiving gate to prevent congestion form happening with time after increasing number of vehicles
- In the future, increase number of working hours or employees as proposed in the tables to absorb the amount of waste and vehicles

5.3.2.8 Natural Disaster Risk

As mentioned in the construction phase, despite the low probability of natural risk to happen, an emergency preparedness and response plan shall be prepared for the proposed project and provide training to all personnel on the plan and how to respond in such risk.

Positive Impacts

5.3.2.9 Employment Opportunities

To promote the positive socio-economic impact of the proposed project, the following measures are proposed:

- Developing recruitment strategy to creating new job opportunities for workers and engineers
- Prioritize employment of local people
- Discuss potential barriers for local employment with labor or training offices in order to overcome them and to reduce collision with local communities (stakeholder engagement)
- Inventorying workers in the informal sector that operates in waste affected by the project, and vocational training programs to raise their efficiency
- Activating the role of civil society organizations NGOs in raising awareness of the local communities about the importance of the project and the importance of preserving the environment
- Provide a complaint mechanism

5.3.3 Mitigation Measures for Significant Impacts during the Closure and Post Closure Activities

Closure and post closure activities should be planed early on the project cycle so that they are incorporated in the financial and technical planning. After the closure of the landfill, the following activities should be performed:

- Maintain the final cover from the different factors such as settlements, erosion or other events and prevent run-on and run-off from eroding the final cover. Walkover inspection should be carried out twice a year after rain months and sand storms
- Maintain and operate leachate collection system. Compare quantities with design capacity every year to detect any leakage. Analysis of treated effluent is done once per year to analyze (BOD, COD and heavy metals)

- Maintain and operate the gas monitoring system. Gases should be collected and flared when necessary
- Measure air quality after closure to make sure no gaseous emissions affect the air quality

To ensure the proper implementation of closure and post closure activities, the following needs to be done:

- Development of a closure plan which specifies the necessary environmental objectives and controls (including technical specifications), future land use (as defined in consultation with local communities and government agencies), closure schedule, financial resources, and monitoring arrangements
- Evaluation, selection, and application of closure methods consistent with post- closure use and which should include the placement of a final cover to prevent further impacts to human health and the environment
- Application of final cover components that are consistent with post closure use and local climatic conditions. The final cover should provide long term environmental protection by preventing direct or indirect contact of living organisms with the waste materials and their constituents; minimize infiltration of precipitation into the waste and the subsequent generation of leachate; control landfill gas migration; and minimize long term maintenance needs
- Final soil cover needs to be sloped (2-3%) to avoid ponding of waters on top of the refuse filled area and to minimize infiltration. Grass is planted in the final soil cover to limit erosion. Final cover should be minimum of 60 cm depth

6 PROJECT ALTERNATIVES

The analysis of the project alternatives forms an integral part of the ESIA as it helps determining the optimum technical and economical options with maximized positive environmental and social impacts and reduced or mitigated negative impacts. This analysis evaluates whether there are viable alternatives to the proposed development which can fulfill the same function while reducing the overall environmental impact. This section discusses the following alternatives:

- No action alternative
- Project location/Land alternatives
- Landfill technology alternatives
- Leachate treatment and disposal alternatives
- Landfill gas collection and disposal alternatives

6.1 No Action Alternative

The objectives of the Qalyoubia landfill and the C&D waste treatment facility is basically to enhance the quality of air through preventing the uncontrolled burning of municipal waste and also to improve the environmental and public health conditions, accordingly it is expected, by definition, that the environmental and social benefits will overweigh the impacts.

Unsecured dumpsites pose high potential for negative environmental impacts such as contamination of groundwater resources through uncontrolled discharge of leachate and air pollution resulting from methane generation and toxic substances release from the burning of waste. Additionally, the communities and residents living near the open dumpsites are impacted by bad odor generated by decomposing waste which also attracts vectors like rodents and flies.

On the other hand, the safe and sanitary management of municipal solid waste combined with sorting the waste for recyclable material recovery and separation of hazardous medical waste would have the following positive impacts:

- Minimize the risk of fires
- Minimize groundwater contamination
- Control odor and gas migration
- Improve the possibilities of recovering organic waste and recyclables in the solid waste
- Provide work opportunities for the people in the project and indirect services for contractors and entrepreneurs
- Improve the environmental and public health conditions for the people living nearby

Therefore, it can be concluded that the “no project alternative” is not a viable alternative from the environmental and social perspective.

6.2 Project Location/Land Alternatives

The selected project site is an empty unoccupied land, owned by the state, located near to an industrial area and away from residential areas or sensitive receptors.

During identification of suitable sites for construction of a landfill, the procedure follows a two-phase process, negative mapping and positive mapping. Negative mapping excludes sites that are not suitable for the construction of the landfill.

The exclusion criteria include:

- Sites located in flood areas.
- The site is a collection point for rainwater.
- Located in areas with a groundwater level close to the subsurface (≤ 1m).
- The surrounding areas are planned as residential areas.
- The location is less than 500 m from the nearest residential area.
- Located within an area where explosives are used or military activities.
- Located in a landslide area.
- Located in less than 1.5 km from the nearest airport.

Negative mapping is followed by positive mapping where sites that can be considered as a potential site for the construction of landfill is identified. The sites should meet the following criteria:

- Limited use of groundwater for drinking or agriculture due to its high salinity.
- Site is away from populated areas more than 1.5 km, as per Article 38 of the Executive Regulations 1741/2005 amended in Executive Regulations 964/2015 of Law 4/1994. The landfill site in relation to the residential area should be down-wind the prevailing wind direction.
- Area availability compared to the quantity of waste that will be disposed over the lifetime of the landfill
- Clear land ownership
- Main roads leading to the site are facilitated and leveled, commensurable with the traffic movement, size and number of vehicles arriving daily.

Since the proposed project site complies with both the negative and positive mapping criteria, it is considered the best available location for the construction of the 10th of Ramadan Landfill.

6.3 Technology Alternatives

The overall aim for solid waste management is protection of human health and the environment in a manner that is affordable, environmentally friendly and socially acceptable. To achieve that, the adoption of an integrated solid waste management system is recommended.
The most important two alternatives for the project are:

- Waste avoidance and reduction
- Waste incineration or waste to energy
- Direct waste disposal by landfilling

Both alternatives have major disadvantages as discussed below:

6.3.1 Waste Avoidance and Reduction

The aim of waste avoidance and reduction is to achieve waste minimization. However, waste minimization programs are not possible to envisage zero waste generation in the foreseeable future.

6.3.2 Waste Incineration

Waste incineration is characterized by high capital, operating and maintenance costs.
Special types of incinerators completed with its necessary air pollution abatement systems must be used to avoid air pollution due to the waste incineration. Also, high energy requirements will be supplied to operate the incinerators, leading to air pollution due to fuel combustion. In addition, the incineration process requires highly qualified operators to avoid any process failure. For these reasons waste incineration is not recommended from the environmental perspective.

6.3.3 Direct Waste Disposal by Landfilling

Direct landfilling of municipal waste without sorting will lead to the following:

1. Increase the amount of waste to be buried; hence reducing the lifetime of the landfill.
2. Valuable material that could be recycled and reused will be lost which will decrease the economic benefits of the project and represent a loss of resources
3. Increase the amount of plastic waste that will be buried instead of recycling it, which remains for decades without degradation.
4. Large amounts of landfill gas will be produced and emitted to the atmosphere due to the burial of organic material Large amounts of leachate will be produced also due to the presence of organic waste which will increase the possibility of soil and underground water contamination if not collected and treated properly.

From the above it is clear that the proposed project is a landfill for domestic wastes/rejects, recycling of municipal and demolition and construction waste generated from Cairo and Qalyoubia Governorates and access as well as internal infrastructure. Hence, it is expected to prevent wastage of potentially useful materials, reduce consumption of fresh raw materials, energy usage, and air pollution, as well as increase the landfill lifetime.

6.4 Leachate Treatment and Disposal Alternatives

6.4.1 Recirculation of Leachate through the Landfill

This technology involves the decomposition of some of the soluble organic compounds by the bacteria present in the landfill. During dry season, the leachate volume reduces significantly through evaporation. This technique is used when large quantities of organic waste are disposed by landfilling, accordingly it is not recommended to be used in the proposed project.

6.4.2 Disposal off-site to Sewer for Treatment

To collect the resulting leachate in underground tanks and transfer of leachate off site via appropriate tankers to an existing near domestic sewage treatment plant. This method is known to be used with relatively small amounts of leachate and when a near treatment plant is available to reduce the transportation cost.

6.4.3 Leachate Treatment Techniques

6.4.3.1 Aerobic Biological Treatment

This technology involves the rapid removal of organic pollutants through nitrification. On the other hand, it's known for its large production of excess sludge, high consumption of oxygen, and great energy costs.

6.4.3.2 Anaerobic Biological Treatment

This technology utilizes the absence of dissolved oxygen to decompose organic matter present in the leachate. This treatment method is characterized by its low treatment costs and high energy recovery through biogas collection and exploitation.

6.4.3.3 Constructed Wetlands

These engineered systems utilize wetland plants, soil, and associated microorganisms to remove pollutants from wastewater effluents and significantly reduce leachate volumes through surface evaporation.

6.4.4 Recommended Technique

From the above presented options for leachate handling it is preferred either to:

1. Send the leachate to an off-site sewage treatment plant in case of small leachate amount and the availability of a near treatment plant, or:
2. To collect the leachate at an evaporation pond in case of area availability. This has to be decided before finalising the site layout

6.5 .Landfill Gas Collection and Disposal Alternatives

6.5.1 Landfill Gas to Energy

Collect methane and use it to fuel onsite engines or turbines, generating electricity to power surrounding homes and neighborhoods which further reduces greenhouse gases and air pollution. This technique is feasible when organic waste are buried and large quantities of LFG are produced.

6.5.2 Landfill Gas Bottling

Methane gas resulting from anerobic conditions in landfills can be captured, processed and bottled to be utilized in the production of liquified petroleum gas. This technique is feasible when organic waste is buried and large quantities of LFG are produced.

6.5.3 Landfill Gas Flaring

Landfill gas can be collected through horizontal trenches and vertical wells and then be sent to be treated or flared. If the amount of gas extracted is relatively small for electricity generation, it can be flared off instead.

The temperature at the project site throughout the year is high, which leads to the decomposition of any organic matter that may be present in the rejects aerobically in the first phase of the decomposition process and the emission of CO_2 gas of biogenic origin. Thus, the amount of organic matter remaining for the anaerobic decomposition process is very small, which does not result in or may produce a very small amount of methane. Hence, the utilization of the landfill gas in power generation will not be economically feasible and it should be thermally destructed through flaring instead.

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The management of the proposed project shall be committed to ensure compliance with the proposed mitigation measures, and all applicable national and international environmental legislation, regulations and standards, as well as the proper management of all significant environmental impacts and the continual improvement of the environmental performance of the project. In order to achieve this, an environmental and social management plan (ESMP) must be established to complete the environmental evaluation. The ESMP summarizes the mitigation measures suggested and discusses initial and ongoing monitoring and management measures of significant impacts of the proposed plant. The management of the proposed project shall be committed to implement the environmental and social management plan (ESMP) requirements included therein.

This section discusses the various elements of an environmental and social management plan for the proposed project. In general, an effective ESMP should aim to fulfill the plan-do-check-act cycle to achieve continual improvement of the environmental performance.

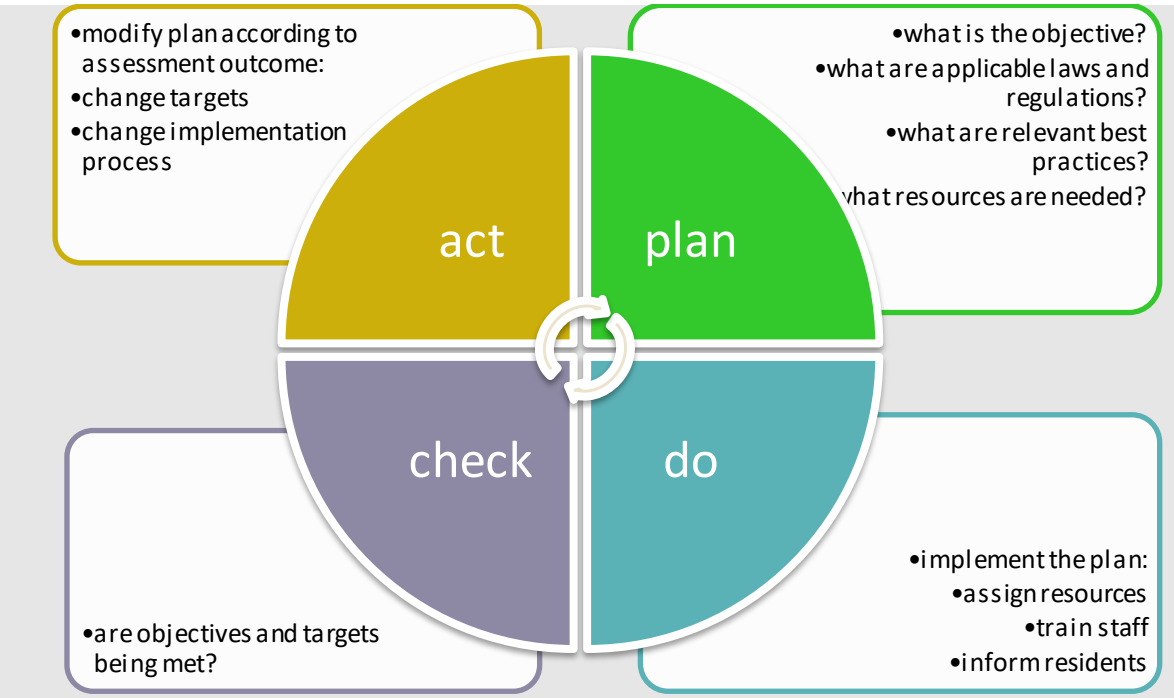


Figure 39 Plan-do-check-act cycle applied to proposed project

Five elements are identified as the corner stone for an effective plan. These include:

1. **Environmental objectives and Targets:** Definition of a set of objectives and targets to achieve; indicators to measure the environmental performance of the system (covered under Environmental Objectives and Targets)
2. **Environmental Management:** The ESMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures can be implemented further

3. **Environmental and Social Monitoring:** Develop a plan to monitor environmental indicators and parameters, covered under Environmental Monitoring Plan
4. **Environmental Register:** Keep up an environmental register to ensure compliance to national legal requirements, covered under Environmental Register

7.1 Environmental Objectives and Targets

The management of the proposed project is committed to implementing an environmental and social management and monitoring plan. The plan will ensure that the construction and the operation of the landfill and the C&D waste treatment facility, involves full implementation of all proposed mitigation measures and complies with:

- World Bank standards
- Egyptian environmental standards
- The procedures and guidelines of the EEAA

Previous sections of this report have outlined: the baseline environmental conditions in the area of the proposed development, have identified the potential impacts on these baseline conditions which could result from both construction and operational activities, and have proposed measures to minimize and mitigate any negative impact identified. To complete the environmental evaluation, this section presents an Environmental and Social Monitoring Plan (ESMP). ESMP reflects the implementation procedures and mechanisms for the mitigation measures suggested. It discusses initial and ongoing monitoring and management of significant impacts of the proposed project. The ESMP will focus on the following:

- Construction impacts management, including control of construction traffic, dust impacts, construction waste, relations with neighboring communities, etc.
- Operational impacts management and control
- Environmental organization, which includes staffing levels, staff training, and communication & reporting

The effectiveness of these environmental and social management and mitigation measures will be monitored throughout the construction and operation of the proposed project. Monitoring will be carried out by the management of the landfill and the C&D waste treatment facility as appropriate to the size and scale of the project.

As explained above, a number of indicators have been selected for each of these objectives. These indicators are measurable. Therefore, when monitored as part of the monitoring and environmental management plan, will provide a quantitative yield on the environmental performance of the system. The explanation of the selected indicators for each goal and their target values are explained in more detail below.

The ESMP provides:

- Evidence of practical and achievable plans for the management of the proposed project
- Framework to confirm compliance with relevant laws, regulations and standards
- Evidence of the management of the project in an environmentally acceptable manner

7.2 Environmental Management Plan

7.2.1 Environmental Management Organization

The project is divided in the management between Cairo and Qalyoubia governorates. The management in the governorates will issue a tender for the project components to be allocated to private sector. Hence, the private sector will be responsible for the construction and operation of the proposed project.

The discretion of the governorates should be used when offering tenders. The proponent (i.e. private sector) should adhere to the implementation of the provisions of the ESMP.

Qualified and experienced contractors will be responsible for implementation of the detailed design and construction of the proposed project. Accordingly, contractor will be responsible for implementation of ESMP and code of conduct. It is important for the proponent to ensure adequate monitoring and evaluation of the contractor. Contractor Construction workers will be required to demonstrate appropriate skills, qualifications and/or experience prior to employment.

The private sector management will ensure that all contracts with contractors and sub-contractors stipulate all construction management measures, operational design criteria and environment, health and safety standards. Implementation of these measures will be enforced and supervised by dedicated HSE manager who will have direct responsibility for the Environment, Safety and Quality Assurance program on site during construction and operation.

The HSE Manager is responsible for ensuring that construction works comply with the requirements of the ESMP and all environmental permits. The HSE manager's key roles will be to:

- Assume the interface with authorities for environmental authorizations and permits
- Ensure that mitigation measures to reduce impacts during the construction phase are implemented
- Ensure that monitoring to be undertaken during construction is implemented
- Ensure compliance with the environmental management plan
- Ensure that health and safety requirements are respected

During operation, direct responsibility for environmental compliance and the implementation of the mitigation and monitoring measures described in this section of the report, will be the responsibility of the private sector taking part of the project components.

7.2.2 Environmental Training

A training program will be designed to ensure that appropriate skilled staff is used to operate the the landfill and the C&D waste treatment facility at all times. The management will ensure that any employee whose work is connected to the operation of th the landfill and the C&D waste treatment facility will be trained on:

- The general operation of the project
- Specific roles and important actions
- Occupational Health and Safety
- Emergency Preparedness and Contingency Response Procedures
- Grievance mechanisms

Environmental specialist training will also be provided for HSE staff as required for their prescribed job role and shall include:

- Induction training on appointment
- Day-to-day monitoring activities
- Collection and analysis of air quality data
- Collection and analysis of water quality information
- Use of monitoring equipment, operation and maintenance
- Industrial hygiene; occupational health and safety

7.3 Social Management Plan

7.3.1 Social Management Structure of Implementing Agency

The ESIA team noted during the field visit to the proposed route of the project area; that the project's land is free from any economic activities or installations, that there is no agricultural land located on or around the proposed project site, or land owned by individuals, or any economic activities. It is expected that no impact on livelihood will occur as a result of the construction and operation of the proposed project.

The ESIA team suggests appointing a "Social Development Officer" who should be working on full time basis during the project construction to ensure the social management plan is sufficiently addressed. The Social Development Officer has to be with relevant background (e.g. a background in social development or social science). It is required that the "Social Officer" be aware of the ESSs. Training courses on participatory approach might be needed in order to build his/her capacity to efficiently follow up the implementation of the social management plan.

7.3.1.1 Social Development Officer

The main roles and responsibilities of the Social Development Officer are as follows:

- Ensuring that the proposed social management plan is sufficiently considered and applied as well as implementation of the mitigationitigation measures related to labor and working conditions.
- Develop detailed list of the local stakeholders and the NGOs representatives and maintain communication channels with them and ensure that they are engaged and consulted
- Developing all the required techniques and formats to monitor the implantation of the social management plan
- Assure transparent and timely sharing of information
- Register all complaints received
- Review PAPs grievance and conduct regular feedbacks and meetings as a proactive and early measure to eliminate disputes
- Report monthly on the social activities conducted, including grievances received.
- Implementation of the SEP section relevant to the landfill and the C&D waste treatment facility.

7.3.1.2 Social Management Plan

This social management plan involves a monitoring process that will be the main responsibility of the Social Development Officer. the adherence to the ESSs necessitates the development of some forms/templates in order to be able to process the management and monitoring system appropriately. This includes a Registration Form for affected land (if needed), containing specific information to identify the owner. Also, a grievance form should be used to record any complaints and ensure that action will be taken. It should be noted that these forms should be updated by the Social Development Officer based on the actual needs.

The results of the monitoring and management system should be reported quarterly to the top management. The monitoring and management will be implemented by the HSE officers under the supervision of the Social Development Officer and HSE manager.

7.4 ESMP Budget

The ESMP matrices provided in Tables (51-53) include several parameters that need to be allocated in the project's final budget. As the project primarily serves the environmental and the community, it is difficult to differentiate between the budget for engineering works and ESSs measures. Hence, it is assumed that all the measures included in Tables (51-53) are included in the project budget except for the following items (related to capacity building and consultancy). Table 51 shows the proposed budget for ESMP. It is important to take into account that the proposed budget is based on the ESIA preparation team judgment based on field survey in 2020. The budget is subject to future changes based on external economic factors, such as inflation.

Table 51 Proposed budget for ESMP

Category	Parameters	Budget (EGP)/yr.
Capacity building	Workers operating the landfill and the C&D waste treatment facility as indicated in section 7.2.2	70,000
	Proponents' HSE staff as indicated in section 7.2.2	150,000
	Capacity building and training activities for staff of the regulatory Ministries (i.e.WMRA, Cairo governorate and Qalyoubia governorate)	30,000
Consultancy	Contracting consulting firm for carrying out environmental/social audit for the project performance and recommending improvement measures (3 audits in 6 years)	360,000
	Contracting consulting firm/expert for carrying out the following studies: • Fire control and prevention plan, • Social engagement plan • Emergency preparedness and response plan • Plans and policies for management of waste not accepted at the landfill and the C&D waste treatment facility • Closure and post closure plan	500,000

7.5 Environmental and Social Monitoring Plan

The management of the landfill and the C&D waste treatment facility will be responsible for monitoring of environmental and social performance during all phases of the project.

This ESMP defines the key information to be monitored, monitoring location, monitoring frequency, monitoring methods, and mitigation actions to be undertaken as detailed in this section and section 8.

The monitoring data will be analyzed and reviewed at regular intervals by the project owner and compared with the relevant standards so that any necessary corrective actions could be taken in a timely manner. Records of monitoring results will be kept in the Environmental register.

The EEAA is entitled to audit the project company in order to ensure conformity with environmental standards and requirements. An experienced auditor shall prepare environmental and social performance reports to ensure compliance with the World Bank standards once every two years and submit to the World Bank.

The environmental and social monitoring plan focuses on fulfilling three objectives:

- Control and reduction of the environmental and social impacts due to construction of the project
- Control and reduction of the environmental and social impacts due to Operation of the project

- Control and reduction of the environmental and social impacts due to closure and post closure of the project

The Proponent will need to review the ESMP every 6 months to demonstrate that the sufficiency of the operational, design and monitoring systems for the development stage of the site has been addressed. The review process should be established to ensure continual improvement in the management and operation of the landfill site. The Proponent should also conduct an Annual Environmental Audit to assess the implementation of the ESMP.

7.5.1 Monitoring During the Construction Phase

Table 52 summarizes the environmental and social management plan for the proposed project during construction phase.

Table 52 Environmental management and monitoring plan for the proposed project during construction phase

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
Risks & Negative Impacts							
Air Quality	**Dust:** • Minimizing drop heights for material transfer activities such as unloading of friable materials; • Cover truck beds with tarps during material transport • Spray water regularly when there is possibility of generating dust • Enforcement of vehicle speed limits on site to <35 km/h. • Planting of trees as wind breakers	Visual inspections and monitoring of dust and exhaust gas releases	Daily during period of dust generating activities	• Dust levels ambient PM (TSP, PM10) • Dust complaints	Border of construction site	Contractor and proponent's HSE manager (and officers)	5500/point/hour (three points per visit)
		Recording and documentation of complaint	Monthly				
		Active collection of samples and laboratory analysis	Once during the excavation of each cell				
Noise (on workers and public)	• Use of appropriate PPE • Fitting of construction	Visual inspections	5 hours of day-time measurements, twice	Noise level below legal limits during day and night time	At the sources; Along perimeter of	Contractor and proponent's HSE manager (and officers)	600/point/day (10 to 20 points) *2*12 = 14,400

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	equipment with silencers or mufflers • Regular maintenance and service of building equipment and vehicles during construction works • Throttling down of noisy equipment • Reduce vehicle speeds (stick to recommended speeds; 20 km/h for heavy trucks) • Optimize transportation management to avoid needless truck drives (as part of a Traffic Management Plan) • Allow truck movements only during daylight, but not between 7 pm and 6 am • Notify population in nearby residential	Records and logs inspection (maintenance, permits to work, safety clearances, complaints) Instrumental measurement	per month during construction period (assumed no construction works at night)	• Regular records and logs are maintained and compliant with permissible limits	construction site; At the sensitive receptors such as the nearest road Cairo-Ismailia desert road		

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	areas in advance about start date and duration of the overall construction works and of specific operations with high noise level Noise levels may not exceed the limits stipulated by the Egyptian Environmental Law/94 and its executive regulations (as stated in section 4 of this ESIA study)						
Soil, geology and hydrology	• The contractor will put in place measures aimed at minimizing soil erosion and soil contamination - To avoid soil erosion, scheduling to avoid heavy rainfall periods (i.e.,	Visual inspection	Daily	No soil contamination from oil and/or sewage No soil erosion	Construction site	Contractor and proponent's HSE manager (and officers)	Included in construction cose

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	during the dry season, which is most of the time of the year in Egypt) to the extent practical. • Activities that involve fueling, lubricating or adding chemicals will not take place on-site unless it is necessary. This is to avoid soil pollution and generation of additional hazardous wastes. If such actions will necessarily take place on-site, they will be conducted over impervious surfaces and a spill kit will be made available on-site. - Containers of used chemicals						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	and oil will be collected in specific labeled drums and disposed in an approved hazardous wastes facility in coordination with the local authorities. • Construction vehicles will be restricted to designated areas to avoid unnecessary soil compaction within the project site • Until Connecting to the public sewage network , to properly store in leak-free septic tanks made of suitable material and to regularly collect and dispose of sewage at the nearest wastewater						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	treatment plant in coordination with the Water and wastewater company. • Completely prohibit uncontrolled washing of concrete mixers and random dumping of concrete remains by implementing regulated concrete washing in washing basins covered by impermeable materials where concrete wash out is left to dry and then recycled/reused or disposed of in authorized dump sites/landfills.						
Waste management	Prepare and implement a construction waste management plan which includes, but not necessarily limited to	Documents and records review Site visual inspection	Regularly during construction	Maintaining valid contracts with authorized waste collection contractors	Construction site	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	the following measures: • Completely prohibit dumping of solid wastes generated in unauthorized dump sites. • Existing waste material at the construction site has to be segregated and stored or disposed of accordingly • Contracting authorized waste handling contractors • Store all hazardous waste in adequate storage sites (lockable, roofed, ventilated, concreted and bunded floor) • Pack all hazardous wastes securely in sealed drums or other suitable containers, clearly identify them by labels, and provide			Records of delivery at final disposal sites Records of the types and quantities of waste generated and amounts diverted through salvage and reuse, and/or recycle.			

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	Materials Safety Data Sheets (MSDS) • Provide spill-control kits to handle any spills due to equipment maintenance • Recyclable waste such as scrap metal, wood, paper and cardboard, etc should be stored in a central waste storage area and sold to local recycling companies in order to divert waste from landfill to the extent possible						
Risk of inappropriate labor and working conditions	• Clear, fair hiring procedures should be put in place to ensure fair treatment, nondiscrimination and equal opportunity of project workers:	Inspection of training records Inspection of complaints and accident records Inspection of complaints	Continuously during construction		Construction site	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• Information regarding terms and conditions of employment (including their rights related to hours of work, wages, overtime, compensation and benefits…) should be established and communicated with the workers as per national laws and the Labor Management Plan (LMP) • Adequate periods of rest per week, annual holiday and sick, maternity and family leave should be ensured, • In case of termination of contract, project workers will receive written notice of termination of	Inspection of Human Resources Policy Inspection of employment contracts Inspection of attendance sheets and ID copies Inspection of insurance policies		Emergency Preparedness and Response Plan implemented No accidents No incidents regarding public health and safety Insurance coverage for everyone on site with proof of their presence on site through attendance sheets and copy of IDs.			

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	employment and details of severance payments in a timely manner • Employment of project workers will be based on the principle of equal opportunity and fair treatment, and there will be no discrimination with respect to any aspects of the employment relationship, such as recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	retirement, or disciplinary practices • The above is a non-exhaustive list of mitigation measures. The different types of project employers will need to follow the Labor Management Plan (LMP) • Contractual agreement with the contractor should include rigid commitments to prepare and implement an OHS Plan, which complies with WBG EHS Guidelines and OHSA requirements including but not limited to the following measures: - to appoint an accredited health						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	and safety officer at site; - The use of appropriate PPE at all time; - to ensure, that medical staff, first aid facilities, ambulance services and any other medical services specified are available at all times at the site and at any worker accommodation; - to put in place workplace processes for Contractor's Personnel to report work situations that are not safe or healthy and give them the right to remove themselves from a work situation						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	which they believe (with reasonable justification) to present an imminent and serious danger to their life or health; - To develop and adopt OHS procedures for all construction activities • . Coverage with appropriate insurance schemes (social and health insurance coverage) for all the types of workers, including casual workers hired by subcontractors and contractors. In addition, the Insurance should be covering work related accidents (injuries and						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	fatalities), as well as insurance for third party. • Anyone entering the project site will register in an attendance sheet/logbook • Records of copy of national IDs will be kept for all types of laborers, including casual laborers hired by subcontractor and contractor. • Develop HSE training plan for all workers regarding work at heights, electrical and vehicular safety, handling of hazardous materials, use of PPE, hazard avoidance and reduction measures,						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	use of first aid and rescue techniques, emergency response, and firefighting, should be submitted, reviewed and approved by the MoE/ WEMRA • Develop and Implement a well communicated and accessible grievance mechanism for workers to address any complaints • Develop and implement a Contingency Preparedness and Response Plan						
COVID-19 pandemic	• Identify a senior person acting as a focal point to deal with COVID-19 issues, and to designate at least one back-up person, in case the	Site inspection Review of documents and records Medical and routine check up	Daily	Number of trained workers Number on infected persons Number of isolated persons	Construction Site	Contractor and proponent's HSE manager (and officers)	To be estimated based on the number of workers and general context

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	focal point becomes ill • Develop and implement procedures to avoid or minimize the transmission and spread of COVID-19 that may be associated with the influx of temporary or permanent contract-related labor. • Develop COVID-19 risk-based procedures tailored to site conditions and workers characteristics, and based on guidance issued by relevant authorities, both national and	of staff and workers					

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	international (e.g. WHO). These shall include but not limited to the following measures: - *Control the entry/exit to the work site;* - *Identify any workers with underlying health issues* - *Conduct temperature checks for all workers and record details of any worker that is denied entry;* - *Ensuring general hygiene (hand washing facilities, soap, disposable paper towels and closed waste bins) are present in all key areas on site;*						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	- *Take all necessary measures for proper isolation of affected areas and workers who have been in contact with infected persons (and infected persons) for 14 days* - *Review worker accommodation and assess suitability in light of the above;* - *Conduct regular and thorough cleaning of all site facilities, including offices, accommodation, canteens, common spaces and review cleaning protocols for key construction equipment;* - *Safely dispose of any medical waste*						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	produced during the care of ill workers in designated containers or bags and treated and disposed according to relevant requirements. • The Contractor is required to convene regular meetings with the project health and safety specialists and medical staff (and where appropriate the local health authorities), and to take their advice in designing and implementing the agreed measures • Clearly communicate the measures taken to the workers, those						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	entering the site and the local community and provide daily (or weekly) briefings focusing on COVI-19 specific considerations including cough etiquette, hand hygiene and distancing measures, using demonstrations and participatory methods. • Encourage workers should to use the project grievance mechanism to report concerns relating to COVID-19						
Community Health and safety	• P information related to community health and safety to be shared regularly	General Implementation/ supervision cost Number and documentation	Annual	Number of complaints	Surrounding community	Social Development Officer	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	and systematically as per stakeholder engagement plan (SEP) • Awareness raising campaigns should be tailored in cooperation with the community-based organization • Using caution tapes that help to keep unauthorised persons away of the site • Development and implementation of a Traffic Management Plan (including routes and alternative routes, truck movements, transport of workers, and short-term closure of roads (if necessary) • The construction site to be fenced and guarded by security	of awareness raising activities and stakeholder engagement activities Interview with community members Inspection of GRM details shared		number of reported incidents with the community Community members aware of the activities conducted and the messages shared/discussed			

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	personnel in order to prevent any unauthorized access to the site • In case of transporting heavy equipment, the nearby population should be notified in advance • Develop and Implement a well communicated and accessible grievance mechanism for community members to address any complaints • Develop and apply a code of conduct (CoC) for workers to regulate worker behavior and penalize any misconduct towards communities including any forms						

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	of verbal or physical assaults.						
Traffic	• Approval from the traffic department prior to construction should be obtained by the contractor prior to the construction preparation • Adopting limits for trip duration and arranging driver rosters to avoid overtiredness. • Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions. • In case of transporting heavy equipment, inform local communities in advance. • Development and implementation of a Traffic Management	Maintaining and controlling traffic on and to the site by inspection of Traffic Management Plan or traffic complaints from workers or community	Regularly during construction (especially during transport of equipment and materials)	Effectiveness/extent of implementation of traffic management plan Number of complaints received associated with traffic and time it took to resolve them Number of unresolved complaints	Surrounding roads	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	Plan (including regulations for truck movements, transport of workers, road closures, details about road use, and alternative routes in peak hours). • Review any complaints related to traffic and accidents • Clear sign surrounding construction site and the entrance / exit gate.						
Risk of Child labor	• Different types of contracts for contractors and sub-contractors should explicitly prohibit and penalize all forms of child labor in all project related activities • The contractor /subcontractor will be obliged to maintain	Verifying contracts Inspection of complaints Inspection of Human Resources Policy Inspection of employment contracts	During contract preparation Continuously during construction	No complaints from community No children on site	Procurment officer Construction site Social Development Officer	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	daily attendance sheets in order to verify the attendance of workers not include staff below 18 years' old, • Develop a monitoring plan including record keeping system for copies of IDs of laborers, daily attendance sheets in order to verify the attendance of workers not include staff below 18 • Develop ToR, contracts, and terms of employment for contractor and subcontractors prohibiting hiring minors	Inspection of attendance sheets and ID copies					
Risk of Gender Based Violence (GBV) Risk	In order to minimize impacts pertaining to labor influx the following should be	Inspection of training records Code of conduct established, disclosed and	Continuously during construction	Worker code of conduct Established	Construction site Social Development Officer	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	thoroughly implemented: • Preparation of appropriate code of conduct that stipulates the commitment of labor towards community groups and behaviors that should be avoided • All workers should be trained on the code of conduct. • Code of conduct to be developed and signed by sub-contractor. It should include prevention of sexual exploitation and abuse and sexual harassment (SEA/SH) at workplace. • Apply the full requirements related to operating the grievance mechanism	workers are trained on The monitoring of workers' compliance to the Code of Conduct when interacting with the surrounding communities to avoid behaviors such as verbal assault, sexual harassment and other forms of GBV. Inspection of complaints Inspection of training records Number and documentation of awareness raising activities and stakeholder		No complaints from community No accidents Community members aware of the activities conducted and the messages shared/discussed			

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	including anonymous channels • Dedicated grievance mechanism channels for GBV will be announced and coordination will take place with the appropriate governmental entity (e.g. National Council for Women)23 • Raising awareness of the local community about the project commitment towards communities' and the measures taken for that through public consultation and focus group discussions	engagement activities Interview with community members Inspection of drug tests and alcohol tests conducted Numbers of penalties applied					

23 The National Council for Women is running a dedicated grievance system for dealing with GBV cases. The system ensures anonymity of the complaints and ensures that specialized professional responses are offered as well as referral to existent support systems (e.g. women shelter).

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• Apply clearly articulated and strict penalization system to workers violating the code of conduct • Random drug and alcohol tests to be conducted. • If workers will be staying in rented apartments by contractor or sub-contractor, in labor camps or in any other accommodation facilities, the developed code of conduct should be complied to.						
Infrastructure and underground utilities	• Conduct surveillance activities to detect any available pipelines or networks (water or electricity) • Coordinate with the Local Governmental Units (Tenth of	Documentation of affected infrastructure and corrective procedures taken	Prior to all excavation work	No complaints received No accidents	Construction site	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

Risks/Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	Ramadan City Authority / New Urban Communities) and the water and network companies to repair any damages. The contract should pay for this cost.						
Chance of finding antiquities	• Such chance-finds needs special care in handling so as to keep their condition that will support the cultural value it represents. • In the unlikely event of finding of such objects, construction work should stop at the respective area of the site and the Ministry of Tourism and Antiquities should be informed so as to adequately handle this object.	Supervision	During excavation	Duration Discovery of archaeological sites, historical sites, remains and objects	Construction site	Contractor and proponent's HSE manager (and officers)	Covered in construction cost

7.5.2 Monitoring During the Operation Phase

Table 53 summarizes the environmental and social management plan for the proposed project during the operation phase. The estimated costs for the various mitigation measures have been provided, where possible. It will be noted that most of these measures will be part of the project's operational costs.

Table 53 Environmental management and monitoring plan for the proposed project during operation phase

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
Risks & Negative Impacts							
Air Quality	**Dust:** • Minimizing drop heights for waste transfer and unloading activities; • Cover truck beds with tarps during waste transport • Spray water regularly when there is possibility of generating dust • Enforcement of vehicle speed limits on site to <35 km/h. • Planting of trees as wind breakers	Visual inspections and monitoring of dust	Daily during period of dust generating activities	• Dust levels ambient PM (TSP, PM10) • Dust complaints	Construction site Border of site	Proponent's HSE manager (and officers)	5500/point/hour (three points per visit)
		Recording and documentation of complaint	Monthly				
		Direct measurement using meters or sample analysis	Quarterly				
	Vehicle emissions: • Implement the equipment manufacturers' recommended engine maintenance, along with the mechanical maintenance for the safe operation of the vehicle /equipment, including proper tire pressure.	Visual inspections monitoring of exhaust gas releases	Daily	SOx, NOx, and CO and black smoke from vehicles	Construction boundary	Proponent's HSE manager (and officers)	(3500/ vehicle) *2 =7000

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• Any vehicle that has high smoke emissions visibly detected should be promptly repaired. • Optimize waste collection routes to minimize distance travelled and overall fuel use and emissions.	Direct measurement using meters or sample analysis	Twice a year				
		Traveled distance and consumed fuel of vehicles	Monthly				
	<u>Landfill gas</u> • Ensure the availability of enough covering material on site and apply covering material and the final cover regularly following the national and World Bank codes	Portable gas flow meters	Continuous monitoring with monthly collection of records	Amount of landfill gas	Near the gas vents	Proponent's HSE manager (and officers)	20,000
	• It is recommended to perform trials to collect the gas early during the landfill operation and before the cell is completely filled (i.e. place gas vents progressively) • Provision of a portable devise permanently working to measure the flow rate of the gases on site • Install landfill gas monitoring wells/probes to regularly monitor landfill gas migration	Collection of samples and analysis of air samples	Twice a year	CH_4, CO_2, NH_3, H_2S and VOCs in ambient air Concentration of methane in the air shouldn't exceed 1.25%	Inside and outside the landfill		5000 * 2 = 10,000

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• The lining system and final cover of the landfill should be properly maintained to avoid overloading landfill cells and allow regular evacuation/ventilation of leachate and gas. • To control GHG emissions, it is recommended to install landfill gas collection system to collect landfill gas and flare it in enclosed flare as recommended by EU directive (1999/31/EC) for the best practices of enclosed flare operation, maintenance and monitoring. • A maintenance schedule for the landfill ventilation/gas collection system should be prepared and followed by the project operator.	Continuous and logged basis of inlet gas to the flare and outlet of the flare	Continuous and logged basis of inlet gas The outlet stream should be measured when there is change in operating conditions of flare or when gas flow rate changes	CH_4, CO_2, O_2 and gas flow rate and temperature of the inlet stream O_2, CO, CO_2, NOx, trace elements of SO_2 of the outlet stream of flare	Landfill gas flare		50,000 for continuous monitoring system of inlet stream 4500/ measurement for the outlet stream
		Ground water analysis to make sure lining system is efficient	Once a year	No carbonic acid in ground water	Groundwater		10,000/measurement
	<u>Odor emissions from Landfill</u> • Maintain application of cover material (at least 15 cm) and compaction. Upgrade the rates of compaction and application of soil cover in case of receiving complaints.	Same as landfill gas: collection of samples and analysis of air samples and conducting air dispersion model	Twice a year	H_2S in ambient air	Inside and outside the landfill	Proponent's HSE manager (and officers)	Included in the above price

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)

	• Control and maintain source of odor:
	  ○ Leachate generation
	  ▪ Avoid accumulation of leachate without treatment
	  ○ Landfill gas
	  ▪ Properly vent and regularly maintain gas flare
	Odor emissions from composting/ recycling plant
	• Provide a list of the types of wastes that should be screened out from the input stream.
	• Ensure a process control is in place for the following:
	  ○ Temperature control
	  ○ Air flow control
		- General site odor.
		- Recording and documentation of complaints
			- Daily
			
			-Monthly
				Complaints	Near sensitive receptors such as nearby roads and residential area		No additional cost

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
Noise (on workers and public)	• Use of appropriate PPE for all workers • Fitting equipment with silencers or mufflers • Regular maintenance and service of building equipment and vehicles • Plant wind break trees around the site borders to attenuate any possible impact.	Instrumental measurement	5 hours of day-time measurements, twice per month	Noise level maintained below 50 dB (A) during daytime and 40 dB (A) during night; Regular records and logs are maintained and compliant	At the sources; Along perimeter of site; At the sensitive receptors such as the nearest road Cairo-Ismailia desert road	Implemented by HSE officer	600/point/day (10 -20 points) *2*12 = 14,400
Soil, geology and hydrology: leachate generation and liquid run off	**<u>For landfill, composting/ recycling plant and waste receiving area</u>** • Implement preventive maintenance schedule of leachate collection system • Regular maintenance of impermeable layer (liner system in landfill, area of compost piles and waste receiving area) • Proper leachate treatment and quality measurement according to Egyptian standards and permissible limits • Maintain site drainage that will minimize the inflow of storm water into	Level measurement of the leachate pond and records of pumping station	Monthly	Depth of the leachate collection pond	Leachate collection pond	Proponent's HSE manager (and officers)	32,000

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	the site which will minimize leachate generation • Maintain landfill cell compaction, slopes and daily cover materials to reduce infiltration of rainfall into the deposited waste • Maintain covering material even on the side slopes of the landfill cells, as well as on the lateral surface to avoid soil erosion and landfill collapsing	Representative sampling and laboratory Analysis	Quarterly for COD, BOD and pH and annually for the rest	COD, BOD, pH, TDS, total N, total P and heavy metals, of leachate	Leachate collection pond		6000 *4 = 24,000
		Monitoring precipitation	In rainy months (as identified in baseline)	Average precipitation (mm/year)	The site		No additional cost needed
		Amount of collected sludge	Once after de-sludging	Records of sludge pump	Leachate collection pond		No additional cost needed
Hazardous waste mixed with solid waste	• Develop a waste acceptance criteria , and communicate it with waste collectors and transporters • Train landfill workers on waste identification and sorting • Controlled access and tracking • Ensure all workers are aware of the potential risks and use appropriate PPEs at all time.	Visual inspection	Daily	Amount of hazardous waste found Health records about occupational injuries And infectious diseases among workers	Waste sorting area	Proponent's HSE manager (and officers)	No additional cost for visual inspection
Risk of inappropriate labor and	• Clear, fair hiring procedures should be put in place to ensure fair treatment,	Inspection of complaints	Daily	Occupational health and safety Incident reports	Workers at the project location	Proponent's HSE manager (and officers)	Included in **Table 51**

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
working conditions	nondiscrimination and equal opportunity of project workers: • Information regarding their terms and conditions of employment (including their rights related to hours of work, wages, overtime, compensation and benefits…) should be established and communicated with the workers • Regular payment as per national laws and the LMP • Adequate periods of rest per week, annual holiday and sick, maternity and family leave should be ensured, • In case of termination of contract, project workers will receive written notice of termination of employment and details of severance payments in a timely manner • Employment of project workers will be based on the principle of equal opportunity and fair treatment, and there will be no discrimination with respect to any aspects of the employment relationship, such as recruitment	Inspection of Human Resources Policy Inspection of employment contracts Health records about occupational injuries and infectious diseases among workers Inspection of attendance sheets and ID copies Inspection of insurance policies Inspection of Training records		Medical reporting on received cases No accidents No incidents regarding public health and safety Insurance coverage for everyone on site with proof of their presence on site through attendance sheets and copy of IDs.			

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, or disciplinary practices • The above is a non-exhaustive list of mitigation measures. The different types of project employers, employer will also need to follow the Labor Management Plan (LMP) • Training of all workers on the landfill as regards health and safety • Enforcement on the use of Personal Protective Equipment whilst on site • Recording of all accidents and investigating them for establishing root causes and instigating corrective measures • Training on fire safety and first aid for staff • Restrict unauthorized access to landfill area • Control of vermin, insects and birds by compaction of deposited waste and						

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	application of cover materials according to the waste filling plan. • All workers of the landfill, recycling and composting plants should receive adequate training on the types of hazardous waste that could be found, the type of hazards and the appropriate methods of handling. • Coverage with appropriate insurance schemes (health and social insurance coverage) for all the types of workers, including casual workers hired by subcontractors and the contractor • Anyone entering the project site will register in an attendance sheet/logbook • Records of copy of national IDs will be kept for all types of laborers, including casual laborers hired by subcontractor and contractor. • The employer must make arrangements to conduct the periodic medical examination once every six months to ensure the fitness of workers and to uncover possible upcoming risks of occupational diseases in its early stages • Develop emergency plans.						

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• A worker's complaint system must be made available to workers on the facility. •						
GBV risk	• Preparation of appropriate code of conduct that stipulates the commitment of labor towards community groups and behaviors that should be avoided • All workers should be trained on the code of conduct. • Code of conduct to be developed and signed by operator. It should include prevention of sexual exploitation and abuse and sexual harassment (SEA/SH) at workplace. • Apply the full requirements related to operating the grievance mechanism including anonymous channels • Specified grievance mechanism channels for GBV will be announced and coordination will take place with the appropriate governmental entity (e.g. National Council for Women)24	Inspection of training records The monitoring of workers' compliance to the Code of Conduct when interacting with the surrounding communities to avoid behaviors such as sexual harassment and GBV. Inspection of complaints Inspection of training records	Continuous	Worker code of conduct Established No complaints from community No incident Community members aware of the activities conducted and the messages shared/discussed	Landfill and the C&D waste treatment facility	Proponent's HSE Manager Social Development Officer of the MoE	Covered in Operation fees

24 The National Council for Women is running a dedicated grievance system for dealing with GBV cases. The system ensures anonymity of the complaints and ensures that specialized professional responses are offered as well as referral to existent support systems (e.g. women shelter).

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• Raising awareness of the local community about the project commitment towards communities' and the measures taken for that through public consultation and focus group discussions • Apply penalties to workers violating the code of conduct • Random drug and alcohol tests to be conducted. • If workers will be staying in rented apartments by contractor or sub-contractor, in labor camps or in any other accommodation facilities, the developed code of conduct should be complied to	Number and documentation of awareness raising activities and stakeholder engagement activities Interview with community members					
Risk related to community Health and safety/ community dissatisfaction with the operation of the the landfill and the C&D	• Follow the mitigation measures mentioned in sections (Air Quality, Noise) same as mentioned above to reduce the risk of odurs, Noise, Fire, and to ensure that operational impacts are minimized and that community satisfaction is maintained, • Provide a complaint mechanism for the community. • Regular consultation as well as information sharing with surrounding communities to ensure the sustainable operation of the project	Community grievance log Reviewing community consultation reports Interview with community members	Monthly	number of reported complaints from the community Community members aware of the activities conducted and the messages shared/discussed (through the beneficiary	Site	Social development officer in collaboration with other relevant officers (OHS and environment)	Included in the operation cost

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
waste treatment facility due to operation related impacts (e.g. odur)				feedback survey)			
	<u>Fire</u> • Provide sufficient firefighting equipment onsite and train workers on using them • Design the facility for access by firefighting equipment, including clear aisles among windrows and access to an adequate water supply • Post emergency telephone numbers in clearly visible points • Establish fire prevention and control plan • For sanitary landfills: - Maintain the application of cover material and waste compaction - Develop regular maintenance and monitoring of gas venting - The availability of foam and surfactants for firefighting in	Recording temperature and moisture content of the compost pile (identification board)	Monitoring the operation of the composting plant daily	Temperature below 60 ºC	Composting/ recycling plant	HSE officer	Included in Table 51 + 250,000 annually for temperature and gas composition monitoring
		Monitor temperature of landfill at depth through monitoring wells in and around suspected fire zones	Monthly	<55 ºC: Normal landfill temperature 55 – 60 ºC: Elevated biological activity 60 - 70 ºC: Abnormal elevated biological activity >70 ºC: likelihood of landfill fire	Sanitary landfill		

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	landfill to avoid having leachate problem in case water is used	Monitor gas composition (methane, oxygen and carbon monoxide) at depth through the same monitoring wells for temperature monitoring mentioned above	Monthly	CO concentration above 25 ppm indicated possible fire in the area Oxygen percent above 1% indicates oxygen seeping and poor efficiency of cover material Methane percent higher than 40% indicates consumption of oxygen and favorable anaerobic conditions are taking place			
	Infestation by flies and vermin • Incoming fresh waste and separated organic should not be stored on site for more than 24 hours • Install wheel washing facility at entry and exit points to the site	Visual inspection	Daily	Absence of flies and vermin	Sanitary landfill	HSE officer	Included in operation cost

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• Perform daily cleaning for the facility and storage areas • Maintaining the application of daily cover of thickness 10-15 cm has proved to be effective in controlling rats and other vermin such as feral animals						
	Control of litter • Facilities are to be cleaned daily • All vehicles entering the site should have their containers covered • Compact and cover waste promptly after discharge from the vehicle delivering the waste • Provide perimeter planting, landscaping, or fences to reduce wind	Visual inspection and cleaning daily checklist	Daily	Absence of litter and tidy site	The site	HSE officer	Included in operation cost
Traffic	• A traffic plan should be developed to provide the maximum safety to the population. Which should include: - Coordination with traffic department (ministry of interior) for vehicles route and movement. - Time management for vehicles movement; especially avoiding the peak hours and use of the route with less traffic intensity.	Vehicle maintenance inspection records Reported complaints	Monthly	Number of recorded complaints	The site	HSE officer	No additional cost needed

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions. • Use of traffic signs during operations • Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. • Adhere to speed limit (40 km/hr) Add complaint number on the vehicles back to report any complaints from the driver						
Positive Impacts							
Employment opportunities	• Clear, fair hiring procedures should be put in place to ensure fair treatment, nondiscrimination and equal opportunity of project workers including fair opportunity for women and local communities. • As part of potential integration for the informal sector, inventorying workers in the informal sector and offer vocational training programs that could allow them to benefit from the offered jobs.	Inspection of recruitment strategy Inspection of employment contracts (also of subcontractors) Inspection of complaints Interviews with Employees	3 times; prior, during, and after construction	Employment contracts according to national and international labor standards No complaints Training programs PAPs lists	Construction site	HR manager	

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost (EGP)
	• Activating the role of civil society organizations NGOs in raising awareness of the local communities about the importance of the project and the importance of preserving the environment • Provide a complaint mechanism.	Community grievance log Reviewing community consultation reports		Awareness raising programs			

7.5.3 Monitoring after Landfill Closure

Table 54 summarizes the environmental and social management and monitoring plan for the proposed project after landfill closure. The cost estimated in this table presents the future value of the cost in the operation phase with annual increase of 1%.

Table 54 Environmental management and monitoring plan for the proposed project during closure phase

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost
Air quality	**Landfill gas:** • Assign the responsibility for monitoring landfill gas to the same trained personnel who were responsible during the operation phase • In case the monitoring indicated gas leak the reason for the leak should be identified and adequately handled	Gas flow meters	Continuous monitoring with monthly collection of records	Amount of landfill gas	Near the gas vents	WMRA under ministry of environment and governorates officials	33,000
		Collection of samples and analysis of air samples	Annual	CH_4, CO_2, NH_3, H_2S and VOCs in ambient air	Site border		16,500
	Odor emissions • Put a final soil top cover and vegetate into a public park • Continue collection of leachates with treatment and discharge	Same as landfill gas: collection of samples and analysis of air samples and conducting air dispersion model	Twice a year	H_2S in ambient air	Site border	WMRA under ministry of environment and governorates officials	Included in the above price

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost
	• Continue collection of landfill gas and flaring	Recording and documentation of complaints	Monthly	Complaints	Near sensitive receptors such as nearby roads and residential area		
Soil, geology and hydrology: leachate generation and liquid run off	**<u>For landfill, and waste receiving area</u>** • Continue maintaining leachate collection system until no more leachate is generated • Apply final cover according to World bank landfill standards (slope and thickness, etc.)	Level measurement of the leachate pond and records of pumping station	Twice a year	Depth of the leachate collection pond	Leachate collection pond	WMRA under ministry of environment and governorates officials	53,000
		Representative sampling and laboratory Analysis	Quarterly for COD, BOD and pH and annually for the rest	COD, BOD, pH, TDS, total N, total P and heavy metals, of leachate	Leachate collection pond		40,000
		Amount of collected sludge	Once after de-sludging	Records of sludge pump	Leachate collection pond		No additional cost needed
Visual impacts	• Plantation of adequate plants over the final cover of the landfill and maintain it	Green areas planted over final cover	Annual	Visual estimation of the green cover % of the completed cells	Landfill completed cells	WMRA under ministry of environment and	No additional cost needed

Risks /Impacts	Mitigation measures	Methods of monitoring (How)	Frequency of monitoring (When)	Performance Indicators (What)	Monitoring location (Where)	Responsibility (Who)	Estimated cost
						governorates officials	

7.6 Environmental Register

According to the law 4/1994 and its modifications in 2009 and Article 17 of its Executive Regulations, the proposed project is required to keep up an Environmental Register as outlined in Annex 3 of the Executive Regulations.

The implementation of simple environmental monitoring plan as outlined herein facilitates the upkeep of the Environmental Register, as all information required will be regularly collected and documented as part of the self-monitoring activities.

8 PUBLIC CONSULTATION AND ENGAGEMENT

The public consultation chapter aims to highlight the key consultation and community engagement activities and their outcomes, in addition to outlining the key aspects to be addressed when holding the consultation activities of the site-specific ESIA upon final project detailing. It is worth noting that the effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation.

Throughout the various consultation and engagement activities, the work teams recorded the different reactions of the community and the governmental stakeholders towards the proposed project.

Public consultation activities have been implemented during the preparation of the site-specific studies. The public consultation activities scheduled are the following:

- Consultation activities were conducted in February and March 2020 with Relevant government entities
- A public consultation session was conducted on 15th of March 2020 in Cairo Governorate
- A public consultation session will be conducted in Cairo Governorate in April to present the findings of the ESIAs and get the stakeholders feedback to incorporate whatever is relevant to the findings of the ESIA and/or the design of the project. Given the restrictions imposed by the Government in response to the COVID-19 pandemic, the consultation will be conducted using various modalities that would allow for maintain physical distancing.
- Consultation is an ongoing process and further consultations will be conducted all over the life cycle of the project as per the activities suggested for stakeholder engagement and information sharing under the SEP.

8.1 Legal Framework for Consultation

Consultation activities (i.e. scoping, interviews, focus group discussions, public hearings/consultations) with various stakeholders and community people in the host communities were held for the proposed project. These activities were conducted to be in compliance with all national regulations relevant to public consultation as well as World Bank standards relevant to disclosure and public consultation.

- WB standards relevant to disclosure and public consultation, namely,
  - WB ESS10 stakeholder engagement and Information Disclosure
- Egyptian regulations relevant to public consultation

- Law 4/1994 modified by Law 9/2009/2009 modified with ministerial decrees no. 1095/2011 and no. 710/2012

Accordingly, this chapter describes the stakeholder engagement and consultation activities that will be undertaken in the current stage, and those planned for the future. It aims to focus on key stakeholder interactions and on the analysis of their outcomes. More elaborated information on the stakeholder engagement activities conducted and planned during the course of the project implementation for this sub-project and the project at large could be found in the SEP.

8.1.1 Methodology

In terms of methodology, consultation activities will be conducted through Public consultation sessions, focus group discussions and interviews with concerned authorities and stakeholders. These activities will be performed in compliance with all national regulations relevant to public consultation as well as World Bank ESSs relevant to disclosure and public consultation.

8.2 Consultation Objectives

Objectives of various consultation activities are summarized as follows:

- Define potential project stakeholders and suggest their possible project roles
- Disseminate comprehensive information about the project to enable stakeholders to identify their concerns, needs, and recommendations
- Listen to their comments, ideas and concerns and recording the same for follow up
- Document stakeholder feedback and enhance the ESIA accordingly
- Identify the most effective outreach channels that support continuous dialogue with the community
- Avoid any misconceptions about the project and properly manage expectations
- Discuss potential resettlement plans and impacts of involuntary resettlement

As a result, the key principles of effective engagement that guide stakeholder consultations include:

- Ensuring that all interactions are free of intimidation or coercion
- Providing meaningful information in a format and language that is understandable and tailored to the needs of the target stakeholder group(s)
- Being inclusive in the representation of views, i.e. including different ages, genders, and incorporating vulnerable and/or minority groups
- Respecting local traditions in the decision-making processes
- Information should be easily accessible for stakeholders and be culturally appropriate

To ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner and format.

8.3 Defining Relevant Stakeholders

The first step in the process of stakeholder engagement is stakeholder identification; that is, determining who the project stakeholders are and what they should be grouped under. According to the World Bank's Standard 10, a stakeholder refers to "individuals or groups who: (a) are affected or likely to be affected by the project (project-affected parties); and (b) may have an interest in the project (other interested parties)".[25] Most importantly, identifying stakeholder representatives is key to carrying out consultations seamlessly. These representatives do not only inform the project with their valuable information, but they also serve as a communication channel to disseminate information to large numbers of stakeholders and receive information from them.

Table 55 presents all potential project stakeholders.

Table 55 Detailed list of stakeholders

Stakeholder Groups **Project affected parties**		**Role**
Environmental Sector	Ministry of Environment - Egyptian Environmental Affairs Agency (EEAA)	• Responsible for developing public policies related to the protection of environment and improving its quality. In addition, it is responsible for issuing regulations for environmental determinants and monitoring their implementation. • EEAA is one of the main stakeholders that work closely with the Project in order to warrantee their level of environmental commitment; through reviewing and approving EIAs, and monitoring implementation of the Environmental Management Plan • In addition, EEAA is the owner of the project
	Waste Management Regulatory Authority (WMRA)	• Responsible for regulating, following-up and overseeing all waste management processes at both central and local levels, in a manner improving the environmentally safe management. • Providing information and data available about the waste sector in Egypt. • Provide technical support to raise public awareness and community commitment.

[25] World Bank ESS 10. Available at: http://documents.worldbank.org/curated/en/476161530217390609/ESF-Guidance-Note-10-Stakeholder-Engagement-and-Information-Disclosure-English.pdf

Stakeholder Groups Project affected parties		Role
		• Responsible for managing some project components
	Environmental Office within the Governorates	Responsible for monitoring the compliance to environmental requirements
Governmental sector	Ministry of Environment (MoE)	MoE is the main implementing agency for the project. For each component separate agencies and ministries will be involved in the implementation of various project components from a sectoral perspective
	Ministry of Local Development (MoLD)	Responsible for implementing the national strategy for solid waste management and the specific master plans that have been put in place by the waste management body in the concerned governorates
Other Governmental Entities	Governorates, Cairo Qalyoubia	• Responsible for collecting and transporting waste through the concerned departments in each governorate • Supporting the project by providing requested services such as various permits required, and infrastructure maps, when requested.
	City Council ١٠th of Ramadan	• The main role of the Local Units authority is the provision of support to the project through giving permits for electricity installation and water supply and mobilizing people to gain information about the project. • Permits for the lands needed for the project, should be prepared by the Governorate and approved by the LGU.
	Army Intelligence force	They provide the project with permissions and approvals.
The informal sector	The private sector in waste management Contractors and workers in the field of waste collection, sorting and utilization • Garbage collectors • Sheikh of scavengers	• Impact on potential economic activity due to the project • Constitute Vulnerable Groups that may severely be affected by the impacts • They are the community leaders of the project affected communities • They will be responsible for communicating with the Project and their Workers in this sector • Investment opportunities for the private sector in operating the project

Stakeholder Groups		Role
Project affected parties		
Potential Affected Communities in the project areas	Khanqa Markaz Tenth of Ramadan	• They will be affected by the impacts of the project. • Vulnerable status may cause them to be severely affected by positive or negative impacts • Constitute interest group as potential candidates for job opportunities They have interests in the project as they might get a job opportunity
Private Sector Factories Companies	waste recycling waste management	• Potential participants in project activities • Cooperation with the implementing agencies
Contractors	Not yet defined	Responsible for the implementation of project management plans
Financial Institutes	The World Bank (WB)	Financiers and regulators
other interested parties		
Civil Society	NGOs (International, regional, local) Grassroots Community- Based Organizations (CBO) Recyclobicia Association (Mustafa Hamdan) Youth Spirit Association (Izzat Naeem)	• Organizations with direct interest in the project and which may have useful data or insight into local issues of relevance to the project. These organizations can also influence the views of others regarding the project, nationally and internationally. • Responsible of sharing information with the community
Media	Television Newspaper Websites editors Online journalism	• Disclosure of information about the project on the website of the Ministries. • Disclosure of information about the project on the Facebook pages of the local government.
Suppliers and Traders	Private companies	Mainly potential tenderers for the construction works.
	Traders (small-scale stores) (unofficial suppliers)	• Provide construction materials. • Provide fuels to cars and machineries. • Provide workers with food and amenities.

8.4 Scoping Consultation Event

A scoping consultation session was conducted, as part of the process of preparing the ESIA in line with the national legislative requirements and the World Bank standards. This

session was held prior to preparing the ESIA draft. The session was held in Cairo House "Bait El-Kahera" in Cairo, which is affiliated to the Ministry of Environment on 15th March 2020.

The list of invitees included:

- Ministry of Environment
  - EEAA
  - Central Department of Air Quality and Noise Protection
  - Climate Change Central Department
- Waste Management Regulatory Authority (WMRA)
- Ministry of Health and Population
- Ministry of Transportation
- Ministry of Local Development (local authorities in the governorates concerned with waste management)
- Cairo Public Transport Authority (CTA)
- General Administration of Traffic at the Ministry of Interior
- Cairo and Qalyoubia governorate (Cleanliness and Beautification Agencies in the governorates)
- The local units of Cairoand Qalyoubia governorate (Al Khankah, Abu Zaabal, Banha, Karimat, 10th of Ramadan)
- Academic and Research Entities
  - Cairo University (Soil, Water and Environment Research Institute)
  - Institute of Environmental Studies and Research, Ain Shams University
  - Environmental Research Center, Banha University, Qalyoubia
  - Land, Water and Environmental Research Institute in Banha, Qalyoubia
  - Faculty of Engineering, El-Mataria, Helwan University
  - The Higher Technological Institute in the 10th of Ramadan
  - The National Research Center
  - The Institute for Sustainable Environment Research and the Center for Sustainable Development of the American University in Cairo
- Contractors and workers in the field of waste collection, sorting and use
- Waste pickers (scavengers)
- Sheikh Al-Zaabalin and Al-Nabashin in the areas concerned with the project (in particular: Abu Zaabal, Al Khankah, and 10th of Ramadan
- The private sector (consultants, factories, companies, suppliers and traders working in the field of waste recycling)
  - Chemonics Environmental Consultancy
  - Out Greens Egypt for Waste Management
  - The Egyptian Company for Solid Waste Recycling "ECARU"
  - Recyclobekia for e-waste recycling (Mustafa Hamdan)

- Transport planning expert, Dr. Ahmed Moussa, former Minister of Transport Planning and founder of "Masarat Misr for Consultations" in the field of transport and communications
- Dr. Hossam Abdel-Gawad, CEO of SETS for Engineering Consultancy (in Transport and Infrastructure)

- Possible affected communities in the project areas (Al Khankah, Abu Zaabal, Banha, Al Kuraimat, Tenth of Ramadan)
- Local and international civil society organizations concerned with the project area
- Association for the Protection of the Environment from Pollution A.P.E
  - The Egyptian Women's Health Association
  - New Woman Foundation
  - Association for the Advancement and Development of Women
  - National Council for Women
  - Egyptian Center for Women's Rights
  - Harassment Map Initiative
  - Youth Spirit Foundation for Zabbalin Empowerment (Ezzat Naeem
  - Alashanak Ya Baladi Foundation
  - Arab Bureau for Youth and Environment
  - CEDARE
  - German Friedrich-Ebert-Stiftung Foundation
  - International Society of City and Regional Planners (ISOCARP)
- Various media

Participants were invited through mails, faxes, emails, and phone calls. However, there was poor attendance in the scoping session, in terms of the number of attendees. This is due to extremely bad weather conditions across the country caused by the "Dragon Storm". Such conditions resulted in the death of 20 people at least, flooding the streets of Cairo due to torrential rains, and severe damages in public and private properties and infrastructure. Moreover, the scoping session was convened during the global Coronavirus "COVID-19" pandemic that led to cancelling all large gatherings in several countries worldwide. Nevertheless, the scoping session was the last meeting to be held in the Ministry of Environment before the government's decision to ban all social events and gatherings.

A total of 25 persons attended the scoping session in addition to the WB auditor and the ESIA consultant staff. About 20% of the attendees were females and 80% were males. The distribution of attendees from different entities, excluding the WB auditor and the ESMF consultant staff, as shown in Table 56.

Table 56 Distribution of attendees according to their affiliation

Distribution of participants according to their affiliation	Numbers	Percentage (%)
Administrative official's governorate level (8 WMRA, 3 MoE, EEAA, …)	11	44
Administrative officials' local level (Giza, Cairo and Qalyoubia governorates)	4	16

Consultants (experts)	2	8
Community members (representatives)	1	4
Civil society	1	4
Academic Institutions	1	4
Private sector (factories, companies, suppliers and traders working in the waste field)	5	20
Total	25	100

The following topics were presented during the scoping consultation session:

- The goal of the consultation session
- The current status of solid waste in Egypt
- The current status of solid waste - Cairo Governorate
- The current status of solid waste - Qalyoubia Governorate
- Describe the main components of the project
- Environmental and social impact assessment methodology
- The general structure of the ESIA study

Most attendees participated actively in the session and brought up fruitful ideas for discussion as depicted in Figure 40 and Figure 41. Table 57 provides a summary of the key comments and concerns raised during the scoping session. It is worth noting that many of the received comments are classified as not directly linked to this component of the project. The most common and repeated of these comments is the one related to the importance of the integration of the waste informal sector and the risk of them losing their livelihoods. Despite the close linkage and relevance of the comment to the project at large, it is not one of the potential risk anticipated under this specific sub-component. During the consultation, reference was made to the ESMF currently under preparation and the fact that this element is included under its scope. The RF also is covering the groups that could be at risk of loss of livelihoods (e.g. as a result of closing dumpsites). The SEP will also establish systematic engagement protocol for engaging with diverse stakeholders including the informal sector.

Figure 40 The consultants presenting the project

Figure 41 Discussions during the scoping sessions

Table 57 Main remarks and comments raised during the scoping meeting

Participant/ affiliation	Questions/Remarks	Response or approach in ESIA
Dr. Hossam AbdelGawad **Director of transport and infrastructure division,** **SETS International consulting** **(private sector)**	1. Consideration of the impacts of long-distance transport of waste due to the closure of Arab Al Olayqat dumpsite (Abu Zaabal dumpsite) which shall increase the distance travelled for waste disposal from Qalyoubia to 10th Ramadan City in Sharqiyah 2. Traffic studies are needed for the waste collection routes	Remarks made shall inform many aspects of the ESIA including: • The development of the Impacts assessment framework • Analysis of the project's alternatives • Mitigation, management, and monitoring of potential impacts from the project component
Mr. Hossam Mustafa, Regional manager, Recyclobekia for E-waste manaegement (private sector)	Dr. Hossam Mustafa discussed some of the challenges facing the disposal of hazardous waste, in addition to presenting some suggestions that could be taken into account in the next stage, as follows: 1. There is no formal procedure for disposal or recycling of batteries (lead, cobalt, and lithium-ion) since they contain toxic materials 2. The Nasiriya waste management facility in Alexandria currently does not accept E-waste into the complex, despite it being a hazardous waste management facility 3. Urged the inclusion of E-waste to the accepted waste types in the newly developed landfill in 10th of Ramadan 4. 50% of total waste produced in Cairo and Giza are handled by the informal sector (collectors and waste pickers).	In response to remark no. 3, it was explained that the proposed landfill in the 10th of Ramadan is designed for municipal solid waste and shall not be handling hazardous waste, and hence e-waste will not be accepted into this particular landfill. Handling of industrial hazardous waste and proposed location is still to be determined subject to further studies. A candidate site in Kuraymat might be dedicated for hazardous waste. If selected, another round of consultation will take place with key stakeholder

Participant/ affiliation	Questions/Remarks	Response or approach in ESIA
	5. Suggested the re-evaluation of financing of the proposed integrated waste facility (10th of Ramadan) to a more inclusive model for the informal sector, which is responsible for 80% of recycling of e-waste and constitute about 1000 small private MSMEs (workshops) for sorting and recycling activities 6. Urged the commitment towards the integration of the informal sector by building capacity and improve the operations of the small private MSMEs and workshops. This will lift up burden on the government 7. Recommended the consideration of lessons-learned from previous experiences with foreign solid waste management companies on handling waste such as FCC and AMA Arab companies.	engagement session where all involved stakeholders will be invited to share their concerns. In response to remark no. 6 reference was made to the ESMF currently under preparation and the fact that this element is included under the ESMF scope including: • Baseline information on the current formal e-waste management procedures: remarks 1, 2, 4, and 7 • Impacts assessment in the framework assessment and particularly social impacts: remarks 6, and 7 •
Dr. Khaled Farra	Dr. Khaled added an explanation of some aspects related to the project components and objectives within the framework of the financing policy 1. The proposed $250m project is not a fund, but rather a soft loan. This means that benefiting governorates shall need to repay back investment returns. 2. The project component on developing SWM infrastructure does not only consist of establishing landfills, but rather integrated waste management facility for handling, treatment, and disposal to encourage the private sector engagement in	Highlighting the project objectives and elaborating on its components. The comments shall inform the language and approach used to describe the project in the ESIA and its objectives. The comments

Participant/ affiliation	Questions/Remarks	Response or approach in ESIA
	the waste management sector and to reduce the amount of landfilled inert solid waste. 3. One of the main objectives of the project is ensuring the integration of the informal sector into the SWM sector by establishing bigger companies/entities from the small independent workshops and MSMEs currently in place. 4. In response to Hossam Mostafa about the lessons learned from the foreign contracts with FCC and AMA Arab: the government are now preparing tenders for private sector within all Governorates to promote and enhance the SWM sector 5. There is currently a strong political will towards improving SWM in Egypt, with opportunities available for the private sector to partake in recycling, treatment, RDF, etc.	also provided a general context to the SWM situation, which shall inform the approach towards the baseline analysis for the ESIA.
Dr. Mahmoud Mansour **Cairo Cleaning and Beautification Authority**	Dr. Mohamed Mansour stressed on the impacts of the project on the traffic that can result during the operating phase and that it must be taken into account during the preparation of preliminary studies for the project, and coordination with the relevant authorities required, in order to achieve the project sustainability 1. Traffic studies needed to be included in the ESIA in order to determine waste transfer routes to the proposed new landfills 2. The social impacts due to the diversion of waste from the informal dumpsite or landfills located within the cities to the newly developed sanitary landfills, which are located further away: Ensure the manshiyet Naser community (both waste collectors and scavengers) are compensated for losing their livelihood after the opening of 10th of Ramadan landfill, which will replace the dumps they currently operate in. What will be their situation? And will they be transferred to work in the new sites?	The consultant emphasized that the traffic impacts during the construction and operation phases were covered in the ESIA, and the mitigation measures for these impacts were established. There is no direct linkage between the 10th Ramadan landfill and the waste collection and sorting in Manshiyet Naser district. However, the informal sector groups that could be affected in relevance to the project interventions are identified as part of the potentially affected

Participant/ affiliation	Questions/Remarks	Response or approach in ESIA
		stakeholders and all the further detailed assessment will propose measures to integrate them and minimize negative impacts on them.
Mr. Ezzat Naim **Deputy head of Waste collectors Syndicate**	1. Participant provided a lot of important statistics related to waste generated amounts, composition …etc. 2. Suggested that waste segregation at source measures would be beneficial for the SWM system in Egypt 3. Waste collectors and waste pickers are willing, upon incentives, to partake in segregation activities to provide raw material (organic waste) for biogas units to produce energy and organic fertilizer facilities (potential positive economic gains) 4. Waste pickers operate inside the dumpsites and do not deal firsthand with the waste producers (households) and the social impacts on them are more concerning than on informal collectors 5. Stakeholder engagement should be done at grassroots level and early on in the decision-making process in order to reduce resistance from involved stakeholders. There could be adverse effects on livelihood of current waste collectors due to pushing them away from the SWM system. It is crucial to include them in consultation early on in the project and involve them in the decision-making process. He elaborated that he is available for further consultation on the informal sector and stated that he represented his community	To answer the question raised about the involvement of the Giza Governorate in the project: the Consultant explained the different stages of the project, development phase and the role of the Consultant in this stage, which is preparing the ESIA, after the components had been determined at an earlier stage. Dr. Farra explained that the components were identified based on previously conducted feasibility studies and consultation and stakeholder engagement activities Remarks made shall inform many aspects of the ESMF including:

Participant/ affiliation	Questions/Remarks	Response or approach in ESIA
	and syndicate in various conferences and occasions nationally and internationally. 6. E-vehicles as alternatives for waste transfer 7. Micro model (engagement of small-scale private sector including the informal sector) for SWM rather than macro model (eg: FCC and AMA Arab big companies previously contracted in Cairo for SWM) in order to capacitate and support the current informal waste collector community which has been working in the waste sector since 1949. 8. Why is Giza not addressed sufficiently in the project components? He further referenced Arab Abu Said brick factories that produce significant pollutants (heavy metals) and Carbon emissions due to burning of very low-quality fuels. 9.	• Most of the comments are relevant and will benefit this study (baseline) or other assessment (ESMF), RF and the SEP • Baseline information: points 1, 2, 3, and 11 • Remark no. 13 regarding alternatives analysis was identified as out of scope of this study.

Participant/ affiliation	Questions/Remarks	Response or approach in ESIA
Mr. Ahmed Badawi **Project implementation manager at WMRA**	1. Defining the contractual agreements model and technical framework for waste handling across all governorates 2. Approximately 5,000 tonnes of waste will need to be transported from Qalyoubia to 10th of Ramadan daily. So, impacts need to be addressed. 3. proposed landfill sites are not located near Zaabaleen communities, therefore consider the feasibility of developing recycling facilities within Qalyoubia to reduce landfilled waste	Remarks made shall inform many aspects of the ESIA including: • Impacts assessment and management framework: comment 2 by proposing traffic studies for the analysis of all environmental and social impacts along waste collection routes • Analysis of project alternatives: comments 1 and 3 were identified as out of scope of this particular project, yet could be used to inform the development of future projects.
Mr. Mohamed Hussein **Head of Municipal solid waste department at WMRA**	Social impacts on waste pickers are more concerning than on informal collectors since they are much larger in number	This component of the project under this ESIA will not have direct implications on the waste pickers nor the other informal sector groups. Those impacts are covered in more details in the ESMF and will be covered later in other instruments to be prepared

Participant/ affiliation	Questions/Remarks	Response or approach in ESIA
		(e.g. the livelihoods rehabilitation plan)
Mr. Emad Aldin Adly **Civil Society**	Dr. Emad raised some issues related to the solid waste management system, and he also made some suggestions that could contribute to better management 1. Capacity building and integration of the informal sector is crucial to ensure the overall advancement of the SWM system in Egypt. It is also essential to ensure positive engagement and acceptance on the project 2. Incentives are encouraged to be put in place for waste segregation from source, and incentives for private contractors to promote private sector engagement in segregation and sorting 3. Expressed concerns over the extent of public disclosure of information and transparency regarding the newly developed state programs, plans, and projects regarding SWM	Remarks made shall inform analyzing the baseline and the impacts assessment and management framework for the ESMF, and particularly social impacts on the informal waste collectors and scavengers. Remark no. 3 shall be considered in the stakeholder engagement and public disclosure activities conducted during the development of the ESIA.
Mr. Mahmoud Mansour **Egypt Cleaning and Beautification Authority**	There are already contracts for 10 years starting from 2020 for the sanitary landfill and composting/recycling plant in the Cairo governorate part. The contracts were made between Cairo governorate, Ministry of Local Development and investor. The investor is currently operating in Obour landfill and Al-Salam Recycling factory.	Dr. Yasmine asked about the contacts of the investor to be part of the stakeholders' engagement plan

8.5 Proposed Grievance Mechanism

This section aims to highlight on the importance of the Grievance Mechanism and the main contents that should be included in the project's Grievance Mechanism during the different project life stages.

Grievances and redress represent one of the important processes that should be tackled carefully during the project implementation. Grievance system should ensure that complaints are properly handled without delay that may negatively affect the project.

8.5.1 Grievance Mechanism Objectives

Grievance Mechanism is important to ensure that complaints are properly handled immediately and to ensure that information is shared transparently and that they are accountable to the hosting communities. A functioning Grievance Redress Mechanisms (GRM) is considered to be a good feedback mechanism from the project affected persons and one tool of the citizen engagement.

The project should operate a comprehensive GRM procedure: leaflets, posters and brochures are prepared and distributed to the NGOs, local governmental units, mosques and churches. Thus, sufficient and appropriate information about the GRM should be shared with the communities prior to the construction phase.

Additionally, the World Bank's Grievance Redress Service (GRS) provides an additional, accessible way for individuals and communities to complain directly to the World Bank if they believe that a World Bank-financed project had or is likely to have adverse effects on them or their community. The GRS enhances the World Bank's responsiveness and accountability by ensuring that grievances are promptly reviewed and responded to, and problems and solutions are identified by working together. The GRS ensures that complaints are being promptly reviewed and addressed by the responsible units in the World Bank.

The objective of the Grievance Redress Service is to make the Bank more accessible for project-affected communities and to help ensure faster and better resolution of project-related complaints through the following link (http://www.worldbank.org/grs) and e-mail (grievances@worldbank.org).

In general, all grievances and communications must be registered and the actions taken/responses should be tracked and recorded. Proper administration and internal records of stakeholder complaints and communications are essential for transparency and quality of MoT, responsiveness and reporting to stakeholders on the resolution of grievances.

8.5.2 Institutional Responsibility for Handling Grievances

The entity responsible for handling grievances will mainly be the Environmental Affair Department within the relevant Technical Implementation Unit (MoE/EEAA/WMRA). The

Social Development Officer (SDO) in the TIU in cooperation with the contractor should address all grievances raised by community members, particularly the ones related to resettlement activities. The main tasks related to grievances of the SDO are:

- Raise awareness about channels and procedures of grievance redress mechanisms
- Collect the grievances received through different communication channels
- Document all received grievances
- Transfer the grievance to the responsible entity
- Follow up on how the problem was addressed and solved
- Document, report and disseminate the outcome of received grievances
- Ensure that each legitimate complaint and grievance is satisfactorily resolved by the responsible entity
- Identify specific community leaders, organizations and citizen groups required to enhance the dialogue and communication through a public liaison office to avoid or limit friction and respond effectively to general concerns of the community
- Monitoring grievance redress activities

During construction the contractor should accept all comments and complaints associated with the project from any stakeholder. Comments can be made via email, post, fax, on the telephone or in person. The comments and complaints will be summarized and listed in a Complaints/Comments Log Book, containing the name/group of commenter/complainant, date the comment was received, brief description of issues, information on proposed corrective actions to be implemented (if appropriate) and the date of response sent to the commenter/complainant. A telephone number should be available for the community people to tell their complaints.

8.5.3 Registration of GRM

All grievances should be registered and acknowledged within 6 working days and responded to within 21 days (calendar days). Registration of grievance will be done via a categorization system to be able to analyze complaints received and provide appropriate and timely response. The project management will keep a grievance log and report on grievance management, as part of annual project progress reports, which will be available for the purposes of monitoring and follow-up.

8.5.4 Grievance Channels

Comments and concerns regarding the project can be submitted verbally or in writing to the relevant TIUs (MoE/ EEAA/WMRA) through the following channels:

- Hot line: 19808
- Telephone: 0225256470
- By post or hand delivered to: 30 Misr Helwan Agricultural Road - Maadi
- E-Mail: citiserv.eeaa@gmail.com
- WhatsApp: 01222693333

In addition to the complaints channels of the Ministry of Environment, complaints can be submitted through the unified Government Complaints portal in the Council of Ministers (E-Government Portal):

- Hot line: 16528
- Website: https://www.shakwa.eg

Confidentiality: Individuals have the right to submit their grievance anonymously if they wish to do so, and in case they agree to include their name they have the right for their names to be kept confidential.

8.5.5 Response to Grievances

Responses to grievances will be conducted through the following channels:

- Response should be conducted using the same channel for submitting the grievance. Written grievances must be replied in written format. Grievances submitted via the website should be replied by email. In cases of phone calls call back to inform them of the resolution
- Grievances should be responded to within the identified time limit, to give the community the sense of responsibility towards their concerns and taking effective measures to solve arising issues

The complaints are documented and followed up by the Environmental Complaints Department in MoE within a period not exceeding 21 days (Calendar days)

- The aggrieved person (community member or workers[26]) has to be informed of the proposed corrective measure
- In case no corrective action is required, the petitioner should also be informed accordingly
- Implementation of the corrective measure and its follow up has to be communicated to the complainant and recorded in the grievance register

8.5.6 Monitoring of Grievances

All grievance activities should be monitored in order to verify the process. The following indicators should guide the monitoring process:

- Number of received grievances per month (Channel, gender, age, basic economic status of the complainants should be included)
- Type of grievance received (according to the topic of the complaint)
- Number of grievances solved
- Level of satisfaction with grievance resolutions

[26] The current grievance mechanism allows community members as well as construction workers to submit their grievances.

- Documentation efficiency
- Dissemination activities done
- Efficiency of response to grievance provided (efficiency in time and action taken)

A Grievance Monitoring Report should be developed on a quarterly basis in order to keep track of all grievances developed.

A separate grievance mechanism should be available in the same manner for workers, including employees of both the project-employed and contractors.

8.5.7 Disclosure of Grievances

All grievances and communications will be registered, and the actions taken/responses given will be disseminated through the MoT/ WMRA website. Considering the anonymity of grievances all disclosed grievances should be kept anonymous and/or only an analysis of the grievance report should be disclosed. Frequently asked questions can be added to the website which would include responses to recurrent grievances and methods for handling them. Disclosure of the mentioned documents will go through the website of the MoT/ WMRA.

9 CONCLUSION AND RECOMMENDATIONS

9.1 Conclusion

The ESIA draws several conclusions which mainly focus on the significant positive impacts of implementation of proposed projects. The project will mitigate exposure of the environment and humans to the sever impacts of solid wastes currently disposed in open dumpsites and its associated air pollution. The project will contribute to improving the quality of life and promote healthy environment in Cairo and Qalyoubia governorates in line with the Egypt's strategic goals.

On the other hand, the implementation of the proposed project will generate potential negative impacts. These impacts appear at different stages of the proposed project namely construction, operation and closure and post closure activities. The impacts have been identified and observed to be moderate to high in significance. For these, appropriate mitigation measures have been identified and can be greatly minimized in the design phase and through good operational practice. All of the impacts identified can be reduced to acceptable levels as proposed in the Environmental and Social Management Plan.

Considering the thorough analysis of collected data during the study, the following main points are concluded:

- The project is vital for the improvement of the sanitary conditions in Cairo and Qalyoubia governorates to give every resident the right of a better quality of life and valorize waste instead of making it a burden
- The positive environmental impacts outweigh the negative ones; the latter can be contained by the proposed ESMP
- The proposed project is located in a desert area complying with the initial plan of 10th of Ramadan city away from sensitive receptors and will not compromise the well-being of the neighboring community, ecology or any other conditions if all the proposed mitigation measures are implemented
- This component of the project does not have any impacts related to land and assets expropriation nor it will have any negative impact on the livelihoods of any group.

9.2 Recommendations

The following points present the recommendation of the ESIA:

- The private sector responsible for building and operating should conduct scoped ESIA for the different components of the proposed project to take into account impacts, mitigating and ESMP of the detailed design parameters

- The proposed project to be implemented in compliance with the Egyptian and WB legislation and planning requirements
- An elaborate and effective management structure be in place to ensure sustainable management of the proposed project
- Possible employment opportunities and other benefits should target local communities
- Cooperation with the informal sector because they have the experience and the capacity of solid waste management in Egypt
- The landfill management in partnership with relevant stakeholders should develop the following:
    - Fire control and prevention plan
    - Social engagement plan
    - Emergency preparedness and response plan
    - Plans and policies for management of waste not accepted at the landfill and the C&D waste treatment facility
    - Closure and post closure plan
- Air, water and noise quality monitoring program shall be scheduled for periodic tests as stipulated in the ESMP
- Public consultation, awareness and environmental campaigns should be maintained on continuous basis throughout the life of the project
- Efficient and proactive management of the grievance redress system to be established during construction and operational phases of the project
- The proponent to conduct Environmental Audits every two years and submit to WB and EEAA

10 REFERENCES

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11 ANNEXES

11.1 Leachate Generation Estimation

The amount of leachate depends on the Field Capacity (FC) of the waste and the associated daily cover. FC is the amount of liquid that a given mass of waste will absorb prior to downward percolation of that liquid due to gravitational forces. Accordingly, the leachate will only be released from the bottom of the landfill if the water content inside the landfill body is more than its Field Capacity.

There are many factors that affect the Field Capacity, in which the most important is the degree of compaction applied to the waste. The more the compaction the less the field capacity. In the sanitary landfill, the compaction rate will be 800-850 kg/m^3, which is high compaction. That means that the field capacity of the landfill will be small. Hence, more leachate will be generated.

Conceptual investigation of the potential quantity of leachate that the sanitary landfill is expected to generate was implemented following the water balance equations suggested by the Egyptian Code of Design Principal and Implementation Conditions for MSW Management follows:

$$L_t = \Delta S_t - W_t$$

Where:

L_t: amount of leachate generated (m^3)

ΔS_t: change in the amount of water stored in solid waste in the landfill (m^3)

W_t: water holding capacity in the landfill (m^3)

If a negative value is obtained, this means no leachate will be collected; as it will all be held be held into the landfill body.

$$\Delta S_t = W_{sw} + W_P - W_G - W_{RO}$$

Where:

W_{sw}: moisture content in waste (assumed to be 30% of the disposed waste according to SOE, 2015) (m^3)

W_P: precipitation rate (m^3) (average of 8 mm/year from hydrology study – annex 7 multiplied by area of landfill)

W_G: water lost in the formation of landfill gas (m^3) (0.22 m^3/ton waste)

W_{RO}: run off water out of landfill area (calculated as 75% of precipitation (W_P)) (m^3)

$$W_t(t) = FC(t) * D(t)$$

Where:

T: denotes time from disposal of MSW

FC: the field capacity (assumed to reach 0.2 after a year because of effective compaction)

D: dry weight of MSW (m^3)

Using the above equations, the estimated amount of leachate generated from Cairo and Qalyoubia sanitary landfills resulted in negative value. This indicates that the body of waste will keep the water and will not generate leachate for the first year of landfill operation. This is consistent given the low organic matter, which is the main source of leachate generation that will be handled in composting/recycling plants and waste receiving plants from waste delivery trucks.

11.2 Land GEM Results Report for LFG Estimation

About LandGEM:

First-Order Decomposition Rate Equation: $$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_o \left(\frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation ($m^3/year$)

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate ($year^{-1}$)

L_o = potential methane generation capacity (m^3/Mg)

M_i = mass of waste accepted in the i^{th} year (Mg)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2020**	
Landfill Closure Year (with 80-year limit)	**2070**	
Actual Closure Year (without limit)	***2070***	
Have Model Calculate Closure Year?	**No**	
Waste Design Capacity		*megagrams*

MODEL PARAMETERS

Methane Generation Rate, k	**0.020**	*year*$^{-1}$
Potential Methane Generation Capacity, L_o	**100**	*m*^{3} */Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**Total landfill gas**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**NMOC**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2020	1,423,500	1,565,850	0	0
2021	1,423,500	1,565,850	1,423,500	1,565,850
2022	1,423,500	1,565,850	2,847,000	3,131,700
2023	1,423,500	1,565,850	4,270,500	4,697,550
2024	1,423,500	1,565,850	5,694,000	6,263,400
2025	1,423,500	1,565,850	7,117,500	7,829,250
2026	1,423,500	1,565,850	8,541,000	9,395,100
2027	1,423,500	1,565,850	9,964,500	10,960,950
2028	1,423,500	1,565,850	11,388,000	12,526,800
2029	1,423,500	1,565,850	12,811,500	14,092,650
2030	1,423,500	1,565,850	14,235,000	15,658,500
2031	1,423,500	1,565,850	15,658,500	17,224,350
2032	1,423,500	1,565,850	17,082,000	18,790,200
2033	1,423,500	1,565,850	18,505,500	20,356,050
2034	1,423,500	1,565,850	19,929,000	21,921,900
2035	1,423,500	1,565,850	21,352,500	23,487,750
2036	1,423,500	1,565,850	22,776,000	25,053,600
2037	1,423,500	1,565,850	24,199,500	26,619,450
2038	1,423,500	1,565,850	25,623,000	28,185,300
2039	1,423,500	1,565,850	27,046,500	29,751,150
2040	1,423,500	1,565,850	28,470,000	31,317,000
2041	1,423,500	1,565,850	29,893,500	32,882,850
2042	1,423,500	1,565,850	31,317,000	34,448,700
2043	1,423,500	1,565,850	32,740,500	36,014,550
2044	1,423,500	1,565,850	34,164,000	37,580,400
2045	1,423,500	1,565,850	35,587,500	39,146,250
2046	1,423,500	1,565,850	37,011,000	40,712,100
2047	1,423,500	1,565,850	38,434,500	42,277,950

2048	1,423,500	1,565,850	39,858,000	43,843,800
2049	1,423,500	1,565,850	41,281,500	45,409,650
2050	1,423,500	1,565,850	42,705,000	46,975,500
2051	1,423,500	1,565,850	44,128,500	48,541,350
2052	1,423,500	1,565,850	45,552,000	50,107,200
2053	1,423,500	1,565,850	46,975,500	51,673,050
2054	1,423,500	1,565,850	48,399,000	53,238,900
2055	1,423,500	1,565,850	49,822,500	54,804,750
2056	1,423,500	1,565,850	51,246,000	56,370,600
2057	1,423,500	1,565,850	52,669,500	57,936,450
2058	1,423,500	1,565,850	54,093,000	59,502,300
2059	1,423,500	1,565,850	55,516,500	61,068,150

Waste acceptance rate (continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2060	1,423,500	1,565,850	56,940,000	62,634,000
2061	1,423,500	1,565,850	58,363,500	64,199,850
2062	1,423,500	1,565,850	59,787,000	65,765,700
2063	1,423,500	1,565,850	61,210,500	67,331,550
2064	1,423,500	1,565,850	62,634,000	68,897,400
2065	1,423,500	1,565,850	64,057,500	70,463,250
2066	1,423,500	1,565,850	65,481,000	72,029,100
2067	1,423,500	1,565,850	66,904,500	73,594,950
2068	1,423,500	1,565,850	68,328,000	75,160,800
2069	1,423,500	1,565,850	69,751,500	76,726,650
2070	1,423,500	1,565,850	71,175,000	78,292,500
2071	0	0	72,598,500	79,858,350
2072	0	0	72,598,500	79,858,350
2073	0	0	72,598,500	79,858,350
2074	0	0	72,598,500	79,858,350
2075	0	0	72,598,500	79,858,350
2076	0	0	72,598,500	79,858,350
2077	0	0	72,598,500	79,858,350
2078	0	0	72,598,500	79,858,350
2079	0	0	72,598,500	79,858,350
2080	0	0	72,598,500	79,858,350
2081	0	0	72,598,500	79,858,350
2082	0	0	72,598,500	79,858,350
2083	0	0	72,598,500	79,858,350
2084	0	0	72,598,500	79,858,350
2085	0	0	72,598,500	79,858,350
2086	0	0	72,598,500	79,858,350
2087	0	0	72,598,500	79,858,350
2088	0	0	72,598,500	79,858,350
2089	0	0	72,598,500	79,858,350
2090	0	0	72,598,500	79,858,350
2091	0	0	72,598,500	79,858,350
2092	0	0	72,598,500	79,858,350
2093	0	0	72,598,500	79,858,350
2094	0	0	72,598,500	79,858,350
2095	0	0	72,598,500	79,858,350
2096	0	0	72,598,500	79,858,350
2097	0	0	72,598,500	79,858,350
2098	0	0	72,598,500	79,858,350
2099	0	0	72,598,500	79,858,350

Pollutant Parameters

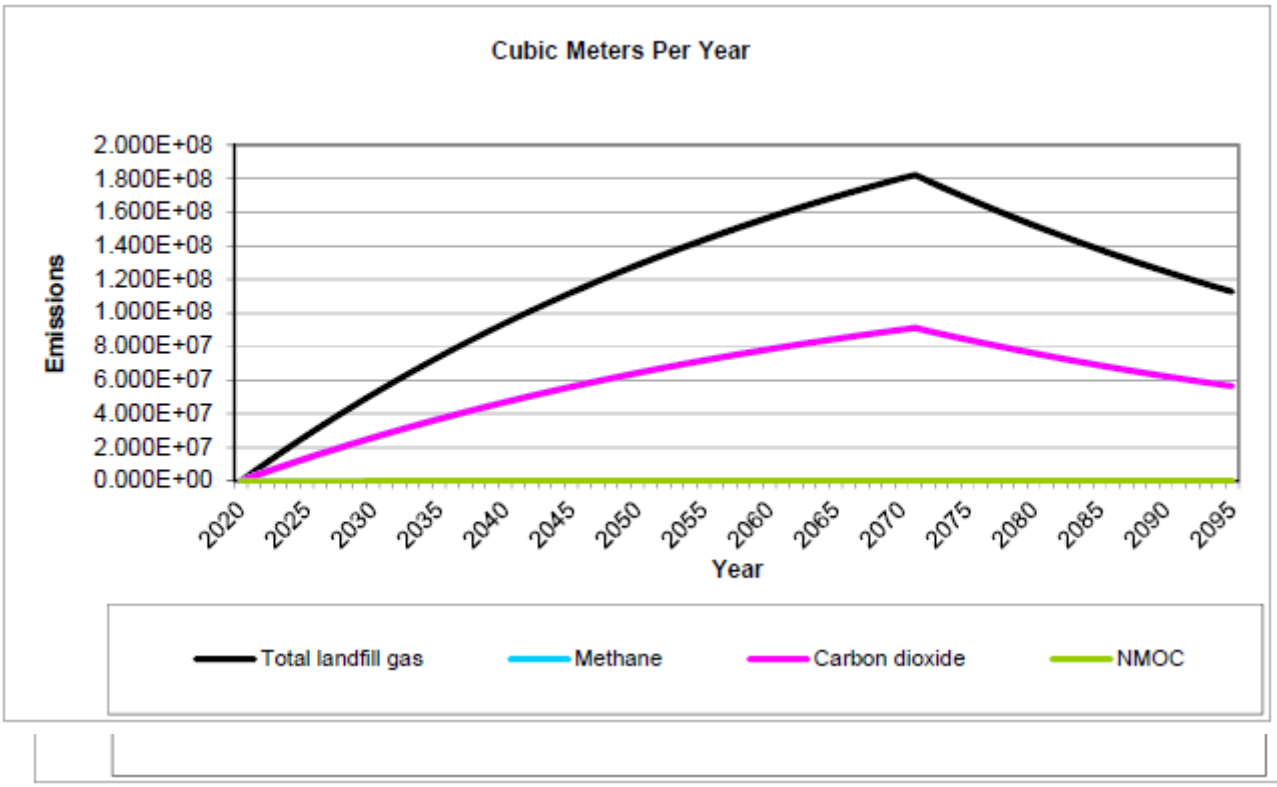
Gas / Pollutant Default Parameters: ***User-specified Pollutant Parameters:***

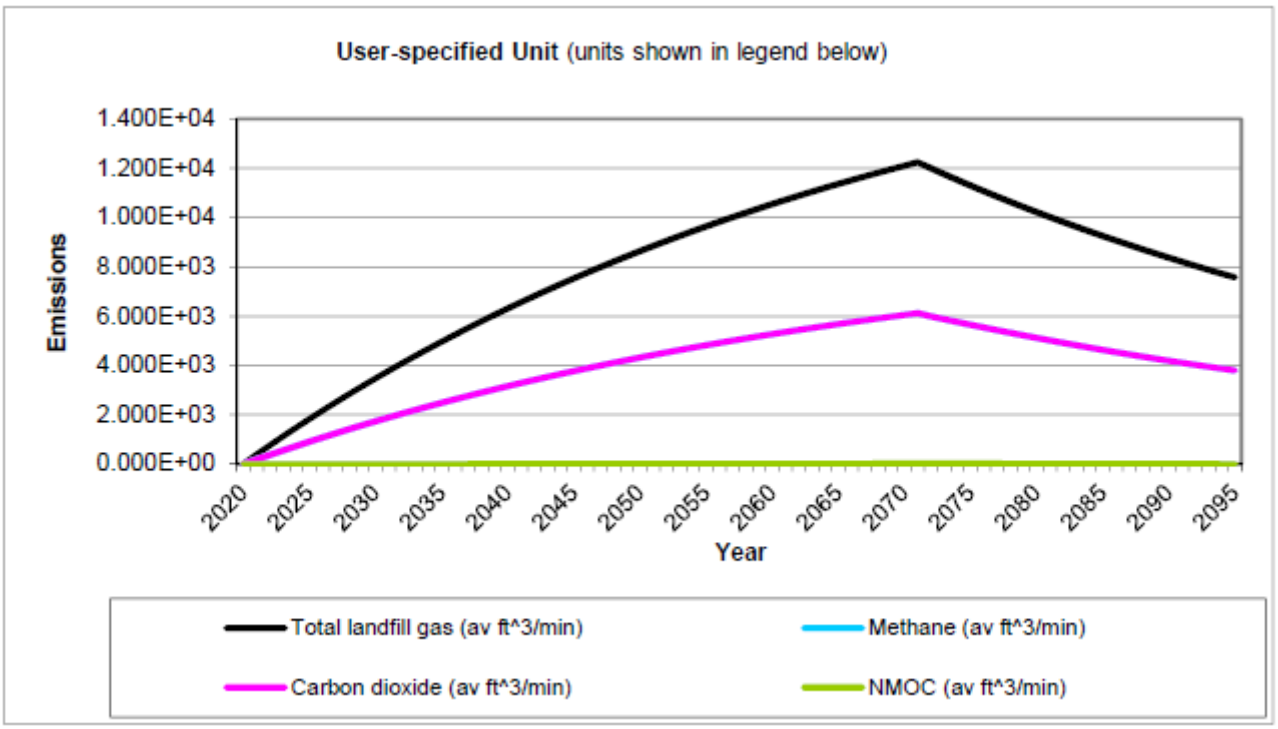
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		

Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99
	2-Propanol (isopropyl alcohol) - VOC	50	60.11
	Acetone	7.0	58.08
	Acrylonitrile - HAP/VOC	6.3	53.06
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11
	Benzene - Co-disposal - HAP/VOC	11	78.11
	Bromodichloromethane - VOC	3.1	163.83
	Butane - VOC	5.0	58.12
	Carbon disulfide - HAP/VOC	0.58	76.13
	Carbon monoxide	140	28.01
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84
	Carbonyl sulfide - HAP/VOC	0.49	60.07
	Chlorobenzene - HAP/VOC	0.25	112.56
	Chlorodifluoromethane	1.3	86.47
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52
	Chloroform - HAP/VOC	0.03	119.39
	Chloromethane - VOC	1.2	50.49
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147
	Dichlorodifluoromethane	16	120.91
	Dichlorofluoromethane - VOC	2.6	102.92
	Dichloromethane (methylene chloride) - HAP	14	84.94
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13
	Ethane	890	30.07
	Ethanol - VOC	27	46.08

	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88		
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08		
	Mercury (total) - HAP	2.9E-04	200.61		
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83		
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40		
	Vinyl chloride - HAP/VOC	7.3	62.50		
	Xylenes - HAP/VOC	12	106.16		

Graphs


Cubic Meters Per Year
Emissions
2.000E+08
1.800E+08
1.600E+08
1.400E+08
1.200E+08
1.000E+08
8.000E+07
6.000E+07
4.000E+07
2.000E+07
0.000E+00
2020
2025
2030
2035
2040
2045
2050
2055
2060
2065
2070
2075
2080
2085
2090
2095
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


User-specified Unit (units shown in legend below)
1.400E+04
1.200E+04
1.000E+04
8.000E+03
6.000E+03
4.000E+03
2.000E+03
0.000E+00
Emissions
2020
2025
2030
2035
2040
2045
2050
2055
2060
2065
2070
2075
2080
2085
2090
2095
Year
Total landfill gas (av ft^3/min)
Methane (av ft^3/min)
Carbon dioxide (av ft^3/min)
NMOC (av ft^3/min)

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2070	2.250E+05	1.801E+08	1.210E+04	6.009E+04	9.007E+07	6.052E+03
2071	2.276E+05	1.822E+08	1.224E+04	6.078E+04	9.111E+07	6.122E+03
2072	2.231E+05	1.786E+08	1.200E+04	5.958E+04	8.931E+07	6.000E+03
2073	2.186E+05	1.751E+08	1.176E+04	5.840E+04	8.754E+07	5.882E+03
2074	2.143E+05	1.716E+08	1.153E+04	5.724E+04	8.580E+07	5.765E+03
2075	2.101E+05	1.682E+08	1.130E+04	5.611E+04	8.411E+07	5.651E+03
2076	2.059E+05	1.649E+08	1.108E+04	5.500E+04	8.244E+07	5.539E+03
2077	2.018E+05	1.616E+08	1.086E+04	5.391E+04	8.081E+07	5.429E+03
2078	1.978E+05	1.584E+08	1.064E+04	5.284E+04	7.921E+07	5.322E+03
2079	1.939E+05	1.553E+08	1.043E+04	5.180E+04	7.764E+07	5.217E+03
2080	1.901E+05	1.522E+08	1.023E+04	5.077E+04	7.610E+07	5.113E+03
2081	1.863E+05	1.492E+08	1.002E+04	4.977E+04	7.459E+07	5.012E+03
2082	1.826E+05	1.462E+08	9.826E+03	4.878E+04	7.312E+07	4.913E+03
2083	1.790E+05	1.433E+08	9.631E+03	4.781E+04	7.167E+07	4.815E+03
2084	1.755E+05	1.405E+08	9.440E+03	4.687E+04	7.025E+07	4.720E+03
2085	1.720E+05	1.377E+08	9.253E+03	4.594E+04	6.886E+07	4.627E+03
2086	1.686E+05	1.350E+08	9.070E+03	4.503E+04	6.750E+07	4.535E+03
2087	1.652E+05	1.323E+08	8.891E+03	4.414E+04	6.616E+07	4.445E+03
2088	1.620E+05	1.297E+08	8.714E+03	4.326E+04	6.485E+07	4.357E+03
2089	1.588E+05	1.271E+08	8.542E+03	4.241E+04	6.357E+07	4.271E+03
2090	1.556E+05	1.246E+08	8.373E+03	4.157E+04	6.231E+07	4.186E+03
2091	1.525E+05	1.221E+08	8.207E+03	4.074E+04	6.107E+07	4.103E+03
2092	1.495E+05	1.197E+08	8.044E+03	3.994E+04	5.986E+07	4.022E+03
2093	1.466E+05	1.174E+08	7.885E+03	3.915E+04	5.868E+07	3.943E+03
2094	1.437E+05	1.150E+08	7.729E+03	3.837E+04	5.752E+07	3.865E+03
2095	1.408E+05	1.128E+08	7.576E+03	3.761E+04	5.638E+07	3.788E+03
2096	1.380E+05	1.105E+08	7.426E+03	3.687E+04	5.526E+07	3.713E+03
2097	1.353E+05	1.083E+08	7.279E+03	3.614E+04	5.417E+07	3.639E+03
2098	1.326E+05	1.062E+08	7.135E+03	3.542E+04	5.309E+07	3.567E+03
2099	1.300E+05	1.041E+08	6.994E+03	3.472E+04	5.204E+07	3.497E+03
2100	1.274E+05	1.020E+08	6.855E+03	3.403E+04	5.101E+07	3.428E+03
2101	1.249E+05	1.000E+08	6.719E+03	3.336E+04	5.000E+07	3.360E+03
2102	1.224E+05	9.802E+07	6.586E+03	3.270E+04	4.901E+07	3.293E+03
2103	1.200E+05	9.608E+07	6.456E+03	3.205E+04	4.804E+07	3.228E+03
2104	1.176E+05	9.418E+07	6.328E+03	3.142E+04	4.709E+07	3.164E+03
2105	1.153E+05	9.232E+07	6.203E+03	3.079E+04	4.616E+07	3.101E+03
2106	1.130E+05	9.049E+07	6.080E+03	3.018E+04	4.524E+07	3.040E+03
2107	1.106E+05	8.870E+07	5.959E+03	2.959E+04	4.435E+07	2.980E+03
2108	1.086E+05	8.694E+07	5.841E+03	2.900E+04	4.347E+07	2.921E+03
2109	1.064E+05	8.522E+07	5.726E+03	2.843E+04	4.261E+07	2.863E+03
2110	1.043E+05	8.353E+07	5.612E+03	2.786E+04	4.177E+07	2.806E+03
2111	1.022E+05	8.188E+07	5.501E+03	2.731E+04	4.094E+07	2.751E+03
2112	1.002E+05	8.026E+07	5.392E+03	2.677E+04	4.013E+07	2.696E+03
2113	9.824E+04	7.867E+07	5.286E+03	2.624E+04	3.933E+07	2.643E+03
2114	9.630E+04	7.711E+07	5.181E+03	2.572E+04	3.855E+07	2.590E+03
2115	9.439E+04	7.558E+07	5.078E+03	2.521E+04	3.779E+07	2.539E+03
2116	9.252E+04	7.409E+07	4.978E+03	2.471E+04	3.704E+07	2.489E+03
2117	9.069E+04	7.262E+07	4.879E+03	2.422E+04	3.631E+07	2.440E+03
2118	8.889E+04	7.118E+07	4.783E+03	2.374E+04	3.559E+07	2.391E+03
2119	8.713E+04	6.977E+07	4.688E+03	2.327E+04	3.489E+07	2.344E+03
2120	8.541E+04	6.839E+07	4.595E+03	2.281E+04	3.419E+07	2.298E+03

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2070	2.250E+05	1.801E+08	1.210E+04	6.009E+04	9.007E+07	6.052E+03
2071	2.276E+05	1.822E+08	1.224E+04	6.078E+04	9.111E+07	6.122E+03
2072	2.231E+05	1.786E+08	1.200E+04	5.958E+04	8.931E+07	6.000E+03
2073	2.186E+05	1.751E+08	1.176E+04	5.840E+04	8.754E+07	5.882E+03
2074	2.143E+05	1.716E+08	1.153E+04	5.724E+04	8.580E+07	5.765E+03
2075	2.101E+05	1.682E+08	1.130E+04	5.611E+04	8.411E+07	5.651E+03
2076	2.059E+05	1.649E+08	1.108E+04	5.500E+04	8.244E+07	5.539E+03
2077	2.018E+05	1.616E+08	1.086E+04	5.391E+04	8.081E+07	5.429E+03
2078	1.978E+05	1.584E+08	1.064E+04	5.284E+04	7.921E+07	5.322E+03
2079	1.939E+05	1.553E+08	1.043E+04	5.180E+04	7.764E+07	5.217E+03
2080	1.901E+05	1.522E+08	1.023E+04	5.077E+04	7.610E+07	5.113E+03
2081	1.863E+05	1.492E+08	1.002E+04	4.977E+04	7.459E+07	5.012E+03
2082	1.826E+05	1.462E+08	9.826E+03	4.878E+04	7.312E+07	4.913E+03
2083	1.790E+05	1.433E+08	9.631E+03	4.781E+04	7.167E+07	4.815E+03
2084	1.755E+05	1.405E+08	9.440E+03	4.687E+04	7.025E+07	4.720E+03
2085	1.720E+05	1.377E+08	9.253E+03	4.594E+04	6.886E+07	4.627E+03
2086	1.686E+05	1.350E+08	9.070E+03	4.503E+04	6.750E+07	4.535E+03
2087	1.652E+05	1.323E+08	8.891E+03	4.414E+04	6.616E+07	4.445E+03
2088	1.620E+05	1.297E+08	8.714E+03	4.326E+04	6.485E+07	4.357E+03
2089	1.588E+05	1.271E+08	8.542E+03	4.241E+04	6.357E+07	4.271E+03
2090	1.556E+05	1.246E+08	8.373E+03	4.157E+04	6.231E+07	4.186E+03
2091	1.525E+05	1.221E+08	8.207E+03	4.074E+04	6.107E+07	4.103E+03
2092	1.495E+05	1.197E+08	8.044E+03	3.994E+04	5.986E+07	4.022E+03
2093	1.466E+05	1.174E+08	7.885E+03	3.915E+04	5.868E+07	3.943E+03
2094	1.437E+05	1.150E+08	7.729E+03	3.837E+04	5.752E+07	3.865E+03
2095	1.408E+05	1.128E+08	7.576E+03	3.761E+04	5.638E+07	3.788E+03
2096	1.380E+05	1.105E+08	7.426E+03	3.687E+04	5.526E+07	3.713E+03
2097	1.353E+05	1.083E+08	7.279E+03	3.614E+04	5.417E+07	3.639E+03
2098	1.326E+05	1.062E+08	7.135E+03	3.542E+04	5.309E+07	3.567E+03
2099	1.300E+05	1.041E+08	6.994E+03	3.472E+04	5.204E+07	3.497E+03
2100	1.274E+05	1.020E+08	6.855E+03	3.403E+04	5.101E+07	3.428E+03
2101	1.249E+05	1.000E+08	6.719E+03	3.336E+04	5.000E+07	3.360E+03
2102	1.224E+05	9.802E+07	6.586E+03	3.270E+04	4.901E+07	3.293E+03
2103	1.200E+05	9.608E+07	6.456E+03	3.205E+04	4.804E+07	3.228E+03
2104	1.176E+05	9.418E+07	6.328E+03	3.142E+04	4.709E+07	3.164E+03
2105	1.153E+05	9.232E+07	6.203E+03	3.079E+04	4.616E+07	3.101E+03
2106	1.130E+05	9.049E+07	6.080E+03	3.018E+04	4.524E+07	3.040E+03
2107	1.108E+05	8.870E+07	5.959E+03	2.959E+04	4.435E+07	2.980E+03
2108	1.086E+05	8.694E+07	5.841E+03	2.900E+04	4.347E+07	2.921E+03
2109	1.064E+05	8.522E+07	5.726E+03	2.843E+04	4.261E+07	2.863E+03
2110	1.043E+05	8.353E+07	5.612E+03	2.786E+04	4.177E+07	2.806E+03
2111	1.022E+05	8.188E+07	5.501E+03	2.731E+04	4.094E+07	2.751E+03
2112	1.002E+05	8.026E+07	5.392E+03	2.677E+04	4.013E+07	2.696E+03
2113	9.824E+04	7.867E+07	5.286E+03	2.624E+04	3.933E+07	2.643E+03
2114	9.630E+04	7.711E+07	5.181E+03	2.572E+04	3.855E+07	2.590E+03
2115	9.439E+04	7.558E+07	5.078E+03	2.521E+04	3.779E+07	2.539E+03
2116	9.252E+04	7.409E+07	4.978E+03	2.471E+04	3.704E+07	2.489E+03
2117	9.069E+04	7.262E+07	4.879E+03	2.422E+04	3.631E+07	2.440E+03
2118	8.889E+04	7.118E+07	4.783E+03	2.374E+04	3.559E+07	2.391E+03
2119	8.713E+04	6.977E+07	4.688E+03	2.327E+04	3.489E+07	2.344E+03
2120	8.541E+04	6.839E+07	4.595E+03	2.281E+04	3.419E+07	2.298E+03

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2121	8.372E+04	6.704E+07	4.504E+03	2.236E+04	3.352E+07	2.252E+03
2122	8.206E+04	6.571E+07	4.415E+03	2.192E+04	3.285E+07	2.207E+03
2123	8.043E+04	6.441E+07	4.327E+03	2.148E+04	3.220E+07	2.164E+03
2124	7.884E+04	6.313E+07	4.242E+03	2.106E+04	3.157E+07	2.121E+03
2125	7.728E+04	6.188E+07	4.158E+03	2.064E+04	3.094E+07	2.079E+03
2126	7.575E+04	6.066E+07	4.075E+03	2.023E+04	3.033E+07	2.038E+03
2127	7.425E+04	5.945E+07	3.995E+03	1.983E+04	2.973E+07	1.997E+03
2128	7.278E+04	5.828E+07	3.916E+03	1.944E+04	2.914E+07	1.958E+03
2129	7.134E+04	5.712E+07	3.838E+03	1.905E+04	2.856E+07	1.919E+03
2130	6.992E+04	5.599E+07	3.762E+03	1.868E+04	2.800E+07	1.881E+03
2131	6.854E+04	5.488E+07	3.688E+03	1.831E+04	2.744E+07	1.844E+03
2132	6.718E+04	5.380E+07	3.615E+03	1.795E+04	2.690E+07	1.807E+03
2133	6.585E+04	5.273E+07	3.543E+03	1.759E+04	2.637E+07	1.772E+03
2134	6.455E+04	5.169E+07	3.473E+03	1.724E+04	2.584E+07	1.736E+03
2135	6.327E+04	5.066E+07	3.404E+03	1.690E+04	2.533E+07	1.702E+03
2136	6.202E+04	4.966E+07	3.337E+03	1.657E+04	2.483E+07	1.668E+03
2137	6.079E+04	4.868E+07	3.271E+03	1.624E+04	2.434E+07	1.635E+03
2138	5.959E+04	4.771E+07	3.206E+03	1.592E+04	2.386E+07	1.603E+03
2139	5.841E+04	4.677E+07	3.142E+03	1.560E+04	2.338E+07	1.571E+03
2140	5.725E+04	4.584E+07	3.080E+03	1.529E+04	2.292E+07	1.540E+03
2141	5.612E+04	4.494E+07	3.019E+03	1.499E+04	2.247E+07	1.510E+03
2142	5.500E+04	4.405E+07	2.959E+03	1.469E+04	2.202E+07	1.480E+03
2143	5.392E+04	4.317E+07	2.901E+03	1.440E+04	2.159E+07	1.450E+03
2144	5.285E+04	4.232E+07	2.843E+03	1.412E+04	2.116E+07	1.422E+03
2145	5.180E+04	4.148E+07	2.787E+03	1.384E+04	2.074E+07	1.394E+03
2146	5.078E+04	4.066E+07	2.732E+03	1.356E+04	2.033E+07	1.366E+03
2147	4.977E+04	3.985E+07	2.678E+03	1.329E+04	1.993E+07	1.339E+03
2148	4.878E+04	3.906E+07	2.625E+03	1.303E+04	1.953E+07	1.312E+03
2149	4.782E+04	3.829E+07	2.573E+03	1.277E+04	1.915E+07	1.286E+03
2150	4.687E+04	3.753E+07	2.522E+03	1.252E+04	1.877E+07	1.261E+03
2151	4.594E+04	3.679E+07	2.472E+03	1.227E+04	1.839E+07	1.236E+03
2152	4.503E+04	3.606E+07	2.423E+03	1.203E+04	1.803E+07	1.211E+03
2153	4.414E+04	3.535E+07	2.375E+03	1.179E+04	1.767E+07	1.187E+03
2154	4.327E+04	3.465E+07	2.328E+03	1.156E+04	1.732E+07	1.164E+03
2155	4.241E+04	3.396E+07	2.282E+03	1.133E+04	1.698E+07	1.141E+03
2156	4.157E+04	3.329E+07	2.237E+03	1.110E+04	1.664E+07	1.118E+03
2157	4.075E+04	3.263E+07	2.192E+03	1.088E+04	1.631E+07	1.096E+03
2158	3.994E+04	3.198E+07	2.149E+03	1.067E+04	1.599E+07	1.074E+03
2159	3.915E+04	3.135E+07	2.106E+03	1.046E+04	1.568E+07	1.053E+03
2160	3.838E+04	3.073E+07	2.065E+03	1.025E+04	1.536E+07	1.032E+03

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2020	0	0	0	0	0	0
2021	5.165E+03	2.822E+06	1.896E+02	1.214E+01	3.386E+03	2.275E-01
2022	1.023E+04	5.587E+06	3.754E+02	2.403E+01	6.705E+03	4.505E-01
2023	1.519E+04	8.298E+06	5.575E+02	3.569E+01	9.958E+03	6.691E-01
2024	2.005E+04	1.096E+07	7.361E+02	4.712E+01	1.315E+04	8.833E-01
2025	2.482E+04	1.356E+07	9.111E+02	5.833E+01	1.627E+04	1.093E+00
2026	2.949E+04	1.611E+07	1.083E+03	6.931E+01	1.934E+04	1.299E+00
2027	3.408E+04	1.862E+07	1.251E+03	8.007E+01	2.234E+04	1.501E+00
2028	3.857E+04	2.107E+07	1.416E+03	9.062E+01	2.528E+04	1.699E+00
2029	4.297E+04	2.347E+07	1.577E+03	1.010E+02	2.817E+04	1.893E+00
2030	4.728E+04	2.583E+07	1.735E+03	1.111E+02	3.100E+04	2.083E+00
2031	5.151E+04	2.814E+07	1.891E+03	1.210E+02	3.377E+04	2.269E+00
2032	5.565E+04	3.040E+07	2.043E+03	1.308E+02	3.648E+04	2.451E+00
2033	5.972E+04	3.262E+07	2.192E+03	1.403E+02	3.915E+04	2.630E+00
2034	6.370E+04	3.480E+07	2.338E+03	1.497E+02	4.176E+04	2.806E+00
2035	6.760E+04	3.693E+07	2.481E+03	1.589E+02	4.432E+04	2.978E+00
2036	7.143E+04	3.902E+07	2.622E+03	1.678E+02	4.683E+04	3.146E+00
2037	7.518E+04	4.107E+07	2.760E+03	1.767E+02	4.928E+04	3.311E+00
2038	7.886E+04	4.308E+07	2.894E+03	1.853E+02	5.169E+04	3.473E+00
2039	8.246E+04	4.505E+07	3.027E+03	1.938E+02	5.406E+04	3.632E+00
2040	8.599E+04	4.698E+07	3.156E+03	2.021E+02	5.637E+04	3.788E+00
2041	8.945E+04	4.887E+07	3.283E+03	2.102E+02	5.864E+04	3.940E+00
2042	9.285E+04	5.072E+07	3.408E+03	2.182E+02	6.087E+04	4.090E+00
2043	9.617E+04	5.254E+07	3.530E+03	2.260E+02	6.305E+04	4.236E+00
2044	9.943E+04	5.432E+07	3.650E+03	2.337E+02	6.518E+04	4.380E+00
2045	1.026E+05	5.607E+07	3.767E+03	2.412E+02	6.728E+04	4.521E+00
2046	1.058E+05	5.778E+07	3.882E+03	2.485E+02	6.933E+04	4.658E+00
2047	1.088E+05	5.946E+07	3.995E+03	2.557E+02	7.135E+04	4.794E+00
2048	1.118E+05	6.110E+07	4.105E+03	2.628E+02	7.332E+04	4.926E+00
2049	1.148E+05	6.271E+07	4.214E+03	2.697E+02	7.525E+04	5.056E+00
2050	1.177E+05	6.429E+07	4.320E+03	2.765E+02	7.715E+04	5.184E+00
2051	1.205E+05	6.584E+07	4.424E+03	2.832E+02	7.901E+04	5.308E+00
2052	1.233E+05	6.736E+07	4.526E+03	2.897E+02	8.083E+04	5.431E+00
2053	1.260E+05	6.885E+07	4.626E+03	2.961E+02	8.261E+04	5.551E+00
2054	1.287E+05	7.030E+07	4.724E+03	3.024E+02	8.436E+04	5.668E+00
2055	1.313E+05	7.173E+07	4.820E+03	3.085E+02	8.608E+04	5.784E+00
2056	1.339E+05	7.313E+07	4.914E+03	3.146E+02	8.776E+04	5.897E+00
2057	1.364E+05	7.451E+07	5.006E+03	3.205E+02	8.941E+04	6.007E+00
2058	1.388E+05	7.585E+07	5.097E+03	3.263E+02	9.102E+04	6.116E+00
2059	1.413E+05	7.717E+07	5.185E+03	3.319E+02	9.261E+04	6.222E+00
2060	1.436E+05	7.847E+07	5.272E+03	3.375E+02	9.416E+04	6.327E+00
2061	1.460E+05	7.973E+07	5.357E+03	3.430E+02	9.568E+04	6.429E+00
2062	1.482E+05	8.098E+07	5.441E+03	3.483E+02	9.717E+04	6.529E+00
2063	1.505E+05	8.220E+07	5.523E+03	3.536E+02	9.863E+04	6.627E+00
2064	1.526E+05	8.339E+07	5.603E+03	3.587E+02	1.001E+05	6.723E+00
2065	1.548E+05	8.456E+07	5.682E+03	3.637E+02	1.015E+05	6.818E+00
2066	1.569E+05	8.571E+07	5.759E+03	3.687E+02	1.028E+05	6.910E+00
2067	1.589E+05	8.683E+07	5.834E+03	3.735E+02	1.042E+05	7.001E+00
2068	1.610E+05	8.793E+07	5.908E+03	3.782E+02	1.055E+05	7.090E+00
2069	1.629E+05	8.901E+07	5.981E+03	3.829E+02	1.068E+05	7.177E+00

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2070	1.649E+05	9.007E+07	6.052E+03	3.874E+02	1.081E+05	7.262E+00
2071	1.668E+05	9.111E+07	6.122E+03	3.919E+02	1.093E+05	7.346E+00
2072	1.635E+05	8.931E+07	6.000E+03	3.841E+02	1.072E+05	7.201E+00
2073	1.602E+05	8.754E+07	5.882E+03	3.765E+02	1.050E+05	7.058E+00
2074	1.571E+05	8.580E+07	5.765E+03	3.691E+02	1.030E+05	6.918E+00
2075	1.540E+05	8.411E+07	5.651E+03	3.618E+02	1.009E+05	6.781E+00
2076	1.509E+05	8.244E+07	5.539E+03	3.546E+02	9.893E+04	6.647E+00
2077	1.479E+05	8.081E+07	5.429E+03	3.476E+02	9.697E+04	6.515E+00
2078	1.450E+05	7.921E+07	5.322E+03	3.407E+02	9.505E+04	6.386E+00
2079	1.421E+05	7.764E+07	5.217E+03	3.340E+02	9.317E+04	6.260E+00
2080	1.393E+05	7.610E+07	5.113E+03	3.273E+02	9.132E+04	6.136E+00
2081	1.365E+05	7.459E+07	5.012E+03	3.209E+02	8.951E+04	6.014E+00
2082	1.338E+05	7.312E+07	4.913E+03	3.145E+02	8.774E+04	5.895E+00
2083	1.312E+05	7.167E+07	4.815E+03	3.083E+02	8.600E+04	5.779E+00
2084	1.286E+05	7.025E+07	4.720E+03	3.022E+02	8.430E+04	5.664E+00
2085	1.260E+05	6.886E+07	4.627E+03	2.962E+02	8.263E+04	5.552E+00
2086	1.236E+05	6.750E+07	4.535E+03	2.903E+02	8.100E+04	5.442E+00
2087	1.211E+05	6.616E+07	4.445E+03	2.846E+02	7.939E+04	5.334E+00
2088	1.187E+05	6.485E+07	4.357E+03	2.789E+02	7.782E+04	5.229E+00
2089	1.164E+05	6.357E+07	4.271E+03	2.734E+02	7.628E+04	5.125E+00
2090	1.141E+05	6.231E+07	4.186E+03	2.680E+02	7.477E+04	5.024E+00
2091	1.118E+05	6.107E+07	4.103E+03	2.627E+02	7.329E+04	4.924E+00
2092	1.096E+05	5.986E+07	4.022E+03	2.575E+02	7.184E+04	4.827E+00
2093	1.074E+05	5.868E+07	3.943E+03	2.524E+02	7.041E+04	4.731E+00
2094	1.053E+05	5.752E+07	3.865E+03	2.474E+02	6.902E+04	4.637E+00
2095	1.032E+05	5.638E+07	3.788E+03	2.425E+02	6.765E+04	4.546E+00
2096	1.012E+05	5.526E+07	3.713E+03	2.377E+02	6.631E+04	4.456E+00
2097	9.915E+04	5.417E+07	3.639E+03	2.330E+02	6.500E+04	4.367E+00
2098	9.719E+04	5.309E+07	3.567E+03	2.284E+02	6.371E+04	4.281E+00
2099	9.526E+04	5.204E+07	3.497E+03	2.239E+02	6.245E+04	4.196E+00
2100	9.338E+04	5.101E+07	3.428E+03	2.194E+02	6.122E+04	4.113E+00
2101	9.153E+04	5.000E+07	3.360E+03	2.151E+02	6.000E+04	4.032E+00
2102	8.972E+04	4.901E+07	3.293E+03	2.108E+02	5.881E+04	3.952E+00
2103	8.794E+04	4.804E+07	3.228E+03	2.066E+02	5.765E+04	3.874E+00
2104	8.620E+04	4.709E+07	3.164E+03	2.026E+02	5.651E+04	3.797E+00
2105	8.449E+04	4.616E+07	3.101E+03	1.985E+02	5.539E+04	3.722E+00
2106	8.282E+04	4.524E+07	3.040E+03	1.946E+02	5.429E+04	3.648E+00
2107	8.118E+04	4.435E+07	2.980E+03	1.908E+02	5.322E+04	3.576E+00
2108	7.957E+04	4.347E+07	2.921E+03	1.870E+02	5.216E+04	3.505E+00
2109	7.800E+04	4.261E+07	2.863E+03	1.833E+02	5.113E+04	3.435E+00
2110	7.645E+04	4.177E+07	2.806E+03	1.796E+02	5.012E+04	3.367E+00
2111	7.494E+04	4.094E+07	2.751E+03	1.761E+02	4.913E+04	3.301E+00
2112	7.345E+04	4.013E+07	2.696E+03	1.726E+02	4.815E+04	3.235E+00
2113	7.200E+04	3.933E+07	2.643E+03	1.692E+02	4.720E+04	3.171E+00
2114	7.057E+04	3.855E+07	2.590E+03	1.658E+02	4.627E+04	3.109E+00
2115	6.918E+04	3.779E+07	2.539E+03	1.626E+02	4.535E+04	3.047E+00
2116	6.781E+04	3.704E+07	2.489E+03	1.593E+02	4.445E+04	2.987E+00
2117	6.646E+04	3.631E+07	2.440E+03	1.562E+02	4.357E+04	2.928E+00
2118	6.515E+04	3.559E+07	2.391E+03	1.531E+02	4.271E+04	2.870E+00
2119	6.386E+04	3.489E+07	2.344E+03	1.501E+02	4.186E+04	2.813E+00
2120	6.259E+04	3.419E+07	2.298E+03	1.471E+02	4.103E+04	2.757E+00

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2121	6.135E+04	3.352E+07	2.252E+03	1.442E+02	4.022E+04	2.702E+00
2122	6.014E+04	3.285E+07	2.207E+03	1.413E+02	3.942E+04	2.649E+00
2123	5.895E+04	3.220E+07	2.164E+03	1.385E+02	3.864E+04	2.596E+00
2124	5.778E+04	3.157E+07	2.121E+03	1.358E+02	3.788E+04	2.545E+00
2125	5.664E+04	3.094E+07	2.079E+03	1.331E+02	3.713E+04	2.495E+00
2126	5.552E+04	3.033E+07	2.038E+03	1.305E+02	3.639E+04	2.445E+00
2127	5.442E+04	2.973E+07	1.997E+03	1.279E+02	3.567E+04	2.397E+00
2128	5.334E+04	2.914E+07	1.958E+03	1.253E+02	3.497E+04	2.349E+00
2129	5.228E+04	2.856E+07	1.919E+03	1.229E+02	3.427E+04	2.303E+00
2130	5.125E+04	2.800E+07	1.881E+03	1.204E+02	3.360E+04	2.257E+00
2131	5.023E+04	2.744E+07	1.844E+03	1.180E+02	3.293E+04	2.213E+00
2132	4.924E+04	2.690E+07	1.807E+03	1.157E+02	3.228E+04	2.169E+00
2133	4.826E+04	2.637E+07	1.772E+03	1.134E+02	3.164E+04	2.126E+00
2134	4.731E+04	2.584E+07	1.736E+03	1.112E+02	3.101E+04	2.084E+00
2135	4.637E+04	2.533E+07	1.702E+03	1.090E+02	3.040E+04	2.042E+00
2136	4.545E+04	2.483E+07	1.668E+03	1.068E+02	2.980E+04	2.002E+00
2137	4.455E+04	2.434E+07	1.635E+03	1.047E+02	2.921E+04	1.962E+00
2138	4.367E+04	2.386E+07	1.603E+03	1.026E+02	2.863E+04	1.924E+00
2139	4.281E+04	2.338E+07	1.571E+03	1.006E+02	2.806E+04	1.885E+00
2140	4.196E+04	2.292E+07	1.540E+03	9.859E+01	2.751E+04	1.848E+00
2141	4.113E+04	2.247E+07	1.510E+03	9.664E+01	2.696E+04	1.812E+00
2142	4.031E+04	2.202E+07	1.480E+03	9.473E+01	2.643E+04	1.776E+00
2143	3.951E+04	2.159E+07	1.450E+03	9.285E+01	2.590E+04	1.740E+00
2144	3.873E+04	2.116E+07	1.422E+03	9.101E+01	2.539E+04	1.706E+00
2145	3.796E+04	2.074E+07	1.394E+03	8.921E+01	2.489E+04	1.672E+00
2146	3.721E+04	2.033E+07	1.366E+03	8.744E+01	2.440E+04	1.639E+00
2147	3.648E+04	1.993E+07	1.339E+03	8.571E+01	2.391E+04	1.607E+00
2148	3.575E+04	1.953E+07	1.312E+03	8.402E+01	2.344E+04	1.575E+00
2149	3.505E+04	1.915E+07	1.286E+03	8.235E+01	2.297E+04	1.544E+00
2150	3.435E+04	1.877E+07	1.261E+03	8.072E+01	2.252E+04	1.513E+00
2151	3.367E+04	1.839E+07	1.236E+03	7.912E+01	2.207E+04	1.483E+00
2152	3.301E+04	1.803E+07	1.211E+03	7.756E+01	2.164E+04	1.454E+00
2153	3.235E+04	1.767E+07	1.187E+03	7.602E+01	2.121E+04	1.425E+00
2154	3.171E+04	1.732E+07	1.164E+03	7.452E+01	2.079E+04	1.397E+00
2155	3.108E+04	1.698E+07	1.141E+03	7.304E+01	2.038E+04	1.369E+00
2156	3.047E+04	1.664E+07	1.118E+03	7.159E+01	1.997E+04	1.342E+00
2157	2.986E+04	1.631E+07	1.096E+03	7.018E+01	1.958E+04	1.315E+00
2158	2.927E+04	1.599E+07	1.074E+03	6.879E+01	1.919E+04	1.289E+00
2159	2.869E+04	1.568E+07	1.053E+03	6.742E+01	1.881E+04	1.264E+00
2160	2.813E+04	1.536E+07	1.032E+03	6.609E+01	1.844E+04	1.239E+00

11.3 Geological, Geophysical and Geotechnical

11.4 Seismic Study

11.5 Traffic Study

11.6 Ambient Air Quality Measurements

11.7 Hydrology Study

11.8 Terms of Reference for the ESIA scoped to each project component

This section discusses the terms of reference for carrying out necessary Environmental and Social studies for the construction and operation of the waste processing facilities which may involve private sector. The waste processing facilities in the proposed project include: sanitary landfills, composting/recycling plants, medical waste treatment plant and construction and demolition plant/. That means each independent component has its independent ESIA.

Components of the TOR applicable to the different components are presented in the following subsection.

11.8.1 Background

Cairo and Qalyoubia governorates are experiencing air pollution mainly due to inadequate collection and disposal of solid waste and open burning. To address this inadequate solid waste management, the Government of Egypt, through Waste Management Regulatory Authority (WMRA) in Ministry of Environment and Ministry of Local Development initiated the design of Qalyoubia landfill and the C&D waste treatment facility. The objective of the project is to:

- Reduce air emissions related to the solid waste sector to improve air quality in Greater Cairo
- Achieve Egypt's strategic goals to improve public health and environmental conditions in Greater Cairo
- Maximize the benefit and economic viability of solid waste
- Encourage private sector participation in the solid waste management system

The project is in line with the goals of Egypt's Sustainable Development Strategy 2030. In addition, the Government of Egypt (GOE) formulated the Nationally-Determined Contribution (NDC) which indicated the importance of taking actions to reduce air emissions, including in the SWM sector. As stated in its NDC the GoE's goal is to "develop and implement a strong, economically feasible mitigation program which would achieve proposed emission reductions for 2030." The project is already an activity in mitigation of existing concerns as it minimizes emission of greenhouse gases, which is a global challenge by incorporating gas collection and venting system in the proposed project.

11.8.2 Applicable requirements

The main legal framework for environmental issues is Law No. 4 of 1994 and amended by Law No. 9 of 2009 and Law 105 of 2015 and its implementing regulations amended by Resolution 1095 of 2011 and then Resolution 710 of 2012 and Resolution 964 of 2015 known as the Environmental Protection Law.

Egyptian code of Design Principal and implementation conditions for municipal solid waste management systems Number 717/2019.

11.8.3 Objective of the assignment

The objective of the ESIA is to identify and assess the potential environmental and social impacts of the proposed project (Qalyoubia landfill for domestic wastes/rejects and the C&D waste treatment facility), evaluate alternatives, and design appropriate mitigation, management, and monitoring measures.

11.8.4 Scope of work and tasks

There are 10 task identified as follows:

- Task 1: Identification of the environmental and social regulations, standards, policies and administrative framework.
- Task 2: Specification of project designs, plans and activities that would be associated with environmental and social aspects.
- Task 3: Conducting project site visit to familiarize with the project area, surroundings, the detailed project activities and consult with workers to clearly understand the project description.
- Task 4: Description of the environmental and social baseline conditions prior to the implementation of the project interventions.
- Task 5: Identification of both positive and negative impacts and the most during construction and operation phases.
- Task 6: Analyzing alternatives for the proposed project according to their environmental and social pros.
- Task 7: Development of an environmental and social management and monitoring program (ESMMP) during construction and operation and presentation of plans to minimize, mitigate, or eliminate negative effects and impacts. Description of implementation of ESMMP. Clearly identify monitoring methods, frequency, performance indicators, locations, responsibility and estimated cost (EGP).
- Task 8: Conduct consultations and meetings with stakeholder groups, individuals and concerned people in a manner that is informative, inclusive and well representative. Ensure that the views of the stakeholders are well integrated in the development of the ESIA
- Task 9: Responding to all correspondences with EEAA relating to the ESIA in close consultation with the client.
- Task 10: Acquisition of an Environmental and Social Impact Assessment approval from EEAA.

For each ESIA, there will be required measurements, calculations and models to be carried out presented in the following table.

Table 58 required measurements, calculations and models

ESIA	Required measurement and models
Sanitary landfills	Air dispersion model of emissions from landfill gas flare Air dispersion model to assess odor impact

ESIA	Required measurement and models
	Estimation of landfill gas generation Estimation of leachate generation
Construction and demolition plant	Noise model of the crusher
Medical waste	Air dispersion model of the emissions of stack from incinerator
Composting plant	Estimation of leachate generation

11.8.5 Disclosure

The report shall be prepared in Arabic language. The executive summaries of the draft and final ESIA reports should be translated into English. All reports shall be disclosed in the Client's country as per World Bank guidelines and will be disclosed both in-country at appropriate sites and at the World Bank external website.

11.8.6 Deliverables

The Consultant will submit the following deliverables:

- Draft Non-Technical Summary for consultation and disclosure to the public
- Draft Environmental and Social Impact Assessment
- Final documentation

All final documents and reports prepared for this contract will be delivered in Word and PDF versions.

11.8.7 Timeframe

The Consultant should make all possible efforts to complete the assignment in the shortest possible time. Every effort will have to be made to respect the agreed deadlines.

11.8.8 Team composition

The private sector shall hire a licensed consultant approved from EEAA to conduct the ESIA studies. A suggested composition of the ESIA team is as follows (key team members, to be complemented as appropriate):

- Project manager: a consultant with experience in managing ESIAs of large-scale infrastructure projects with excellent communication skills
- Environmental specialist with experience in ESIAs in the solid waste sector
- Social specialist(s) with experience in Egypt, including public consultation in the local context, as required

11.9 Presents all potential project stakeholders

Detailed list of stakeholders

Stakeholder Groups		Role
Project affected parties		
Environmental Sector	Ministry of Environment - Egyptian Environmental Affairs Agency (EEAA)	• Responsible for developing public policies related to the protection of environment and improving its quality. In addition, it is responsible for issuing regulations for environmental determinants and monitoring their implementation. • EEAA is one of the main stakeholders that work closely with the Project in order to warrantee their level of environmental commitment; through reviewing and approving EIAs, and monitoring implementation of the Environmental Management Plan • In addition, EEAA is the owner of the project
	Waste Management Regulatory Authority (WMRA)	• Responsible for regulating, following-up and overseeing all waste management processes at both central and local levels, in a manner improving the environmentally safe management. • Providing information and data available about the waste sector in Egypt. • Provide technical support to raise public awareness and community commitment. • Responsible for managing some project components
	Environmental Office within the Governorates	Responsible for monitoring the compliance to environmental requirements
Governmental sector	Ministry of Environment (MoE)	MoE is the main implementing agency for the project. For each component separate agencies and ministries will be involved in the implementation of various project components from a sectoral perspective
	Ministry of Local Development (MoLD)	Responsible for implementing the national strategy for solid waste management and the specific master plans that have been put in place by the waste management body in the concerned governorates

Stakeholder Groups		Role
Project affected parties		
Other Governmental Entities	Governorates, Cairo Qalyoubia	• Responsible for collecting and transporting waste through the concerned departments in each governorate • Supporting the project by providing requested services such as various permits required, and infrastructure maps, when requested.
	City Council 10th of Ramadan	• The main role of the Local Units authority is the provision of support to the project through giving permits for electricity installation and water supply and mobilizing people to gain information about the project. • Permits for the lands needed for the project, should be prepared by the Governorate and approved by the LGU.
	Ministry of Defense	They provide the project with permissions and approvals.
Potential Affected Communities in the project areas	Khanqa Markaz Tenth of Ramadan	• Unless if the Qalyoubia landfill and the C&D waste treatment facility are managed following solid environmental and social measures, they could be affected by the project. • Constitute interest group as potential candidates for job opportunities They have interests in the project as they might get a job opportunity
Private Sector Factories Companies (including potential interested groups of the informal sector)	waste recycling waste management	• Potential participants in project activities • Cooperation with the implementing agencies • Investment opportunities for the private sector in operating the project
Contractors	Not yet defined	Responsible for the implementation of project management plans
Financial Institutes	The World Bank (WB)	Financiers and regulators
other interested parties		
Civil Society	NGOs (International, regional, local)	• Organizations with direct interest in the project and which may have useful data or insight into local issues of relevance to the

Stakeholder Groups		Role
Project affected parties		
	Grassroots Community- Based Organizations (CBO) Recyclobicia Association (Mustafa Hamdan) Youth Spirit Association (Izzat Naeem)	project. These organizations can also influence the views of others regarding the project, nationally and internationally. • Responsible of sharing information with the community
Media	Television Newspaper Websites editors Online journalism	• Disclosure of information about the project on the website of the Ministries. • Disclosure of information about the project on the Facebook pages of the local government.
Suppliers and Traders	Private companies	Mainly potential tenderers for the construction works.
	Traders (small-scale stores) (unofficial suppliers)	• Provide construction materials. • Provide fuels to cars and machineries. • Provide workers with food and amenities.