Environmental and Social Risks Screening and Impact Assessment of Proposed Concrete Climate Change Adaptation Measures / Interventions under the Adaptation Fund Project:

« Increasing the resilience of both displaced persons and host communities to climate change-related water challenges in Jordan and Lebanon»

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Risk Screening – Adaptation Fund Requirements

Rainwater Harvesting at Public Buildings

Following the guidance document for UN-Habitat and partners to comply with the Adaptation Fund ESP and GP, the table below illustrates that the rainwater harvesting at public buildings project complies to all 15 principles with no potential or significant risks.

Adaptation Fund Principles	Risk Screening Result	Justification
Principle 1: Compliance with the Law	No potential risks	According to Annex 1 of Decree No. 8633,2012 of MoE, the project does not require an Environmental Impact Assessment. National guidelines for rainwater harvesting prepared by the Ministry of Energy and Water, were adopted.
Principle 2: Access and Equity	No potential risks	Based on consultations done with vulnerable groups in the area. Kindly refer to consultation document 04. The process to select the public buildings: - List all public schools, churches, mosques and other public buildings in Zahle Caza - Evaluate the footprint of the building on Google Earth for design efficiency. - Select suitable buildings across all regions in the Caza.
Principle 3: Marginalized and Vulnerable Groups	No potential risks	Rainwater harvesting at public buildings will not impose disproportionate adverse impacts on vulnerable and marginalized groups that exist in the area.
Principle 4: Human Rights	No potential risks	No perceived risks in project preparation and execution.
Principle 5: Gender Equality and Women's Empowerment	No potential risks	Gender equality and women's empowerment is not applicable in the implementation of rainwater harvesting projects.
Principle 6: Core Labour Rights	No potential risks	It is mandatory that all core labor rights, as well as safety and health requirements are part of any contract signed. This is achieved by hiring a qualified and competent contractor to execute the work.
Principle 7: Indigenous People	No potential risks	No indigenous people in the project area.
Principle 8: Involuntary Resettlement	No potential risks	No resettlement or displacement will take place.

Adaptation Fund Principles	Risk Screening Result	Justification
Principle 9: Protection of Natural Habitats	No potential risks	No protected natural habitats were found at the vicinity of the project area.
Principle 10: Conservation of Biological Diversity	No potential risks	No negative impacts on biological diversity will result from the project. The intervention will be done on existing buildings, thus will not disturb any natural environment or existing biodiversity.
Principle 11: Climate Change	No potential risks	The project will not result in significant or unjustified increase in greenhouse gas emissions or other drivers of climate change. The project does not belong to any of these sectors: energy, transport, heavy industry, building materials, large scale agriculture and forest products, or waste management.
Principle 12: Pollution Prevention and Resource Efficiency	No potential risks	The design of rainwater harvesting will take into consideration using durable material, and the possibility of using PV panels for the pumps.
Principle 13: Public Health	No potential risks	Water treatment (media and micro filter and a chlorination tank) will be installed at every public building in order to treat the rainwater harvested and ensure it is safe to use.
Principle 14: Physical and Cultural Heritage	No potential risks	No heritage sites in the project area.
Principle 15: Lands and Soil Conservation	No potential risks	The project will not pose any risks on soil. It is at the level of existing buildings.

Risk Screening – Adaptation Fund Requirements

Water-efficient Irrigation

Following the guidance document for UN-Habitat and partners to comply with the Adaptation Fund ESP and GP, the table below illustrates that installing water efficient irrigation techniques complies to all 15 principles with no potential or significant risks.

Adaptation Fund Principles	Risk Screening Result	Justification
Principle 1: Compliance with the Law	No potential risks	According to Annex 1 of Decree No. 8633,2012 of MoE, the project does not require an Environmental Impact Assessment. No national standards for irrigation water quality exist. Therefore, international FAO guidelines will be adopted. No guidelines for drip irrigation installation exist. The Lebanese Agricultural and Research Institute (LARI) has the relevant experience to install irrigation systems and test new crop varieties.
Principle 2: Access and Equity	No potential risks	Based on consultations done with vulnerable groups in the area. Kindly refer to consultation document 04. Proper outreach to the farmers in the area will guarantee equal access to the service provided.
Principle 3: Marginalized and Vulnerable Groups	No potential risks	Installing water efficient irrigation techniques will not impose disproportionate adverse impacts on vulnerable and marginalized groups that exist in the area.
Principle 4: Human Rights	No potential risks	No perceived risks in project preparation and execution.
Principle 5: Gender Equality and Women's Empowerment	No potential risks	Gender equality and women's empowerment is applicable if the farmers taking the training are women.
Principle 6: Core Labour Rights	No potential risks	It is mandatory that all core labor rights, as well as safety and health requirements are part of any contract signed.
Principle 7: Indigenous People	No potential risks	No indigenous people in the project area.
Principle 8: Involuntary Resettlement	No potential risks	No resettlement or displacement will take place.

Adaptation Fund Principles	Risk Screening Result	Justification
Principle 9: Protection of Natural Habitats	No potential risks	No protected natural habitats were found at the vicinity of the project area.
Principle 10: Conservation of Biological Diversity	No potential risks	No negative impacts on biological diversity will result from the project. The intervention will be done on existing agricultural fields.
Principle 11: Climate Change	No potential risks	The project will not result in significant or unjustified increase in greenhouse gas emissions or other drivers of climate change. The project does not belong to any of these sectors: energy, transport, heavy industry, building materials, large scale agriculture and forest products, or waste management.
Principle 12: Pollution Prevention and Resource Efficiency	No potential risks	Installing water efficient irrigation techniques will lead to a more efficient use of water resources.
Principle 13: Public Health	No potential risks	The project will not intervene in the supply of water but rather in improving the irrigation techniques. Therefore, no risks on public health are perceived. The Bekaa Water Establishment is responsible for the monitoring of water quality from public wells and reservoirs.
Principle 14: Physical and Cultural Heritage	No potential risks	No heritage sites in the project area.
Principle 15: Lands and Soil Conservation	No potential risks	The project will not pose any risks on soil.

Risk Screening – Adaptation Fund Requirements

Use of Zahle WWTP Effluent for Irrigation

Following the guidance document for UN-Habitat and partners to comply with the Adaptation Fund ESP and GP, the table below illustrates that reusing the effluent from Zahle WWTP for irrigation complies to all 15 principles with no potential or significant risks.

Adaptation Fund Principles	Risk Screening Result	Justification
Principle 1: Compliance with the Law	No potential risks	According to Annex 1 of Decree No. 8633,2012 of MoE, the project does not require an Environmental Impact Assessment. No national standards for irrigation water quality exist. Therefore, international FAO guidelines will be adopted.
Principle 2: Access and Equity	No potential risks	Based on consultations done with vulnerable groups in the area. Kindly refer to consultation document 04. An irrigation canal will distribute the effluent from the WWTP to adjacent agricultural fields. The Bekaa Water Establishment in collaboration with farmer cooperatives will be responsible for managing the water.
Principle 3: Marginalized and Vulnerable Groups	No potential risks	Reusing effluent from Zahle WWTP for irrigation, which is otherwise discharged into the polluted Litani River tributary, will not impose disproportionate adverse impacts on vulnerable and marginalized groups that exist in the area.
Principle 4: Human Rights	No potential risks	No perceived risks in project preparation and execution.
Principle 5: Gender Equality and Women's Empowerment	No potential risks	Gender equality and women's empowerment is not applicable in this intervention.
Principle 6: Core Labour Rights	No potential risks	It is mandatory that all core labor rights, as well as safety and health requirements are part of any contract signed.
Principle 7: Indigenous People	No potential risks	No indigenous people in the project area.
Principle 8: Involuntary Resettlement	No potential risks	No resettlement or displacement will take place.
Principle 9: Protection of Natural Habitats	No potential risks	No protected natural habitats were found at the vicinity of the project area.

Adaptation Fund Principles	Risk Screening Result	Justification
Principle 10: Conservation of Biological Diversity	No potential risks	No negative impacts on biological diversity will result from the project. The intervention will be adjacent to existing agricultural fields.
Principle 11: Climate Change	No potential risks	The project will not result in significant or unjustified increase in greenhouse gas emissions or other drivers of climate change. The project does not belong to any of these sectors: energy, transport, heavy industry, building materials, large scale agriculture and forest products, or waste management.
Principle 12: Pollution Prevention and Resource Efficiency	No potential risks	Reusing effluent from Zahle WWTP will lead to a more efficient use of water resources, because the treated effluent is rather discharged into a polluted river.
Principle 13: Public Health	No potential risks	Water quality of the effluent from the treatment plant should be monitored against FAO guidelines for irrigation water quality. If the quality is not suitable, it will not impact public health per se, but rather will damage the crops.
Principle 14: Physical and Cultural Heritage	No potential risks	No heritage sites in the project area.
Principle 15: Lands and Soil Conservation	No potential risks	The project will not pose any risks on soil.

Environmental Impact Assessment

Constructed Wetland in Bar Elias

Disclaimer

Environmental Impact Assessment Report - **Bar Elias Constructed Wetland** in the Municipality of Bar Elias, Bekaa Valley.

This Environmental Impact Assessment (EIA) report has been prepared by KREDO s.a.l. with care and due diligence. The information contained in this report is, to the best of our knowledge, accurate at the time of printing.

The interpretations and recommendations are based on our experience, using reasonable professional skill and judgment, and based upon the information that was made available to us. This report is confidential to the client and we accept no responsibility, whatsoever in nature to third parties to whom this report, or any part thereof, is made known.

8 January 2020

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SUMMARY

UNICEF-UN Habitat intends to construct a Free Water Surface (FWS) constructed wetland on the barren Plot No. 1951, which belongs to Litani River Authority (LRA) in the Municipality of Bar Elias, Bekaa Caza. The total area of this plot is estimated at around 60,000 m^2. The wetland will be operated and maintained by LRA.

The polluted Ghezayel tributary will be partially diverted, around 6,000 cubic meters per day, to the wetland to be treated. The wetland effluent becomes a clean source for cropland irrigation in Bar Elias meeting irrigation standards. The main objectives of the proposed project are:

- Improve, in part, the quality of the Ghezayel tributary flow as a lotic system on its own,
- Improve the overall biodiversity of the site, which is currently barren due to the adverse effects of previous land uses;
- Improve the overall Litani river water quality for safer irrigational purposes.

With the absence of operational wastewater treatment in Bar Elias and the country in general, constructed wetlands are proven low maintenance alternatives to treating polluted waters and even raw wastewaters with little to no negative impacts on the local ecosystem and locale of Bar Elias. This report has demonstrated that:

- The proposed project does not affect any areas of archaeological or heritage importance.
- The proposed project does not depict any significant negative environmental impacts.

A number of opportunities are however available, which include the following:

- Provide a natural ecosystem for migratory birds and other animals as well.
- An opportunity to improve the landscaping and the visual amenity of the immediate area.
- Opportunities for providing jobs within the construction sector (labor workers, material suppliers etc.) as well as improving the tourism to said area.
- Improve the water quality of the polluted Ghezayel tributary.

Taking into consideration the sparsely residential area and limited scale of the project and the assessment of the environmental impacts mentioned in this EIA report, the proposed Bar Elias constructed wetland project does not have any significant long term, or residual impacts that should be mitigated for such innocuous projects.

To avoid redundancy, kindly refer to Table 11 for the Environmental Management Plan and Table 12 for the Environmental Monitoring Plan.

1. INTRODUCTION

1.1 Project Background

UNICEF-UN Habitat intends to construct a Free Water Surface (FWS) wetland on the barren Plot No. 1951 belonging to the Litani River Authority (LRA) in the Municipality of Bar Elias, Bekaa caza. The total area of this plot is estimated at around 60,000 m^2 and the location is shown in **Error! Reference source not found.**.

KREDO s.a.l. were approached by UNICEF-UN Habitat and subsequently hired to implement said Environmental Impact Assessment (EIA) report.

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The project is funded by UN-Habitat, and will be operated and maintained by Litani River Authority.

The main objective of the constructed wetland is to partially divert the polluted Ghezayel tributary through the wetland in order to improve the quality of said water. Once this objective has been achieved, the wetland effluent becomes a clean source for cropland irrigation in Bar Elias.

The proposed constructed wetland project generally encompasses the construction of the following structures along with selected flora suitable for phytoremediation:

- Sequential shallow and deep ponds.
- Containment berms
- Fences, pump and other structures

1.2 EIA Study Team

UNICEF-UN Habitat has retained the services of the consultant, KREDO s.a.l. (Achrafieh, Beirut, Tel: 01-204957, fax: 01-336399; kredo@kredo.net), for the preparation of the EIA.

Dr. Mark Saadeh (Hydrogeologist), assisted by Ms. Diana El Halawani (Environmental Engineer), Engineers Roula Bassil-Srouji (Civil Engineer) and

Mahmoud Noun (GIS and Surveying Engineer) have all contributed to the following report.

1.3 EIA Aim & Methodology

The aim of this Environmental Impact Assessment (EIA) report is to evaluate the major environmental issues identified in the scoping phase, propose pertinent mitigation measures, and monitoring plan in order to ensure the proper implementation of the environmental management plan (**EMP**).

The client, should commit to the implementation of the EMP in full through the signing of the pledge letter by the Ministry of Environment (MoE) after granting approval for the EIA study.

As for the methodology pertaining to data collection, the following bullets are included:

- Site visits (October through December 2019))
- Meetings with stakeholders (October through December 2019)
- Public hearing with consultations (18 December 2019)
- Literature review (mainly of similar projects i.e. constructed wetlands)
- Best management practices

2. PROJECT DESCRIPTION

2.1. Objectives

The proposed wetland in Bar Elias aims at:

- Improving in part the quality of the Ghezayel tributary flow as a lotic system on its own,
- Improving the overall biodiversity of the site, which is currently barren due to the adverse effects of previous land uses;
- Improving the overall Litani river water quality for safer irrigational purposes.

2.2. Project Location

The proposed project is located in the Bekaa caza, in the Municipality of Bar Elias. There are around 100,000 residents in Bar Elias including a high number of refugees. The proposed plot #1951 belongs to Litani River Authority. According to the Directorate General of Urban Planning, the land falls in a zone classified as E, suitable for touristic and residential projects.

The GPS coordinates were measured during the site visit of 15 October 2019, and are as follows:

- -434751.5 Northing
- -296365.5 Easting
- Approximately 873 mASL

Figure 1: Ghzayel Tributary to be Treated by Constructed Wetland

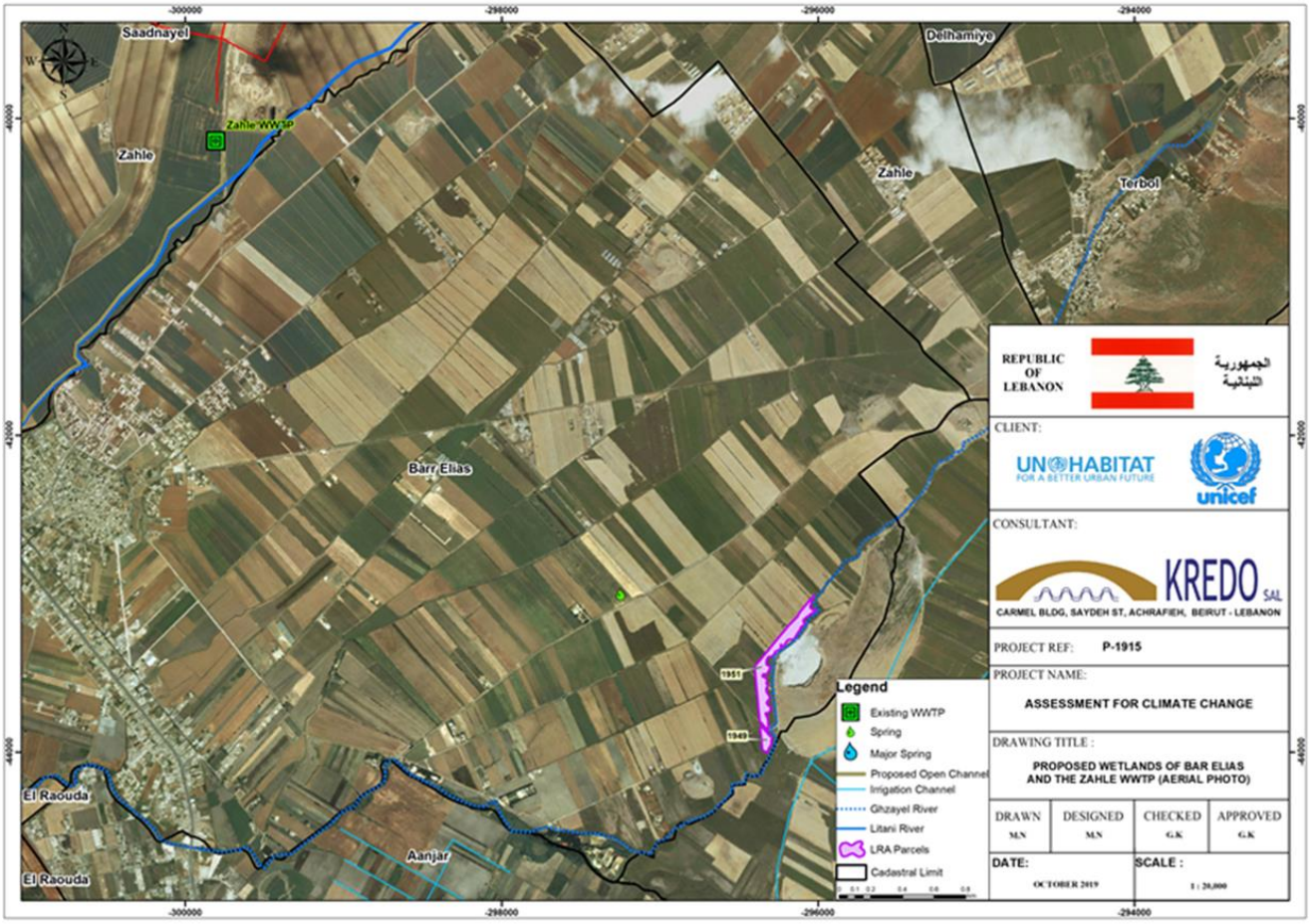


Figure 2: Location of Plot #1951 in Bar Elias Municipality

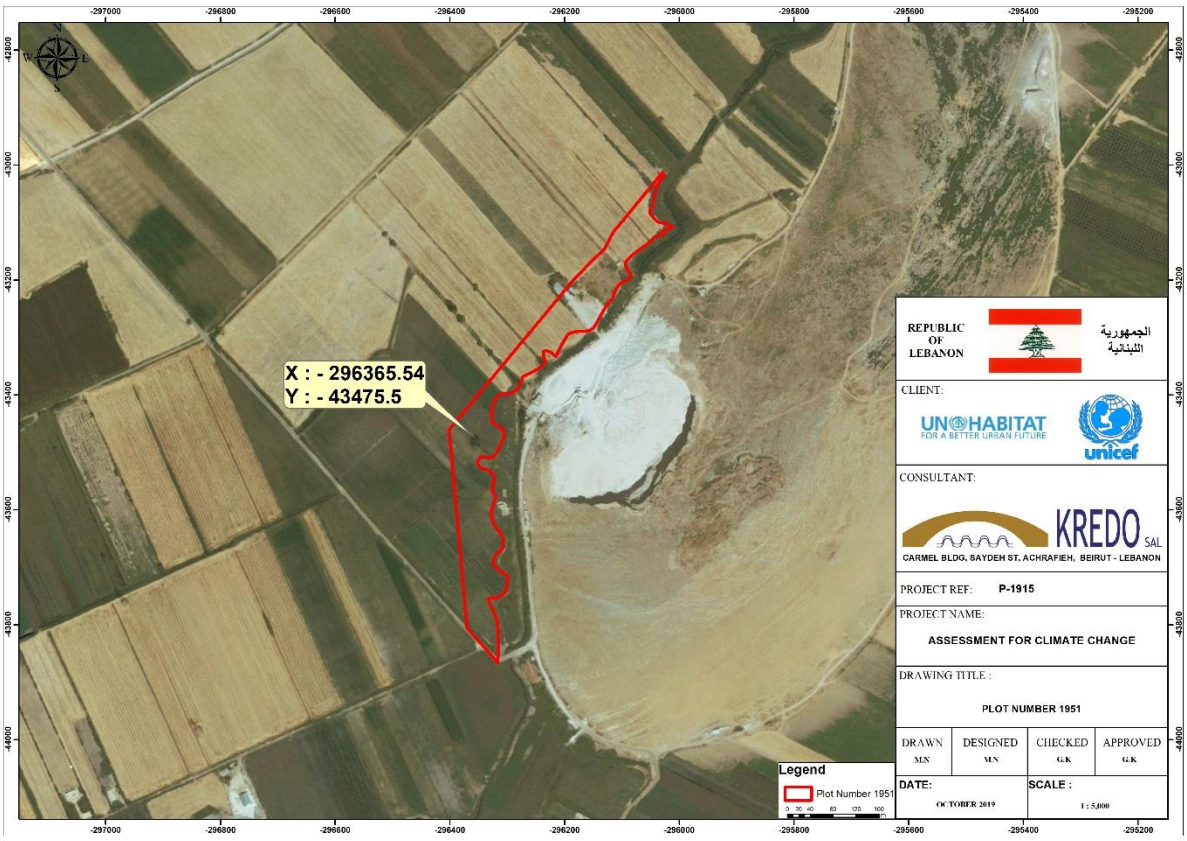


Figure 3: Aerial Photograph of Plot #1951

2.3. Project Components

The stated objective of the constructed wetland is to partially divert (around 6,000 cubic meters per day) the polluted Ghezayel tributary through the proposed constructed wetland in order to improve the quality of said water. The wetland effluent becomes a clean source for cropland irrigation in Bar Elias meeting irrigation standards.

The proposed constructed wetland project encompasses in general the construction of the following structures along with selected flora suitable for phytoremediation as stipulated by the US Environmental Protection Agency (USEPA) and typically includes the following components:

- Sequential shallow and deep ponds also known as cells
- Warning signs and placards, with few employees required
- Containment berms (in the case surface flow types of wetlands)
- Fences, pump and other auxiliary structures

- Recommended indigenous flora (for phytoremediation) such as fragmites, and cat-tails.

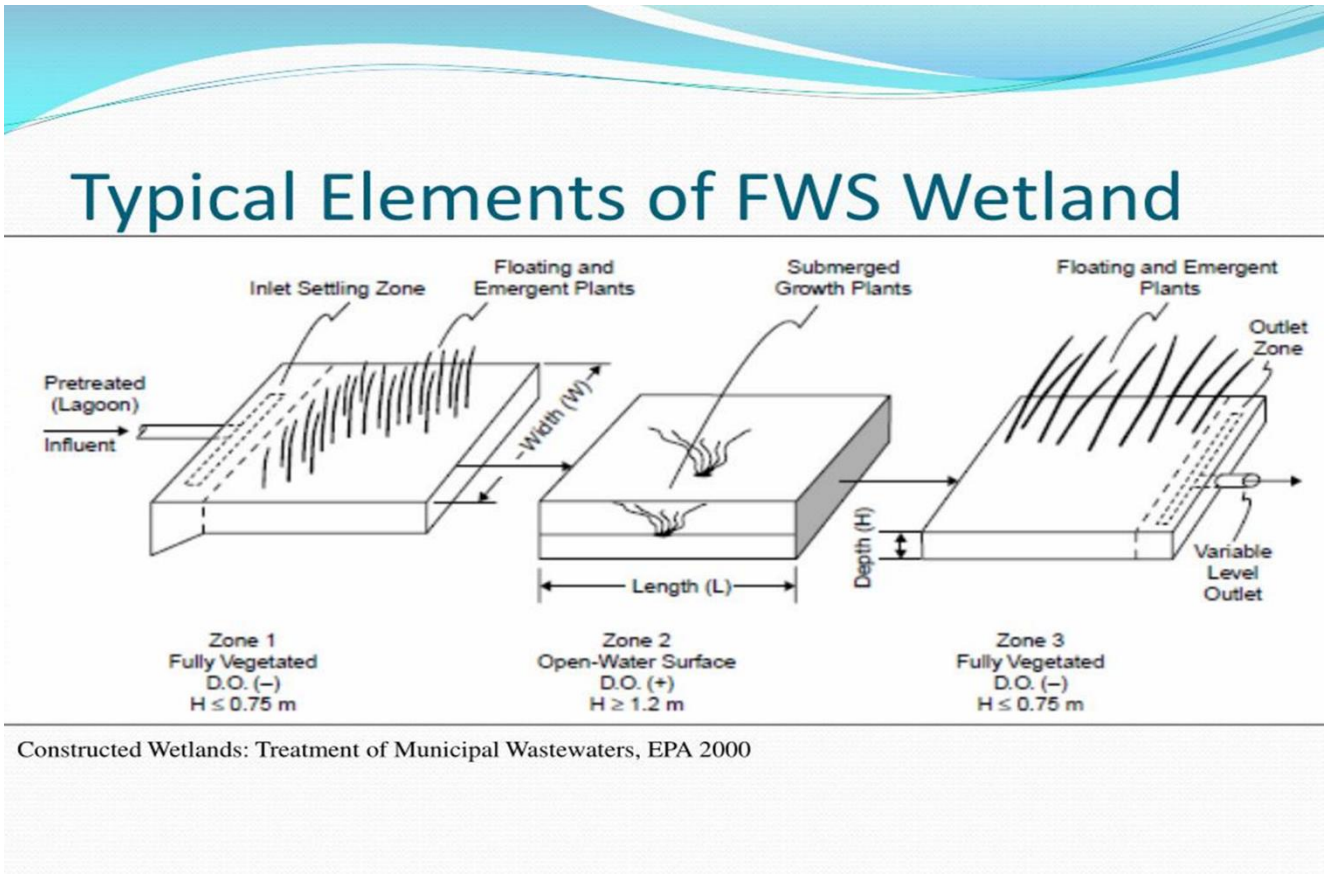


Figure 4:Proposed Bar Elias Constructed Wetland Project Components (USEPA, 2000)

The estimated cost of the project is around one million dollars. The $400,000 mentioned in the scoping report is the estimated unit price for the construction of a wetland with an area of 30,000 m^2. The proposed wetland in Bar Elias will have an area of 60,000 m^2 so the cost is doubled. Moreover, design and supervision costs, training costs, as well as the cost for an access road to the site are estimated to add up to one million dollars.

3. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This chapter offers a description of the associated laws, policies and regulations as well as any international standards and guidelines relevant to the proposed project.

3.1. Legislative Framework in Lebanon

The Lebanese government established the Ministry of Environment (MoE) in 1993 by the law No.216 (later modified by law No.667 in 1997). The MoE's main tasks

include monitoring and control of environmental parameters, protection of natural reserves and prevention from pollution. The MoE also sets the environmental standards, specifications and guidelines for different sectors that might have an impact on the environment.

The national laws, decrees and decisions relevant to the proposed project are listed in Table 1**Error! Reference source not found.** below.

Table 1: Overview of the Relevant Lebanese Legislative Framework

Legislation	Date	Brief Description
Law 64	1988	➢ Preserving the environment against noxious waste and hazardous substances. ➢ Municipalities are responsible for the collection and disposal of household wastes
Law 216	1993	➢ Establishment of the Ministry of Environment.
Decree No. 4917	1994	➢ Amending the classification of the dangerous, hazardous to health and disturbing establishments.
Decision 52/1	1996	➢ National Standards for Environmental Quality and Environmental Limit Values (ELVs) for Air, Noise, Water and Soil
Decision 8/1	2001	➢ Update Decision 52/1 by developing National Standards for Environmental Quality (NSEQ) related to air pollutants, liquid effluents and wastewater treatment waste emitted from classified establishments and wastewater treatment plants into receiving water bodies
Law 432	July 2002	➢ Stockholm Convention on Persistent Organic Pollutants aims to eliminate or restrict the production and use of persistent organic pollutants (POPs). Lebanon signatory.
Law 444	2002	➢ Environmental Protection Law: Defines basis and norms for environmental protection Environmental Code: ➢ Protection of the Environment. ➢ Wastes should be managed taking into consideration country specific economic conditions. This includes collection, transportation, storage, treatment and final disposal. ➢ Disposal sites must be designed and managed within established guidelines and principles. ➢ The imports, storage, transport and selling of hazardous waste should be prohibited. ➢ Local authorities are responsible for collection, transport, storage, treatment and disposal of waste within economic efficiency; for that reason, the private sector can be contracted.

		➢ Producers of hazardous waste are responsible for treatment and disposal of waste within established guidelines and principles. ➢ Every person is responsible to inform the local authorities about any kind of waste that adversely affect the environment. ➢ Persons that dump wastes to inform wastes illegally are obliged to dig out all the waste, and minimize or compensate for adverse impacts on the environment.
Decision 6/1	2003	➢ The decision sets new guidelines for the solid waste management sector.
Law 646/2004	2004	➢ Regulations for Building Construction, includes amended provisions such as landscape protection, environmental sustainability etc.
Law 690	2005	➢ Definition of the Mission of the Ministry of Environment and its structural organization etc.
Decree No. 2366	2009	➢ Sets out to define a system for land classification of Lebanon.
Decree No. 2275	2009	➢ Organizing the units of the Ministry of Environment (MoE) in determining its functions and staffing, and special conditions of appointment in some of its functions.
MOE Circular 10/1	2011	➢ Monitoring the operation and exploitation of generators
Decree No. 8633 (EIA)	2012	➢ Defines the scope and stages of the national Environmental Impact Assessment process
MOE Circular 1/1	2013	➢ Procedures for payment of fees related to EIA and IEE reports
MOE Circular 9/1	2014	➢ Reminder to attach important documents to the IEE/EIA report
DGUP Decision 9/1	2014	➢ Establishing land use regulations. ➢ Developing master plans for cities and villages. ➢ Develops road and street plans within cities and villages. ➢ Carries out infrastructure works related to water distribution network.
MOE Circulars 260/1, 261/1,262/1,6/1	2015	➢ Procedure for reviewing IEE ➢ Procedure for reviewing reports on scope of EIA and EIA reports ➢ Procedure for reviewing complaints on MOE decisions on EIA reports ➢ Principles of receipt of payments for reviewing IEE and EIA reports and the value of the bond and its return
Decision 189/1	2016	➢ Decision pertains to requirements for an environmental audit with the Ministry of Environment (MoE).
Law 78/2018	April 2018	➢ Said law appeared in the official bulletin dated 19 April 2018, and deals generally with the monitoring of the ambient air quality from miscellaneous emission sources,

		by officially certified laboratories for a multitude of parameters.
Law 77	April 2018	➢ Aims at the sustainable management of water resources and its protection from overexploitation ➢ National water committee to set a national water strategy ➢ Defines water rights
Decision 241/1	April 2019	➢ Formation of technical committees within the MoE to review scoping reports for potential Environmental Impact Assessment (EIA) reports.
Decrees 5605 & 5606	Sept. 2019	➢ Sorting of domestic solid wastes at the source ➢ Management of hazardous wastes

3.2. EIA Decree 8633

The Ministry of Environment issued the Decree No. 8633 in August 2012, which provides a comprehensive description of the EIA and EIA procedures (Figure 5). The EIA Decree also identifies the responsibilities of major stakeholders, as well as the role of the MoE as a principal coordinator within the EIA system.

This EIA study will adopt the MoE procedures of the EIA Decree. In addition, it will be coordinated with all concerned entities to satisfy the national requirements and to obtain the approval of the MoE in order to proceed with the proposed project, taking account of all environmental aspects and recommended mitigation measures.

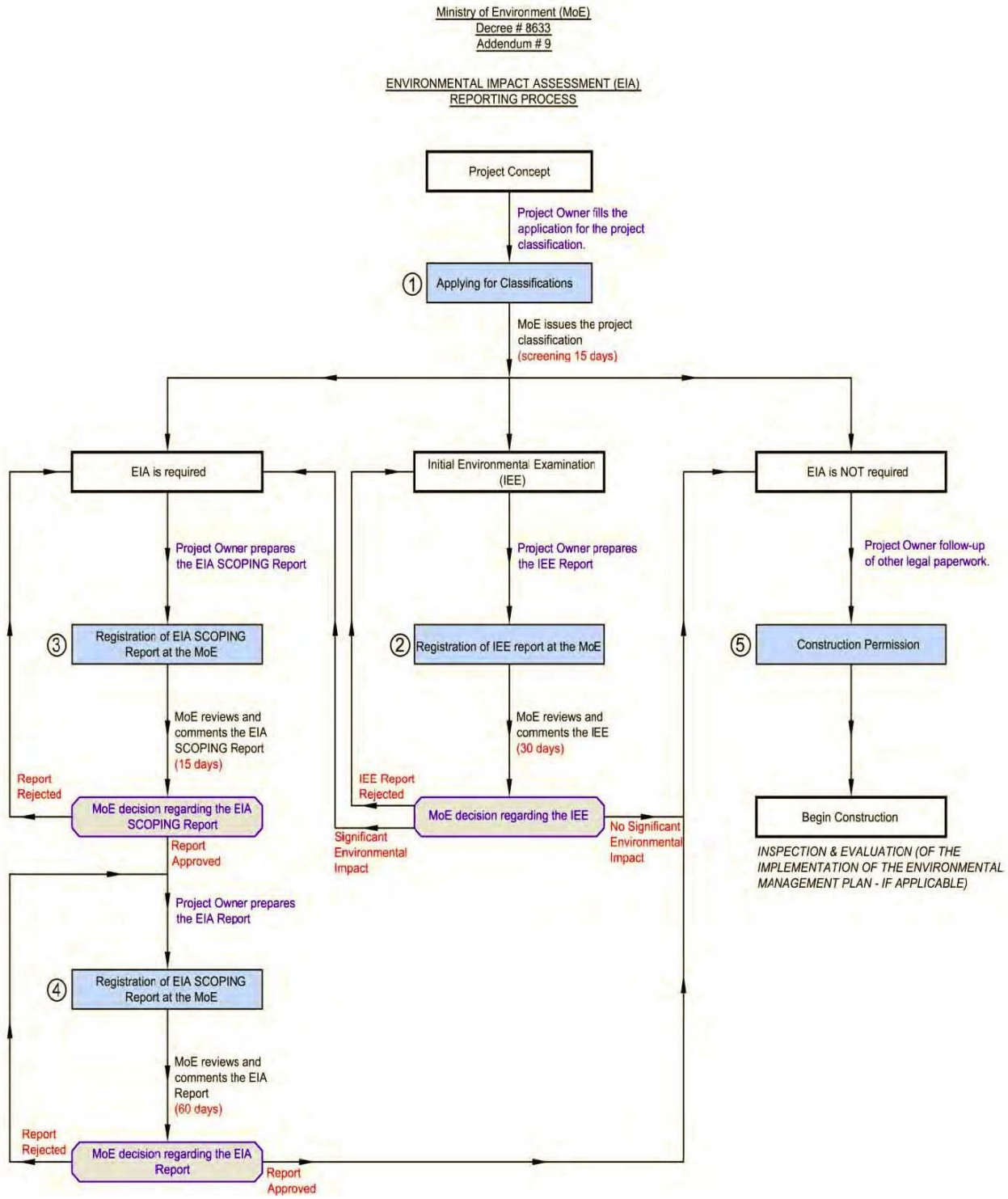


Figure 5: Description of EIA/EIA Procedure in Lebanon

3.3. Environmental Standards

3.3.1. Noise

The Ministry of Environment issued the Decision No. 52/1 (12/9/1996) that sets the limits for noise levels according to the type of region (see Table 2). The proposed project is located in a residential urban area and working hours will be during 7 am and 5 pm. Therefore, according to Table 2, noise levels should be within the limit standards of the region type "Residential urban areas" during "day time (7 am till 6 pm)" set by the MoE.

Table 2: Permissible Noise Levels in Selected Areas

	Limit dB(A)		
	Day time 7 a.m.-6 p.m.	Evening time 6-10 p.m.	Night time 10 p.m.-7a.m.
Residential areas with some construction sites or commercial activities or located near a road	50-60	45-55	40-50
Urban residential areas	45-55	40-50	35-45
Industrial areas	60-70	55-65	50-60
Rural residential areas, hospitals and gardens	35-45	30-40	25-35

3.3.2. Air Quality

Decision No. 52/1 (09/12/1996) also sets the permissible levels for air emissions. Therefore, emissions should not exceed the limits stipulated in the following standard for air quality set by the MoE (see Table 3 below).

Table 3:Standards for Air Emissions in Lebanon

Pollutant	Maximum Allowable Concentration (in µg/m^3)	Averaging Period
Sulfur Dioxide (SO_2)	350	1hour
	120	24 hours
	80	1 year
Nitrogen Dioxide (NO_2)	200	1hour
	150	24 hours
	100	1 year
Ozone (O_3)	150	1hour
	100	8 hours
Carbon Monoxide (CO)	30,000	1hour
	10,000	8 hours
Total Suspended Particulate (TSP)	120	24 hours
Particulate Matter (PM_{10})	80	24 hours
Lead	1	1year
Benzene	5 ppb	1 year

Discharge and Emission Standards

The emission limit values are specified in MOE Decision No. 8/1/2001. These emission limit values are valid for all industrial plants as long as no specific regulations for single branches are given.

Concerning the power generators that are operated with fuel having a thermal capacity greater than 0.5 MW, their Environmental Limit Values (ELV) are presented in Table 4.

Table 4: Maximum Limits for Power Generation Emissions (MOE Decision 8/1, 2001).

Parameter	**ELV for New Facilities**	**ELV for Existing Facilities**	**Remark**
O_2 correction	5%	5%	Using soot filter Diesel fuel Other fuel
Dust (mg/m^3)	20 150 250	20 150 250	
CO (mg/m^3)	800	1,500	
NO_x (calculated to NO_2) (mg/m^3) <3MW/ > 3MW thermal capacity	4,000 / 2,000	6,000	
SOx (calculated to SO_2) (mg/m^3) If diesel fuel (European standard) If other type of fuel	- To be determined in later stages	- To be determined in later stages	

Moreover, a minimum stack height has to be kept for the release of exhaust gases in order to ensure the dispersion of pollutants. This method can be used instead of applying the ELVs for generators. This means that an operator of a plant can choose whether the ELVs are met on one hand or installs a capacity correlated stack height on the other hand to fulfill the demands related to the necessary dilution of the emissions.

Formula required for this issue is the following:

$H = h + 0.2\sqrt{kVA}$

Where,

H = Total stack height in meters

h = Height of neighboring building in meters

kVA = Total generator capacity of the set in kVA = kW, i.e. the total capacity which is determined by the maximum fuel (energy) input.

3.3.3. Irrigation Water Quality

No national standards for irrigation water quality exist. Instead, FAO guidelines for interpretations of water quality for irrigation will be adopted. These are illustrated in the table below (Food and Agriculture Organization (FAO), 1994).

Table 5: Guidelines for Interpretations of Water Quality for Irrigation

Potential Irrigation Problem				Units	Degree of Restriction on Use		
					None	Slight to Moderate	Severe
Salinity *(affects crop water availability)*[2]							
	EC_w			dS/m	< 0.7	0.7 – 3.0	> 3.0
	(or)						
	TDS			mg/l	< 450	450 – 2000	> 2000
Infiltration *(affects infiltration rate of water into the soil. Evaluate using EC_w and SAR together)*[3]							
SAR	= 0 – 3	and EC_w	=		> 0.7	0.7 – 0.2	< 0.2
	= 3 – 6		=		> 1.2	1.2 – 0.3	< 0.3
	= 6 – 12		=		> 1.9	1.9 – 0.5	< 0.5
	= 12 – 20		=		> 2.9	2.9 – 1.3	< 1.3
	= 20 – 40		=		> 5.0	5.0 – 2.9	< 2.9
Specific Ion Toxicity *(affects sensitive crops)*							
	Sodium (Na)[4]						
	surface irrigation			SAR	< 3	3 – 9	> 9
	sprinkler irrigation			me/l	< 3	> 3	
	Chloride (Cl)[4]						
	surface irrigation			me/l	< 4	4 – 10	> 10
	sprinkler irrigation			me/l	< 3	> 3	
	Boron (B)[5]			mg/l	< 0.7	0.7 – 3.0	> 3.0
	Trace Elements (see Table 21)						
Miscellaneous Effects *(affects susceptible crops)*							
	Nitrogen (NO_3 - N)[6]			mg/l	< 5	5 – 30	> 30
	Bicarbonate (HCO_3)						
	(overhead sprinkling only)			me/l	< 1.5	1.5 – 8.5	> 8.5
	pH				**Normal Range 6.5 – 8.4**		

3.4. International Conventions and Legislation

Lebanon has signed and ratified many international conventions regarding environmental legislation, and these form the backbone of Lebanese environmental legislation. The international conventions that are applicable to the proposed project are presented in Table 6 below.

Table 6: International Conventions, Treaties and Protocols

Subject	Conventions and Protocols	Dates
Protection of biodiversity, heritage and atmosphere.	UNESCO Convention	21/11/1972, 06/11/1972
	Vienna Agreement	1985
	Montreal Protocol	1987
	Rio de Janeiro Convention	05/06/1992
Kyoto protocol to the United Nations Framework Convention on Climate Change aiming to fight Global Warming.	Kyoto Protocol	15/05/2006
Stockholm convention on persistent organic pollutants.	Stockholm Convention	2001
Montreal protocol on substances that deplete the ozone layer.	Montreal Protocol	1987

3.5. Institutional Framework

The institutional framework is defined and dictated by the objectives of the project. In addition to the Ministry of Environment, other governmental organizations are involved and play a role in environmental protection. In particular, the following entities are listed:

- Litani River Authority (**LRA)**
- Municipality of Bar Elias
- Bekaa Water Establishment (**BWE)**

Table 7: Concerned Entities and their Responsibility

Institution	General Mission/Responsibility
Ministry of Environment	1. Monitor and control of environmental protection, prevention of pollution, protection of wildlife, and preservation of environmental balance 2. Set environmental standards, specifications and guidelines for sectors that might have an impact on the environment and for the management of natural resources and amenities 3. Policy planning and setting laws and regulations required to protect public health and the environment and then to strictly enforce them 4. Define the environmental policy and ensure that it is appropriate to the nature, scale and environmental impacts of the activities 5. Approve EIA studies giving way to permitting for the establishment of industrial facilities and other types of projects/activities
Municipality of Bar Elias	1. Local presence, supervision and enforcement 2. Communicate with local population and solicit their feedback and concerns 3. Granting municipal approval in permitting process 4. Administrative clearance of documentation submitted for project permitting
Litani River Authority	1. Provide the land 2. Operate the constructed wetland, and maintain, when needed 3. Monitor water quality and effectiveness of treatment
Bekaa Water Establishment	1. Responsible for water quality monitoring at public wells and reservoirs 2. Water management

3.6. Adaptation Fund Requirements

The project should also comply with the adaptation fund requirements for Environmental and Social Policy (ESP) and Gender Policy (GP). These are illustrated in the below 15 principles:

- **Principle 1: Compliance with the Law**
  Projects/programmes supported by the Fund shall be in compliance with all applicable domestic and international law.
- **Principle 2: Access and Equity**
  Projects/programmes supported by the Fund shall provide fair and equitable access to benefits in an inclusive manner that does not exacerbate existing inequities. They should not impede access to basic services.
- **Principle 3: Marginalized and Vulnerable Groups**
  Projects/programmes supported by the Fund shall avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS.
- **Principle 4: Human Rights**
  Projects/programmes supported by the Fund shall respect and where applicable promote international human rights.
- **Principle 5: Gender Equality and Women's Empowerment**
  Projects/programmes supported by the Fund shall be designed and implemented in such a way that both women and men 1) have equal opportunities to participate as per the Fund gender policy; 2) receive comparable social and economic benefits; and 3) do not suffer disproportionate adverse effects during the development process
- **Principle 6: Core Labour Rights**
  Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.
- **Principle 7: Indigenous People**
  The Fund shall not support projects/programmes that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.
- **Principle 8: Involuntary Resettlement**
  Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement.
- **Principle 9: Protection of Natural Habitats**
  The Fund shall not support projects/programmes that would involve unjustified conversion or degradation of critical natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as critical habitat; or (d) recognized as protected by traditional or indigenous local communities.
- **Principle 10: Conservation of Biological Diversity**

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.

- **Principle 11: Climate Change**
  Projects/programmes supported by the Fund shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.
- **Principle 12: Pollution Prevention and Resource Efficiency**
  Projects/programmes supported by the Fund shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.
- **Principle 13: Public Health**
  Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.
- **Principle 14: Physical and Cultural Heritage**
  Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level.
- **Principle 15: Lands and Soil Conservation**
  Projects/programmes supported by the Fund shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.

4. BASELINE ENVIRONMENTAL CONDITIONS

4.1. Climate

The project site is located in the Municipality of Bar Elias, Bekaa, Lebanon. The region receives limited rainfall, particularly towards the north, because Mount Lebanon creates a rain shadow that blocks precipitation coming from the Mediterranean Sea. The northern section has an average annual rainfall of only around 400 millimeters, compared to 610 millimeters in the central valley around Qaraoun.

- Hot season / summer is in June, July, August and September.
- On average, the warmest month is August.
- On average, the coolest month is January.
- The average annual maximum temperature is: 24.0° Celsius
- The average annual minimum temperature is: 17.0° Celsius

Average sunlight hours in Lebanon range between 4 hours per day in January and nearly 12 hours per day in July, the same applies to the Bekaa Valley. There is an average of 2940

hours of sunlight per year with an average of 8.1 hours of sunlight per day. See Figure 4 below (https://en.climate-data.org/location/5593/#climate-graph).

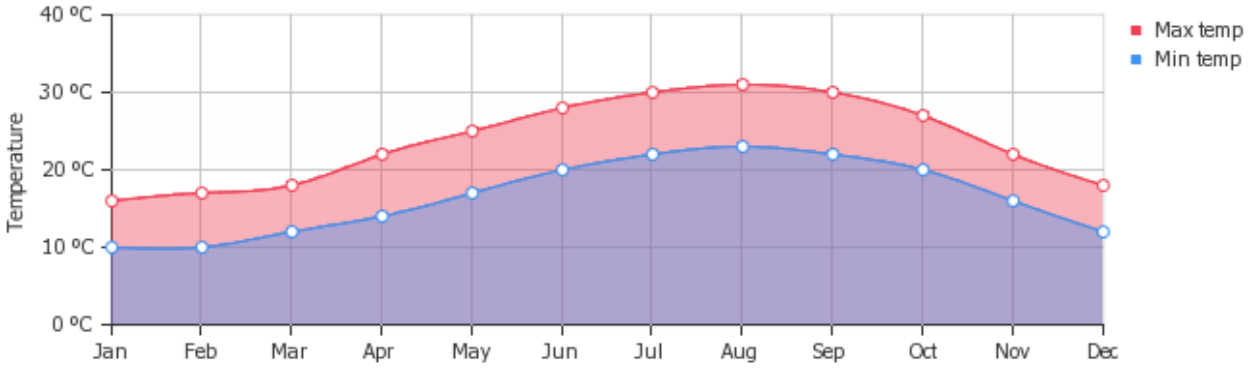


Figure 6: Typical Climate of the Bekaa Valley

4.2. Topography

The average elevation of the site before excavation is only around 870.0 mAOD (above ordnance datum). The total excavation depth will only be limited to the top two meters of soil. The land proposed for construction covers an area of about 60,000 m^2 and is bordered by scattered croplands and adjacent to the Ghezayel tributary.

4.3. Geology & Seismicity

According to the geological map established by Dubertret (1945), the geological formation encountered in the proposed project site of Bar Elias was determined using the GPS coordinates inserted into ArcMAP 10.1, and determined to be of the Quaternary formation (designated as **q**) which is generally composed of loose alluvial material and generally regarded as an aquifer (or permeable hydrostratigraphic formation) of the unconfined type. A geologic map of the project site is attached in the Appendix.

As for Lebanon's seismicity, it is located in a relatively active seismic zone. The most significant fault is the Yammouneh which forms the western boundary of the Bekaa valley, and represents the main northward continuation of the Dead Sea Transfom Fault (DSTF) system to the Ghab fault in Syria, and terminating in the Taurus-Sagros thrust of southern Turkey.

Although at the time this EIA report was being prepared, no comprehensive soil study was undertaken, based on the geological formation of the Quaternary (q) alluvium, the seismic design of the proposed constructed wetland site may be generally be classified as Zone 2B.

4.4. Biodiversity

Any site preparation activities will be mainly focused to the clearing of the lot's existing vegetation limited to a few shrubs and some grasses as obvious in Figures 7 and 8 below.

Figure 7: Vegetation and shrubs at Ghzayel tributary

Figure 8: Barren Land at Project Site

During the site visits, conducted from October through November 2019, it was noted that the presence of said vegetation as well as the absence of fauna, did not constitute a major impact on the enviornment should site clearance and excavation works commence.

4.5. Water Resources

4.5.1. Surface Water

As shown in Figure 1, and based on visual observation, the water in Ghezayel tributary is polluted. Water sampling and testing is needed to evaluate the type and extent of pollution. Despite its poor quality, water from the tributary is being used for irrigation purposes. This is evident from the pumps installed, as shown in Figure 1.

No other surface water bodies such as springs, lakes, or wetlands, besides said tributary, were noted during the site visits conducted from October through November 2019.

4.5.2. Hydrogeology

The water wells in and around the proposed project site generally were reported by locals to have dried up or not operational making it impossible to ascertain the depth of the underlying water table in the Quaternary aquifer formation (q).

4.6. Air and Noise Pollution

There exist practically no construction sites around the proposed project location of Plot #1951; that would normally contribute to PM (particulate matter) dispersion into the surrounding atmosphere. Therefore, said PM emissions are not a major source of concern neither during the constructional or operational phase.

As for noise pollution, noise levels were measured on-site using mobile applications during the site visits of October and November 2019. Throughout the visit, noise levels rarely exceeded 65 dB which is the range of conversational speech (see the figure below).

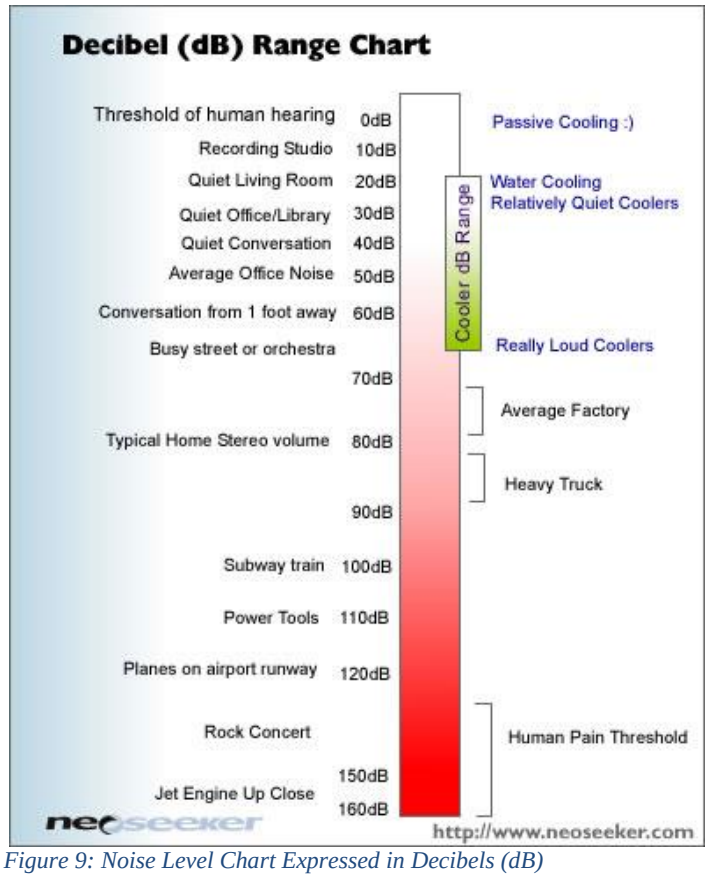


Figure 9: Noise Level Chart Expressed in Decibels (dB)

4.7. Wastewater Infrastructure

Domestic wastewater or sewage is not treated in Bar Elias. It is discharged directly into the tributaries of Litani River. During the public consultation, the mayor of Bar Elias mentioned that this is a critical issue.

4.8. Socio-Economic

The municipality of Bar Elias is expectedly reliant on some local farming and agriculture that often employ a high number of refugees. The population of Bar Elias is 30,000 with around 60,000 to 70,000 refugees.

According to site visits and available literature, the municipality of Bar Elias is largely dominated by croplands (80%) with very few interspersed dwellings. According to UNHCR Lebanon Interagency Coordination Sector, there is generally a lack of access to basic needs and livelihood opportunities in Bar Elias.

The public project site is currently neglected thus having a low economic value. Additionally, once construction is underway, a workforce of an estimated 10 workers might be involved thus creating employment opportunities across myriad professions.

4.9. Cultural and Archeological Sites

It is unlikely that during the excavation or construction phases, any archaeological artifacts will be uncovered on the project site of Plot #1951.

However, in the event of the discovery of such artifacts, construction activities should halt and the Consultant (KREDO) should coordinate with the Directorate General of Antiquities.

Additionally, no cultural sites were visible in the vicinity of the proposed project site which was additionally ascertained by the mayor of Bar Elias.

5. PUBLIC CONSULTATION

A public consultation meeting was held on 18 December 2019, in the municipality of Bar Elias as already mentioned in the previous scoping report submitted to the Ministry of Environment on 30 December 2019.

As is customary, all pertinent documents related to said consultation meeting such as announcement leaflet, invitation letters, photos, advertisements, minutes of meeting, attendees etc. are included in the appendices at the end of this report.

6. ANALYSIS OF ALTERNATIVES

The following analysis of the alternatives demonstrate the advantages as well as the disadvantages of each of the three scenarios demonstrating whether or not the project is required.

1. "Without project" alternative
2. "Location routing" alternative
3. "Alternative design, technologies, construction or operation" alternative

6.1. Without Project Alternative

The no project alternative is not a feasible option considering that currently in Bar Elias, untreated raw sewage is polluting all surface and ground water systems.

As can be seen from the figures taken during the site visit, the stream is evidently polluted. Water sampling and testing is needed to indicate the source of pollution. The water is currently being used for irrigation, as can be seen from the pumps installed at the stream.

As such, in the absence of current waste water treatment systems, the proposed constructed wetland project can only have positive impacts for improving the water quality of the Ghezayel tributary in light of its current level of observable pollution as well as add biodiversity to the area, and from an aesthetic perspective, provide an appealing landscape to a currently barren and polluted area.

In addition to the environmental, visual and health benefits of the project, the proposed wetland is an economically feasible and technically simple option, as proven in the feasibility study.

6.2. Location Routing Alternative

The parcel of land in question (Plot #1951) belonging to the Litani River Authority (LRA), was offered as a potential site for the proposed UN Habitat project of constructing a Free Water Surface (FWS) wetland in the town of Bar Elias.
This unique opportunity regarding the remote Plot #1951, of approximately 60,000 square meters, is ideal for said proposed wetland since an alternative site would be prohibitively expensive as well as intrusive.

6.3. Design Alternative

Given the scale and the location of the project, a constructed wetland is the best option to treat polluted water. At such a scale, it is not feasible to construct a wastewater treatment plant.

The proposed design for the Free water Surface (FWS) constructed wetland is based on the US Environmental Protection Agency (USEPA) manual entitled: Constructed Wetlands, Treatment of Municipal Wastewaters (September 2000) and is illustrated in Figure 4.

At this stage, the proposed wetland is in the infancy and will have to be designed in details once funding for the project has been allocated. Undoubtedly, experts in constructed wetlands will come on board once design and execution of the project kicks in.

The design and the used bio-remediation processes in the constructed wetland cannot be evaluated at this stage because water from the stream has not been sampled and tested. During the design phase, and based on the type of pollutants present in the water, the design of the wetland and the plants to be grown in it will be determined. The plants should be of a native origin.

7. RISK SCREENING – ADAPTATION FUND REQUIREMENTS

Following the guidance document for UN-Habitat and partners to comply with the Adaptation Fund ESP and GP, the table below illustrates that the constructed wetland project complies to all 15 principles with no potential or significant risks.

Table 8: Risk Screening - Adaptation Fund

Adaptation Fund Principles	Risk Screening Result	Justification
Principle 1: Compliance with the Law	No potential risks	According to Decree No. 8633,2012 of MoE, the following steps were taken: - A screening form for the project was submitted - MoE decision was that the project requires an EIA - A public consultation was held on December 18th - A scoping report was submitted to MoE on December 30th - This EIA report is the final step of the EIA process Since the water treated by the wetland will be used for irrigation, international FAO standards for irrigation water quality will be adopted. No national standards exist.
Principle 2: Access and Equity	No potential risks	Based on consultations done with vulnerable groups in the area. Kindly refer to consultation document 04. In the public hearing, no concerns on this topic were raised.
Principle 3: Marginalized and Vulnerable Groups	No potential risks	There are around 60,000 to 70,000 refugees in Bar Elias; however, they will not be negatively impacted by the project. The project will be located in a barren public land that belongs to Litani River Authority.
Principle 4: Human Rights	No potential risks	No perceived risks in project preparation and execution.
Principle 5: Gender Equality and Women's Empowerment	No potential risks	Gender equality and women's empowerment is not applicable in the implementation of a constructed wetland project in Bar Elias.
Principle 6: Core Labour Rights	No potential risks	It is mandatory that all core labor rights, as well as safety and health requirements are part of any contract signed. This is achieved by hiring a qualified and competent contractor to execute the work.
Principle 7: Indigenous People	No potential risks	No indigenous people in the project area.
Principle 8: Involuntary Resettlement	No potential risks	No resettlement or displacement will take place. As seen in Figures 3 and 8, no informal settlements exist.
Principle 9: Protection of Natural Habitats	No potential risks	No protected natural habitats were found at the vicinity of the project area.

Principle 10: Conservation of Biological Diversity	No potential risks	No negative impacts on biological diversity will result from the project. The wetland sub-project will have a positive impact on biodiversity, since it will attract insects and birds, thus creating an ecosystem.
Principle 11: Climate Change	No potential risks	The project will not result in significant or unjustified increase in greenhouse gas emissions or other drivers of climate change. On the contrary, the wetland sub-project is considered a carbon sink. The project does not belong to any of these sectors: energy, transport, heavy industry, building materials, large scale agriculture and forest products, or waste management.
Principle 12: Pollution Prevention and Resource Efficiency	No potential risks	Only some limited excavation works are required for a constructed wetland during the first weeks of construction, but during operation positive impacts are anticipated from improved water quality.
Principle 13: Public Health	No potential risks	Better water quality for irrigation compared to the current water being used. Water quality monitoring of the effluent from wetland is needed.
Principle 14: Physical and Cultural Heritage	No potential risks	No heritage sites in the project area.
Principle 15: Lands and Soil Conservation	No potential risks	The project will not pose any risks on soil. No soil will be completely removed, just reshuffled. In order to determine if fragile soils exist in the project area, a detailed study is needed. There are no available studies, and conducting one is not in the scope of work.

8. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Based on the methodology described in the scoping report, the project impacts will be assessed based on their likelihood of occurrence and their severity, during the construction and operation phases. Consequently, impacts can be classified as follows;

- Negligible – no mitigation measures are needed. Recommendations can be given.
- Minor – mitigation measures are needed, monitoring is recommended if applicable.
- Unacceptable – mitigation measures and strict monitoring are mandatory.
- Beneficial – no mitigation measures are needed. Monitoring is recommended to report on project indicators, thus positive impact.

The impact assessment methodology is summarized in the table below.

Table 9: Impact Assessment Methodology

		Likelihood of Occurrence Score		
		A	**B**	**C**
Severity Score	1	1A	1B	1C
	2	2A	2B	2C
	3	3A	3B	3C
	4	4A	4B	4C
	5	5	5	5

DESCRIPTION			
Consequences		*Likelihood*	*Impact Assessment*
1 – Negligible	*4-Catastrophic*	*A-Unexpected*	*Negligible*
2-Moderate	*5-Beneficial*	*B- Expected*	*Minor*
3-Significant		*C- Unavoidable*	*Unacceptable*
			Beneficial

Based on the scoping report and the baseline conditions, the environmental and social aspects that can be potentially impacted by the project were identified. Table 10 below summarizes the main outcomes of the impact assessment. A detailed justification follows.

Table 10: Summary of Impact Assessment

Environmental and Social Aspects	**Impact Assessment**	
	Construction	**Operation**
Biodiversity	Negligible	Beneficial
Noise	Minor	Minor
Air Quality	Minor	Minor
Water Resources	Minor	Negligible
Solid Waste Management	Negligible	Negligible
Wastewater	Not applicable	Not applicable

Energy and Natural Resources	Minor	Minor
Socio-economic activities	Beneficial	Beneficial
Visual Quality	Negligible	Beneficial
Health and Safety	Minor	Negligible

8.1. Biodiversity

8.1.1. Impacts during Construction

The project site is dominated with some shrubs and grasses, only a few need to be culled, thus, the project will have a very limited potential impact on said floral biodiversity once site clearance and construction works set in.

Additionally, no fauna were observed during the site visits that lasted from October through December 2019. Also, once construction is underway, the expected impact on the local fauna is expected to be minimal.

8.1.2. Mitigation Measures during Construction Phase

Since the potential impact during construction on said biodiversity is limited only to some shrubs; no recommendation for mitigation measures are proposed for this EIA report.

8.1.3. Impacts during Operation

During operation, the nature of the wetland project site, although limited in coverage, will possibly create some new habitats and will most likely have positive impacts on the biodiversity of the area as is the case of the constructed wetland in Job Jannine under the supervision of the Litani River Authority (LRA).

8.1.4. Mitigation Measures during Operation Phase

Since the potential impact during operation on said biodiversity is only positive; no recommendations for mitigation measures are proposed for this EIA report.

8.2. Noise

8.2.1. Impacts during Construction Phase

The barren and sparsely populated area surrounding the project site is mainly identified as receptors of noise disturbance from construction activities. During eventual construction, noise will be mainly generated from ground clearing construction equipment, excavation activities and an auxiliary power generator if needed. However, this impact is minor, temporary and limited mainly to the construction phase and expected to last only about a few months and will not have much impact due to the remoteness of the site.

8.2.2. Mitigation Measures during Construction Phase

The following mitigation measures are recommended during the construction phase:

- Use low noise generating equipment/machinery.
- Operating only well-maintained equipment/machinery.
- Turn machinery/ vehicles off when idle.
- Limit operating hours of construction equipment to daytime hours.
- Provide ear plugs for on-site workers.
- Establish noise barriers around the perimeter should any complaints arise.

8.2.3. Impacts during Operation Phase

During the operation phase, the main source of noise will be limited to any auxiliary generator needed to power the pump and will be used only during power cuts. Said pump will extract partial water from the polluted Ghezayel tributary into the proposed constructed wetland for treatment before final discharge back into same tributary.

8.2.4. Mitigation Measures during Operation Phase

The only mitigation measure proposed for potential generation of noise during the operational phase of the proposed constructed wetland project is to house the auxiliary generator in order to reduce any noise emissions. No other foreseeable sources of noise pollution are anticipated for the proposed wetland once it is in the operational phase.

8.3. Air Quality

8.3.1. Impacts during Construction Phase

During construction, air emissions are mainly generated from construction vehicles and machinery that will be used on site. However, these impacts are temporary, short term and limited to the construction phase and expected to last no more than a few months.

8.3.2. Mitigation Measures during Construction

The following mitigation measures are recommended during the construction phase:

- Regular watering around the project site to reduce dust dispersion.
- Covering open trucks that that are a potential source of particle emissions.
- Covering stockpiles on-site during said phase.
- Turning-off machinery and the power generator during idle times.
- Regular maintenance of said power generator and other machinery.

8.3.3. Impacts during Operation Phase

During operation, the main source of air emissions is limited to the auxiliary generator on the project site. Hence, no mitigation measures are proposed during the operation phase apart from the installation of a cyclonic filter to reduce exhaust emissions. It should also be noted

that a power generator will be used during the operation phase as backup only during power cuts.

8.3.4. Mitigation Measures during Operation

The following mitigation measures are recommended during the operation phase:

- Regular watering around the project site to reduce dust dispersion.
- Regular maintenance of said power generator and the cyclonic filter

8.4. Water Resources

8.4.1. Impacts during Construction Phase

Some earthworks and construction activities are expected during the construction phase but since Plot 1951 is a few meters aback from the Ghezayel tributary, pollution and/or erosion into said tributary is unlikely.

Additionally, the water table in the project area is likely to be deeper than 50 meters as reported by some locals. As such, any impact during the construction phase on ground water is also likely to be insignificant.

8.4.2. Mitigation Measures during Construction Phase

The following mitigation measures are recommended during construction:

- Proper disposal of waste generated from construction material.
- Immediate cleanup of any chemical spills followed by proper disposal.
- Constructing berms to prevent movement of soil and pollutants towards the tributary.
- Use of silt fences to prevent sediment loading in the tributary.

8.4.3. Impacts during Operation Phase

During the operation phase, the main water source for the constructed wetland will be the existing Ghezayal tributary with an influent design rate designed at an optimal 6,000 cubic meters per day for treatment and eventual use for local irrigation.

The constructed wetland is an attractive site for mosquito breeding. This may impact water quality. Since the project is located in a remote area, residents will not be impacted.

8.4.4. Mitigation Measures during Operation Phase

It is recommendded that the Ghezayel inflow to the wetland is maintained in order to avoid deleterious effects on the constructed wetland, which requires a constant stream of water to run optimally.

To mitigate mosquito breeding sites, a commonly used control measure is the introduction of tilapia fish or mosquito fish (gambusia affinis) which naturally feed on mosquito eggs. These fish species exist in Lebanon.

8.5. Solid Waste Management

8.5.1. Impacts during Construction Phase

During construction, the main source of solid waste is the generation of some erosion of soils into the Ghezayel tributary. Very little solid waste in the way of discarded material will be generated during the construction phase such as metals etc.

8.5.2. Mitigation Measures during Construction Phase

Again during construction, the main source of solid waste is the expected generation of some erosion of soils. The amount of excavated soils will be used during construction is minimal as it will be reused as berm material along the perimeter of the pond cells.

Very little other solid waste in the way of discarded material (metal cans, packaging material…) will be generated during the construction phase, nevertheless, they can be placed in dedicated municipal dumpsters for ultimate disposal in the sanitary landfill of Zahleh.

8.5.3. Impacts during Operation Phase

Once said constructed wetland is operational, very little in the way of solid waste is generated that may impact the proposed project or its surroundings.

8.5.4. Mitigation Measures during Operation Phase

Mitigation measures during the operation phase in order to address what little solid wastes are generated, include the following:

- Minimize the waste stream by implementing a reuse, reduce, recover scheme.
- Store solid waste generated in designated bins or dumpsters.
- Ensure proper disposal of all waste material generated from site activities to municipal approved dumpsters for ultimate landfilling in Zahle's sanitary landfill.

8.6. Wastewater

8.6.1. Impacts during Construction Phase

No wastewater will be generated from the proposed Free Water Surface (FWS) constructed wetland neither during the construction or operational phases.

8.6.2. Mitigation Measures during Construction Phase

No mitigation measures are recommended during the construction phase of the proposed Bar Elias Free Water Surface (FWS) constructed wetland in regards to the issue of wastewater generation.

8.6.3. Impacts during Operation Phase

The proposed Bar Elias constructed wetland, will not have any waste water generated during the operational phase since there will be no permanent staff members.

8.6.4. Mitigation Measures during Operation Phase

No mitigation measures are recommended during operation phase of the proposed Bar Elias Free Water Surface (FWS) constructed wetland.

8.7. Energy and Natural Resources

8.7.1. Impacts during Construction Phase

Local power supply and an auxiliary on-site power generator (estimated at 1 kVA) will provide the power needs during construction as well as the operation phases. Energy use during construction will only be short term and minimal.

Impacts on natural resources will also be negligible since construction material will be provided by reworking the top soil into berms for the proposed wetland cells.

8.7.2. Mitigation Measures during Construction Phase

During construction, the following mitigation measures are proposed:

- Turn off power generator/s when unused
- Periodic maintenance of power generator and cyclonic filter for maximum efficiency

8.7.3. Impacts during Operation Phase

Local power supply will provide power needs for the proposed constructed wetland pump. Nevertheless, the backup power generator will be installed on-site for use during power cuts through the operation phase (1 kVA) and limited to daytime hours.

8.7.4. Mitigation Measures during Operation Phase

During operation, the use of a cyclonic filter may be installed on the exhaust of the auxiliary generator in the eventuality that such an auxiliary generated will be installed to power the pump.

Additionally, solar panels may be considered as an alternative energy source during the operational phase in order to power the pump.

8.8. Socio-Economic Activities

8.8.1. Impacts during Construction Phase

Regarding the socio-economic conditions of the workers; the construction of the project is expected to require about 10 workers or even less. Consequently, this will slightly improve the local economy by creating some job opportunities as well as sales of several goods in Bar Elias in general. Hence, the impact of the wetland on the economy is positive during the construction phase.

8.8.2. Mitigation Measures during Construction Phase

No mitigation measures are recommended during the construction phase of the constructed wetland in regards to the socio-economic activities.

8.8.3. Impacts during Operation Phase

No negative impacts are foreseen during the operation phase in regards to the socio-economic activities.

8.8.4. Mitigation Measures during Operation Phase

No mitigation measures are recommended during the operation phase of the constructed wetland in regards to the socio-economic activities.

8.9. Visual Quality

8.9.1. Impacts during Construction Phase

Construction and excavation works might cause a source of disturbance to residents of Bar Elias, but this unavoidable impact like in all similar projects will be temporary and short lived.

8.9.2. Mitigation Measures during Construction Phase

The following mitigation measures are recommended during the construction phase:

- Install barriers onsite to reduce visual impacts on surrounding residents.
- Cover material stockpiles on-site.
- Adhere to daytime working hours.

8.9.3. Impacts during Operation Phase

The impact of the proposed constructed wetland is minimal due to the remoteness of the site in general. Given the remoteness of the site, the project will not greatly obscure the views from nearby dwellings nor will it be the cause of any significant sore eyes being a naturally looking ecosystem.

8.9.4. Mitigation Measures during Operation Phase

No mitigation measures are recommended during the operational phase of the proposed constructed wetland in regards to visual intrusiveness.

8.10. Health and Safety

8.10.1. Impacts during Construction

Impacts on health and safety are only limited to workers during the construction phase. The following potential impacts are expected:

- Heavy equipment and machinery use.
- Tripping, electrocution and falling hazards.
- Exposure to high noise and heat levels.

8.10.2. Mitigation Measures during Construction Phase

The following mitigation measures are recommended during the construction phase of the proposed wetland:

- Provide Personal Protective Equipment (PPE) for workers including hard hats and extinguishers
- Clear paths from debris to prevent slips, trips and falls.
- Ensure electrical safety at all times and locations.
- Prevent occupational injuries and illnesses (best practice working techniques).

In case of an on-site injury, the Lebanese Civil Defense or one of many nearby hospitals should be immediately contacted. Several first aid kit should also be readily available on-site which should be inspected regularly.

8.10.3. Impacts during Operation Phase

The impact of the proposed constructed wetland is minimal during the operational phase regarding health and safety issues, considering that the proposed wetland is generally self sufficient requiring very low maintenance.

8.10.4. Mitigation Measures during Operation Phase

A fence surrounding the proposed project site is recommended in order to avoid any accidental or deliberate intrusions also known as trespassing.

9. ENVIRONMENTAL MANAGEMENT PLAN

Table 11: Environmental Management Plan

Environmental Aspect	Potential Environmental Impact	Phase	Impact Assessment	Justification of Assessment	Mitigation Measure	Responsibility
Biodiversity	Removal of Vegetation	Construction	Negligible	Limited number of shrubs within proposed site.	Possible revegetation potential!	Contractor
		Operation	Beneficial	The nature of the wetland ecosystem can only impart positive effects on the biodiversity of Bar Elias.	None recommended	Proprietor
Noise	Noise Generation	Construction	Minor	Noise generation due to ground clearing, excavation activities and use of some machinery.	-Use low noise generating equipment/machinery. -Operating only well-maintained machinery. -Turn machinery off when idling. -Limit operating hours of construction equipment to daytime hours. -Provide ear plugs to on-site workers.	Construction Contractor
		Operation	Minor	No foreseeable impact of noise during the operational phase of the proposed wetland	None recommended.	Proprietor

Environmental Aspect	Potential Environmental Impact	Phase	Impact Assessment	Justification of Assessment	Mitigation Measure	Responsibility
Air Quality	Air Emissions	Construction	Minor	-Air emissions generated from construction vehicles and machinery. -Large quantities of dust from site excavation, cutting and filling activities.	-Regular watering around project site to reduce dust dispersion. -Covering truck hauls to and from the site. -Covering stockpiles on-site. -Turning-off machinery during idle time. -Regular maintenance of power generator and machinery.	Construction Contractor
		Operation	Minor	The main source of air emissions is limited to some vehicle traffic near the project site which is negligible.	None recommended	Proprietor
Water Resources	Contamination of Water Resources	Construction	Minor	Fuel and oil spills from machinery and equipment. Leaching of construction material into water resources.	-Proper disposal of waste generated from construction material. -Proper storage of used oil, oil filters and oily rags in leak-proof drums and dispose them in proper locations far from water systems.	Construction Contractor
		Operation	Negligible	Wastewater generated is practically absent.	Recommendation focuses mainly on the issue of pests requiring control measures	Proprietor

Environmental Aspect	Potential Environmental Impact	Phase	Impact Assessment	Justification of Assessment	Mitigation Measure	Responsibility
				Polluted water of the Ghezayel tributary will actually be improved. Pests in the form of mosquitoes may become a source of nuisance	such as introducing tilapia fish which naturally feed on their eggs.	
	Water Consumption	Construction	Minor	No water consumption is expected on site during the constructional phase of the project.	None recommended	Construction Contractor
		Operation	Negligible	The amount of water consumed during the operation phase is comparatively insignificant.	None recommended.	Proprietor
Wastewater		Construction	Not applicable	Wastewater generated during construction is practically absent.	None recommended.	Construction Contractor and Design Engineer

Environmental Aspect	Potential Environmental Impact	Phase	Impact Assessment	Justification of Assessment	Mitigation Measure	Responsibility
		Operation	Not applicable	Wastewater generation rate is negligible in the absence of a permanent staff.	None recommended.	Proprietor
Solid Waste	Generation of Construction Waste	Construction	Negligible	Generation of some excavated soil is anticipated.	-The most environmentally sustainable approach to handling excavated material is the application of excess excavated material for beneficial use within the project. -The next preferable option is the disposal of the minimal excess excavated material in the nearest municipally dedicated landfill by a contractor.	Construction Contractor
	Generation of Municipal Waste	Operation	Negligible	Waste produced during peak operation is practically absent in light of the low maintenance of the proposed wetland.	Any domestic solid waste is collected from containers placed nearby by a proprietor namely the Litani River Authority (LRA).	Proprietor
Energy and Natural Resources	Use of Energy and Raw Material	Construction	Minor	Local power supply and an on-site power generator (~50 kVA)	-Use energy efficiently. -Turn off power generator during idle time.	Construction Contractor

Environmental Aspect	Potential Environmental Impact	Phase	Impact Assessment	Justification of Assessment	Mitigation Measure	Responsibility
				will provide power needs during construction.	-Installation of a cyclone filter. -Continuous maintenance of power generators for efficiency.	
				Moderate quantities of material will be needed during construction.	-Apply excess excavated material for beneficial use within the project. -Dispose excess excavated material in the permitted landfill by a contractor.	
		Operation	Minor	Local power supply and a small auxiliary generator can provide the power needs for the pump during operation.	Use of cyclonic or catalytic convertor filter on gas exhaust of generator.	Proprietor
Socio-Economic	Employment Opportunities and Local Economy	Construction	Beneficial	The construction of the wetland will boost the local economy by creating a few new job opportunities.	None recommended	Construction Contractor
		Operation	Beneficial	The proposed project will provide jobs for an caretaker, security officer, etc.	None recommended	Proprietor

Environmental Aspect	Potential Environmental Impact	Phase	Impact Assessment	Justification of Assessment	Mitigation Measure	Responsibility
Visual quality	Visual Intrusion	Construction	Negligible	Visual intrusion from construction and excavation material.	-Install barriers to reduce visual impacts on surrounding receptors. -Cover truck hauls and stockpiles on-site.	Construction Contractor and Design Engineer
		Operation	Beneficial	The project design and landscape will improve the visual acuity of the project.	None recommended	Proprietor
Health and Safety	Health and Safety of Workers	Construction	Minor	-Use of heavy equipment and machinery use. -Tripping and falling hazards. -Exposure to high noise levels. -Heat/cold exhaustion or exposure.	-Provide PPEs for workers. -Clear walkways from debris to prevent slips, trips and falls. -Ensure electrical safety. -Prevent occupational injuries and illnesses (best practice working techniques). -Ensure the availability of first aid kits on-site in case of accidents or emergencies. -A contingency plan is recommended which includes the identification of likely accidents and emergencies outlining	Construction Contractor

Environmental Aspect	Potential Environmental Impact	Phase	Impact Assessment	Justification of Assessment	Mitigation Measure	Responsibility
					response scenarios, assigning responsibilities and coordinating with the proper authorities.	
		Operation	Negligible	-Use of heavy equipment and machinery use. -Tripping and falling hazards. -Heat/cold exhaustion or exposure.	-Provide PPEs for workers. -Clear walkways from debris to prevent slips, trips and falls. -Ensure electrical safety. -Prevent occupational injuries and illnesses (best practice working techniques). -Ensure the availability of first aid kits on-site in case of accidents or emergencies. - Fence to avoid trespassing	Proprietor

10.ENVIRONMENTAL MONITORING PLAN

Environmental monitoring during the construction and operation phases of the project aims to continuously provide information about environmental impacts and the effectiveness of mitigation measures. Such information may allow timely corrective action to be taken when needed.

Environmental monitoring during construction will be the responsibility of the Contractor. Any environmental violations shall be immediately reported to the Ministry of Environment (MoE) in order to implement corrective measures.

During operation, monitoring will be the responsibility of the Project Owner (proprietor) who will supervise and administer the environmental aspects of the project in coordination with the MoE and other authorities as applicable. In this case, the Litani River Authority is willing to maintain the project considering its previous experience in doing so with the similar Job Jannine wetland designed and funded by the US Agency for International Development (USAID).

The following table presents the environmental parameters that should be monitored and the proposed pertinent schedule for the proposed project.

Table 12: Environmental Monitoring Plan

Parameter	Method of Monitoring	Parameters	Standards/Guidelines National/International	Location	Frequency	Responsibility	Estimated Cost
Construction Phase							
Air Quality	Air measurements.	Dust particles	Decision 8/1 of MoE	Downwind receptors within proximity of construction site.	Upon complaints	Contractor	$2000
Noise	Portable integrated noise meter.	Leq (Equivalent Noise Levels) along with L max, L10 & L90.	Decision 52/1 of MoE	Project site boundaries.	Upon complaints	Contractor	Free phone application
Solid Waste Disposal	Visual monitoring.	General site wastes and some excavated soils.	Circular 7/1 of MoE	Construction sites and equipment storage areas.	Weekly	Contractor	NA
Health and Safety	Inspection of hazardous site where injury took place, investigation into why H&S measures were not implemented; or whether they are stringent enough & identify responsible party.	On site injuries.	Health and Safety standards during construction	Within project premises.	Monthly	Contractor	Part of construction supervision costs
Operation Phase							
Project Landscape	Visual monitoring.	- Limited landscaping -Trimming of flora	-	Project Site	Monthly	Proprietor	Salary of 2 laborers
Waste Management	Visual monitoring.	Waste collected in the form of some litter and trimmings	-	Storage containers such as dumpsters or bins.	Weekly	Proprietor	Salary of 2 laborers
Pests	Visual monitoring	Mosquitoes	-	Within project site	Weekly	Proprietor	Salary of 2 laborers
Wastewater	Monitoring of influent and treated effluent	Water quality parameters such as TDS etc. using hand held testers.	FAO guidelines for irrigation water quality	Project site	Monthly	Proprietor	$100 (cost of pocket tester with calibration solution)

11.RECOMMENDATIONS

Constructed wetlands offer, compared to wastewater treatment plants, a low-cost and low-maintenance nature based solution for the treatment of polluted water, especially in rural areas. The design of the wetland can be tailored to the quality of water to be treated by using different plants with different treatment processes.

As shown in this Environmental Impact Assessment, the constructed wetland will have a positive impact on irrigation water in Bar Elias. Implementing this project will pave the way for adopting nature based solutions for water treatment. This is highly needed in Bar Elias area where domestic sewage is discharged untreated into waterways.

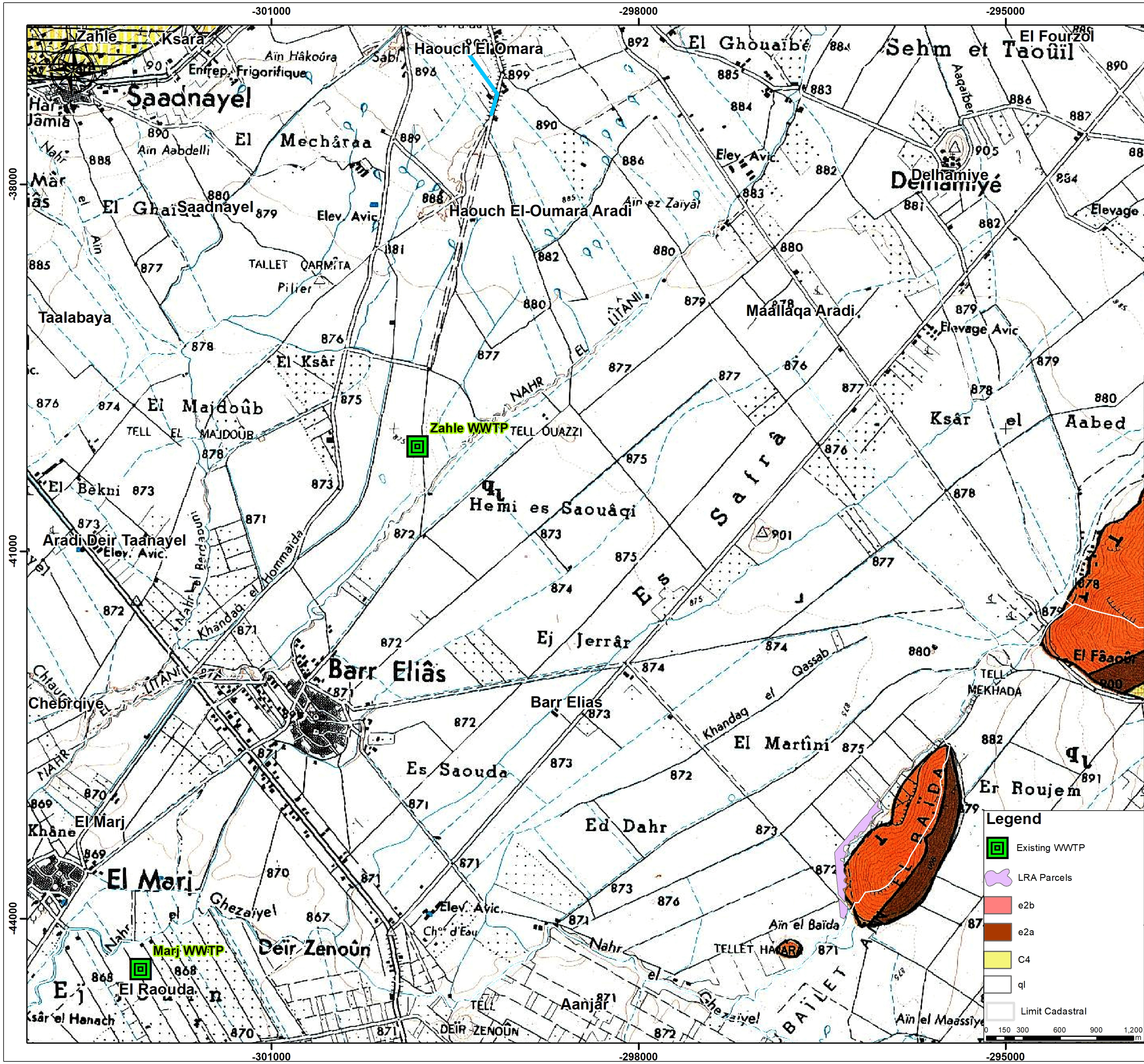
The experience of Litani River Authority in Joub Jennine wetland is very relevant in the successful operation and maintenance of the wetland proposed in Bar Elias.

12.APPENDICES

References

Food and Agriculture Organization (FAO). (1994). *Water Quality for Agriculture*.

GEOLOGIC MAP OF PROJECT SITE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Zahle
Ksara
Saadnayel
Haouch El Omara
Haouch El-Oumara Aradi
Sehm et Taoûîl
El Fourzol
Es Soulloun
Hoshmosh
El Midâne
Terbol
Delhamiye
El Hedâf
Station Zootechnique
El Aaouaïni
Maallaqa Aradi
Taalabaya
El Majdoûb
Zahle WWTP
Tell Ouazzi
Ksâr el Aabed
Hemi es Saouâqi
Es Safra
Aradi Deir Taanayel
Barr Eliâs
Barr Elias
Chebrqiye
Ej Jerrâr
El Fâaour
Tell Mekhada
El Martîni
Es Saouda
Ed Dahr
Er Roujem
El Marj
El Marj
Marj WWTP
Deir Zenoûn
El Raouda
Aanjar
Ain el Baïda
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Existing WWTP
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ql
Limit Cadastral
0 150 300 600 900 1,200 m

REPUBLIC OF LEBANON

الجمهورية اللبنانية

CLIENT:

UN-HABITAT FOR A BETTER URBAN FUTURE

unicef

CONSULTANT:

KREDO SAL

CARMEL BLDG, SAYDEH ST, ACHRAFIEH, BEIRUT - LEBANON

PROJECT REF: P-1915

PROJECT NAME:

ASSESSMENT FOR CLIMATE CHANGE

DRAWING TITLE :

PROPOSED WETLANDS OF BAR ELIAS AND THE ZAHLE WWTP (GEOLOGICAL MAP)

DRAWN	DESIGNED	CHECKED	APPROVED
M.N	M.N	G.K	G.K

DATE:	SCALE :
OCTOBER 2019	1 : 30,000

LEGAL REGISTRATION DOCUMENT

الجمهورية اللبنانية
المديرية العامة للشؤون العقارية

افادة عقارية

MSLEIMAN3

امانة السجل العقاري في زحلة

رقم الطلب : ١٢١٥٧

بناء على الطلب المقدم من : رضا الدسوقي بتاريخ ٢٠١٩-٠٩-٢٥

و لدى مراجعة قيود السجل العقاري اعطيت هذه الإفادة الشاملة

العقار : ١٩٥١ المنطقة العقارية : برالياس المحلة : ضهر الشمالي الطويل زملة حبود

النوع الشرعي للعقار: اميري مساحة العقار/القسم (م٢) : ٦١٦٨٣

المرجع في السجل اليومي		محتويات و وصف العقار و الحقوق العينية و الوقوعات
الرقم	التاريخ	
		وصف العقار : ارض بعل سقي تزرع حبوب وقسم مغروس اشجار تفاح. نوع العقار : أرض غير مبنية.
		ملاحظة: عند طلب اي افادة عن هذا العقار تراجع الصحيفة الاساسية المفرز عنه

المرجع في السجل اليومي		الملكية – التصرف		الحصة
الرقم	التاريخ	نوع الحق خلاصة العقود	اسماء المالكين	سهم
		اخرى (تصحيح، حق مختلف) : عملا بالمرسوم ١٨٠٩٧ / ١٧ / ١٢ / ٢٧ بملف ٩٨٢.	الجمهورية اللبنانية المصلحة الوطنية لنهر الليطاني (اميري)	٢٤٠٠

استوفي الرسم بموجب لصق تمغة على الطلب

زحلة في ٢٠١٩-٠٩-٢٥

هذا ما تم تسجيله على الصحيفة العقارية حتى تاريخه أعلاه

امين السجل العقاري

٢٠١٩-٠٩-٢٥ ١١:٣١:٢٥

LAND CLASSIFICATION AND PLOT LIMITS

المنطقة العقارية: بر الياس
القضاء: زحلة
رقم العقار: ١٩٥١
المنطقة الإرتفاقية: E عرى وزراعة

التخمين:

الجمهورية اللبنانية
وزارة الأشغال العامة والنقل
المديرية العامة للتنظيم المدني

دائرة التنظيم المدني في محافظة البقاع
دائرة التنظيم المدني في قضاء زحلة

رقم التسجيل: ١٩٧٢
التاريخ: ٦/١١/٢٠١٩

افادة تخطيط وتصنيف

افادة تخطيط	~~العقار غير مصاب بأي تخطيط والطرقات الموجودة مصنفة وفقاً لما هو مبين على خريطة المساحة المرفقة~~
	العقار مصاب بتخطيط مصدق وفقاً لما هو مبين على خريطة المساحة المرفقة (١) بموجب المرسوم رقم ١٨٠٩٣ تاريخ ٥٧ والطريق مصنف مصريات تبوشيرين بموجب المرسوم رقم .... تاريخ .... والطريق مصنف .... بموجب المرسوم رقم .... تاريخ .... والطريق مصنف .... والطرقات الموجودة مصنفة لا يوجد طرقات
	العقار مصاب بتخطيط ملحوظ والطريق مصنف : والطرقات الموجودة مصنفة :
افادة تصنيف	العقار يقع خارج أي منطقة مصنفة (١) .... المنطقة موضوعة تحت الدرس بموجب المرسوم رقم .... تاريخ .... والعقار يقع ضمن المنطقة المصنفة .... بموجب قرار المجلس الأعلى للتنظيم المدني رقم .... تاريخ ....
	العقار يقع ضمن المنطقة المصنفة (١) E بموجب المرسوم رقم ٦٩٠٩ تاريخ ٢٠٠١ العقار يقع ضمن المنطقة المصنفة (١) .... بموجب المرسوم رقم .... تاريخ .... العقار يقع ضمن المنطقة المصنفة (١) .... بموجب المرسوم رقم .... تاريخ ....
	المنطقة هي منطقة اصطياف بموجب المرسوم رقم (١) .... تاريخ .... على ظهره نظام المنطقة التي يقع ضمنها العقار. ارتفاقات أخرى ....

يعمل بهذه الافادة لمدة أربعة أشهر من تاريخ ....

الرسام: الطوبوغراف فريد مخايل
المهندس
رئيس دائرة التنظيم المدني في قضاء ....

مهندس المنطقة علي العزير

التراجع المفروض بموجب المرسوم رقم ١٥٢٩٩ تاريخ ١٩٦٤/٢/٥
طريق اولي: ستة عشر متراً عن المحور على ان لا يقل عن خمسة إمتار من حدود الإستملاك
طريق رئيسي ثانوي: اثني عشر مترا عن المحور على ان لا يقل عن أربعة امتار ونصف من حدود الاستملاك
طريق محلي : عشرة امتار عن المحور على ان لا يقل عن اربعة امتار عن حدود الاستملاك

(١) شطب ما لا يلزم

- الشروط المفروضة في المنطقة المصنفة ...E... بموجب المرسوم رقم ...٦٩٠٩... تاريخ ...٢٠٠١...
- الشروط المفروضة في المنطقة المصنفة .... بموجب قرار المجلس الأعلى للتنظيم المدني رقم .... تاريخ ....

			نظام المنطقة E	نظام المنطقة
		E	E	
الإفراز	المساحة الدنيا	٧٠٠٠	١٠٠٠٠	
	الواجهة الدنيا	٣٥	٣٥	
	العمق الأدنى	٣٥	٣٥	
القطع الموجودة	المساحة الدنيا	٥٠٠٠	دون ٥٠٠م ص% طرقات وحدائق عند الإفراز	
	الواجهة الدنيا	٣٠		
	العمق الأدنى	٣٠		
التراجعات	التراجع عن التخطيط	٣,—	٣,—	
	التراجع الخلفي	٦,—	٦,—	
	التراجع الجانبي	٦,—	٦,—	
شروط مختلفة	معدل الإستثمار			
	السطحي	٥%	٥%	
	معدل الإستثمار الأقصى	٠,١٠	٠,٠٥	
	عدد الطوابق	٢	واحد	
	العلو الأقصى	٧,—	٥,—	
	وجهة الإستعمال	لمالك العقار وأولاده		
	نوع البناء			
	نوع الواجهات			
	تكنة قرميد			

راجع الشروط الخاصة والعامة

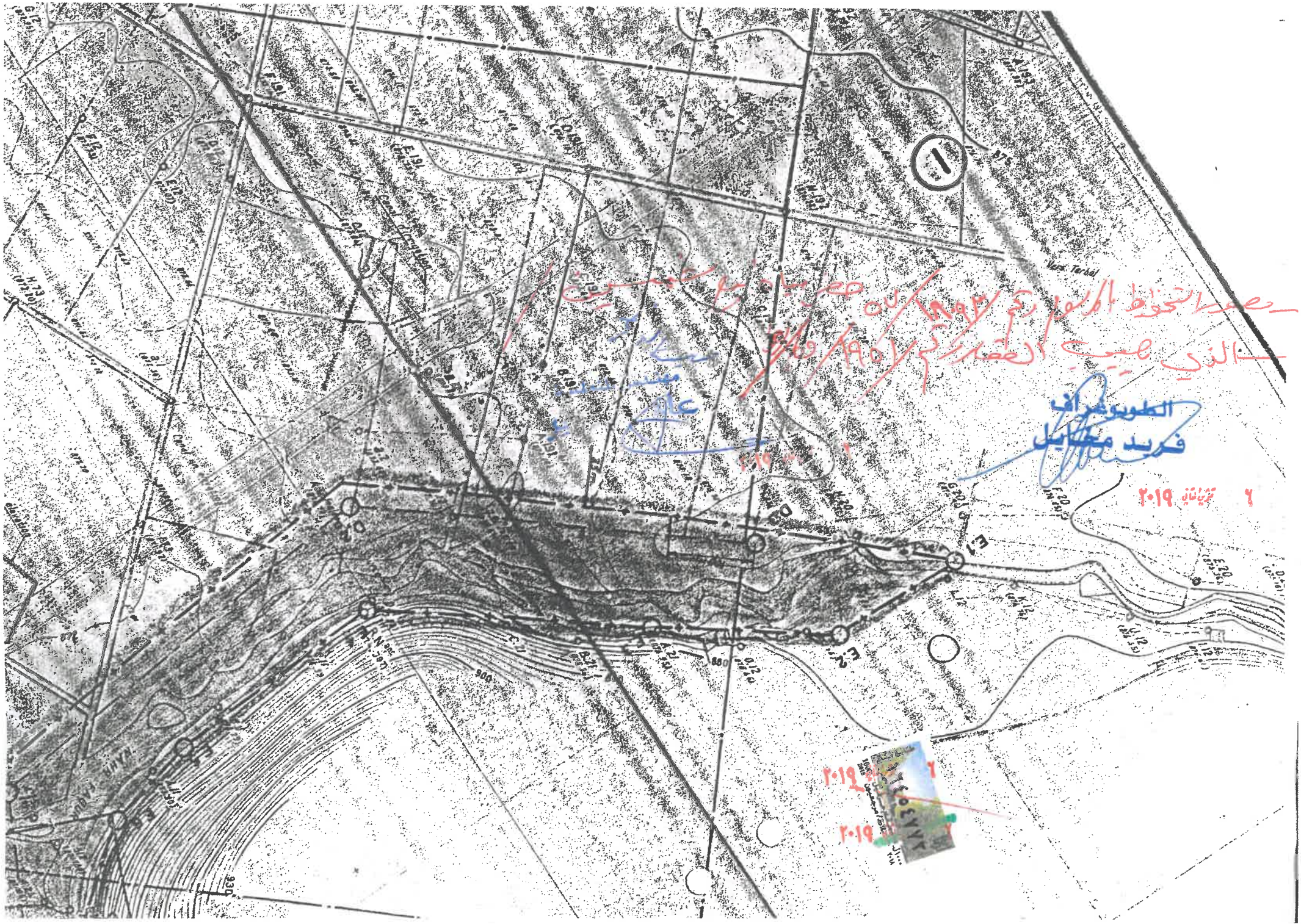
( ) شطب ما لا يلزم

الرسام — الطوبوغرافي فريد ... — ٢ تشرين الثاني ٢٠١٩

المهندس

رئيس دائرة التنظيم المدني في قضاء .... في .... / / ٢٠

مهندس المنطقة ... تشرين الثاني ٢٠١٩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فريد مخايل
٢٠١٩

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CAZA DE ZAHLE

VILLAGE DE BAR-ELIAS

FEUILLE No. 14

ECHELLE 1/2000 e

LEGENDE

FEUILLE 13 AU 1/2000

(FEUILLE 5 AU 1/2000)

Village de kfar zabeb

FEUILLE 12 AU 1/2000

(FEUILLE 7 AU 1/2000)

FEUILLE 11 AU 1/2000

FEUILLE 15 AU 1/2000

BAR-ELIAS 4

PUBLIC CONSULTATIONS

دعوة عامة

لقاء تشاوري مع المجتمع المحلي
لتحديد نطاق الأثر البيئي
لإنشاء مستنقع(Constructed Wetland)
في بلدة بر الياس لمعالجة مياه نهر الغزيل.

تتشرف شركة كريدو ش.م.ل.(Kredo SAL)
بدعوتكم لحضور اللقاء التشاوري
(Public Hearing)

الذي سوف يتناول عرضاً للمشروع ومناقشة الآثار البيئية والإجتماعية المحتملة
لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل

وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩
الساعة الحادة عشرة قبل الظهر وذلك في مقر بلدية بر الياس

العدد 2574 | الخميس 5 كانون الأول 2019 | الجمهورية
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دعوة عامة

لقاء تشاوري مع المجتمع المحلي لتحديد نطاق الأثر البيئي
لانشاء مستنقع (Constructed Wetland)
في بلدة بر الياس لمعالجة مياه نهر الغزيل.

تتشرف شركة كريدو ش.م.ل (Kredo SAL)
بدعوتكم لحضور اللقاء التشاوري
(Public Hearing)
الذي سوف يتناول عرضاً للمشروع ومناقشة الآثار البيئية والاجتماعية المحتملة لمشروع انشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل
وذلك يوم الاربعاء الواقع في 18 كانون الاول 2019
الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس

الخميس ٥ كانون الاول ٢٠١٩

الديار

دعوة عامة

لقاء تشاوري مع المجتمع المحلي لتحديد نطاق الاثر البيئي
لإنشاء مستنقع (Constructed Wetland)
في بلدة بر الياس لمعالجة مياه نهر الغزيل.

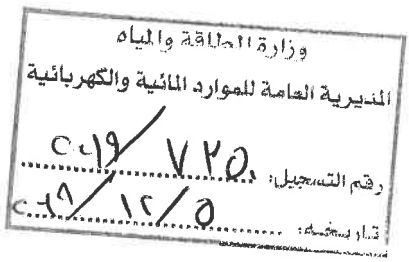
تتشرف شركة كريدو ش.م.ل (Kredo sal)
بدعوتكم لحضور اللقاء التشاوري
(Public Hearing)
الذي سوف يتناول عرضا للمشروع ومناقشة الآثار البيئية والاجتماعية المحتملة لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل
وذلك يوم الاربعاء الواقع في ١٨ كانون الاول ٢٠١٩
الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس

KREDO SAL Consultants
the Karam Research, Engineering & Design Office *P.O.B. 166864 Beirut, Lebanon - www.kredo.net*
Capital 50,000,000 LBP *Tel. (01) 204 957/8/9 - Fax: (01) 336 399*

بيروت في ٣ كانون الأول ٢٠١٩

رقم: P-1915-376/19

جانب وزارة الطاقة والمياه



الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

تحية وإحتراماً ،

بالإشارة إلى الموضوع والمرجع المبيّنين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس.

وتفضّلوا بقبول فائق الإحترام

شركة كريدو ش.م.ل.

الدكتور المهندس جبران كرم

رئيس مجلس الإدارة – المدير العام

د.ج.ك.ب.ك.

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بيروت في ٣ كانون الأول ٢٠١٩

رقم: P-1915-377/19

جانب وزارة البيئة

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

تحية وإحتراماً ،

بالإشارة إلى الموضوع والمرجع المبيّنين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس.

وتفضّلوا بقبول فائق الإحترام

شركة كريدو ش.م.ل.

الدكتور المهندس جبران كرم

رئيس مجلس الإدارة – المدير العام

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بيروت في ٣ كانون الأول ٢٠١٩

رقم: P-1915-378/19

جانب وزارة الثقافة

وزارة الثقافة
المصلحة الإدارية المشتركة
وارد: ٩٧٠
تاريخ: ٥ ١٢ ٢٠١٩

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

تحية وإحتراماً ،

بالإشارة إلى الموضوع والمرجع المبيّنين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس.

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بيروت في ٣ كانون الأول ٢٠١٩

رقم: P-1915-379/19

جانب وزارة الزراعة

الجمهورية اللبنانية - وزارة الزراعة
مصلحة الديوان
تاريخ الورود : ٤ - كانون الأول ٢٠١٩
رقم: ٣/٨٠٨٠٨٥

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

تحية وإحتراماً ،

بالإشارة إلى الموضوع والمرجع المبيّنين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس.

وتفضّلوا بقبول فائق الإحترام

شركة كريدو ش.م.ل.

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بيروت في ٣ كانون الأول ٢٠١٩
رقم: P-1915-380/19

جانب المصلحة الوطنيّة لنهر اللّيطاني

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

تحية وإحتراماً ،

بالإشارة إلى الموضوع والمرجع المبيّنين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس.

وتفضّلوا بقبول فائق الإحترام

شركة كريدو ش.م.ل.

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رئيس مجلس الإدارة – المدير العام

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الجمهورية اللبنانية
المصلحة الوطنية لنهر الليطاني

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د/٢٨٥٢
٤/١٢/٢٠١٩

بيروت في ٣ كانون الأول ٢٠١٩
رقم: P-1019-381/19

جانب مؤسسة مياه البقاع

الموضوع: دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

المرجع: دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

تحية واحتراماً ،

بالإشارة إلى الموضوع والمرجع المبينين أعلاه.

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) ...
١٨ كانون الأول ٢٠١٩ ...

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٢٩٧٦
تاريخ ٥/١٢/٢٠١٩

بيروت في ٣ كانون الأول ٢٠١٩
رقم: P-1915-382/19

جانب المجلس الوطني للبحوث العلمية

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

تحية وإحتراماً ،

بالإشارة إلى الموضوع والمرجع المبيّنين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس.

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بيروت في ٣ كانون الأول ٢٠١٩
رقم: P-1915-383/19

حضرة السيد موسى عراجي المحترم
رئيس بلدية بر الياس

الموضوع: دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

المرجع: دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

تحية وإحتراماً ،

بالإشارة إلى الموضوع والمرجع المبينين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

تدعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس.

وتفضلوا بقبول فائق الإحترام

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بيروت في ٣ كانون الأول ٢٠١٩

رقم: P-1915-384/19

سعادة القاضي كمال أبو جودة المحترم

محافظ البقاع

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل..**

تحية واحتراماً ،

بالإشارة إلى الموضوع والمرجع المبينين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس.

وتفضلوا بقبول فائق الإحترام

شركة كريدو ش.م.ل.

الدكتور المهندس عمران كرم

رئيس مجلس الإدارة – المدير العام

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03 DEC. 2019

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بيروت في ٣ كانون الأول ٢٠١٩
رقم: P-1915-385/19

جانب نقابة المهندسين

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

نقابة المهندسين بيروت
ورد في ...٤/١٢/...
سجل تحت رقم ...١٠٦٠...

تحية وإحتراماً ،

بالإشارة إلى الموضوع والمرجع المبيّنين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس.

وتفضّلوا بقبول فائق الإحترام
شركة كريدو ش.م.ل.

الدكتور المهندس جبران كرم
رئيس مجلس الإدارة – المدير العام

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بيروت في ٣ كانون الأول ٢٠١٩
رقم: P-1915-386/19

جانب التنظيم المدني
وزارة الأشغال العامة والنقل

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل**

تحية وإحتراماً ،

بالإشارة إلى الموضوع والمرجع المبيّنين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس.

المديرية العامة للتنظيم المدني
الديوان
رقم ٨٦٤٣
تاريخ ٢٠١٩/١٢/٤

وتفضّلوا بقبول فائق الإحترام
شركة كريدو ش.م.ل.

الدكتور المهندس جبران كرم
رئيس مجلس الإدارة – المدير العام

KREDO SAL
03 DEC. 2019

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بيروت في ٣ كانون الأول ٢٠١٩

رقم: P-1915-387/19

H2 ALL Consortium Member

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

تحية وإحتراماً ،

بالإشارة إلى الموضوع والمرجع المبيّنين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس.

وتفضّلوا بقبول فائق الإحترام

شركة كريدو ش.م.ل.

الدكتور المهندس جبران كرم

رئيس مجلس الإدارة – المدير العام

Anthony

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بيروت في ٣ كانون الأول ٢٠١٩

رقم: P-1915-388/19

GVC

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

تحية وإحتراماً ،

بالإشارة إلى الموضوع والمرجع المبيّنين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس.

وتفضّلوا بقبول فائق الإحترام

شركة كريدو ش.م.ل.

الدكتور المهندس جبران كرم

رئيس مجلس الإدارة – المدير العام

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بيروت في ٣ كانون الأول ٢٠١٩

رقم: P-1915-389/19

OXFAM

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

تحية وإحتراماً ،

بالإشارة إلى الموضوع والمرجع المبيّنين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الحادية عشرة قبل الظهر وذلك في مقر بلدية بر الياس.

وتفضّلوا بقبول فائق الإحترام

شركة كريدو ش.م.ل.

الدكتور المهندس جبران كرم

رئيس مجلس الإدارة – المدير العام

4/12/2019

د.ج.ك./ب.ك.

KREDO SAL Consultants
the Karam Research, Engineering & Design Office *P.O.B. 166864 Beirut, Lebanon - www.kredo.net*
Capital 50,000,000 LBP *Tel. (01) 204 957/8/9 - Fax: (01) 336 399*

بيروت في ٣ كانون الأول ٢٠١٩

رقم: P-1915-390/19

Norwegian Refugee Council (NRC)

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

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5/12/19

وتفضّلوا بقبول فائق الإحترام

شركة كريدو ش.م.ل.

الدكتور المهندس جبران كرم

رئيس مجلس الإدارة – المدير العام

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بيروت في ٣ كانون الأول ٢٠١٩
رقم: P-1915-391/19

World Vision

الموضوع: دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

المرجع: دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

تحية واحتراما ،

بالإشارة إلى الموضوع والمرجع المبينين أعلاه،

ولما كانت شركتنا تقوم، بتكليف من UN-Habitat، بإعداد دراسة أثر بيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.

ندعوكم للقاء تشاوري (Public Hearing) لتحديد نطاق تقييم الأثر البيئي وذلك يوم الأربعاء الواقع في ١٨ كانون الأول ٢٠١٩ الساعة الثانية بعد الظهر وذلك في مقر بلدية بر الياس.

Charbel Faour

٩/١٢/٢٠١٩

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بيروت في ٣ كانون الأول ٢٠١٩

رقم: P-1915-392/19

UN Habitat

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

تحية وإحتراماً ،

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وتفضّلوا بقبول فائق الإحترام

شركة كريدو ش.م.ل.

الدكتور المهندس جبران كرم

رئيس مجلس الإدارة – المدير العام

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بيروت في ٣ كانون الأول ٢٠١٩

رقم: P-1915-393/19

UNHCR

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

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وتفضّلوا بقبول فائق الإحترام

شركة كريدو ش.م.ل.

الدكتور المهندس جبران كرم

رئيس مجلس الإدارة – المديرَ العام

Received

4/12/19

د.ج.ك./ب.ك.

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بيروت في ٢٧ تشرين الثاني ٢٠١٩
رقم: P-1915-394/19

UNICEF

الموضوع: **دعوة للقاء التشاوري (Public Hearing) لإنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

المرجع: **دراسة أثر البيئي لمشروع إنشاء مستنقع (Constructed Wetland) في بلدة بر الياس لمعالجة مياه نهر الغزيل.**

تحية وإحتراماً ،

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وتفضّلوا بقبول فائق الإحترام
شركة كريدو ش.م.ل.

3/12/2019

الدكتور المهندس جبران كرم
رئيس مجلس الإدارة – المدير العام

د.ج.ك./ب.ك.

KREDO

STAKEHOLDERS MEETING ATTENDANCE

CONSTRUCTED WETLAND IN BAR ELIAS
PUBLIC HEARING FOR SCOPING OF EIA

NAME (الأسم)	ORGANIZATION (الجهة)	EMAIL (البريد الإلكتروني)	PHONE NUMBER (رقم الهاتف)	SIGNATURE (التوقيع)
Christel Beracdy	UN-Habitat	Christelle.beracdy@un.org	71603433	
Elie Mansour	UN-Habitat	elie.mansaur@un.org	03034657	
Mawas Araji	بلدية بر الياس			
Mara Saidy	UNICEF	msaidy@unicef.org	70996617	

KREDO

STAKEHOLDERS MEETING ATTENDANCE

CONSTRUCTED WETLAND IN BAR ELIAS
PUBLIC HEARING FOR SCOPING OF EIA

NAME (الأسم)	ORGANIZATION (الجهة)	EMAIL (البريد الإلكتروني)	PHONE NUMBER (رقم الهاتف)	SIGNATURE (التوقيع)
Georges Abi Sleiman	UN - Habitat	georges.abi-sleiman@un.org	03 175 127	
Maryam Nazzal	UN-Habitat	maryam.nazzal@un.org	70/899669	
Karen Saraya	UN-Habitat	Karen.Saraya@un.org	70/575655	
Wael Sinno	UN_Habitat	wael.sinno@un.org	03/710995	
Ahmad Al Baff	World Vision	ahmad_albaffa@wvi.org	81622062	

STAKEHOLDERS MEETING ATTENDANCE

CONSTRUCTED WETLAND IN BAR ELIAS
PUBLIC HEARING FOR SCOPING OF EIA

DATE AND TIME: December 18th, 2019 – 11:00 A.M. – 12:16 P.M.
LOCATION: Bar Elias Municipality

NAME (الأسم)	ORGANIZATION (الجهة)	EMAIL (البريد الإلكتروني)	PHONE NUMBER (رقم الهاتف)
Dr. Mark Saadeh	KREDO	msaadeh@kredo.net	03/237308
Diana El Halawani	KREDO	dhalawani@kredo.net	76/365975
Georges Abi Sleiman	UN-Habitat	Georges.abi-sleiman@un.org	03/175127
Maryam Nazzal	UN-Habitat	Maryam.nazzal@un.org	70/899609
Karen Sawaya	UN-Habitat	Karen.sawaya@un.org	70/575655
Wael Sinno	UN-Habitat	Wael.sinno@un.org	03/710995
Ahmad Al Baff	World Vision	Ahmad_albaff@wvi.org	81/622062
Christel Berchachy	UN-Habitat	Christelle.bercachy@un.org	71/603433
Elie Mansour	UN-Habitat	Elie.mansour@un.org	03/034657
Mawas Araji	Mayor of Bar Elias		03/639850
Maria Saidy	UNICEF	msaidy@unicef.org	70/996617

MINUTES OF MEETING

CONSTRUCTED WETLAND IN BAR ELIAS
PUBLIC HEARING FOR SCOPING OF EIA

Date	Wednesday December 18th, 2019
Location	Bar Elias Municipality
Facilitator	Dr. Mark Saadeh
Notes taker	Diana El Halawani
Call to order	11:17 am
Meeting adjournment	12:16 pm

Opening Statement

Since 2012, and as per Decree 8633, the Ministry of Environment (MOE) requires most projects to carry on an EIA (Environmental Impact Assessment) before project initiation to explore the potential impacts of this project on its surrounding.

There also exist two other types of possible studies that can be done depending on the scale and type of project;

- IEE (Initial Environmental Examination) which is simpler than an EIA.
- EAR (Environmental Audit Report) which is used for existing projects as a type of retrofitting.

The scale of our project entails the need for an EIA, and the public hearing is the first step of the EIA's implementation.

Project Background

KREDO was approached in September 2019 by UN Habitat to carry out a feasibility study and consequently an EIA for a constructed wetland intervention under the Adaptation Fund for climate change. KREDO has consulted Litani River Authority, the director Dr. Sami Alawieh, to discuss the wetland project. LRA has done a similar wetland project under LRBMS USAID funded project in Joub Jennine – Kherbet Kanafar, and the wetland is still operational. LRA proposed two plots in Bar Elias on Ghzayel or Rafid al Faour stream to construct the wetland. Plot 1951 of an area 63000 m^3 is was found suitable in terms of location and size for the constructed wetland.

Project Description

KREDO has visited the land and the stream with a representative from BWE, and based on the pictures taken, the stream has polluted water that is currently being used for irrigation (apparent pumps withdrawing water from the stream). The objective of the constructed wetland is to treat the water in the stream that is used for irrigation purposes only.

There are two types of constructed wetlands – surface and subsurface. The one proposed is a free surface wetland. The geometry of the constructed wetland is very flexible. The cells can be in series or in parallel. There would be different types of plants in the cells of the wetland capable of purifying the water through different bioremediation processes. Some of the plant species are available in Lebanon, such as fragmites. The water can be diverted to the wetland for a residence time of 5 to 10 days, then discharged back to the stream or to a reservoir for use by surrounding farmers.

Possible Environmental Impacts

	Construction Phase	Operation Phase
Fauna	Affected negatively	Affected positively
Flora	Affected negatively	Affected positively
Noise pollution	Affected negatively	Not affected
New road or other transportation infrastructure	Not affected	Affected positively
Social impact (tourism and recreational activities)	Not affected	Affected positively
Economic impact (job opportunities)	Affected positively	Affected positively

Q&A // Discussions

1. Mr. Moussa Araji, the mayor, commented on the potential sources of pollution of the stream. He noted that the area is not connected to the sewer network, and the village of Kfarzabad usually transfers the sewage to the stream. There are no heavy metals in their sewer because there are no industries.
   Dr. Mark Saadeh noted that it is clear that the water is polluted. To identify the sources of pollution, it needs to be tested. What is certain is that the constructed wetland will help improve the quality of water in the stream.

2. Mr. Elie Mansour, from UN-Habitat, asked whether the plants would attract insects or reptiles, and what would the impact be on the surrounding.
   Dr. Mark Saadeh responded that these plants have a positive impact on the surrounding. They will attract different species and birds, as in the wetland in Kherbet Qanafar, thus creating a new ecosystem in the area.

3. Ms. Maryam Nazzal, from UN-Habitat, asked about the date of establishment of the wetland in Kherbet Qanafar.
   Dr. Mark Saadeh responded that it was established in 2012-2013 and it is a successful and good solution to treat polluted water compared to the expensive, high maintenance wastewater treatment plants.

4. Mr. Elie Mansour, from UN-Habitat, asked whether the plants are capable of treating pollutants present in effluents from industries.

   Dr. Mark Saadeh responded that an expert in constructed wetland is needed to select the type of plants needed in order to treat the water. To do so, water sampling and testing is needed. There are types of plants that can treat water polluted with heavy metals, and even radioactive material. Some plants stabilize pollutants in the roots, others absorb them into the stock and leaves, so they would need to be cut and disposed of. Others rely on the process of phytovolatilization. An expert is needed to identify the type of plants in the cells of the wetland, based on the available pollutants.

5. Mr. Moussa Araji, the mayor, asked about the location of the project, since LRA does not have property at Khzayel River.
   Dr. Mark Saadeh commented that there might be a disagreement on the name of the stream, but it is in Bar Elias adjacent to the land owned by LRA based on the legal registration document of the plot and the maps.

6. Mr. Elie Mansour, from UN-Habitat, asked about who will cover the operation costs of the constructed wetland.
   Mr. Moussa Araji noted that the municipality cannot cover any costs.
   Dr. Mark Saadeh said that the LRA can pay for operation costs. They are low maintenance. The wetland would be fenced for safety.

7. Mr. Moussa Araji, the mayor, asked where the water will be taken.
   Dr. Mark Saadeh reiterated that the water will be diverted from the stream because it is currently polluted and not suitable for irrigation. The water will be pumped from the stream to the wetland, treated, and recirculated back to the stream.

8. Mr. Elie Mansour, from UN-Habitat, asked whether the wetland is expected to improve the agriculture in the surrounding area. TO what extent can the water be extracted? Are there any regulations from the Ministry of Energy and Water?
   Dr. Mark Saadeh, said that the points of irrigation from the treated water coming out of the wetland can be several. This would be determined later. The treated water can be stored or directly abstracted from the outlet of the wetland. It is important to not decrease the volume of the water in the stream.

9. Mr. Ahmad Al Baff, from World Vision, asked whether all the stream will be diverted and treated, and the estimated flow.
   Dr. Mark Saadeh, said that not all the stream will be diverted, part of it. This will be determined at the design stage, when the flow is measured and known. As a rule of thumb, for every two to four hectares, 1000 m^3 of water can be treated in a free surface water wetland.

10. Ms. Maryam Nazzal, from UN-Habitat, asked about how often are the plants cut or replanted, and what are potential negative impacts based on the experience from the wetland in Kherbet Qanafar.
    Dr. Mark Saadeh responded that it depends. In the wetland at Kherbet Qanafar they had the plants for around five years. Potential problems might arise from mosquito breeding sites; however, the area is remote so it will not disturb any residents.

11. Ms. Maria Saidy, from UN-Habitat, if the insects attracted by the wetland will have an impact the surrounding agricultural lands.
    Dr. Mark Saadeh can't refute it 100%; however, in case this happens, there are mitigation measures, such as the introduction of a type of fish called tilapia that feeds on mosquito eggs (remediation measure done in the USA). There will be a balance in the ecosystem created.

12. Georges Abi Sleiman, from UN-Habitat, asked on who is operating the wetland in Kherbet Qanafar.
    Dr. Mark Saadeh responded that it is the LRA.

13. Ms. Christelle Bercachy, from UN-Habitat, noted that it is important to use native species only to avoid any negative impacts.
    Dr. Mark Saadeh agreed, noting that the hired expert in constructed wetland would determine the native species needed.

14. Ms. Maria Saidy, from UNICEF, asked about the watershed of the stream. Do we know about the kind of runoff disposing in this stream, given the high precipitation rates in the area?
    Dr. Mark Saadeh responded that such questions are to be addressed at stage two of the project. The water from the stream needs to be sampled and tested and then we can evaluate the size and design of the wetland, as well as the flooding of the stream.

15. Mr. Wael Sinno, from UN-Habitat, asked about the social and economic benefits of such a project.
    Dr. Mark Saadeh noted that job opportunities will be created during the construction of the project. Moreover, water of better quality will be available for irrigation.

16. Mr. Moussa Araji, the mayor, noted that the Litani River was used for drinking 40 years ago. Bar Elias has a problem with treating sewage, currently it is being disposed of at Ghzayel River.
    Dr. Mark Saadeh responded that constructed wetlands, with their low operation and maintenance costs, can be a solution for treating wastewater, on land that can be offered by the municipality.
    Mr. Moussa Araji agreed that this is a possible solution. He recalled that in rural areas in Germany, bamboo is planted to treat polluted water. They had bamboo planted next to a stream in Bar Elias, but they were cut by LRA.

17. Mr. Elie Mansour, from UN-Habitat, asked about any estimates of the number of beneficiaries. Mr. Moussa Araji, the mayor, said that 80% of the population in Bar Elias relies on agriculture. There are 30,000 residents in Bar Elias, and around 60,000 to 70,000 Syrian refugees in 84 camps.

Closing note: Mr. Elie Mansour said to the mayor that when the project is cleared, UN-Habitat will visit the municipality, and would also like to discuss other projects in Bar Elias under the adaptation fund.

Public Meeting for Scoping of EIA
لقاء تشاوري لتحديد نطاق دراسة الأثر البيئي

Bar Elias Constructed Wetland

Bar Elias Municipality, Zahleh Caza
Bekaa Valley

Kredo S.A.L

UN-HABITAT

18 December 2019

Introduction — المقدمة

- During August 2019, KREDO sal was commissioned by UN-Habitat to carry out an EIA for the project entitled "**Bar Elias Constructed Wetland**" in the municipality of Bar Elias, Zahleh caza.

- The scope of this project is:
  - *To carry out all required aspects related to preparing a scoping report followed by an environmental impact assessment (EIA) report for the constructed wetland, in the municipality of Bar Elias, Bekaa.*
  - *Said EIA study compliant with current governmental regulations, notably Decree 8633, 7 August 2012, Ministry of Environment (MoE).*

Project Background & Rational

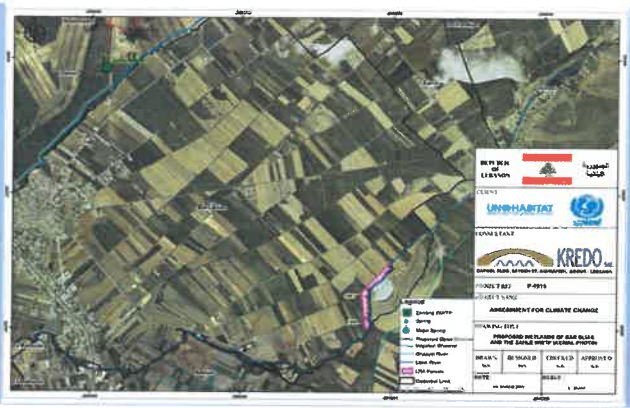
The Environmental Impact Assessment (EIA) report is requested by the Ministry of Environment, for a Free Water Surface (FWS) constructed wetland located on approximately 60,000 m² of public land owned by the Litani River Authority (LRA). The proposed project is located on Plot No. 1951.

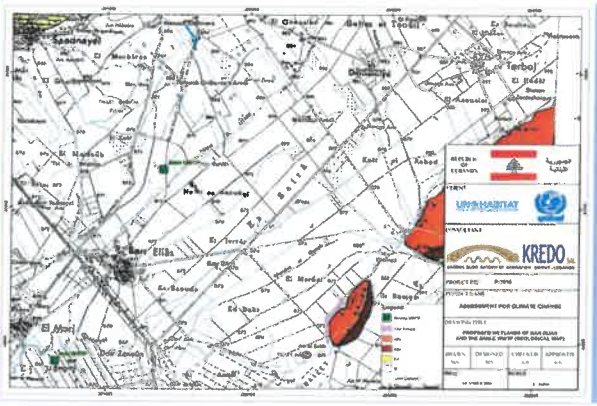
The main objective of the constructed wetland is to partially divert the polluted Ghezayel tributary through the wetland in order to improve the quality of said water for irrigational purposes.

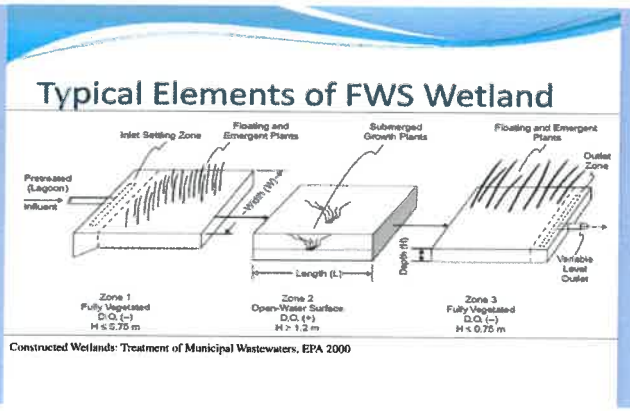
Project Description — مواصفات المشروع

- **Project Location:**
  - ***Bar Elias Municipality, Zahleh caza, Bekaa***
  - ***Local Population: approximately 50,000 local residents***
  - ***Project location: Plot #1951 with an area of roughly 60,000 m²***
  - ***Project construction duration approximately three months***
  - ***Coordinates:***
    - *-434751.5 Northing*
    - *-296365.5 Easting*
    - *Approximately 873 mASL*
  - **Underlying geology pertains to the Quaternary deposits (q) which is an aquifer**
  - **The proposed constructed wetland (free water surface, FWS) is capable of treating roughly 6,000 m³ of Ghezayel's flow per day before redirecting it back into said tributary.**

Ghezayel Tributary , Bar Elias







Constructed Wetlands: Treatment of Municipal Wastewaters, EPA 2000

Typical Flora Found in Constructed Wetlands

Possible Environmental Impacts — التأثيرات البيئية المحتملة

Possible Environmental Impact التأثير البيئي المحتمل	Construction البناء	Operation التشغيل
Fauna الحيوانات	✓-	✓+
Flora - Locally النباتية - محلي	✓-	✓+
Noise Pollution التلوث الصوتي	✓-	X
New road, or other transport infrastructure انشاء طرق او بنى تحتية اخرى	X	✓+
Social Impact (Tourism and recreational activities) اثر اجتماعي (السياحة والأنشطة الترفيهية)	X	✓+
Economic Impact (job opportunities) اثر اقتصادي (فرص العمل)	✓+	✓+

✓ + affected positively; تتأثر بشكل ايجابي

✓ - affected negatively; تتأثر بشكل سلبي

X not affected; لا تتأثر

? Uncertain whether it will be affected or not. غير مؤكد ما اذا كانت ستتأثر ام لا

Thank you for your attention

QUESTIONS?

شكرا على إنتباهكم

أسئلة ؟