COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

REPUBLIC OF LEBANON
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

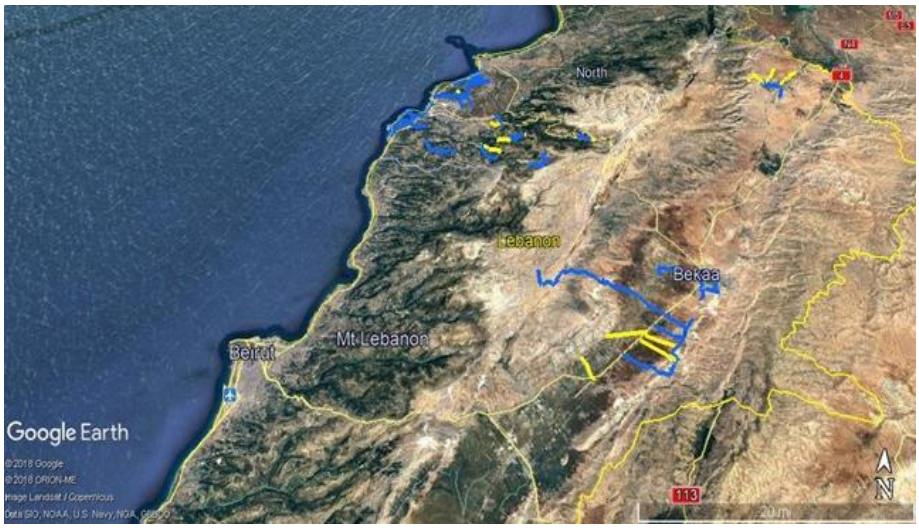
ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

LEBANON ROADS AND EMPLOYMENT PROJECT

LOT 5 - PACKAGE 1 - BCHARRE CAZA

Final

March 2020



TEAM INTERNATIONAL Engineering & Management Consultants *in association with* SUSTAINABLE ALTERNATIVES

EXECUTIVE SUMMARY

INTRODUCTION

The Government of Lebanon (GOL) has solicited and obtained World Bank (WB) financing for the Roads and Employment Project (REP). The Council for Development and Reconstruction (CDR) is acting as the executing agency on behalf of the GOL and its Council of Ministers (COM). The REP involves rehabilitation activities that are confined within the alignments of existing roads with no road widening, no involuntary resettlement, and no land acquisition. As such, the WB classified the REP as a category B project that require the preparation of an Environmental and Social Management Plan (ESMP) for its sub-components. Accordingly, a series of ESMPs were stipulated to be prepared for these roads and put together by CDR in packages for bidding purposes. In this context, CDR awarded the contract number 20379 to TEAM International, hereinafter referred to as the Consultant, to prepare the assessment, design and ESMPs for roads in the districts of Batroun, Bcharre, Koura, Tripoli, Baalbeck, and Hermel. This ESMP is concerned with roads within the Bcharre district.

PROJECT DESCRIPTION

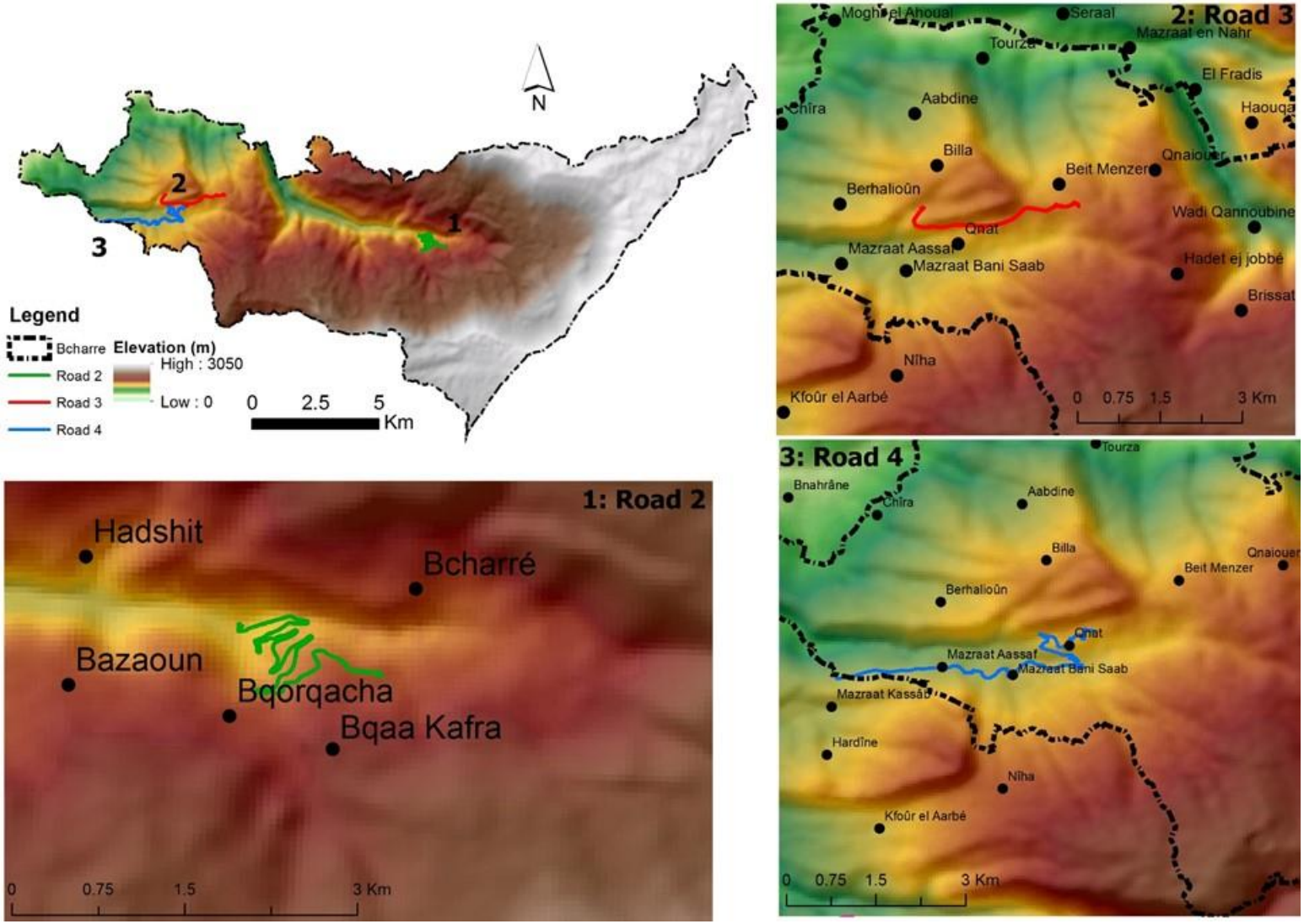
The REP consists of the rehabilitation, maintenance, and minor construction. Activities to be performed during the project vary between one road and the other, depending on the road rating in terms of the condition of the pavement, shoulders, potential flooding and drainage, potential landslide/soil erosion and retaining walls, and/or pedestrian walkways. In the Bcharre district, three roads are proposed (Figure I) whose details are elaborated within the ESMP.

- Road 2 extends for 4.43 kms. It starts at the existing Bcharre-Tanourine Road and Deir Mar Lichaa intersection and extends towards the Wadi Qadisha (Qadisha Valley).

- Road 3 extends for 3.03 km. It includes the main road connecting Beit Mounzir and Qnat.

- Road 4 extends for 6.58 km. It starts at the middle of Road 3 in Qnat and extends towards Mazraat Aassaf at the Bcharre – Batroun caza boundary.

Figure I. Proposed roads within Bcharre Caza (District)



Source: Layers by CNRS

POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

The rehabilitation phase of any development is known to have potential adverse impacts on several indicators including traffic, air quality, noise level, construction waste, water and soil quality, landscape and visual intrusion, resources consumption, damage to existing utilities, health and safety, as well as socio-economics. During the rehabilitation phase, these impacts are temporary with the majority being minor or moderately negative (Table I). During operation, the rehabilitation of the road, combined with the natural increase in the vehicle fleet size, will ultimately increase traffic volume and hence, typical impacts associated with increased traffic will be inevitable in the long term. Yet, improved traffic flow on rehabilitated roads will lead to improved fuel efficiency and better engine performance, thereby reducing vehicle emissions and maintenance. Refurbished roads will lead to improved landscape and visual intrusion, albeit some increase in light glare. Finally, improved safety design of roads can reduce the potential for accidents. The magnitude and significance of these impacts is not the same along all roads. Based on the field surveys and environmental and social assessment, Road 2 encompasses a more sensitive and diversified environment because it passes through the wadi Qadisha valley ending near the Qadisha / Abu Ali river where a few restaurants exist. More importantly, it features several religious sites that are highly visited particularly during the summer.

Table I. Summary of potential impacts of proposed roads in Bcharre district

Potential Impact	*Rehabilitation phase*	*Operation phase*
Traffic	Moderate negative	Minor negative to Positive
Air quality	Minor negative	Minor negative to Positive
Noise	Moderate negative	Minor negative to Positive
Biodiversity	Moderate negative	Minor negative
Construction Waste	Major negative	Neutral
Soil and water	Moderate negative	Minor negative to Zero
Resources consumption	Moderate negative	Neutral
Existing infrastructure	Minor negative	Neutral to Positive
Visual Intrusion	Minor negative	Minor negative to Positive
Health and Safety	Moderate negative	Minor negative to Positive
Socio-Economic	Moderate negative to Positive	Positive
Archaeology / Cultural Heritage	Minor negative	Neutral
Expropriation/involuntary resettlement	Neutral	Neutral

As for socio-economic impacts, during the rehabilitation phase, they are expected to be positive in terms of providing job opportunities and moderately negative in terms of temporary increase in travel time, impeded accessibility to residences / businesses, and potential health and safety, and social tensions that could lead to exploitation, abuse and harassment. During the operation phase, the rehabilitation of roads is expected to have positive impacts by improving access to remote areas, reduced trip times, reduced traffic congestion and accidents, and enhanced livelihood opportunities.

ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

Mitigation Plans

While the road rehabilitation is associated with some potential negative impacts, most of them can be alleviated. Tables II and III present a summary of environmental and Table IV of social mitigation measures that should be adopted to eliminate or minimize these impacts.

Table II. Environmental Mitigation Plan for the Bcharre district roads during the rehabilitation phase

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility of mitigation*	*Responsibility of direct supervision*	*Estimated Cost*
Traffic delays and congestion	❑ Schedule transportation of construction materials during off - peak traffic hours and during night time. Generally peak traffic hours are from 7 to 10 am and from 3 to 6 pm. ❑ Develop routing strategies for construction-related traffic to avoid sensitive receptors ❑ Inform the public about the schedule of rehabilitation activities ❑ Maintain access to roadside businesses and residences via detours and temporary access features ❑ Ensure adequate warning, signing, delineation and channeling at least 500 m down and up-gradient from the construction site. ❑ Provide personnel to manage traffic at the rehabilitation site, supported by Municipal police if need be ❑ Avoid peak traffic times when laying asphalt and to the extent feasible, schedule construction activities outside the peak summer visitation season while always keeping part of the road accessible particularly the road to wadi Qadisha, the only access road for nearly 250000 people in the summer.	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks
Air emissions	❑ Ensure adequate maintenance and repair of construction machinery and vehicles; ❑ Maintain good housekeeping practices that keep the site and its surroundings clean ❑ Ensure good quality of diesel fuel used with on-site equipment ❑ Turn off all equipment when not in use ❑ Sprinkle water on the construction site on windy days to hamper the generation of dust and its entrainment in the wind ❑ Ensure that excavated soil and fine construction material that are stored on site are properly sited away from the dominant wind direction and that they are watered and/or covered entirely by impervious sheeting when not in use	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility of mitigation*	*Responsibility of direct supervision*	*Estimated Cost*
	❑ Handle cement material properly ❑ Keep hauling routes free of dust and regularly cleaned ❑ Ensure good quality of fuel is used in trucks transporting construction material to and from site ❑ Ensure optimum and regular transportation of construction materials to minimize storage of large heaps on-site and to minimize concentrated truck-trips. ❑ Cover all vehicles hauling materials likely to give off excessive dust emissions; ❑ Restrict vehicle speeds to 25km/h on unpaved roads and trucks			
Increased noise levels	❑ Use quiet/well-maintained equipment ❑ Regularly maintain equipment and turn them off when not in use ❑ Use operational noise mufflers ❑ Limit construction activities to working hours designated by decision number 2/163 – 31/1/1995	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks
Biodiversity	❑ Conduct careful rehabilitation work where the road reaches Abu Ali / Qadisha river to avoid damaging nearby ecosystems: Isolate the stretch overlooking the Qadisha / Abu Ali river with a 2 meter blocked fence with access to pedestrians crossing the river at one point. Also, since many buses come down and up Road 2, it is critical to provide wider paved turns for such buses along the road ❑ Control workers' movement and activities to avoid infringing on the nearby ecosystems including agricultural areas. ❑ Instruct workers to protect flora and fauna when feasible as well as their habitats. ❑ Prohibit dumping of solid and liquid waste into the natural environment ❑ Install animal crossing signage on Road 2 in the Qadisha wadi	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility of mitigation*	*Responsibility of direct supervision*	*Estimated Cost*
Generation of construction waste	❑ Minimize the generation of construction waste ❑ Adequately sort construction waste to remove any hazardous substances ❑ Reuse inert waste materials as filling material for road reconstruction where feasible ❑ Establish an arrangement with the municipality and the North Lebanon Governor to secure suitable locations for construction waste disposal	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks
Pollution of soil and water resources	❑ Minimize usage of chemicals (lubricants, oil, solvents) ❑ Ensure the proper storage of building materials, asphalt, oil and chemicals on-site in well- controlled areas and away from river banks ❑ Do not discharge wastewater into river or on soils ❑ Do not discharge waste oil into rivers or on soils ❑ Contractor to provide mobile/portable cabin toilet linked to the existing wastewater network. When the latter is absent within the work zone, the toilet is linked to a polyethylene storage tank that is emptied when full into the nearest wastewater network. ❑ For vehicles and equipment, the Contractor will have to rent a land within the Project area. This land should be fenced and used for parking purpose only. The Contractor shall not perform any repair on site and is obliged to execute vehicles and equipment maintenance in a repair shop preferably located within the Project area. ❑ Waste material or water containing waste chemicals such as thinners, oil, and mineral spirits shall not be pumped or disposed of into storm water drains, sanitary sewers or into the ground. ❑ Cover any stockpiled construction material covered with an impermeable layer. ❑ Store diesel in designated tanks away from the road maintenance site and drainage ditches. Place it on an elevated concrete base to prevent soil or water pollution in case of accidental spill at the specified storage location.	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility of mitigation*	*Responsibility of direct supervision*	*Estimated Cost*
	❑ Conduct all refueling operations off-site. Fuel vehicles up before arriving to the road section. ❑ Decrease water usage ❑ Maintain surface water drainage ❑ Ensure that in the event of any fuel or chemical spills, the affected area is attended to and that the top soil is removed for disposal. A spill response plan shall be in place and all workers should be trained on its implementation. ❑ Control over vehicle hauling hazardous materials ❑ Clean the site periodically ❑ Each receptacle should be marked with the correct technical name of the substance it contains. ❑ Incompatible materials shall not be placed in common containment. ❑ Used or waste fuel or other waste chemicals shall be stored in an isolated area until collected for off-site disposal by an approved waste contractor. ❑ Vehicle and equipment wash-down should only be done in designated areas away from the road under rehabilitation to protect water and soil quality in the area. ❑ Control all operations involving the use of concrete to avoid leaching into water sources. ❑ Provide bins on-site for the disposal of non-construction related wastes ❑ Work with the municipality to include the site on the current solid waste collection route ❑ Minimize soil exposure time ❑ Install retaining walls before starting with drainage ditch excavations to block soil erosion ❑ Carry out excavations for drainage channels in complete precision and transport resulting excavated soil to offsite locations for proper disposal in case of contamination. ❑ Reduce the time excavated drainage channels remain unsupported			

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility of mitigation*	*Responsibility of direct supervision*	*Estimated Cost*
	❑ Keep vegetation clearing to a minimum and encourage re-vegetation immediately after construction activity finishes, at sites where vegetation is removed, ❑ Place geotextile silt traps as appropriate			
Resources consumption	❑ Replace wet cleaning methods with dry clean-up methods whenever practical (sweeping, dust collection vacuum, wiping…etc.), while taking into consideration dust generation. ❑ Install signs near water-using appliances to encourage water conservation. ❑ Use appropriate water proof sheeting to cover the concrete after water curing to preserve moisture and reduce the evaporation that leads to decrease water quantities used ❑ Turn off equipment when not in use ❑ Regularly maintain machinery and generators and operate them in an efficient manner. ❑ Do not leave vehicles idle for long periods. ❑ Site offices shall be well insulated to retain heat or cool, utilize energy efficient bulbs and energy efficient cooling systems. ❑ Reuse excavated material whenever feasible ❑ Accept construction material only from permitted/licensed quarrying sites	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks
Existing infrastructure	❑ Obtain road plans and elevation for each road ❑ Develop procedures for rapid notification of the concerned municipality/ ministry, in the case of disruption of any existing utility, along, with requirements for immediate assistance with re-instatement, and close follow-up with concerned authorities	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility of mitigation*	*Responsibility of direct supervision*	*Estimated Cost*
Visual intrusion	❑ Document existing conditions prior to initiation of the works ❑ Preserve existing vegetation when feasible ❑ Restore depleted vegetative cover by replanting with endemic trees (pine, oak, etc.) where cutting is necessary during construction. ❑ Clearance all equipment, spoil heaps, and other materials after construction ❑ Ensuring that the street light source has the minimum intensity needed.	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks
Health and safety	❑ Follow CDR's and WB's safety, health and environmental regulations and guidelines ❑ Ensure the construction sites are completely enclosed and restrict entrance to construction personnel ❑ Create buffer zones around the site and provide pedestrian walk ways ❑ Ensure traffic by-passes in working areas ❑ Install clear warning signs ❑ Provide adequate loading and off-loading space within the site itself ❑ Provide appropriate personal protective equipment to construction workers, including helmets and earmuffs) ❑ Provide on-site first aid kit with adequate content (ex. including antiseptic fluid, gauze, cotton etc. and other items that are needed to deal with any cuts and bruises) ❑ Provide accident insurance for workers	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks

Table III. Environmental Mitigation Plan for the Bcharre district roads during the operation phase

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility*	*Responsibility of direct supervision*	*Estimated Cost*
Traffic congestion & delays	❒ Maintain road safety infrastructure	❑ MOPWT	❑ Municipality	Included as part of the construction and supervision activities for a one-year Defect Liability Period during operation.
Noise	❒ Provide speed limit signs at critical locations and enforce speed limit ❒ Regularly maintain the roads	❑ MOPWT ❑ Municipalities	❑ MOPWT ❑ Municipalities	Included as part of the construction and supervision activities for a one-year Defect Liability Period during operation.
Biodiversity	❒ Refer to rehabilitation phase ❒ Maintain lighting source ❒ Maintain speed bumps and signage	❑ MOPWT ❑ Municipalities	❑ MOPWT ❑ Municipalities	Included as part of the construction and supervision activities for a one-year Defect Liability Period during operation.
Water and soil quality	❒ Maintain surface water drainage systems ❒	❑ MOPWT ❑ Municipalities	❑ MOPWT ❑ Municipalities	Included as part of the construction and supervision activities for a one-year Defect Liability Period during operation.

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility*	*Responsibility of direct supervision*	*Estimated Cost*
Resource consumption	❒ Using water-efficient equipment during maintenance operations to avoid excessive and overuse of water.	❑ MOPWT ❑ Municipalities	❑ MOPWT ❑ Municipalities	Included as part of the construction and supervision activities for a one-year Defect Liability Period during operation.
Visual intrusion	❒ Ensuring that lights are turned off by a timer or manually when they are not needed.	❑ MOPWT ❑ Municipalities	❑ MOPWT ❑ Municipalities	Included as part of the construction and supervision activities for a one-year Defect Liability Period during operation.
Health and safety	❒ Follow CDR's and WB's safety, health and environmental regulations during maintenance works ❒ Proper road management, signage and maintenance	❑ MOPWT ❑ Municipalities	❑ MOPWT ❑ Municipalities	Included as part of the construction and supervision activities for a one-year Defect Liability Period during operation.

Table IV. Social Mitigation Plan for the Bcharre district roads during the rehabilitation phase

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility*	*Responsibility of direct supervision*	*Estimated Cost*
Socio-economics	❑ Inform the public about the schedule of construction activities ❑ Provide alternative access to residences and roadside businesses ❑ Adopt traffic management plans to ensure a safe and efficient movement of traffic ❑ Develop and communicate clear criteria for job selection and allocation, with attention to ratio of Syrian and Lebanese community workers, types of positions and jobs restricted to Lebanese citizens, and consideration also for sub-group allocations within communities. ❑ Ensure work permit requirements are satisfied in accordance to the Ministry of Labor regulations ❑ Maintain labor registry and age verification record to protect against potential child labor ❑ Ensure non-discrimination and fair treatment such as equal wages/benefits and working conditions among workers ❑ Establish and ensure that GRM is applicable for communities and for workers (both Lebanese and Syrian workers) to file their complaints. Provide the option of anonymity under the GRM ❑ Maintain a site construction insurance plan that covers all workers in case of injury or accidents during construction ❑ Provide workers with the necessary training and awareness sessions on issues related to SEA/H	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks

Monitoring Plan

Since the project is a category B, monitoring activities for such projects rely primarily on visual observation and photographic documentation although measurements of certain indicators (traffic count, air / water quality and noise level) can be conducted upon public complaints. The project supervising consultant holds the responsibility of monitoring activities during the rehabilitation phase to ensure the implementation of the mitigation plan by the contractor. Upon public complaints, a third party (consultant) can also be appointed by CDR to conduct periodic monitoring with measurements of environmental indicators depending on the nature of the complaint. Table V presents a summary of monitoring indicators / activities during the rehabilitation phase.

During the operation phase, regular monitoring activities become more part of the duties and responsibilities of local municipalities and stakeholders. Similar to the rehabilitation phase, upon public complaints, a third party consultant can also be appointed by CDR (up to 2 years after project completion) to conduct periodic monitoring with measurements of environmental indicators depending on the nature of the complaint (Table VI).

During the rehabilitation phase, the Supervising Consultant shall submit a quarterly report about the monitoring activities to various stakeholders including the CDR and the municipalities. These reports shall be made readily available or accessible to the public upon submittal. The content of a typical report should mirror the indicators of the mitigation plan with proper photographic documentation and actions taken in the event of accidents, concerns or complaints.

Table V. Environmental and Social Monitoring Plan for the Bcharre district roads during the rehabilitation phase

Impact	Monitoring activities	Responsibility	Frequency/ Duration	Location	Methods	Estimated Cost[1]
Traffic	Continuous supervision with periodic photographic documentation of mitigation measures (congestion, traffic disruption, speed limits, working hours, the presence of a traffic police and construction worker at detours)	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Air quality	Continuous supervision with periodic photographic documentation of mitigation measures (vehicle and excavation emissions, turning off of equipment not in use, equipment maintenance, type of fuel used on site and in hauling trucks, speed limits, cleanliness of site, water spraying, storage conditions of soil and fine construction material, working hours, schedule of material transportation	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
	Total Suspended Particles (TSP), PM_{10}, $PM_{2.5}$ (wherever feasible), SOx, NOx and CO	Third party Consultant CDR	Upon public complaint	At site and at sensitive receptors within 100 m from site	1-hr measurements, and visual observation of dust dispersion (scale and direction)	2000$/event

Noise	Continuous supervision with periodic photographic documentation of mitigation measures (equipment mufflers, equipment maintenance, equipment turned off when not in use, speed limits, working hours) and measurements of indicators in case of public complaints	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
	L_{eq}, L_{min} and L_{max}	Third party Consultant CDR	Upon public complaint	At site and at sensitive receptors within 100 m from site	Single sample per location (average 1hr reading-15min intervals) during morning (7-8am), evening (1-2pm) and night (4-5pm)	500$/ event
Biodiversity	Continuous supervision with periodic photographic documentation of mitigation measures (worker movement and activity, waste disposal, etc.)	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Construction and other solid waste	Continuous supervision with periodic photographic documentation of mitigation measures while maintaining a record of waste generation, collection, segregation, storage, transportation and disposal in terms of type, quantity, and disposal location of generated waste	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Runoff water/ drainage	Continuous supervision with periodic photographic documentation (chemical usage, chemical and material storage, water usage, wastewater discharge from mobile/portable toilets and storage tanks in existing / nearby sewage network, bins for solid waste disposal, oil spill management) while checking on culverts particularly following rainfall events	Supervising Consultant Contractor	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks

	Water quality analysis	Third party Consultant CDR	Upon public complaint	At nearby river/ stream	Totals suspended solids, BOD, COD, Oil/grease	1000$/ event
Resource consumption	Continuous supervision with periodic photographic documentation of reuse of excavated material, water and energy conservation practices and design elements	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Existing infrastructure	Continuous supervision with periodic photographic documentation of excavation and response to disruption of underground utilities	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Visual intrusion	Continuous supervision with periodic photographic documentation of excavation and re-planting / re-vegetation while checking on culverts particularly following rainfall events	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Health and Safety	Continuous supervision with periodic photographic documentation (PPE, site enclosure, buffer zones, warning signs, first aid kit, accident insurance), while maintaining a record of injuries / accidents specifying cause and location	Supervising Consultant Municipality	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Socio-economic	Continuous supervision with periodic photographic documentation of mitigation measures while maintaining a record of employment and grievance, sharing construction schedule with the public, access to roadside businesses and residences, and grievance record. Documentation of training and raising awareness for SEA/H and signing of the code of conduct as well as record of age verification against child labor.	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks

Table VI. Environmental and Social Monitoring Plan for the Bcharre district roads during the operation phase (up to a year after project completion)

Impact	Monitoring activities	Responsibility	Frequency/ Duration	Location	Methods	Estimated Cost
Air quality	Total Suspended Particles (TSP), PM_{10}, $PM_{2.5}$ (wherever feasible), SOx, NOx and CO	Third party Consultant	Upon public complaint	At site and at sensitive receptors within 100 m from site	1-hr measurements, and visual observation of dust dispersion (scale and direction)	2000$/event
Noise	L_{eq}, L_{min} and L_{max}	Third party Consultant	Upon public complaint	At site and at sensitive receptors within 100 m from site	Single sample per location (average 1hr reading-15min intervals) during morning (7-8am), evening (1-2pm) and night (4-5pm)	500$/ event
Water	Totals suspended solids, BOD, COD, Oil and grease	Third party Consultant	Upon public complaint	At nearby river/ stream	Single sample analytical analysis	1000$/ event

CONSULTATION, DISCLOSURE AND GRIEVANCE REDRESS MECHANISM

Public Consultation

A public consultation meeting was conducted on December 13, 2019 at the Federation of Municipalities in the Bcharre district in Dimane during which the ESMP results were presented (see Annex D). Fifteen individuals attended the meeting including four females, heads of municipalities or their representative in the Bcharre district, as well as a representative of NGOs and cooperatives in the district. Several issues were raised during the meeting such as:

- The selection criteria applied for road selection are not clear.
- Some sections of the proposed roads that have recently undergone rehabilitation works. Could the allocated budget be transferred to additional works along those roads?
- Lighting is preferred along the roads and not within the towns where there is usually lighting.
- During the rehabilitation works of Road 2, the contractor should ensure that parts of the road remain accessible as this road is the only access road to Wadi Qadisha.
- Rehabilitation works on this road should not be scheduled during the peak season of tourist visits in the summer, which extends from June until mid-September. Furthermore, the works on this road should be expedited and preferably completed within 2 months.
- Also, since many buses come down and up Road 2, it is critical to provide wider paved turns for such buses along the road
- Construction waste may be re-used by other contractors in the area (such as Hamid Keirouz), depending on the status of their projects. Milled asphalt should be sorted and handled alone. It should not be used for backfilling.
- Contractor to give priority employment to local people from the towns where the roads rehabilitation is taking place.
- Enforcing construction schedule in a timely fashion.
- Employment opportunities were discussed for both Lebanese and Syrian workers. The latter contributes significantly in the construction sector throughout Lebanon including the Bcharre District. Besides private entities, the municipalities are resorting to Syrian labor in this sector in particular. There appears to be a clear split in job types between local communities. The delineation line is between skilled jobs (mainly taken by the Lebanese workforce) and unskilled labor (filled primarily by Syrian workers). This split has resulted in a control of potential tensions or conflict between the communities.

A side discussion took place with female attendees towards the end of the meeting. It revealed similar and consistent concerns as outlined above. As for NGOs Consultation, this ESMP has targeted them according to their position in Lebanon. They consist of two levels as follows: (1) Local: they are specific to each Caza. Their mission is to address different concerns and issues among the local society including social, economic, gender equality, environment, poverty, women empowerment, etc. and (2) International: they are cover the whole country and their consultation will be applied to all the ESMPs of the REP. When the crisis in Syria erupted in early 2011, numerous International NGOs responded to the humanitarian crisis and worked directly with the Syrians in Lebanon by providing aid and responding to their critical situation.

A grievance redress mechanism (GRM) is established by the CDR to allow stakeholders to voice their concerns during the project phases: pre-rehabilitation, rehabilitation, and operation. The GRM is designed to allow a timely resolution of concerns, assuring stakeholders that grievances have been heard and that the institutionalized mechanism will yield a fair and impartial outcome. Furthermore, the grievance mechanism is applicable for communities and for workers (both Lebanese and Syrian workers) with the option to remain anonymous when filing a grievance to encourage workers to speak out without potential fear of repercussions.

الملخص التنفيذي

المقدمة

حصلت الحكومة اللبنانية على تمويلاً من البنك الدولي (البنك) لصالح مشروع الطرق والعمالة (المشروع). ويقوم مجلس الإنماء والاعمار (المجلس) بدور الجهة المنفذة لصالح الحكومة اللبنانية ومجلس الوزراء. يشمل المشروع أنشطة تأهيلية محصورة بمسارات الطرق الحالية ولا ينطوي على توسيعات لها، ولا اعادة إسكان قسرية، ولا أية استملاكات. وبناء عليه صنف البنك المشروع تحت فئة ب التي تستدعي تحضير خطة الإدارة البيئية والاجتماعية (الخطة) لمكونات المشروع الجزئية. وبناء على ذلك توجب إعداد تصاميم لهذه الطرق التي وضبها المجلس في رزم لأغراض طرح مناقصات التنفيذ. وفي هذا المجال وقع المجلس عقداً مع تيم انترناشيونال (الاستشاري) تحت رقم ٢٠٣٧٩ لإعداد التقييم والتصميم وإعداد خطط الإدارة البيئية والاجتماعية للطرق في أقضية البترون، بشري، الكورة، طرابلس، بعلبك والهرمل. وهذا التقرير يخص خطة الإدارة البيئية والاجتماعية في قضاء بشري.

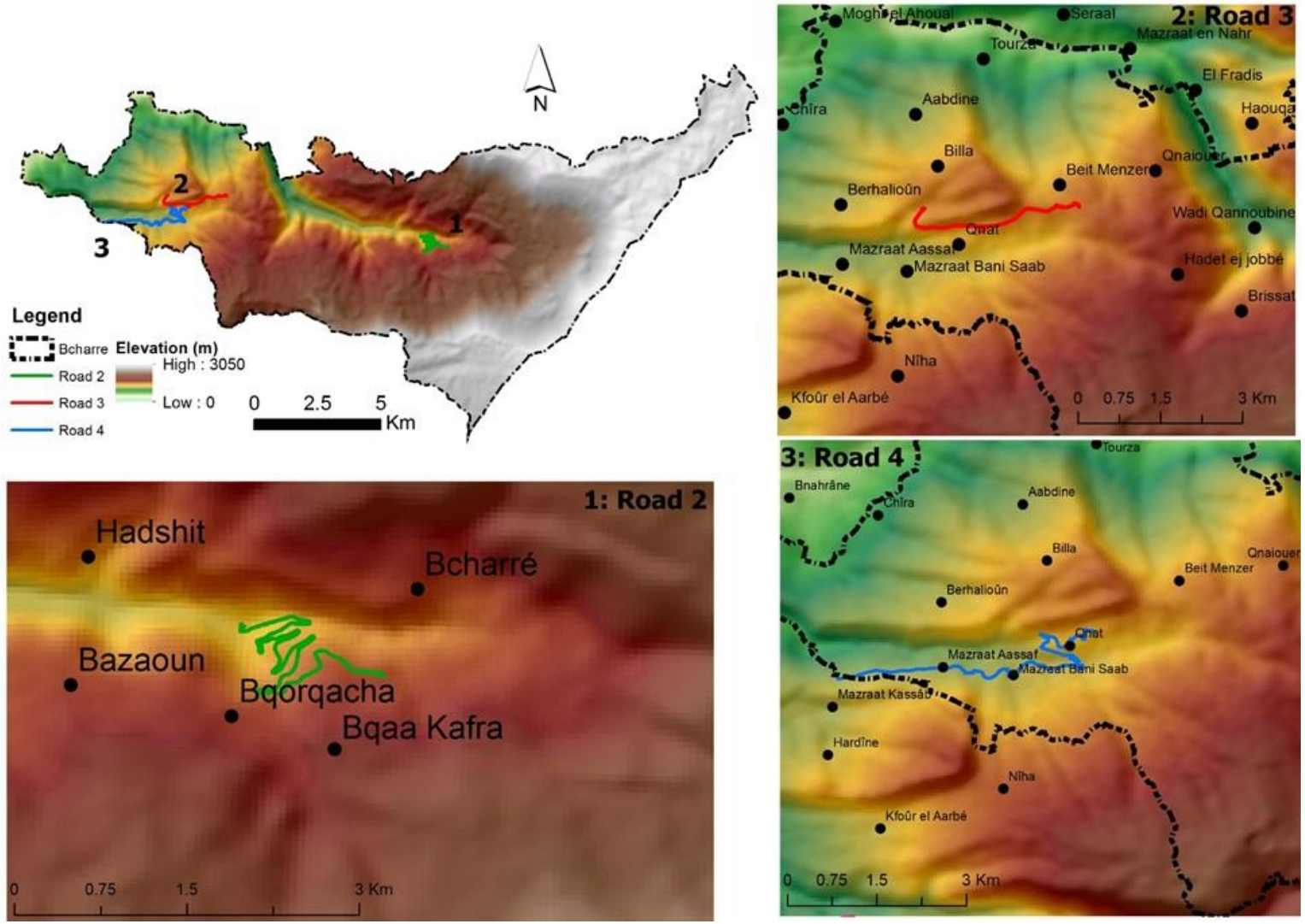
وصف المشروع

المشروع هو كناية عن تأهيل وصيانة و إنشاءات ثانوية. والأنشطة التي ينبغي القيام بها تختلف بين طريق وآخر، حسب تقييم الطريق، من حيث حالة طبقة الرصف، الأكتاف، صرف مياه الأمطار و احتمال اغراق الطريق، احتمال الانهيارات وجرف التربة، جدران الدعم و/أو ممرات المشاة.

وفي قضاء بشري ، يشمل المشروع ثلاثة طرق (الشكل ١) مفصلة حسب الخطة.

- يمتد الطريق ٢ لمسافة ٤,٤٣ كم. ويبدأ من طريق بشري - تنورين القائم وتقاطع دير مار ليشع ويمتد نحو وادي قاديشا.
- الطريق ٣ يمتد ل٣,٠٣مسافة كم. ويشمل الطريق الرئيسي الذي يربط بين بيت منذر وقنات.
- يمتد الطريق ٤ لمسافة ٦,٥٨ كم. يبدأ من منتصف الطريق ٣ في قنات ويمتد نحو مزرعة عساف عند الحدود بين قضاءي بشري و البترون.

الشكل ١ - الطرق المقترحة في قضاء بشري



المصدر: طبقات من CNRS

الآثار البيئية والاجتماعية المحتملة

من المعروف أن أية عملية تأهيل يمكن أن ينتج عنها تأثيرات سلبية على عدة مؤشرات تشمل حركة المرور، نوعية الهواء، مستوى الضجيج، مخلفات الإنشاءات، المياة والتربة، المناظر الطبيعية والتداخل البصري، استهلاك الموارد، ضرر على الخدمات العامة، الصحة والسلامة، بالإضافة إلى التأثيرات الاقتصادية والاجتماعية. تكون هذه التأثيرات أثناء عملية التأهيل ظرفية وفي غالبيتها غير ذات بال أو سلبية لدرجة معتدلة (الجدول ١). وفي مرحلة التشغيل سينتج عن عملية التأهيل مضافاً إليها النمو الطبيعي في حجم اسطول المركبات زيادة في الحركة المرورية لا يمكن تفاديها في المدى الطويل. ولكن تحسن تدفق المركبات على الطرق المؤهلة سيؤدي إلى تخفيض استهلاك الوقود وكفاءة أعلى في تشغيل محركات المركبات، مما يخفض انبعاثاتها واحتياجاتها للصيانة. وتأهيل الطريق يؤدي إلى تحسين مظهر المناظر الطبيعية ولكن أيضاً يؤدي الى زيادة في وهج الضوء. وأخيراً فإن تحسين تصميم الطريق يؤدي لسلامة أفضل يخفض مخاطر الحوادث المحتملة. إن مقدار وأهمية هذه التاثيرات ليست نفسها على جميع الطرق. واستناداً إلى المسوح الميدانية والتقييم البيئي والاجتماعي، يشمل الطريق ٢ بيئة أكثر حساسية وتنوعاً لأنه يمر عبر وادي قاديشا الذي ينتهي بالقرب من نهر قاديشا / أبو علي حيث توجد بضعة مطاعم. والأهم من ذلك، أنه يضم العديد من المواقع الدينية التي تتم زيارتها للغاية وخاصة خلال فصل الصيف.

الجدول ١ - موجز الآثار المحتملة للطرق المقترحة في قضاء بشري

الأثر المحتمل	*مرحلة التأهيل*	*مرحلة التشغيل*
النرور	سلبي معتدل	سلبي ضئيل الى ايجابي
نوعية الهواء	سلبي ضئيل	سلبي ضئيل الى ايجابي
الضجيج	سلبي معتدل	سلبي ضئيل الى ايجابي
التنوع البيولوجي	سلبي معتدل	سلبي ضئيل
فضلات الانشاءات	سلبي كبير	محايد
التربة و الماء	سلبي معتدل	سلبي ضئيل الى صفر
استهلاك الموارد	سلبي معتدل	محايد
البنى التحتية الموجودة	سلبي ضئيل	محايد الى ايجابي
التلوث البصري	سلبي ضئيل	سلبي ضئيل الى ايجابي
الصحة و السلامة	سلبي معتدل	سلبي ضئيل الى ايجابي
اجتماعي-اقتصادي	سلبي معتدل الى ايجابي	ايجابي
الآثار/الارث الثقافي	سلبي ضئيل	محايد
الاستملاك/اعادة الاسكان غير الطوعي	محايد	محايد

أما فيما يتعلق بالآثار الاجتماعية - الاقتصادية، فإنه من المتوقع أن تكون إيجابية خلال مرحلة إعادة التأهيل من حيث توفير فرص العمل وسلبية إلى حد ما من حيث الزيادة المؤقتة في وقت السفر، وإعاقة إمكانية

الوصول إلى المساكن/الأعمال التجارية، والصحة والسلامة المحتملة، والتوترات الاجتماعية التي يمكن أن تؤدي إلى الاستغلال وسوء المعاملة والمضايقة. وخلال مرحلة التشغيل، من المتوقع أن يكون لإصلاح الطرق آثار إيجابية من خلال تحسين الوصول إلى المناطق النائية، وتقليل أوقات الرحلات، والحد من الازدحام المروري والحوادث، وتعزيز فرص كسب الرزق.

خطة الإدارة والرصد البيئية والاجتماعية

خطط التخفيف

وفي حين أن إصلاح الطرق يرتبط ببعض الآثار السلبية المحتملة، فإن معظمها يمكن تخفيفه. ويقدم الجدولان ٢ و٣ موجزاً لتدابير تخفيف الآثار البيئية والجدول ٤ لتدابير تخفيف الآثار الاجتماعة التي ينبغي اعتمادها لازالة هذه الآثار أو التقليل منها إلى أدنى حد.

الجدول ٢ : خطة التدابير التخفيفية البيئية لطرق قضاء بشري خلال مرحلة التأهيل

الآثار المحتملة	تدابير التخفيف المقترحة	مسؤولية التخفيف	مسؤولية الإشراف المباشر	التكلفة المقدرة
تأخر حركة المرور والازدحام	❑ جدولة نقل مواد البناء خارج ساعات الذروة وخلال الليل. ذروة ساعات حركة المرور هي عموما من ٧ إلى ١٠ صباحا ومن ٣ إلى ٦ مساء. ❑ وضع استراتيجيات لمسارات حركة المرور المتعلقة بالبناء لتجنب المستقبلات الحساسة ❑ إعلام الجمهور بجدول أنشطة إعادة التأهيل ❑ الحفاظ على إمكانية الوصول إلى المؤسسات والمساكن على جانبي الطريق باستحداث تحويرات وميزات الوصول المؤقتة ❑ اشارات تنبيه و انذار قبل ٥٠٠ م من مواقع الأشغال ❑ توفير موظفين لإدارة حركة المرور في موقع إعادة التأهيل، بدعم من الشرطة البلدية إذا لزم الأمر ❑ تجنب أوقات الذروة عند وضع الأسفلت وإلى أقصى حد ممكن، وجدولة أنشطة البناء خارج ذروة موسم الزيارات الصيفية مع الحفاظ دائما على جزء من الطريق سالكا إليها ولا سيما الطريق إلى وادي قاديشا، و هو الطريق الوحيد لوصول ما يقرب من ٢٥٠٠٠٠ زائر في فصل الصيف.	❑ المقاول ❑ البلديات	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة والسلامة و البيئة من بين مهام أخرى	مشمولة كجزء من أنشطة البناء والإشراف. مهندس المقاول في الموقع المسؤول عن الصحة و السلامة و البيئة من بين مهام أخرى مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهام أخرى
انبعاثات الهواء	❑ ضمان الصيانة والإصلاح الكافيين لآلات ومركبات المقاول؛ ❑ الحفاظ على ممارسات التدبير المنزلي الجيدة التي تحافظ على نظافة الموقع والمناطق المحيطة به ❑ ضمان نوعية جيدة من وقود الديزل المستخدم للمعدات في الموقع ❑ إيقاف تشغيل محركات جميع المعدات عندما لا تكون مستخدمة ❑ رش المياه في موقعالاشغال في الأيام العاصفة لإعاقة اثارة الغبار وضبطه في مهب الريح ❑ التأكد من أن التربة المحفورة ومواد البناء الدقيقة المخزنة في الموقع تقع بشكل صحيح بعيدا عن اتجاه الرياح السائد، وأن تسقى و/أو تغطيها بالكامل الأغطية المنيعة عندما لا تكون قيد الاستخدام ❑ التعامل مع مواد الأسمنت بشكل صحيح ❑ الحفاظ على طرق جلب المواد خالية من الغبار وتنظيفها بانتظام ❑ ضمان استخدام نوعية جيدة من الوقود في الشاحنات التي تنقل مواد البناء من وإلى الموقع ❑ ضمان النقل الأمثل والمنتظم لمواد البناء لتقليل تخزين أكوام كبيرة في الموقع وتقليل تركيز رحلات الشاحنات إلى أدنى حد. ❑ تغطية جميع المركبات التي تنقل المواد التي يحتمل أن تؤدي إلى انبعاثات غبار مفرطة؛ ❑ تقييد سرعة المركبات إلى ٢٥ كم/ساعة على الطرق غير المعبدة	❑ المقاول	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة والسلامة و البيئة من بين مهام أخرى	مشمولة كجزء من أنشطة البناء والإشراف. مهندس المقاول في الموقع المسؤول عن الصحة و السلامة و البيئة من بين مهام أخرى مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهام أخرى

الآثار المحتملة	تدابير التخفيف المقترحة	مسؤولية التخفيف	مسؤولية الإشراف المباشر	التكلفة المقدرة
زيادة مستويات الضوضاء	❑ استخدام معدات هادئة / مصانة بشكل جيد ❑ صيانة المعدات بانتظام وإيقاف محركاتها عندما لا تكون مستخدمة ❑ استخدام كاتم الصوت على المعدات ❑ قصر أنشطة إعادة التأهيل على ساعات العمل المحددة بموجب القرار رقم ١٦٣/٢ - ١٩٩٥/١/٣١	❑ المقاول	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة والسلامة و البيئة من بين مهام أخرى	مشمولة كجزء من أنشطة البناء والإشراف. مهندس المقاول في الموقع المسؤول عن الصحة و السلامة و البيئة من بين مهام أخرى مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهام أخرى
التنوع البيولوجي	❑ القيام بأعمال إعادة تأهيل متأنية حيث يصل الطريق إلى نهر أبو علي / قاديشا لتجنب الإضرار بالنظم الإيكولوجية القريبة: ❑ عزل الامتداد المطل على نهر قاديشا / أبو علي مع سياج مسدود بعلو مترين مع حصر إمكانية عبور المشاة للنهر في نقطة واحدة. أيضا، حيث أن العديد من الحافلات يستخدم الطريق ٢ بلاتجاهين، فمن الأهمية بمكان توسيع المنعطفات المعبدة لخدمة هذه الحافلات على طول الطريق ❑ مراقبة حركة العمال وأنشطتهم لتجنب التعدي على النظم الإيكولوجية المجاورة بما في ذلك المناطق الزراعية. ❑ إرشاد العمال إلى حماية النباتات والحيوانات عندما يكون ذلك ممكناوكذلك موائلها. ❑ حظر إلقاء النفايات الصلبة والسائلة في البيئة الطبيعية ❑ تركيب لافتات تنبه لعبور الحيوانات على الطريق ٢ وصولا إلى وادي قاديشا	❑ المقاول	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة والسلامة و البيئة من بين مهام أخرى	مشمولة كجزء من أنشطة البناء والإشراف. مهندس المقاول في الموقع المسؤول عن الصحة و السلامة و البيئة من بين مهام أخرى مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهام أخرى
توليد نفايات البناء	❑ تقليل توليد نفايات البناء ❑ فرز نفايات البناء لإزالة أي مواد خطرة بكفاءة ❑ إعادة استخدام مواد النفايات الخاملة كمواد ردم لإعادة بناء الطرق حيثما كان ذلك ممكنا ❑ وضع ترتيب مع البلدية ومحافظ شمال لبنان لتأمين مواقع مناسبة للتخلص من نفايات البناء	❑ المقاول	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة والسلامة و البيئة من بين مهام أخرى	مشمولة كجزء من أنشطة البناء والإشراف. مهندس المقاول في الموقع المسؤول عن الصحة و السلامة و البيئة من بين مهام أخرى مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهام أخرى
تلوث التربة والموارد المائية	❑ التقليل إلى أدنى حد من استخدام المواد الكيميائية (زيوت التشحيم والزيوت والمذيبات) ❑ ضمان التخزين السليم لمواد البناء والأسفلت والنفط والمواد الكيميائية في الموقع في المناطق الخاضعة للرقابة بشكل جيد وبعيدا عن ضفاف الأنهار ❑ عدم تصريف مياه الصرف الصحي في الأنهار أو في التربة ❑ عدم تصريف نفايات النفط في الأنهار أو على التربة ❑ على المقاول توفير مرحاض المقصورة القابلة للنقل و ربطها بشبكة مياه الصرف الصحي القائمة. و عندما يكون هذا الأخير غير متوفر فب منطقة الأشغال، يتم تصريف مياه المرحاض الآسنة إلى خزان من البولي إيثيلين ا يتم تفريغه عندما يمتلئ في أقرب شبكة مياه الصرف الصحي. ❑ بالنسبة للمركبات والمعدات، سيتعين على المقاول استئجار أرض داخل منطقة المشروع. يجب تسييج هذه الأرض واستخدامها لغرض وقوف السيارات فقط. لا	❑ المقاول	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة والسلامة و البيئة من بين مهام أخرى	مشمولة كجزء من أنشطة البناء والإشراف. مهندس المقاول في الموقع المسؤول عن الصحة و السلامة و البيئة من بين مهام أخرى مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهام أخرى

الآثار المحتملة	تدابير التخفيف المقترحة	مسؤولية التخفيف	مسؤولية المباشر	الإشراف	التكلفة المقدرة
	يجوز للمقاول إجراء أي إصلاح في الموقع وهو ملزم بتنفيذ صيانة المركبات والمعدات في ورشة إصلاح يفضل أن تكون موجودة داخل منطقة المشروع. ❑ لا يجوز ضخ أو التخلص من النفايات أو المياه التي تحتوي على مواد كيميائية نفايات مثل المواد المذيبة، والنفط، والمواد الروحية المعدنية، أو التخلص منها في مصارف مياه الأمطار أو المجاري الصحية أو في باطن الأرض. ❑ تغطية أي مواد بناء مخزونة بغطاء غير قابل للاختراق. ❑ تخزين الديزل في خزانات مخصصة بعيدا عن موقع صيانة الطرق و أقنية تصريف مياه الأمطار وضعه على قاعدة خرسانية مرتفعة لمنع تلويث التربة أو المياه في حالة الانسكاب العرضي في موقع التخزين المحدد. ❑ إجراء جميع عمليات التزود بالوقود خارج الموقع. مركبات الوقود قبل الوصول إلى قسم الطريق. ❑ تقليل استخدام المياه ❑ الحفاظ على تصريف المياه السطحية ❑ التأكد من أنه في حالة حدوث أي انسكابات وقود أو مادة كيميائية، يتم الاهتمام بالمنطقة المتضررة وإزالة التربة العلوية للتخلص منها. ويجب وضع خطة للاستجابة للانسكابات وتدريب جميع العمال على تنفيذها. ❑ مراقبة نقل المركبات للمواد الخطرة ❑ تنظيف الموقع بشكل دوري ❑ ينبغي وضع علامة على كل وعاء بالاسم التقني الصحيح للمادة التي يحتوي عليها. ❑ لا توضع المواد غير المتوافقة في الاحتواء المشترك.				

الآثار المحتملة	تدابير التخفيف المقترحة	مسؤولية التخفيف	مسؤولية المباشر	الإشراف	التكلفة المقدرة
	❑ يخزن الوقود المستعمل أو نفايات الوقود أو غيرها من المواد الكيميائية للنفايات في منطقة معزولة إلى أن يتم جمعها للتخلص منها خارج الموقع من قبل مقاول نفايات معتمد. ❑ ينبغي ألا يتم غسل المركبات والمعدات إلا في مناطق محددة بعيدا عن الطريق قيد الصيانة لحماية نوعية المياه والتربة في المنطقة. ❑ يوفر أوعية تحت الآلات و المعدات لجمع ما قد تسرب منها من الهيدروكربونات (مثل المولدات المتنقلة). ❑ مراقبة جميع العمليات التي تنطوي على استخدام الخرسانة لتجنب الرشح في مصادر المياه. ❑ توفير حاويات في الموقع للتخلص من النفايات غير المتعلقة بالتشييد ❑ العمل مع البلدية لإدراج الموقع على الطريق الحالي لجمع النفايات الصلبة ❑ تقليل وقت تعرض التربة ❑ انشاء جدران الدعم قبل البدء بحفريات أقنية الصرف لمنع جرف التربة ❑ إجراء حفريات لقنوات الصرف بدقة تامة ونقل الناتج عن حفر التربة إلى مواقع خارج الموقع للتخلص منها على النحو السليم في حالة التلوث. ❑ تقليل الوقت الذي تظل قنوات الصرف المحفورة غير مدعمة ❑ الحد من ازالة الغطاء النباتي الى أدنى حد مع تشجيع تشجيع إعادة زرع الغطاء النباتي فور انتهاء أنشطة البناء، في المواقع التي تتم فيها إزالة الغطاء النباتي، ❑ وضع أفخاخ من الجيوتكستايل لجمع الطمي حسب الاقتضاء				
استهلاك الموارد	❑ استبدال أساليب التنظيف الرطب بأساليب التنظيف الجاف كلما كان ذلك عمليًا (كنس، شفط الغبار، مسح... الخ) ، مع الأخذ في الاعتبار حصر توليد الغبار. ❑ تركيب لافتات بالقرب من الأجهزة التي تستخدم المياه لتشجيع الحفاظ على المياه. ❑ استخدام الأغطية غير الراشحة لتغطية الخرسانة بعد رشها بالمياه للحفاظ على الرطوبة والحد من التبخر مما يؤدي إلى تقليل كميات المياه المستخدمة ❑ إيقاف محركات المعدات عندما لا تكون مستخدمة ❑ صيانة الآلات والمولدات بانتظام وتشغيلها بطريقة فعالة. ❑ لا تترك محركات المركبات شغالة لفترات طويلة و هي متوقفة. ❑ يجب عزل مكاتب الموقع بشكل جيد للاحتفاظ بالحرارة أو التبريد، والاستفادة من المصابيح الموفرة للطاقة وأنظمة التبريد الموفرة للطاقة. ❑ إعادة استخدام المواد الناتجة عن عمليات الحفر كلما كان ذلك ممكنا ❑ قبول مواد البناء فقط من مواقع المحاجر المسموح بها	❑ المقاول	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة والسلامة و البيئة من بين مهام أخرى	مشمولة كجزء من أنشطة البناء والإشراف. مهندس المقاول في الموقع المسؤول عن الصحة و السلامة و البيئة من بين مهام أخرى مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهام أخرى

الآثار المحتملة	تدابير التخفيف المقترحة	مسؤولية التخفيف	مسؤولية الإشراف المباشر	التكلفة المقدرة
البنية التحتية القائمة	❑ الحصول على المخططات الأفقية و العامودية لكل طريق ❑ وضع إجراءات للإخطار السريع للبلدية/الوزارة المعنية، في حالة تعطيل أي مرفق قائم، إلى جانب توفير المساعدة الفورية في إعادة الامور الى وضعها السابق، والمتابعة الحثيثة مع السلطات المعنية	❑ المقاول	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة والسلامة و البيئة من بين مهام أخرى	مشمولة كجزء من أنشطة البناء والإشراف. مهندس المقاول في الموقع المسؤول عن الصحة و السلامة و البيئة من بين مهام أخرى مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهام أخرى
التسلل البصري	❑ توثيق الظروف القائمة قبل بدء الأعمال ❑ الحفاظ على الغطاء النباتي القائم عندما يكون ذلك ممكنا ❑ استعادة الغطاء النباتي المنضب عن طريق إعادة الزراعة بالأشجار المتوطنة (الصنوبر والبلوط وما إلى ذلك) حيث يكون القطع ضروريا أثناء البناء. ❑ إزالة جميع المعدات، أكوام الغنائم، وغيرها من المواد بعد البناء ❑ ضمان أن يكون مصدر ضوء الشارع هو الحد الأدنى من الكثافة اللازمة.	❑ المقاول	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة والسلامة و البيئة من بين مهام أخرى	مشمولة كجزء من أنشطة البناء والإشراف. مهندس المقاول في الموقع المسؤول عن الصحة و السلامة و البيئة من بين مهام أخرى مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهام أخرى
الصحة والسلامة	❑ اتباع اللوائح القياسية للسلامة والصحة والبيئة في مجلس الانماء والاعمار والبنك الدولي ❑ التأكد من أن مواقع البناء مغلقة بالكامل وحصر الدخول للعاملين على الموقع فقط ❑ تحوير السير حول الموقع وتوفير ممرات للمشاة ❑ تثبيت لافتات تحذير واضحة ❑ توفير مساحة كافية للتحميل والتنزيل داخل الموقع نفسه ❑ توفير معدات الحماية الشخصية المناسبة لعمال البناء، بما في ذلك الخوذات و أغطية الأذن) ❑ توفير تجهيزات الإسعافات الأولية في الموقع تشمل الأشياء المناسبة (على سبيل المثال السائل المطهر والشاش والقطن وما إلى ذلك وغيرها من البنود اللازمة للتعامل مع أية جروح وكدمات) ❑ توفير التأمين ضد الحوادث للعمال	❑ المقاول	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة والسلامة و البيئة من بين مهام أخرى	مشمولة كجزء من أنشطة البناء والإشراف. مهندس المقاول في الموقع المسؤول عن الصحة و السلامة و البيئة من بين مهام أخرى مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهام أخرى

الجدول ٣ : خطة التدابير التخفيفية البيئية لطرق قضاء بشري خلال مرحلة التشغيل

الآثار المحتملة	تدابير التخفيف المقترحة	مسؤولية التخفيف	مسؤولية الإشراف المباشر	التكلفة المقدرة
الازدحام المروري والتأخير	❑ صيانة البنية التحتية للسلامة على الطرق	❑ وزارة الأشغال العامة والنقل ❑ البلديات	❑ البلديات	مدرجة كجزء من عقدي الأشغال والإشراف خلال السنة الواحدة من المسؤولية عن العيوب أثناء التشغيل.
الضوضاء	❑ توفير علامات الحد الأقصى للسرعة في المواقع الحرجة وفرض الحد الأقصى للسرعة ❑ إضافة مواد امتصاص الضوضاء القائمة على البيتومين للأسطح على الأقسام المجاورة للمناطق السكنية والمستقبلات الحساسة مثل محمية أرز تنورين. ❑ صيانة الطرق بانتظام	❑ وزارة الأشغال العامة والنقل ❑ البلديات	❑ وزارة الأشغال العامة والنقل ❑ البلديات	مدرجة كجزء من عقدي الأشغال والإشراف خلال السنة الواحدة من المسؤولية عن العيوب أثناء التشغيل.
التنوع البيولوجي	❑ نفس التدابير التخفيفية لمرحلة إعادة التأهيل ❑ الحفاظ على مصدر الإنارة ❑ صيانة مطبات السرعة واللافتات	❑ وزارة الأشغال العامة والنقل ❑ البلديات	❑ وزارة الأشغال العامة والنقل ❑ البلديات	مدرجة كجزء من عقدي الأشغال والإشراف خلال السنة الواحدة من المسؤولية عن العيوب أثناء التشغيل.
جودة المياه والتربة	❑ الحفاظ على أنظمة تصريف المياه السطحية ❑ يجب على المركبات التي تنقل المواد الخطرة إبلاغ الإدارات الإدارية ولا يمكنها الجري على الطريق ما لم تحصل على تصاريح. وبالإضافة إلى ذلك، ينبغي تزويد هذه المركبات بعلامات واضحة ولا يمكن إيقافها إلا في مواقع محددة	❑ وزارة الأشغال العامة والنقل ❑ البلديات	❑ وزارة الأشغال العامة والنقل ❑ البلديات	مدرجة كجزء من عقدي الأشغال والإشراف خلال السنة الواحدة من المسؤولية عن العيوب أثناء التشغيل.
استهلاك الموارد	❑ استخدام معدات ذات كفاءة في استخدام المياه أثناء عمليات الصيانة لتجنب الإفراط في استخدام المياه	❑ وزارة الأشغال العامة والنقل ❑ البلديات	❑ وزارة الأشغال العامة والنقل ❑ البلديات	مدرجة كجزء من عقدي الأشغال والإشراف خلال السنة الواحدة من المسؤولية عن العيوب أثناء التشغيل.
التسلل البصري	❑ ضمان إطفاء الأنوار بواسطة جهاز توقيت أو يدويًا عندما لا تكون هناك حاجة إليها.	❑ وزارة الأشغال العامة والنقل ❑ البلديات	❑ وزارة الأشغال العامة والنقل ❑ البلديات	مدرجة كجزء من عقدي الأشغال والإشراف خلال السنة الواحدة من المسؤولية عن العيوب أثناء التشغيل.
الصحة والسلامة	❑ اتبع لوائح السلامة والصحة والبيئة القياسية في مجلس الإنماء والاعمار والبنك الدولي أثناء أعمال الصيانة ❑ إدارة الطرق واللافتات ولصيانتها بكفاءة	❑ وزارة الأشغال العامة والنقل ❑ البلديات	❑ وزارة الأشغال العامة والنقل ❑ البلديات	مدرجة كجزء من عقدي الأشغال والإشراف خلال السنة الواحدة من المسؤولية عن العيوب أثناء التشغيل.

الجدول ٤ : خطة التدابير التخفيفية الاجتماعية لطرق قضاء بشري خلال مرحلة التأهيل

الآثار المحتملة	تدابير التخفيف المقترحة	مسؤولية التخفيف	مسؤولية الإشراف المباشر	التكلفة المقدرة
الاقتصادية الاجتماعية	❑ إعلام الجمهور بجدول أنشطة البناء ❑ توفير إمكانية وصول بديلة إلى المساكن والشركات على جانب الطريق ❑ اعتماد خطط لإدارة حركة المرور لضمان حركة مرور آمنة وفعالة ❑ وضع معايير واضحة ونشرها عن التوظيف و تخصيص الوظائف ، مع مراعاة نسبة العمال من السوريين واللبنانيين في بيئة العمل، وفئات الوظائف والتخصصات المقتصرة على المواطنين اللبنانيين حصرا، والنظر أيضا في حصص المجموعات الفرعية داخل المجتمعات المحلية. ❑ ضمان استيفاء متطلبات تصريح العمل وفقا للوائح وزارة العمل ❑ الحفاظ على سجل العمل وسجل التحقق من السن للحماية من عمل الأطفال المحتمل ❑ ضمان عدم التمييز والمعاملة العادلة مثل المساواة في الأجور/الاستحقاقات وظروف العمل بين العمال ❑ إنشاء آلية تظلم فعالة للجمهور لتقديم شكاويهم. وينبغي أن تضمن الآلية وصول الشكاوى إلى الطراف المعنية، بمن فيهم المقاول، والاستشاري المشرف، والبلديات، و مجلس الانماء و الاعمار، والعمال. ❑ توفير خيار عدم الكشف عن الهوية بموجب آلية استعراض الانتهاكات للشكاوى الداخلية والخارجية على حد سواء. ❑ استمرار صلاحية بوالص التأمين التي تغطي جميع العمال في حالة الإصابة أو الحوادث أثناء تنفيذ الأشغال	❑ المقاول ❑ مجلس الإنماء والاعمار ❑ البلديات	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة والسلامة و البيئة من بين مهام أخرى	مشمولة كجزء من أنشطة البناء والإشراف. مهندس المقاول في الموقع المسؤول عن الصحة و السلامة و البيئة من بين مهام أخرى مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهام أخرى

خطة الرصد

وبما أن المشروع هو من الفئة باء، فإن أنشطة الرصد لهذه المشاريع تعتمد في المقام الأول على الرصد البصري والتوثيق الفوتوغرافي على الرغم من أن قياسات بعض المؤشرات (تعدادات المرور، ونوعية الهواء/المياه، ومستوى الضوضاء) يمكن إجراؤها بناء على شكاوى الجمهور. ويتولى الاستشاري المشرف على المشروع مسؤولية أنشطة الرصد خلال مرحلة إعادة التأهيل لضمان تنفيذ المقاول لخطة التخفيف. وعند تقديم شكوى من الجمهور، يمكن أيضاً تعيين طرف ثالث (استشاري) من قبل مجلس الانماء و الاعمار لإجراء رصد دوري مع قياس للمؤشرات البيئية حسب طبيعة الشكوى. ويقدم الجدول الخامس موجزاً لمؤشرات/أنشطة الرصد خلال مرحلة إعادة التأهيل.

وخلال مرحلة التشغيل، تصبح أنشطة الرصد المنتظمة بدرجة أكبر من واجبات ومسؤوليات البلديات المحلية وأصحاب المصلحة. وعلى غرار مرحلة إعادة التأهيل، يمكن أيضاً، عند تقديم الشكاوى من الجمهور، تعيين خبير استشاري من طرف ثالث من قبل مجلس الانماء و الاعمار (حتى سنتين بعد إنجاز المشروع) لإجراء مراقبة دورية مع قياسات المؤشرات البيئية حسب طبيعة الشكوى (الجدول ٦).

وخلال مرحلة إعادة التأهيل، يقدم الاستشاري المشرف تقريرا فصليا عن أنشطة الرصد إلى مختلف أصحاب المصلحة بما في ذلك مجلس الانماء و الاعمار والبلديات. وتكون هذه التقارير متاحة بسهولة أو يمكن أن يطلع عليها الجمهور عند تقديمها. وينبغي أن يعكس محتوى التقرير النموذجي مؤشرات خطة التخفيف معززا بوثائق فوتوغرافية ملائمة وإجراءات تتخذ في حالة وقوع حوادث أو ما يثير الاهتمام أو الشكاوى.

الجدول ٥ ـ خطة الرصد البيئي والاجتماعي لطرق قضاء بشري خلال مرحلة التأهيل

الاثر	أنشطة الرصد	المسؤوليه	التردد/المده	الموقع	الاساليب	التكلفة المقدرة١
حركه المرور	الإشراف المستمر مع توثيق التصوير الدوري لتدابير التخفيف (الازدحام، تعطل حركة المرور، حدود السرعة، ساعات العمل، وجود شرطة المرور وعامل البناء في المنعطفات)	استشاري مشرف	يومي	في موقع إعادة التأهيل	المراقبة البصرية والتوثيق الفوتوغرافي	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهامه الأخرى
حركه المرور جودة الهواء	الإشراف المستمر مع توثيق التصوير الفوتوغرافي الدوري لتدابير التخفيف (الازدحام، تعطل حركة المرور، حدود السرعة، ساعات العمل، وجود شرطة المرور وعامل البناء في تحويرات السير)	الاستشاري المشرف	يومي	في موقع إعادة التأهيل	المراقبة البصرية والتوثيق الفوتوغرافي	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهامه الأخرى
	الإشراف المستمر مع التوثيق الفوتوغرافي الدوري لتدابير التخفيف (انبعاثات المركبات وآليات الحفر، وإيقاف محركات المعدات غير المستخدمة، وصيانة المعدات، ونوع الوقود المستخدم في الموقع وفي شاحنات التزويد بالمواد، وحدود السرعة، ونظافة الموقع، ورش المياه، وظروف تخزين التربة ومواد البناء الدقيقة، وساعات العمل، وجدول نقل المواد	الاستشاري المشرف	يومي	في موقع إعادة التأهيل	المراقبة البصرية والتوثيق الفوتوغرافي	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهامه الأخرى
الضوضاء -الضوضاء	مجموع الجسيمات المعلقة TSP ، PM10، PM2.5 (حيثما كان ذلك ممكنا)، أكاسيد الكبريت، أكاسيد النيتروجين و أول أوكسيد الكربون	استشاري طرف ثالث لمجلس الانماء والإعمار	بناء على شكوى من الجمهور	في الموقع وفي المستقبلات الحساسة ضمن مسافة ١٠٠ متر من الموقع	قياسات لساعة واحدة والمراقبة البصرية لتشتت الغبار (الحجم والاتجاه)	٢٠٠٠ دولارلكل مرة
	الإشراف المستمر مع التوثيق الفوتوغرافي الدوري لتدابير التخفيف (كاتواتم الصوت، وصيانة المعدات، وإيقاف تشغيل محركات المعدات عند عدم استخدامها، وحدود السرعة، وساعات العمل) وقياسات المؤشرات في حالة الشكاوى من الجمهور	الاستشاري المشرف	يومي	في موقع إعادة التأهيل	المراقبة البصرية والتوثيق الفوتوغرافي	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهامه الأخرى
التنوع البيولوجي	L_{eq}, L_{min} and L_{max}	مستشار طرف ثالث مجلس الانماء والإعمار	بناء على شكوى من الجمهور	في الموقع وفي المستقبلات الحساسة ضمن نطاق ١٠٠ متر من الموقع	عينة واحدة لكل موقع (قراءة كل ساعة واحدة لمدة ١٥ دقيقة على المعدل ، صباحا (٧-٨ صباحا) و (١-٢ ب.ظ) وليلا (٤-٥ مساءً)	٥٠٠ دولار/ حدث
التنوع البيولوجي	الإشراف المستمر مع التوثيق الفوتوغرافي الدوري لتدابير التخفيف، حركة العمال ونشاطهم، والتخلص من النفايات، وما إلى ذلك	الاستشاري المشرف	يومي	في موقع إعادة التأهيل	المراقبة البصرية والتوثيق الفوتوغرافي	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من

						بين مهامه الأخرى
النفايات الصلبة من الأشغال و غيرها	الإشراف المستمر مع التوثيق الفوتوغرافي الدوري لتدابير التخفيف مع الاحتفاظ بسجل لتوليد النفايات وجمعها وعزلها وتخزينها ونقلها والتخلص منها من حيث نوع النفايات المتولدة وكميتها وموقع التخلص منها	الاستشاري المشرف	يومي	في موقع إعادة التأهيل	المراقبة البصرية والتوثيق الفوتوغرافي	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهامه الأخرى
مياه الجريان السطحي/ تصريف المياه	الإشراف المستمر مع الوثائق الفوتوغرافية الدورية (الاستخدام الكيميائي، تخزين المواد الكيميائية، واستخدام المياه، وصناديق للتخلص من النفايات الصلبة، وتصريف مياه الصرف الصحي من المراحيض المتنقلة / المحمولة وخزانات التخزين في شبكة الصرف الصحي القائمة / القريبة. إدارة الانسكابات النفطية) أثناء التحقق من العبارات وخاصة بعد هطول الأمطار	الاستشاري المشرف المقاول	يومي	في موقع إعادة التأهيل	المراقبة البصرية والتوثيق الفوتوغرافي	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهامه الأخرى
استهلاك الموارد	تحليل جودة المياه	مستشار طرف ثالث مجلس الانماء والإعمار	بناء على شكوى الجمهور	في النهر أو مجرى المياه القريب	مجموع المواد الصلبة المعلقة، BOD، COD، الزيوت / الشحوم	١٠٠٠ دولار / حدث
استهلاك الموارد	الإشراف المستمر مع التوثيق الفوتوغرافي الدوري لإعادة استخدام المواد المحفورة والمياه وممارسات حفظ الطاقة وعناصر التصميم	الاستشاري المشرف	يومي	في موقع إعادة التأهيل	المراقبة البصرية والتوثيق الفوتوغرافي	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهامه الأخرى
البنية التحتية القائمة	الإشراف المستمر مع التوثيق الفوتوغرافي الدوري للتنقيب والاستجابة لتعطيل المرافق تحت الأرض	الاشراف مشرف	يومي	في موقع إعادة التأهيل	المراقبة البصرية والتوثيق الفوتوغرافي	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهامه الأخرى
التسلل البصري	الإشراف المستمر مع التوثيق الفوتوغرافي الدوري للتنقيب وإعادة الزراعة / إعادة الغطاء النباتي أثناء التحقق من المجاري خاصة بعد أحداث هطول الأمطار	الاشراف مشرف	يومي	في موقع إعادة التأهيل	المراقبة البصرية والتوثيق الفوتوغرافي	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهامه الأخرى
الصحة والسلامة	الإشراف المستمر مع وثائق التصوير الدوري (PPE، نطاق الموقع، المناطق العازلة، علامات التحذير، مجموعة الإسعافات الأولية، والتأمين ضد الحوادث)، مع الحفاظ على سجل من الإصابات / الحوادث التي تحدد السبب والموقع	الاشراف مستشار بلديه	يومي	في موقع إعادة التأهيل	المراقبة البصرية والتوثيق الفوتوغرافي	مهندس الاستشاري في الموقع المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهامه الأخرى
الاجتماعية	الإشراف المستمر مع التوثيق الفوتوغرافي الدوري لتدابير التخفيف مع الحفاظ على سجل التوظيف والتظلم ، واتاحة	الاشراف	يومي	في موقع إعادة التأهيل	المراقبة البصرية والتوثيق	مهندس الاستشاري في الموقع

والاقتصادية	برنامج العمل لاطلاع الجمهور ، وتأمين الوصول إلى المؤسسات والمساكن على جانب الطريق ، وسجل المظالم. توثيق التدريب والتوعية بـ "التقييم البيئي الاستراتيجي/الصحة" وتوقيع مدونة قواعد السلوك وكذلك سجل التحقق من السن منعا لتشغيل الأطفال.	مشرف	الفوتوغرافي	المسؤول عن الإشراف على الصحة و السلامة و البيئة من بين مهامه الأخرى

الجدول ٦ : خطة الرصد البيئي والاجتماعي لطرق قضاء بشري خلال مرحلة التشغيل (حتى سنة بعد استكمال تنفيذ المشروع)

الاثر	أنشطة الرصد	المسؤوليه	التردد/المده	الموقع	الاساليب	التكلفة المقدرة
جودة الهواء	مجموع الجسيمات المعلقة ((TSP، PM10، PM2.5 (حيثما كان ذلك ممكنا)، أكاسيد الكبريت، أكاسيد النيتروجين وCO	طرف ثالث مستشار	بناء على شكوى من الجمهور	في الموقع وفي المستقبلات الحساسة على بعد ١٠٠ متر من الموقع	قياسات ساعة واحدة والمراقبة البصرية لتشتت الغبار (الحجم والاتجاه)	٢٠٠٠ دولار/حدث
الضوضاء	Leq وLmin وLmax	مستشار طرف ثالث	بناء على شكوى من الجمهور	في الموقع وفي المستقبلات الحساسة على بعد ١٠٠ متر من الموقع	عينة واحدة لكل موقع (قراءة كل ساعة واحدة لمدة ١٥ دقيقة على المعدل ، صباحا (٧-٨ صباحا) و (١-٢ ب.ظ) وليلا (٤-٥ مساءً)	٥٠٠ دولار/ حدث
المياه	Totals suspended solids, BOD, COD, Oil and grease	مستشار طرف ثالث	بناء على شكوى من الجمهور	في النهر القريب و مجرى المياه القريب	فحص تحليلي لعينة واحدة	١٠٠٠ دولار / حدث

مشاورة وإبلاغ العامة والية مراجعة الشكاوى

مشاورة العامة

عُقد اجتماع تشاوري عام في ١٣ كانون الأول ٢٠١٩ في اتحاد البلديات في قضاء بشري في الديمان تم خلاله عرض نتائج خطة الادارة البيئية الاجتماعية (انظر المرفق دال للتقرير الأساسي). وحضر الاجتماع خمسة عشر فردا من بينهم أربع نساء و رؤساء البلديات أو من يمثلهم في قضاء بشري، و ممثلين للمنظمات غير الحكومية والتعاونيات في القضاء. وأثيرت عدة مسائل خلال الاجتماع كاننها:

- المعايير الاختيار المطبقة لاختيار الطرق التي ستخضع للتأهيل ليست شفافة و غير واضحة.
- بعض أقسام الطرق المقترحة للتأهيل كانت قد خضعت مؤخرا لأعمال إعادة التأهيل. وكان هناك تساؤل حول امكانية تحويل الميزانية المخصصة إلى أعمال إضافية على طول تلك الطرق؟
- تفضيل الإضاءة على طول الطرق وليس داخل القرى فقط لأنها تكون عادة مضاءة.
- وخلال أعمال إعادة تأهيل الطريق ٢، ينبغي للمقاول أن يكفل إمكانية استخدام أجزاء من الطريق لأن هذا الطريق هو الطريق الوحيد المؤدي إلى وادي قاديشا.
- ينبغي عدم جدولة أعمال إعادة التأهيل على هذا الطريق خلال موسم الذروة من الزيارات السياحية في فصل الصيف، الذي يمتد من شهر حزيران حتى منتصف أيلول. وعلاوة على ذلك، ينبغي التعجيل بالأعمال على هذا الطريق ويفضل أن تكتمل في غضون شهرين.
- الطريق ٢ يستخدم كثيرا من الحافلات، فمن الأهمية بمكان توسيع المنعطفات المعبدة لخدمة هذه الحافلات على طول الطريق
- يمكن إعادة استخدام نفايات البناء من قبل مقاولين آخرين في المنطقة (مثل حميد كيروز)، حسب حالة مشاريعهم. كما يجب فرز الأسفلت المطحون والتعامل معه بمفرده. لا ينبغي استخدامه لاعادة طمر الحفريات.
- على المقاول إعطاء فرص العمل للسكان المحليين من القرى التي تجري فيها إعادة تأهيل الطرق بالأولوية.
- تنفيذ الأشغال حسب الجدول الزمني المعتمد بدقة.
- تمت مناقشة فرص العمل لكل من العمال اللبنانيين والسوريين. والسوريون يساهمون بشكل كبير في قطاع البناء في جميع أنحاء لبنان بما في ذلك قضاء بشري. وإلى جانب القطاع الخاص، تلجأ البلديات إلى العمالة السورية في هذا القطاع على وجه الخصوص. ويبدو أن هناك تقاسما واضحا في أنواع الوظائف بين المجتمعات المحلية. والخط الفاصل بين الوظائف الماهرة (التي تشغلها أساساً القوى العاملة اللبنانية) والعمالة غير الماهرة (التي يشغلها في المقام الأول العمال السوريون). وقد أدى هذا التقاسم إلى احتواء التوترات و الحد من الصراعات المحتملة بين الطرفين.

- وجرت مناقشة جانبية مع الحضور من النساء قرب نهاية الاجتماع. و قد كشفن عن هواجس مماثلة ومتسقة على النحو المبين أعلاه. وبالإضافة إلى ذلك، تم الاتصال بالعديد من المنظمات غير الحكومية المحلية وأصحاب المصلحة (الذين يعملون على مستوى لبنان بأكمله) للحصول على مساهماتهم حول معرفتهم وخبرتهم مع القوى العاملة السورية محلياً وفي لبنان. واستناداً إلى هذه المحادثات، تبين أن العمال السوريين موجودون في منطقة المشروع ويتم الاعتماد عليهم عادة لا سيما في قطاعي البناء والزراعة.

ومن المقترح إنشاء آلية لمراجعة الشكاوى لتمكين أصحاب المصلحة الداخليين والخارجيين من التعبير عن شواغلهم خلال مراحل المشروع: ما قبل البناء، وخلال تنفيذ الاشغال، و خلال التشغيل. وتهدف هذه الآلية المقترحة السماح بحل الاشكالات في الوقت المناسب، مع طمأنة أصحاب المصلحة إلى أن الشكاوى قد سُمعت على مختلف المستويات وأن الآلية المؤسسية ستسفر عن نتيجة عادلة ونزيهة. وعلاوة على ذلك، تنطبق آلية مراجعة الشكاوى على العمال اللبنانيين والسوريين على حد سواء، بحيث يكون لديهم خيار عدم الكشف عن هويتهم عند تقديم الشكوى لتشجيع العمال على التعبير عن آرائهم دون خوف محتمل من العواقب.

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LIST OF ABBREVIATIONS

AREC	American University of Beirut Advancing Research Enabling Communities Center
AUB	American University of Beirut
CDR	Council for Development and Reconstruction
DoA	Department of Antiquities
EA	Environmental Assessment
EIA	Environmental Impact Assessment
ESC	Environmental and Social Consideration
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FI	Financial Intermediary
GIS	Geographic Information Systems
GOL	Government of Lebanon
GRM	Grievance Redress Mechanism
IBA	Important Bird Area
IEE	Initial Environmental Examination
LARI	Lebanese Agricultural Research Institute
MoA	Ministry of Agriculture
MoC	Ministry of Culture
MoE	Ministry of Environment
MoEW	Ministry of Energy and Water
MoIM	Ministry of Interior and Municipalities
MoL	Ministry of Labor
MoPWT	Ministry of Public Works and Transport
MSL	Mean Sea Level
NGO	Non-Governmental Organization
OP	Operational Policy
PIU	Project Implementation Unit
REP	Lebanon Roads and Employment Project
SEA/H	Sexual Abuse and Exploitation and Harassment
WB	World Bank

LIST OF NOMENCLATURES

%	Percent
□g	Microgram
g	Gram
kg	Kilograms
km	Kilometers
Leq	Average equivalent noise levels
Lmin	Minimum noise level
Lmax	Maximum noise level
MJ	Mega Joules
min	Minutes
mm	millimeter
hr	Hour
ha	Hectare
m^2	Square meter
m^3	Cubic meter
ppm	Parts per million
s	Seconds

1 INTRODUCTION

1.1 Project background

The Government of Lebanon (GOL) has solicited and obtained World Bank (WB) financing for the Roads and Employment Project (REP). The Council for Development and Reconstruction (CDR) is acting as the executing agency on behalf of the GOL and its Council of Ministers (COM). The REP seeks to improve transport connectivity along select paved road sections and create short term employment opportunities for local communities. These road sections were categorized into six lots (1, 2, 3, 4, 5, and 6), with each lot covering several cazas[1] and each caza encompassing at least one road or more.

The REP involves rehabilitation activities that are confined within the alignments of existing roads with no road widening. The REP triggered the World Bank Operational Policy OP 4.01 requiring Environmental and Social assessment. As such, an Environmental and Social Management Framework (ESMF) was prepared for the REP through CDR with support from the WB (CDR, 2018). The ESMF concluded that the REP activities are not expected to have significant environmental impacts and classified the REP under WB category B projects that require the preparation of an Environmental and Social Management Plan (ESMP) that is normally not associated with further screening or scoping studies for the various roads under consideration. Besides no significant environmental impacts, the ESMF equally anticipated no impacts on physical and cultural resources or natural habitats, no involuntary resettlement, and no land acquisition. Accordingly, a series of ESMPs were stipulated to be prepared at the caza level and put together in packages for bidding purposes. In this context, CDR awarded the contract number 20379 to TEAM International, hereinafter referred to as the Consultant, to prepare the assessment, design and ESMPs of Lot 5 encompassing the of Cazas of Batroun, Bcharre, Koura and Tripoli and Lot 6 encompassing the Cazas of Baalbeck and Hermel under the REP.

This ESMP is concerned with the following roads within the Bcharre district (Caza) of the North Lebanon governorate (Mohafazah):

- Road 2: Deir Mar Lichaa - Wadi Qadisha
- Road 3: Beit Mounzir - Qnat

[1] The Lebanese territory is administratively divided into eight governorates (mouhafazah). These governorates are further divided administratively into 25 districts (cazas). The cazas are further divided into municipalities. Two or more municipalities can form a federation of municipalities. The project covers selected roads in the 25 cazas throughout Lebanon with an expected total length of 835 km grouped in the six lots.

- Road 4: Qnat - Mazraat Aassaf

Refer to Chapter 3- Project Description for details on these roads.

1.2 Project Rationale

The ESMF (CDR, 2018) provided the main rationale behind the REP by elaborating about Lebanon's largely adequate extent and coverage of the road network, but with a substantial percentage in poor condition, hindering local and economic development particularly in rural and lagging underserved regions where the condition of the main network is worse than the national average. The ESMF attributed these poor conditions to several factors including years of underinvestment, inefficient spending, weak capacity in road agencies and the absence of asset management tools. The ESMF stressed that this situation was aggravated by the influx of Syrian refugees which has substantially increased traffic demand and the utilization of the road network. Hence, the general objectives of the REP are to improve transport connectivity along select paved road sections and create short term jobs for Lebanese and Syrians through specific components that encompass rehabilitation and maintenance, improvement of emergency response capacity, and capacity building and implementation support.

1.3 Report Objectives

Pursuant to the World Bank OP 4.01 (Environmental Assessment), this ESMP report seeks to satisfy the following objectives:

- Providing a sound basis for decision-making about the design of the Project components that takes environmental and social considerations into account.
- Ensuring that the Project is implemented with full awareness of environmental and social factors.
- Developing the ESMP for the rehabilitation and operation phases of the Project,
- Informing the public when and how the project implementation may affect their environment, and
- Facilitating the public participation in the decision-making process.

More specifically, the report aims to:

- Establish environmental and socio-economic baseline
- Set the legal, institutional, standards & policies frameworks
- Identify the responsible authorities and assign roles for different organizations in the efficient implementation of this ESMP.

It is worth mentioning here that Decree No. 8633/2012 about Fundamentals of Environmental Impact Assessment (EIA) is not relevant to the Project since this latter is not categorized under either Annex I or II of the EIA Decree.

1.4 Methodology

In order to achieve the ESMP objectives outlined above, we have reviewed relevant project designs and studies particularly the ESMF prepared for the project In addition, we:

- Examined the national legislation and World Bank safeguard policies relevant to the project
- Conducted field visits in 2019 to observe and document baseline conditions and collected data from the relevant municipalities
- Reviewed relevant literature including the project ESMF
- Synthesized and processed information related to coverage using the geographic information systems (AcrGIS Desktop Version 10.61 by ESRI, License type: Advanced) to prepare baseline maps
- Assessed environmental and social impacts associated with the project at various stages of the project using factors such as health and safety as well as the natural environment
- Wherever relevant, defined mitigation measures to alleviate or reduce potential adverse impacts
- Developed a monitoring plan with emphasis on the rehabilitation phase when impacts are expected with estimated implementation resources
- Documented public consultation and opinions with potentially affected stakeholders
- Development of grievance redress mechanisms (GRM) for the project

Note that since the project is category B under the World Bank guidelines, no field measurements of environmental indicators were anticipated (i.e. traffic, air quality, noise levels, water quality) under this contract. Instead, we relied on data from existing studies wherever available. We equally used a worst case condition approach that would form an envelope of the maximum possible impact which when judged to be minor or moderate reflect an acceptable project impact. Details of such an approach are outlined when assessing a specific indicator below (i.e. air quality and noise).

1.5 ESMP Report Structure

Besides the above introductory Chapter, the scope of work implemented in the preparation of the ESMP includes the following:

- Definition of the existing legal and administrative framework (Chapter 2)

- Description of the proposed project (Chapter 3)
- Definition of baseline environmental and social conditions (Chapter 4)
- Identification of potential environmental and social impacts (Chapter 5)
- Identification of environmental and social mitigation measures (Chapter 6)
- Development of the environmental and social mitigation and monitoring plan (Chapter 7)
- Soliciting public participation including grievance redress mechanisms (Chapter 8)

2 LEGAL, INSTITUTIONAL, STANDARDS AND POLICIES FRAMEWORKS

2.1 Legal Framework

Several laws, decrees, and decisions in Lebanon define the environmental standards and regulations to be met while implementing projects. The most basic and general law is Law No. 444 (Environment Protection Law) dated 8 August 2002. Table 2-1 presents a list of selected legislation relevant to the Project.

Table 2-1. List of selected legislation relevant to the Project

Legislation[2]	*Date of Issue*	*Subject*	*Relevance to the project*
		Environment-related legislation	
Law 80	10/10/2018	Integrated solid waste management law	The requirements of the law shall be adhered to for the management of solid wastes generated from the project.
Law 78	13/04/2018	Law for the protection of air quality	The requirements of the law shall be adhered to for the management of air emissions from the project.
Law 77	13/04/2018	Water Resources Law	Penalizes unauthorized discharges or disposal of any kind of waste in water resources
MOE Decree 8803/2002 and its amendments,	04/10/2002	Organizes the activity of quarries and crushers, licensing procedures, as well as the operation, management and rehabilitation of quarries.	Ensures the provision of construction material and the disposal of construction waste comply with the decree
Law 444	29/7/2002	Environmental protection framework law. Includes the general provisions for the protection of the environment.	Ensures project activities are in line with the requirements of the Law, particularly the articles in Chapter 5 on the protection of environmental media (air, coast, water, noise, facilities, natural resources, etc.)
MOE Decision 8/1	30/1/2001	Updates Decision 1/52 and in setting of the National Standards for Environmental Quality by the MOE	Ensures project activities comply with national environmental standards

[2] Lebanon's legislative body is represented by the Lebanese Parliament that approves and issues Laws. Lebanon's executive body is represented by the Council of Ministers (COM) and is headed by the Presidency of the Council of Ministers. The COM enacts regulations in the form of Decisions (denoted COM Decision Number) and Decrees. Decisions are issued by a specific minister and are limited to the affairs of the ministry that promulgated it. Ministerial Decisions are subject specific.

Legislation[2]	*Date of Issue*	*Subject*	*Relevance to the project*
MOE Decision 1/52	12/9/1996	Setting of the National Standards for Environmental Quality by the MOE	Ensures project activities comply with national environmental standards
MOA Decision 499	14/10/1996	Considers the Cedars of God in Bcharre as protected forest subject to Law 558	Ensures project activities comply with this Decision and adhere to the law for the protection of forests
Law 558	24/07/1996	Law for the protection of forests	The requirements of the law shall be adhered to for the protection of forests.
Decree 2761	19/12/1933	Guidelines related to wastewater management and disposal	Ensures waste management activity comply with the decree
Decree Law 8735	23/08/1974	Maintaining general cleanliness	Ensures project activities adhere to this decree particularly in terms of waste disposal
Cultural heritage related legislation			
MOC Decision 60	16/10/1997	Inclusion of the Qadisha Valley (Qannoubine and Qozhaya) in the general inventory of historical buildings	Adhering to this Decision which states that it is not allowed to perform any action that would change the natural and environmental landscape of this valley without prior approval from the Directorate General Antiquities on the actions intended and the materials intended to be used
Decree law 166	7/11/1933	Antiquity law	Defines chance find procedures that should be followed in case antiquities were identified in the project site
Urban/ rural planning and construction-related legislation			
Law 58	29/05/1991	Expropriation Law	Adhere to provisions in case the project requires expropriation.
Law 118	30/06/1977	Municipalities Law. It stipulates the role of the Municipalities and Municipalities councils.	Defines the roles of municipalities in the provision of environmental services such as solid waste management, wastewater management, etc.
Labor-related legislation			
Decree 3791	30/06/2016	Sets minimum wage for employees and workers	Adhere to the requirements of this decree with regards to wages of employees on this project.
Decree 8987	29/09/2012	Prohibition of employment of minors under the age of 18 in work that may harm their health, safety or morals	Adhere to the requirements of this decree with regards to employment for this project.
Decree 11802	30/01/2004	Organizes prevention, safety and occupational health in all institutions subject to the Labor Law	Adhere to the requirements of this decree in terms of occupational health of staff working on the project
Law 400	05/06/2002	Allows the Government to ratify the Minimum Age Convention C-138, 1973	Adhere to the provisions of the convention in terms of prohibition of work to children less than 15 years of age

Legislation[2]	*Date of Issue*	*Subject*	*Relevance to the project*
Law 335	02/08/2001	Allows the Government to ratify the Worst Forms of Child Labour Convention C-182, 1999	Adhere to the provisions of the convention in terms of prohibition of work which is likely to harm the health, safety or morals of children
Labor Law	23/09/1946	Labor law and its amendments	Adhere to provisions of the law and its amendments related to employment contracts, employment of children and women; work hours and holidays, wages, dismissal, inspection, health and safety.
Penal Code	1/3/1943	Penal code	Abide by Article 522
Traffic-related legislation			
Law 243	25/10/2012	New traffic law	Adhere to requirements of this Law with regards to traffic movement of construction-related equipment, re-routing schemes, design of road signage, etc.

2.2 Institutional

Several ministries and government bodies are responsible for transport and traffic related activities in Lebanon including the:

- Council for Development and Reconstruction (CDR)
- Ministry of Public Works and Transportation (MoPWT)
- Ministry of Interior and Municipalities (MoIM)
- Ministry of Environment (MoE)
- Ministry of Culture (MoC) – Department of Antiquities (DoA).
- Ministry of Energy and Water/ Water Establishments/ Electricite du Liban
- Ministry of Agriculture (MoA)
- Ministry of Labor (MoL)

A statement of the transport/traffic related mission of each including aspects related to road-highway construction is summarized in Table 2-2. At this stage, it is expected that the proposed project will involve primarily the CDR. Since some proposed roads may pass near sensitive areas, close coordination with relevant ministries is also anticipated in the event any finds are made. At the completion of the project, the road becomes under the jurisdiction of the MoPWT for the purpose of maintenance and rehabilitation whenever required.

Table 2-2. Summary of functional responsibilities of transport/traffic involved ministries/agencies

Agency	*Mission*	*Role in project*
Council for Development & Reconstruction (CDR)	❑ Plan and arrange for financing of projects including relations with donors and loan management ❑ Execute projects in all sectors ❑ Manage contracts in all sectors, including the transportation sector, which involve planning, design, construction, and supervision of construction	❑ Monitors activities of construction contractors to ensure delivery as per contracts, which will include mitigation and monitoring measures identified in the ESMP
Ministry of Public Works and Transportation (MoPWT)	❑ Organize and supervise land, maritime and air transport ❑ Construct, equip, manage and exploit publicly owned transport modes and facilities and develop them in harmony with the social and economic development and according to the needs of the country ❑ Supervise the safety of transport means and facilities, its maintenance, modernization, and development ❑ Prepare plans and conduct techno-economic studies aiming at operating transport means and facilities ❑ Implement laws and regulations related to the transport and public maritime property ❑ Exercise tutelage authority over the autonomous authorities and public enterprises in the public transport sector ❑ Exercise control over transport concessions ❑ Control and periodically update transport tariffs ❑ Collect and analyze relative data and statistics and operate a road materials lab ❑ Perform and oversee road design ❑ Perform and supervise road studies and execution ❑ Perform road maintenance ❑ Take care of traffic safety in cooperation with other ministries/government agencies ❑ Develop master and detailed plans for cities and villages, and establishing land use regulations ❑ Develop road and street plans within cities and villages	❑ Responsible for operating and maintaining these roads following project completion.
Ministry of Interior and Municipalities (MoIM)	❑ Manage vehicle registration and inspection, and driver licensing ❑ Enforce law, including that of the Traffic Code ❑ Organize and manage civil defense activities and traffic related functions ❑ Contribute to strengthening decentralization and activation of local government ❑ Supervise municipal government units and ensure conformity with administrative and financial regulations ❑ Coordinate among municipal units ❑ Provide technical assistance and support to municipal governments ❑ Cooperate and coordinate with other administrations on issues related to municipal and rural affairs	❑ Municipalities involved in the project have a role in collaborating with the contractor to implement environmental management related measures including solid waste management, wastewater management, traffic management, etc.

Agency	*Mission*	*Role in project*
Ministry of the Environment (MoE)	❑ Monitor and control of environmental protection, preservation of natural sites and amenities ❑ Prevent pollution, protect wildlife, and preserve environmental balance ❑ Set environmental standards, specifications and guidelines ❑ Manage natural resources and amenities ❑ Coordinate and encourage environmental awareness programs	❑ Compliance of ESMP with the Lebanese environmental standards and regulations issued by MoE
Ministry of Culture (MoC) –Department of Antiquities	❑ Manage archeological finds ❑ Review and approve project specific "Archaeological Chance Find" procedures which would be used by construction contractors, consulting engineer and archaeological consultants to address actions to be taken if unrecorded archaeological materials are encountered during the course of project implementation	❑ In case of archaeological chance finds, review and approve project specific "Archaeological Chance Find" procedures which would be used by construction contractors, consulting engineer and archaeological consultants to address actions to be taken if unrecorded archaeological materials are encountered during the course of project implementation
Ministry of Energy and Water (MOEW)	❑ In charge of electricity, water, wastewater, irrigation and stormwater drainage projects. ❑ Authorities acting under its auspices are: 4 Water Establishments (Beirut & Mount Lebanon, North, South and Bekaa), the Litani River Authority and Electricite du Liban (EdL)	❑ Coordinate with relevant authorities under the MOEW in case of accidental damage to water and electricity related infrastructure during project implementation.
Ministry of Agriculture (MoA)	❑ In addition to being in charge of the agricultural sector, the MOA is in charge of protecting and promoting the sustainable management of natural and genetic resources, including forests	❑ Coordinate with MOA in case of the need for tree cutting
Ministry of Labor (MoL)	❑ Responsible for labor and employment issues.	❑ Ensure labor laws are adhered to

2.3 Environmental Standards

National environmental standards were issued by the MOE under Decision 1/52 of 1996 and Decision 8/1 of 2001. The latter overrides Decision 1/52 of 1996 and cancels Annexes 1, 2, 6, 7, 8, 9, 11 12, and 13 of Decision 1/52. The three most relevant standards to the current project are the maximum limits of ambient air quality (Table 2-3), the permissible ambient noise levels (Tables 2-4 and 2-5), and the wastewater discharge standards (Tables 2-6 and 2-7), since air and noise emissions as well as wastewater effluents are potential impacts associated with the rehabilitation of roads and should be mitigated to meet the national standards.

2.3.1 Air quality

Table 2-3. Maximum allowable ambient air quality concentrations as per MOE Decision 1/52

Pollutant	*Maximum limits (□g/m³)*	*Avg period*
Sulfur Dioxide (SO_2)	350 120 80	1 hour 24 hours 1 year
Nitrogen Dioxide (NO_2)	200 150 100	1 hour 24 hours 1 year
Ozone (O_3)	150 100	1 hour 8 hours
CO	30,000 10,000	1 hour 8 hours
PM_{10}	120	24 hours
Lead	1.0	1 year
Benzene	5 ppb	1 year

2.3.2 Noise levels

Table 2-4. Lebanese noise guidelines in different zones as per MOE Decision 1/52

Area classification	*Maximum accepted noise level dBA*		
	Day[1]	Evening[2]	Night[3]
Business district	55 – 65	50 – 60	45 –55
Residential area with few construction sites, commercial activities or on highway	50 – 60	45 – 55	40 – 50
Urban residential area	45 – 55	40 – 50	35 – 45
Residential suburb	40 – 50	35 – 45	30 – 40
Rural residential, hospital, public garden	35 – 45	30 – 40	25 – 35
Industrial zone	60 – 70	55 – 65	50 – 60

[1] 7 a.m. to 6 p.m. [2] 6 p.m. to 10 p.m. [3] 10 p.m. to 7 a.m.

Note that the Lebanese noise standards were adopted primarily from the World Health Organization (WHO) standards, which are based on threshold levels for health impacts. Such standards are typically difficult if not impossible to meet near road projects and therefore abatement criteria promulgated by the US Federal Highway Administration (FHWA, 1997) (Table 2-5) are more commonly relied upon for noise impact assessments near road projects.

Table 2-5. Summary of FHWA noise abatement criteria

Land use category	FHWA Standard Leq (dBA)	Description of land use category
A	57 (exterior)	Land where serenity and quiet are of extraordinary importance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreational areas, playgrounds, parks.
C	72 (exterior)	Developed lands, properties or activities not included in A and B
D		Undeveloped land
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums

Source: FHWA (1997)

As for the national occupational noise exposure standards in work areas, they are far higher and include the following:

- 90 dB(A) for a duration of 8 hrs
- 95 dB(A) for a duration of 4 hrs
- 100 dB(A) for a duration of 2 hrs
- 115 dB(A) for a duration of 0.25 hrs

2.3.3 Wastewater discharge

Table 2-6. Limit values for wastewater discharged into surface water as per MOE Decision 8/1

Parameter	*ELV for existing facilities*	*ELV for new facilities*
pH	5 – 9	6 – 9
Temperature	30°C	30°C
BOD_5 mgO_2/L	100	25
COD mgO_2/L	250	125
Total Phosphorous mgP/L	16	10
Total Nitrogen, mgN/L[3]	40	30
Suspended Solids mg/L	200	60
AOX	5	5
Detergents mg/L	3	3
Coliform Bacteria 37°C in 100 ml[4]	2,000	2,000
Salmonellae	absence	absence
Hydrocarbons mg/L	20	20
Phenol index mg/L	0.3	0.3
Oil and Grease mg/L	30	30
Total Organic Carbon (TOC) mg/L	75	75
Ammonia (NH_4^+) mg/L	10	10
Silver (Ag) mg/L	0.1	0.1
Aluminium (Al) mg/L	10	10
Arsenic (As) mg/L	0.1	0.1
Barium (Ba) mg/L	2	2
Cadmium (Cd) mg/L	0.2	0.2
Cobalt (Co) mg/L	0.5	0.5
Chromium total (Cr) mg/L	2	2
Hexavalent Chromium (Cr^{VI}) mg/L	0.5	0.2
Copper total (Cu) mg/L	1.5	0.5
Iron total (Fe) mg/L	5	5
Mercury total (Hg) mg/L	0.05	0.05
Manganese (Mn) mg/L	1	1
Nickel total (Ni) mg/L	2	0.5
Lead total (Pb) mg/L	0.5	0.5
Antimony (Sb) mg/L	0.3	0.3
Tin total (Sn) mg/L	2	2
Zinc total (Zn) mg/L	5	5
Active Cl_2 mg/L	1	1
Cyanides (CN^-)mg/L	0.1	0.1
Fluoride (F^-) mg/L	25	25
Nitrate (NO_3) mg/L	90	90
Phosphate (PO_4^{3-}) mg/L	5	5
Sulphate (SO_4^{2-}) mg/L	1,000	1,000
Sulphide (S^{2-})mg/L	1	1

[3] Sum of Kjeldahl-N (organic N + NH_3), NO_3-N, NO_2-N
[4] For dischargers in close distance to bathing water a stricter ELV could be necessary

Table 2-7. Limit values for wastewater discharged into the sewage network as per MOE Decision 8/1

Parameter	*ELV for existing and new facilities*
pH	6 – 9
Temperature	35°C
BOD_5 mgO_2/L[5]	125
COD mgO_2/L[6]	500
Total Phosphorous mgP/L[7]	10
Total Nitrogen, TN mg/L[8]	60
Suspended Solids mg/L	600
AOX	5
Salmonellae	absence
Hydrocarbons mg/L	20
Phenol index mg/L	5
Oil and Grease mg/L	50
Total Organic Carbon (TOC) mg/L	750
Ammonia (NH^{4+}) mg/L[9]	-
Silver (Ag) mg/L	0.1
Aluminium (Al) mg/L	10
Arsenic (As) mg/L	0.1
Barium (Ba) mg/L	2
Cadmium (Cd) mg/L	0.2
Cobalt (Co) mg/L	1
Chromium total (Cr) mg/L	2
Hexavalent Chromium (Cr^{VI}) mg/L	0.2
Copper total (Cu) mg/L[10]	1
Iron total (Fe) mg/L	5
Mercury total (Hg) mg/L	0.05
Manganese (Mn) mg/L	1
Nickel total (Ni) mg/L[11]	2
Lead total (Pb) mg/L[10]	1
Antimony (Sb) mg/L	0.3
Tin total (Sn) mg/L	2
Zinc total (Zn) mg/L[10]	10
Cyanides (CN^-)mg/L	1
Fluoride (F^-) mg/L	15
Nitrate (NO_3) mg/L[11]	-
Phosphate (PO_4^{3-}) mg/L[11]	-
Sulphate (SO_4^{2-}) mg/L	1,000
Sulphide (S^{2-}) mg/L	1

[5] Assuming an outlet concentration of 25 mg/l and a cleaning capacity of 80 percent
[6] Assuming an outlet concentration of 125 mg/L and a cleaning capacity of 75 percent
[7] Assuming an outlet concentration of 2 mg/l and a cleaning capacity of 80 percent
[8] Assuming connection to a biological waste water treatment plant. Performance of waste water treatment plant related to the concentration in the inflow: 70 – 80 percent, ELV at outlet: 15 mg/L N
[9] Assuming connection to a biological waste water treatment plant. Performance of waste water treatment plant related to the concentration in the inflow: 70 – 80 percent, ELV at outlet: 15 mg/l N
[10] ELV of 0.5 mg/L must be kept at the outlet of WWTP.
[11] ELV of 0.5 mg/L must be kept at the WWTP outlet.
[11] ELV for total nitrogen and total phosphor has to be kept

2.3.4 Gap analysis for national environmental standards

The national environmental standards were compared to their corresponding standards in the WBG Environmental Health and Safety General Guidelines (IFC, 2007). For ambient air quality, the WBG guidelines adopt the WHO ambient air quality guidelines. These guidelines are either the same or stricter than the maximum limits defined by the MOE.

Table 2-8. Comparison of national ambient air quality standards to WHO guidelines

Pollutant	*National standards as per Decision 1/52*		*WHO guidelines*	
	Maximum limits (□g/m³)	*Avg period*	*Maximum limits (□g/m³)*	*Avg period*
Sulfur Dioxide (SO_2)	350 120 80	1 hour 24 hours 1 year	500 20	10 minute 24 hours
Nitrogen Dioxide (NO_2)	200 150 100	1 hour 24 hours 1 year	200 40	1 hour 24 hours 1 year
Ozone (O_3)	150 100	1 hour 8 hours	 100	1 hour 8 hours
CO	30,000 10,000	1 hour 8 hours	NA	1 hour 8 hours
PM_{10}	120	24 hours	50 20	24 hours 1 year
$PM_{2.5}$	NA	NA	25 10	24 hours 1 year
Lead	1.0	1 year	NA	NA
Benzene	5 ppb	1 year	NA	NA

For noise levels, the WBG guidelines set the one-hour Leq at 55 dBA during daytime and 45 dBA during nighttime for residential, institutional and educational areas. These are stricter than the FHWA standard (67 dBA) but less strict than the national standards (35-40 dBA) for rural areas.

As for the wastewater discharge, EHS guidelines provides standards for discharge of treated sewage from an industrial facility to surface water. This does not apply to this project. National limit values for wastewater discharge into surface water and into the sewage network are more detailed in terms of parameters and will be adopted when necessary.

2.4 World Bank Policies

As stated above, the REP triggered the World Bank Operational Policy OP 4.01 requiring Environmental and Social assessment. As such, this ESMP report should comply with the safeguards policies and procedures of the World Bank–OP 4.01 on Environmental and Social Assessment to ensure environmentally sound and sustainable decision making. An ESMF was

prepared for the REP through CDR with support from the WB (CDR, 2018). The ESMF concluded that the REP activities are not expected to have significant environmental impacts and classified the REP under WB category B projects that require the preparation of an ESMP that is normally not associated with further screening or scoping studies for the various roads under consideration. Besides no significant environmental impacts, the ESMF equally anticipated no impacts on physical and cultural resources or natural habitats, no involuntary resettlement, and no land acquisition. The borrower initiates such consultations early when possible. The preparation of this ESMP considered the WBG Environmental Health and Safety General Guidelines (IFC, 2007).

Note that the ESMF recognized that the project implementation might result in small scale land acquisition or impacts on squatters or encroachers approaching to government lands or involuntary taking of land. Therefore, the project triggered the Bank policy on Involuntary Resettlement OP 4.12 and a resettlement policy framework (RPF) was prepared according to the World Bank policy and relevant Lebanese laws and regulations as a guideline for resettlement. However, the proposed roads in the Bcharre district do not involve involuntary resettlement or land acquisition.

2.4.1 Access to Information (AI) policy

Introduced in 2010, the World Bank's Policy on Access to Information (AI Policy) has made the Bank a more effective development partner Based on the concept that any information in the Bank's possession is public, except for that which falls under a defined list of exceptions, the AI Policy remains the standard for international development institutions. It has also provided the basis for the accompanying open initiatives—including Open Data, Open Finances, the Open Knowledge Repository, and the Open Archives—all of which make the Bank's work more transparent, accessible, and accountable.

2.4.2 EHS guidelines

The preparation of this ESMP considered the WBG Environmental Health and Safety General Guidelines which are consistent with the CDR Safety, Health, and Environmental Regulations for Construction Projects (Annex C).

2.5 International treaties and conventions

Lebanon has ratified several international conventions related to the environment in general. Selected laws of relevance to the project impact assessment are summarized in Table 2-9.

Table 2-9. International laws and conventions signed by Lebanon

Date & Place Signed	*Treaty*	*Relevance to the project*
1994 Rio de Janeiro ratified via Law 359 dated 1/8/1994	UN framework convention on climate change with the aim to stabilize greenhouse gas concentrations at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system.	Considers greenhouse gas emissions
1992 Rio de Janeiro ratified via Law 360 dated 1/8/1994	UN framework convention on Biological Diversity: Conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of benefits from the use of genetic resources, including appropriate access to such resources and transfer of relevant technologies	Considers terrestrial biodiversity in the vicinity of the project.
1998	Inscription of Wadi Qadisha (the Holy Valley) and the Forest of the Cedars of God (Horsh Arz el-Rab) on the World Heritage List.	Assessment of potential impacts on the World Heritage Site

3 PROJECT DESCRIPTION

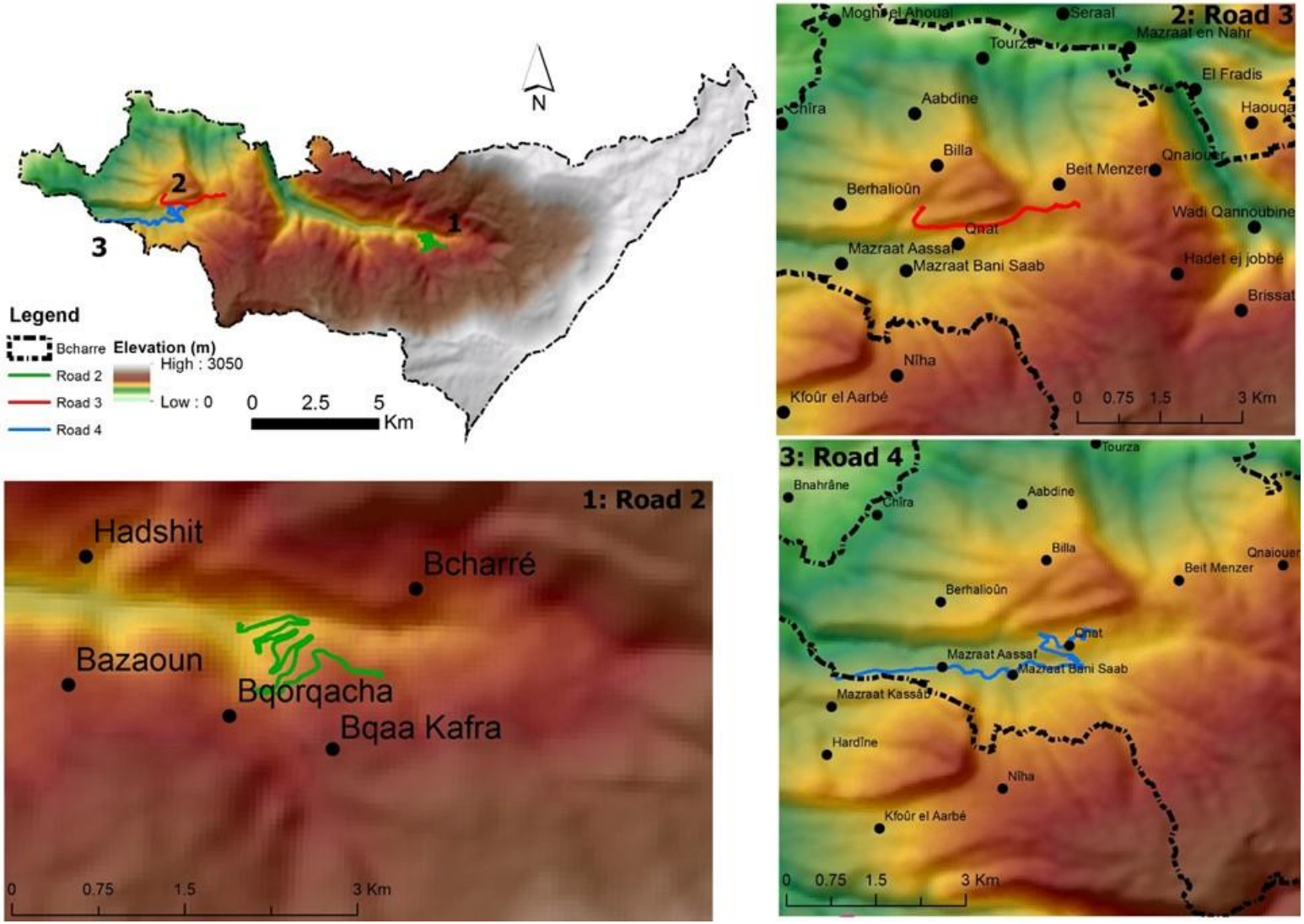
As stated above, the GOL solicited and obtained WB financing for the REP being implemented by CDR towards improving transport connectivity along select paved road sections and create short term employment opportunities for local communities (skilled Lebanese and poor Syrian refugees). The selection of road sections was based on a number of criteria that considers the pavement and safety condition of the road, the level of traffic, the balancing of roads between regions and communities, the balancing of road sections by categories (primary, secondary, and tertiary), and the labor creation potential with broader socioeconomic impacts. Using these criteria, several roads were selected in the Bcharre Caza for rehabilitation, maintenance, and minor construction. Activities to be performed vary between one road and the other, depending on the road rating in terms of the condition of the pavement, shoulders, potential flooding and drainage, potential landslide/soil erosion and retaining walls, and/or pedestrian walkways.

3.1 Location

The proposed roads for rehabilitation are located in the Bcharre Caza, two of them to the west of the Caza and one to the east. A general layout of these roads (Roads 2 – 3 – 4) is presented in Figure 3-1. The location and coordinates of the proposed roads in addition to key characteristic features or potential sensitive receptors are presented in Table 3-1 and the alignment of each road is shown in Figures 3-2 to 3-4.

- Road 2 extends for 4.43 kms. It starts at the existing Bcharre-Tanourine Road and Deir Mar Lichaa intersection and extends towards the Wadi Qadisha (Qadisha Valley).
- Road 3 extends for 3.03 km. It includes the main road connecting Beit Mounzir and Qnat.
- Road 4 extends for 6.58 km. It starts at the middle of Road 3 in Qnat and extends towards Mazraat Aassaf at the Bcharre – Batroun caza boundary.

Figure 3-1. Location overview and elevation of proposed roads within the Bcharre district



Source: Layers by CNRS

Table 3-1. Location and characteristics of Bcharre district proposed roads

Road code	*Location*	*Villages: From to*	*Coordinates*		*Classification*	*Length (Km)*	*Width range (m)*	*Elevation range (m)*	*Key features*
			Start	*End*					
Road 2	Bcharre–Deir Mar Lichaa intersection towards Wadi Qadisha	Deir Mar Lichaa intersection towards Wadi Qadisha	34°14'32.9"N 36°00'31.9"E	34°14'47.6"N 35°59'51.3"E	Primary	4.43	5-7	1400-1071	Valley, high elevations, religious building, few restaurants and residences, monastery
Road 3	Beit Mounzir – El Ghamqa – Qnat	Beit Mounzir - Qnat	34°15'31.6"N 35°54'50.0"E	34°15'28.8"N 35°53'18.6"E	Primary	3.03	5-7	1237-1309	Main road, few scattered residences, monastery, gas station
Road 4	Qnat – Mazraat Bani Saab – Mazraat Aassaf – Bcharre Caza boundary	Qnat - Mazraat Bani Saab	34°15'18.7"N 35°53'56.9"E	34°14'50.0"N 35°51'33.8"E	Primary	6.58	5-7	965-1180	Main road, two small villages, few residences, a monastery, and a small stream

Projected Coordinate System: WGS_1984_UTM_Zone_63N

Figure 3-2. Road alignment of Bcharre Road 2 (Deir Mar Lichaa – Wadi Qadisha) with contour elevations

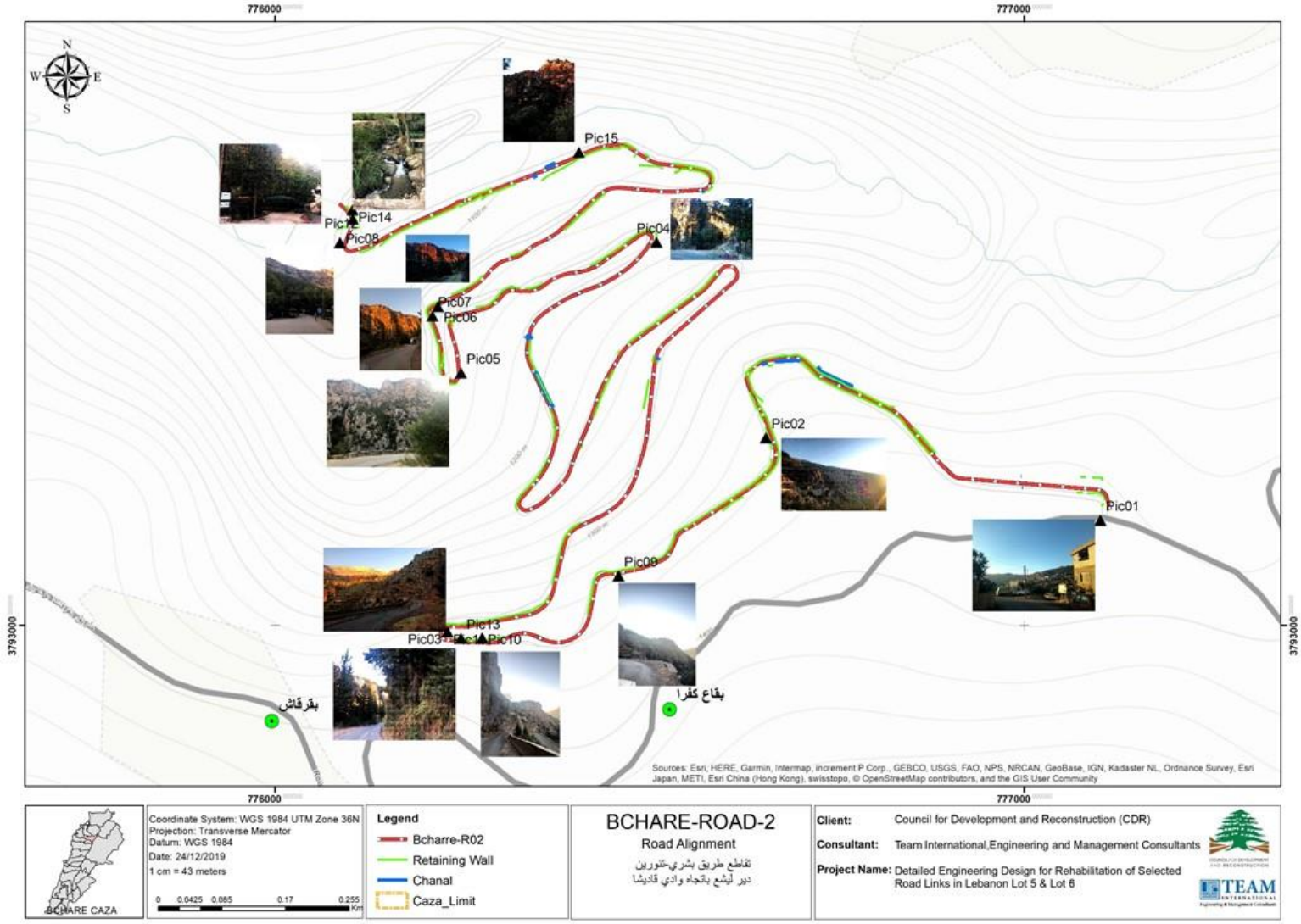


Figure 3-3. Road alignment of Bcharre Road 3 (Beit Mounzir - Qnat) with contour elevations

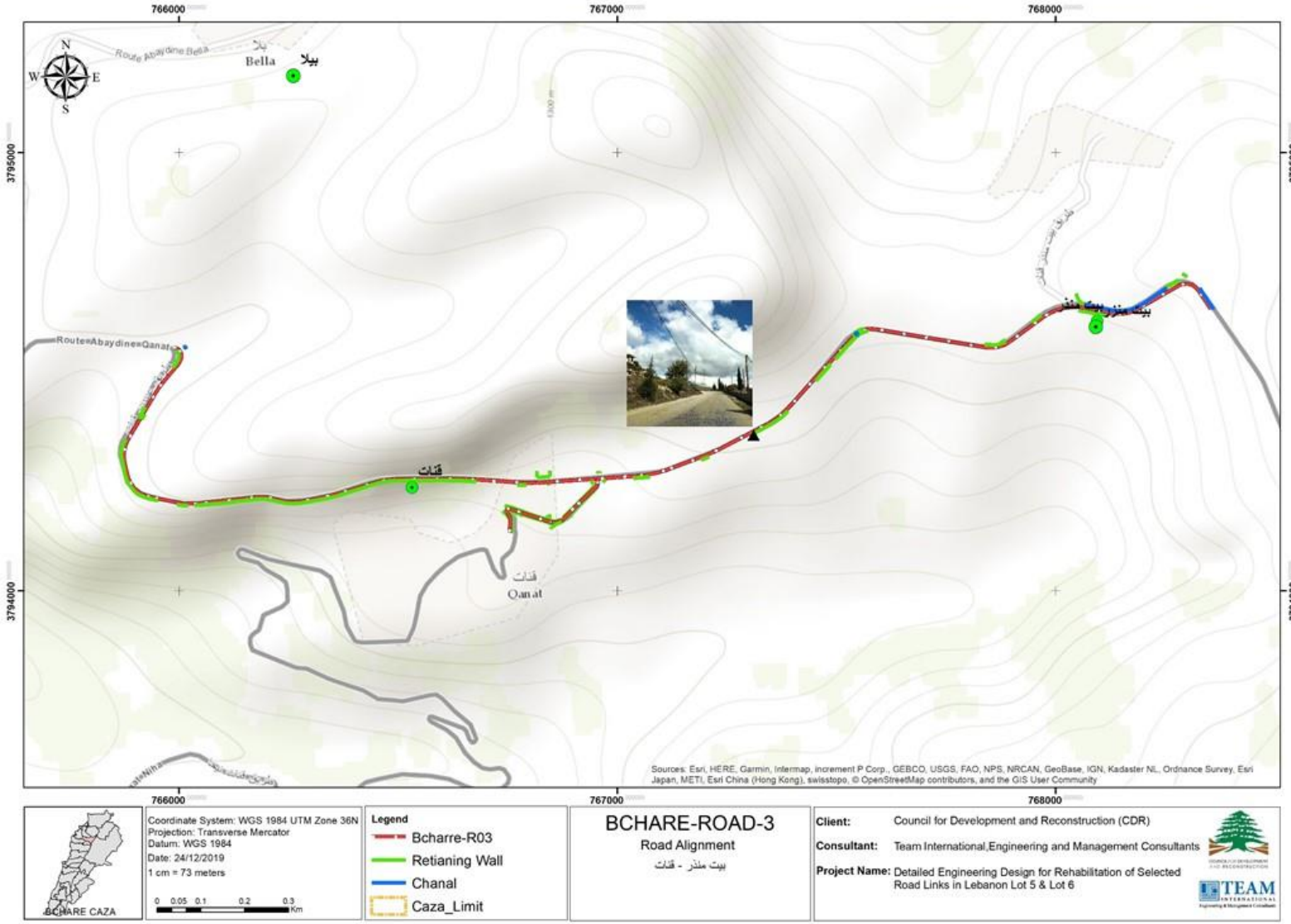
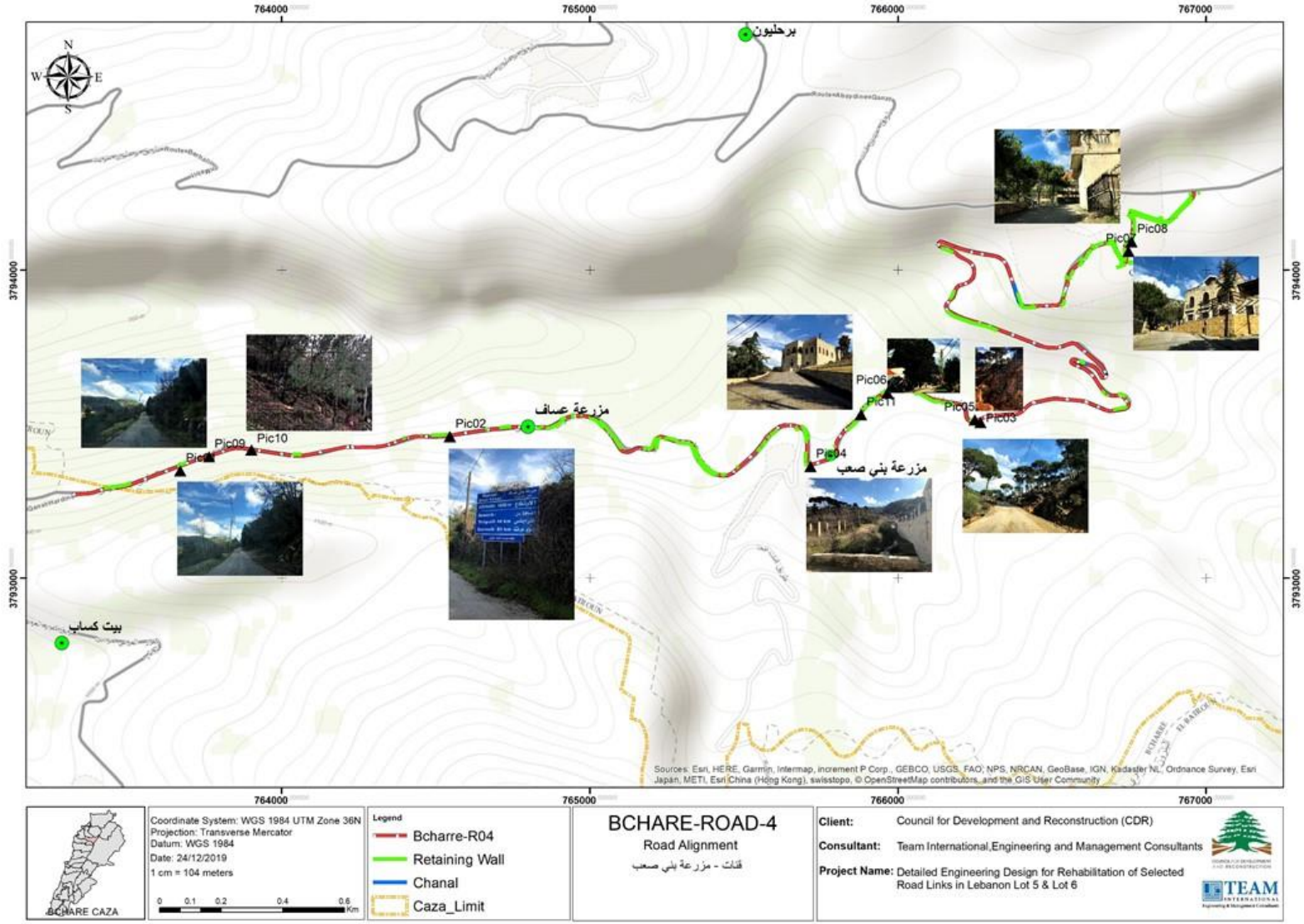


Figure 3-4. Road alignment of Bcharre Road 4 (Qnat - Mazraat Aassaf) with contour elevations



3.2 Project activities

The main civil works which are expected to take place under the REP including the Bcharre caza may include:

- Construction and reconstruction of retaining walls/footwalls;
- Pavement reconstruction (aggregate base course, bituminous base course, …);
- Pavement rehabilitation (Milling & overlay, deep & shallow pothole patching, crack sealing);
- Structural concrete repair;
- Sidewalk repairs and construction;
- Pedestrian Crossings (grade separation/at grade);
- Improvement of the median barrier (construction and repairs);
- Median/Side lighting system and all related electrical and civil works;
- Road marking & signing;
- Storm water drainage improvement (construction and repairs);
- Safety barriers: New Jersey/ Texas barrier and steel guard rail;
- Relocation/Expansion of existing utilities as applicable;
- Other ancillary and associated works including traffic management during rehabilitation;
- Reinstatement of roads disturbed by the works and tapering to the existing roads as necessary.

More specifically, Table 3-2 summarizes the main design elements to be executed along the roads, in addition to asphalting, along with the quantities of construction material needed. Note that the excavations will not exceed 40 cm in depth minimizing potential interference with existing infrastructure such as water supply.

Table 3-2. Design elements along proposed Bcharre district roads with estimated construction material

Road code and villages	*Excavation depth From – to (cm)*	*Excavation Volume (m^3)*	*Retaining walls No. and length (m)*	*Culverts Number*	*Sidewalks (m)*	*Construction Material needed*			
						Reinforced Concrete (m^3)	*Reinforcing Steel (ton)*	*Crushed Aggregate Base Course (m^3)*	*Asphalt Concrete (m^3)*
Bcharre Road 2 *Deir Mar Lichaa – Wadi Qadisha*	20-40	1700	30 3000	1	0	88	8.8	2112	1320
Bcharre Road 3 *Beit Mounzir- Qnat*	20-40	1200	25 3200	3	0	60	6	3840	1200
Bcharre Road 4 *Qnat – Mazraat Bani Assaf*	20-40	2600	28 3600	7	0	1301	13	2216	1540

3.3 Material and Equipment

The following are the types of construction equipment which may be used. Other equipment may be added as needed by the site activities.

- JCBs
- Excavators with jack hammers
- Milling machines
- Bobcats
- Pavers
- Rollers
- Graders
- Shovels
- Soil Compactors
- Pickup trucks
- Trucks
- Pickup trucks with integrated small cranes
- Bitumen tanks with spreaders
- Air Compressors
- Power generators
- Asphalt saw cutters.

The Contractor will not install on-site any plants for asphalt and concrete batch.

3.4 Site Staffing

At this stage, the final number of workers needed for the REP in Caza of Batroun is based on estimation since the total volume of each activity as per the bill of quantities of the tender documents is not prepared yet by the awarded Contractor. Therefore, it is estimated that the rehabilitation works would require the workforce of 150 to 200 laborers.

3.5 Site facilities

The Project site will not include on-site facilities such as site offices for Engineers and for the Contractor, laborers camps, lodging on site, containers, power generators and repair garages.

During the work implementation, the Contractor will have to rent a flat located in the Project area to serve as Project Offices. These offices will be used by the Contractor Engineers, technical skilled workers and Supervising Consultants. The flat will be equipped with toilets, kitchen (including drinking water and appliances), lockers and other supplies needed for the daily administrative

activities. It might also serve as a meeting point for all Project workers at the start and end of their shifts.

The work implementation will also require unskilled workers (laborers) needed to perform earthworks on-site. The Contractor will be encouraged to hire laborers from the local community living in the Project area. During working hours, laborers will be entitled with a one-hour break on-site. Usually, every laborer brings from home his own food and drinking water. The on-site rest point will be decided by the Contractor at the time of works.

The Contractor will have to service the on-site with portable cabin toilet. The porta cabin will be mobile and its placement depends on the length of the work zone. Accordingly, the Contractor will have to move it based on the progress of rehabilitation works. The Contractor should link the porta cabin toilet to the existing wastewater network. In case the network is not available within the work zone, the Contractor will need to link it to a polyethylene storage tank and the Supervising Consultant shall inspect it on a regular basis and ensure emptying the tank when filled into the nearest wastewater network.

For vehicles and equipment, the Contractor will have to rent a land within the Project area. This land should be fenced and used for parking purpose only. The Contractor shall not perform any repair on site and is obliged to execute vehicles and equipment maintenance in a repair shop preferably located within the Project area.

4 BASELINE ENVIRONMENTAL AND SOCIAL CONDITIONS

The preparation of the ESMP report included field surveys to observe and document baseline conditions. Information related to coverage deemed important in the context of the ESMP was synthesized and processed to prepare the maps presented in this report. Field observations coupled with reported literature form the basis for defining the physical, biological, and social characteristics of the general project area as outlined below.

4.1 Physical environment

4.1.1 Topography

Road 2 is located at relatively high elevations varying between 1,200 and 1,400 m ASL. Road 3 falls on a relatively flat terrain at altitudes ranging between 1,250 m and 1,200 m, with no major slope changes. On the other hand, Road 4 starts at an elevation of approximately 1,200 m near Qnat and continues downhill until it reaches around 1,000 m at Mazraat Aassaf and stays at that elevation until it reaches the Bcharre Caza boundary with the Batroun Caza. Figure 4-1 shows the three road layouts as a function of the slopes they cross through. The steep slopes that Road 2 crosses as it descends into Wadi Qadisha are shown in Figure 4-5. The general topographic map of the proposed roads and their surroundings is shown in Figures 4-2 to 4-4.

Figure 4-1. Slopes in the Bcharre area along with the three proposed district roads

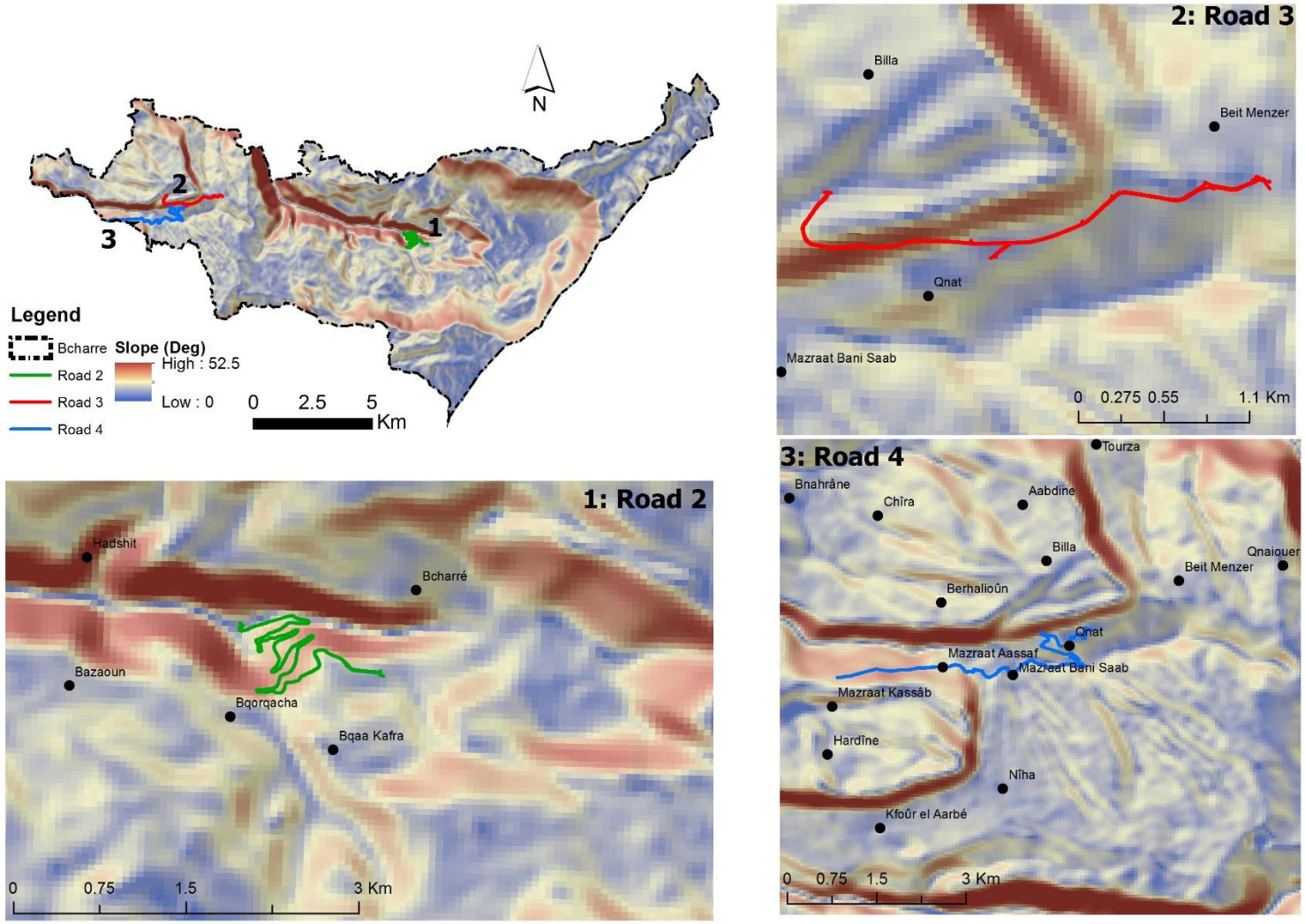
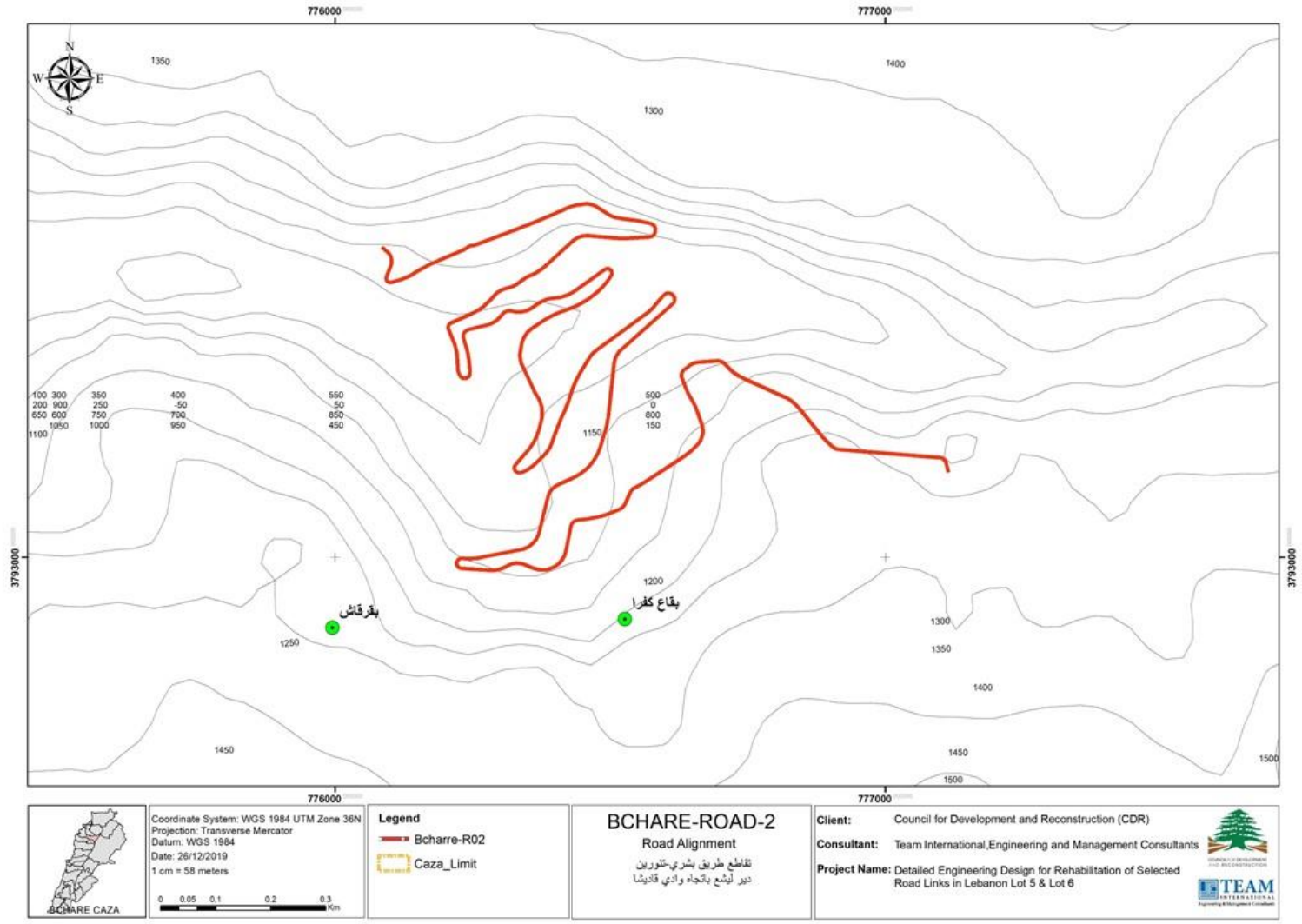
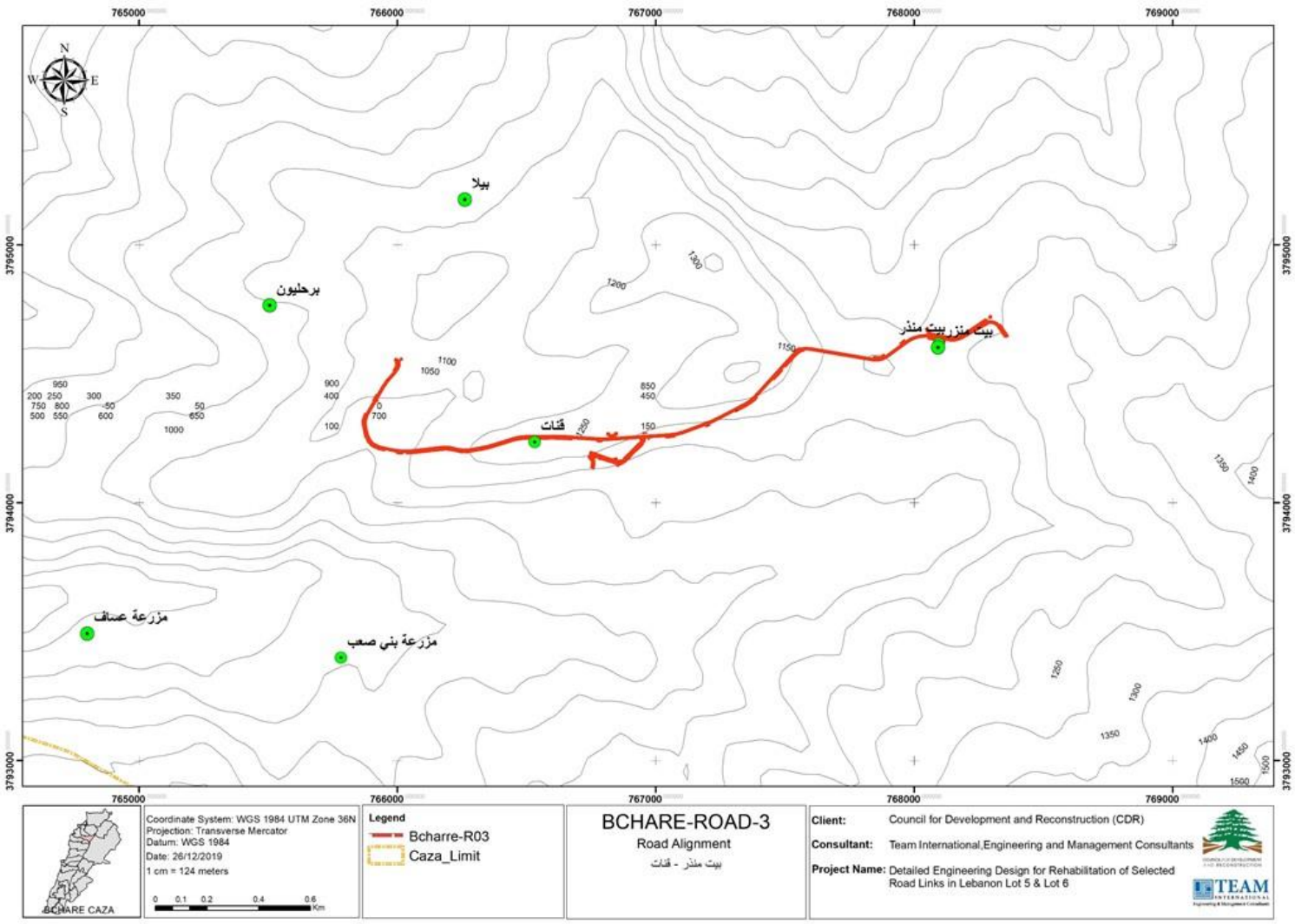


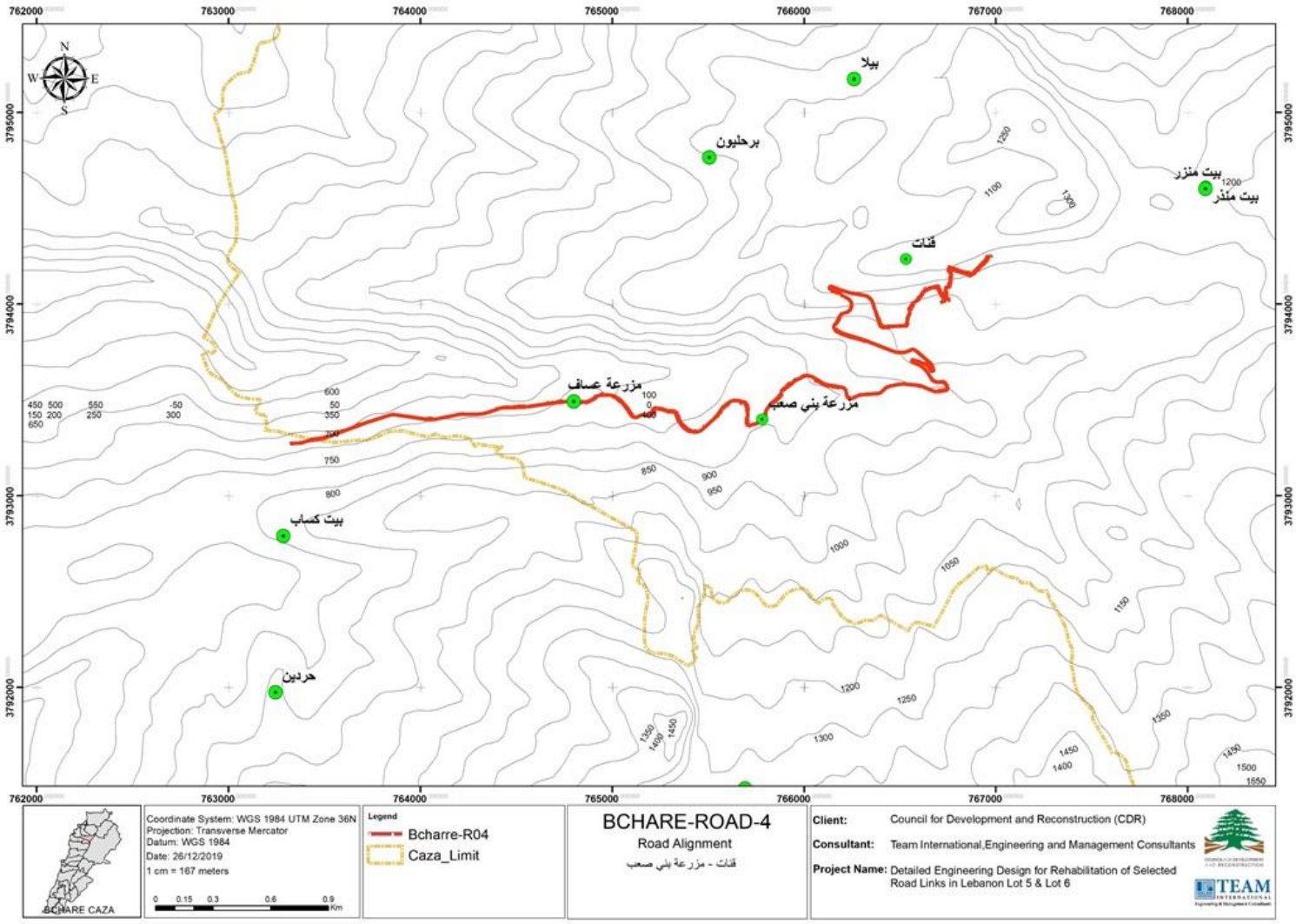
Figure 4-2. Contour maps for the proposed roads in the Bcharre district



Road 2 (Deir Mar Lichaa - Wadi Qadisha)

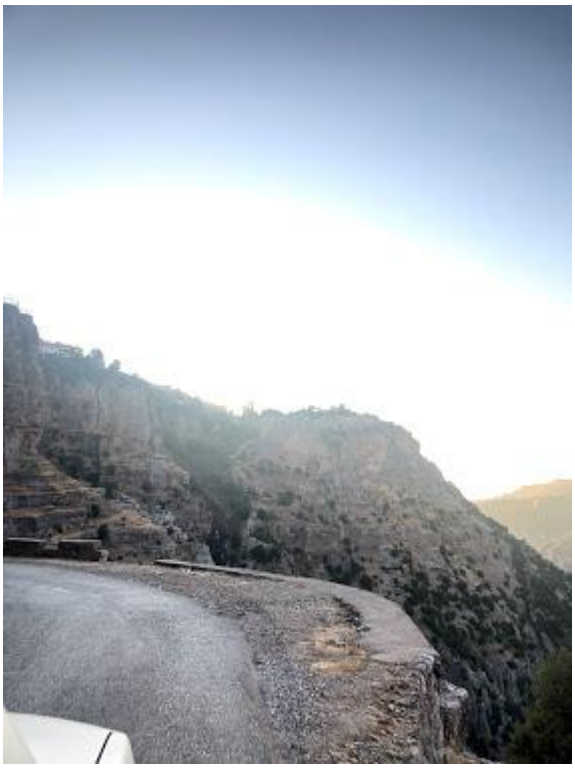


Road 3 (Beit Mounzir - Qnat)



Road 4 (Qnat - Mazraat Aassaf)

Figure 4-3. Steep slopes along Road 2 (Deir Mar Lichaa – Wadi Qadisha)



Road 2- Wadi Qadisha
(34°14'31.2"N 36°00'06.1"E)
A. Maalouf, A. Chehab, M. (Oct, 2019)

Road 2- Wadi Qadisha
(34°14'28.7"N 35°59'58.9"E)
A. Maalouf, A. Chehab, M. (Oct, 2019)

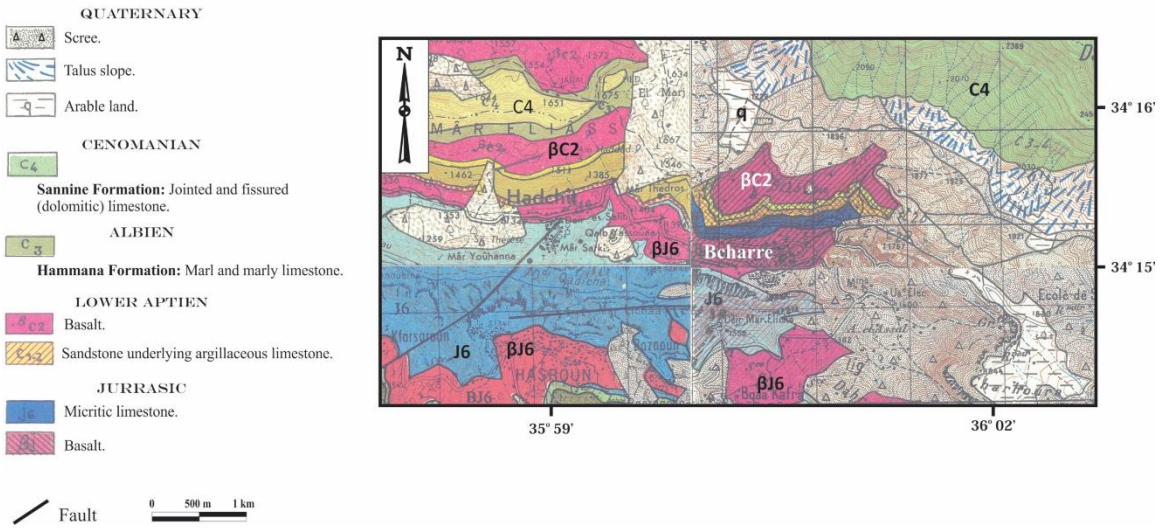
Road 2- Wadi Qadisha (34°14'29.0"N 35°59'57.1"E)
A. Maalouf, A. Chehab, M. (Oct, 2019)

4.1.2 Geology

4.1.2.1 Lithology and main geological formations

As evident in the geological map below, adapted from Wetzel (1945), Dubertret and Wetzel (1945), and Dubertret (1949; 1951), the Bcharre Caza is mainly covered by basalts (βj and βC2) and limestone (J6) (Figure 4-4). It is a mountainous region characterized by relatively steep slopes and cliffs favoring the failure of coherent masses of rocks and rock debris. To the northeast of Bcharre, the Temm Laila Mountain, a dolomitic limestone (C4) exceeding 2,000 m in elevation has steep slopes and it is the source of talus deposits. Elevated rock masses are known to fall, hit the ground, and then bounce and roll. This is inferred from the different cone shaped accumulations (Figure 4-4) of broken rock fragments that eventually generate debris flows (a saturated sediment flow of variable sized particles). These risky zones are abundant in the north, east and southeast of Bcharre Caza and even affect its main road. They are also a concern in regions to the west of the Caza, for instance on the road leading to Hadchit.

Figure 4-4. Geological map of the Bcharre area, Mount Lebanon



Source: Adapted from Wetzel 1945; Dubertret and Wetzel 1945; Dubertret 1949, 1951 (for illustration only)

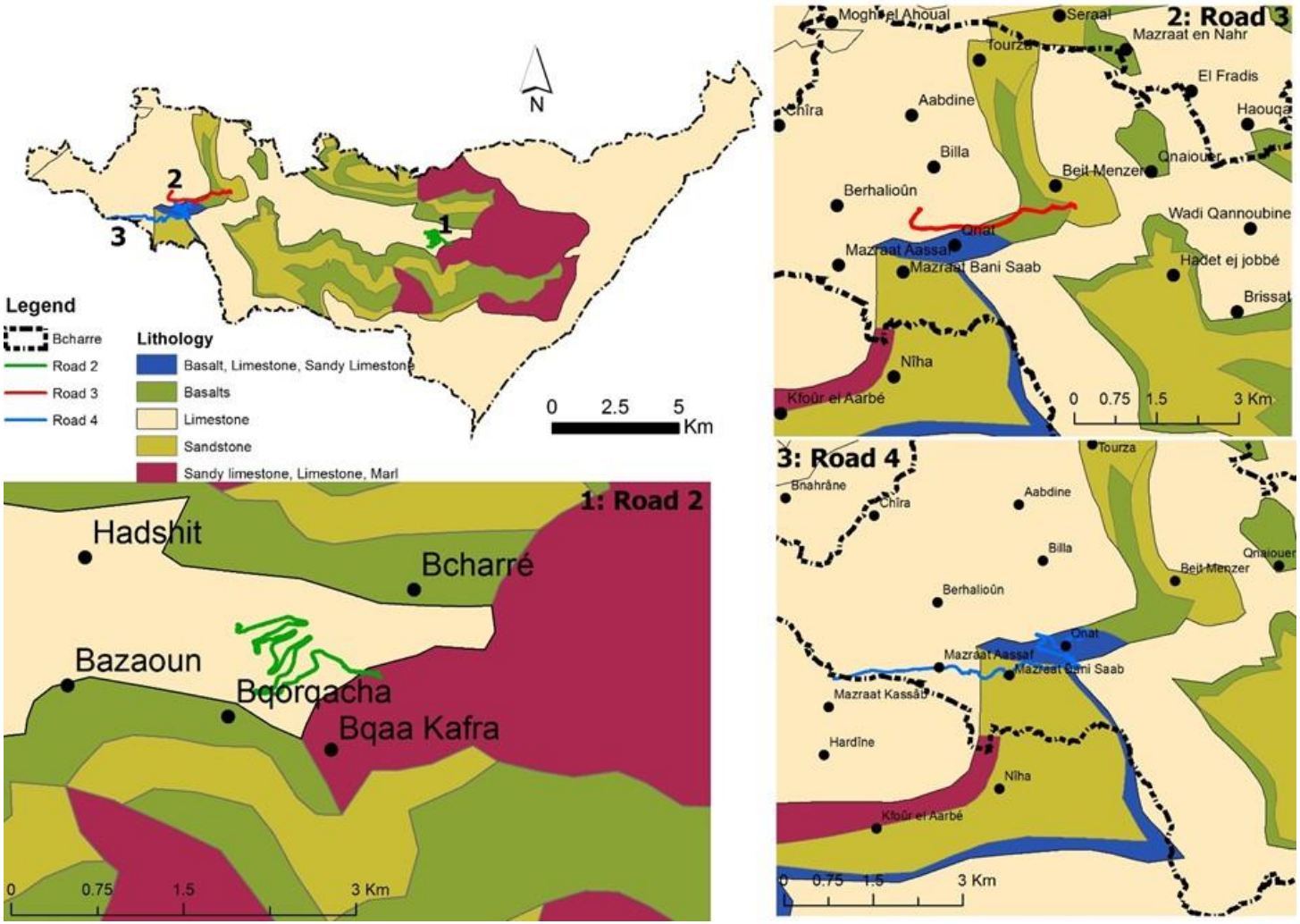
The topmost layer in the area is the Quaternary semi-aquifer, which is made of alluvial deposits and is a conglomerate of different lithologies. It is usually found uncomfortably lying on top of the Jurassic and Cretaceous aged rocks that are very good aquifers (Kesrouane J4 and Sannine C4). The Sannine- aquifer of the Cenomanian age consists of finely bedded limestone, dolomitic limestone and marly limestone and its thickness can range between 750-900 m. Underlying the C4 (Sannine) Aquifer is the Hammana Aquitard, which is made of brown and green marls, with a carbonaceous lithology. The Jurassic age aquifers in this area are mainly the Bikfaya and Keserouane Formations, which alternate with the basaltic aquitard of the Bhannes Formation. The Kesserouane Formation, which is a highly permeable limestone aquifer, can be as thick as 1,000 m

in certain regions of Bcharreh. The main lithology and formations crossed by the three proposed roads are presented in Figure 4-5. Moreover, the distribution of these formations within a 50 m buffer of the roads are shown in Table 4-1. As can be seen in the table, Road 2 crosses predominantly Jurassic (Kesrouane) J4 limestones. Road 3 largely passes in regions with Pliocene Basalts or limestone from the Cenomanian Sannine (C4) formation. Few sections of the road crosses through the Chouf sandstone and to a lesser extent through the basaltic aquitard of the upper Jurassic Bhannes, Bikfaya, Salima formation. Road 4 crosses largely through the same formations as Road 3, with the exception of having a higher percentage crossing through the Chouf sandstone.

Table 4-1. Main lithology and formations crossed by proposed roads

Road	*Lithology*	*Formation*
Road 2: Deir Mar Lichaa-Wadi Qadicha	Limestone	Jurassic (Kesrouane) J4
	Sandy limestone, Limestone, Marl	Middle Cretaceous Abeih, Mdairej, Hemmana (C2a,C2b,C3)
Road 3: Beit Mounzir – Qnat	Limestone	Cenomanian Sannine (C4)
	Basalt, Limestone, Sandy Limestone	Upper Jurassic Bhannes, Bikfaya,Salima (J5,J6,J7)
	Sandstone	Chouf sandstone (C1)
	Basalts	Pliocene Basalts (p)
Road 4: Qnat –Mazraat Aassaf	Limestone	Jurassic (Kesrouane) (J4)
	Limestone	Cenomanian Sannine (C4)
	Basalt, Limestone, Sandy Limestone	Upper Jurassic Bhannes, Bikfaya,Salima (J5,J6,J7)
	Sandy limestone, Limestone, Marl	Middle Cretaceous Abeih, Mdairej, Hemmana (C2a,C2b,C3)
	Sandstone	Chouf sandstone (C1)
	Basalts	Pliocene Basalts (p)

Figure 4-5. Lithology of the Bcharre district and along proposed roads

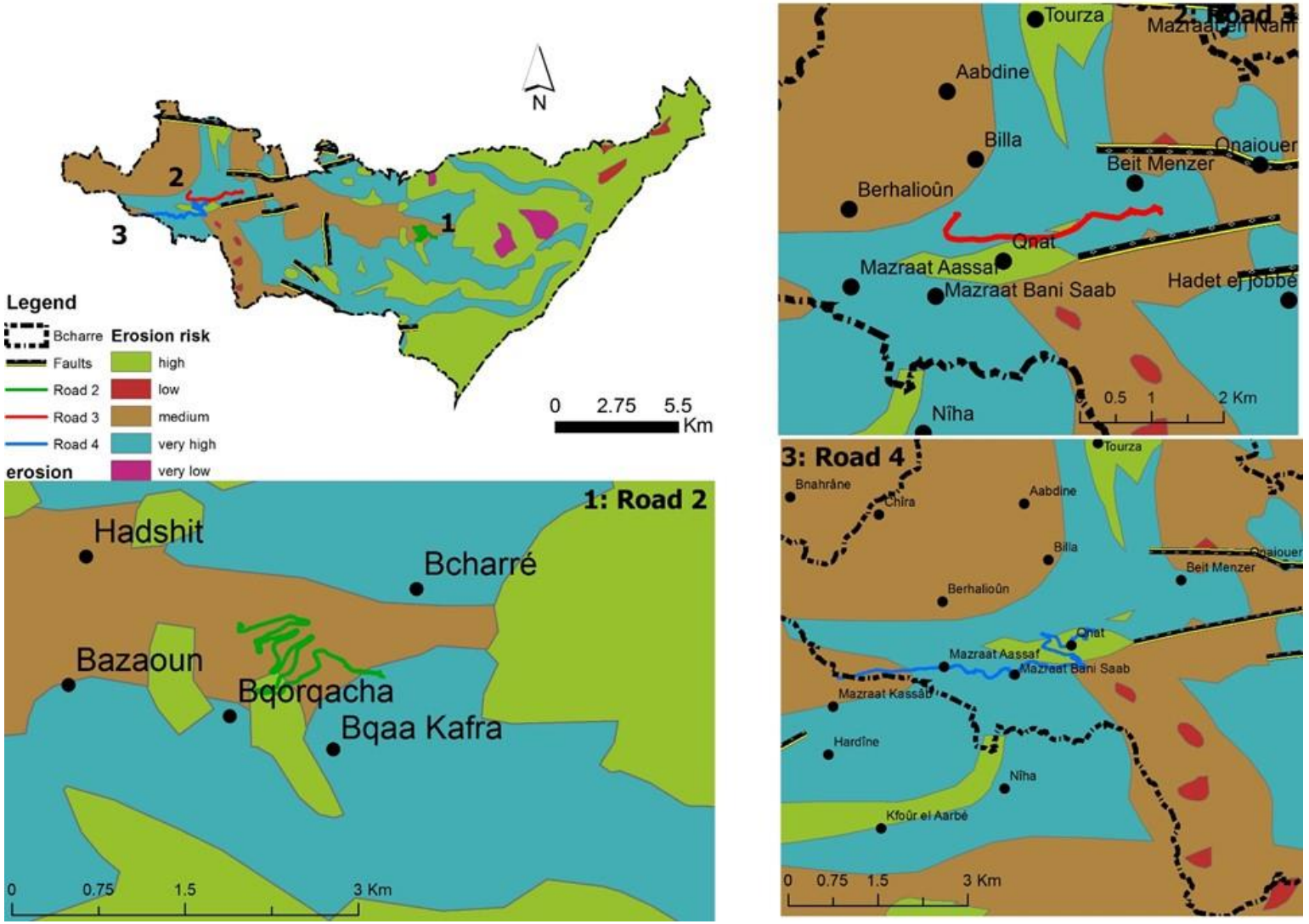


CNRS database – updated from UNDP 1970

4.1.2.2 Faults, erosion, landslides, and earthquakes

Several faults crisscross the Bcharre Caza (Figure 4-6). None of the proposed roads are crossed by a fault line or are within 300 m of one. Road 3 is the closest road to a fault line (within 350 m). The risk for erosion across the proposed roads is overall high. The erosion risk for Road 2 (Deir Mar Lichaa – Wadi Qadicha) is medium to high. Road 3 (Beit Mounzir – Qnat) largely passes in regions with a very high erosion risk across its span. Along Road 4 (Qnat– Mazraat Aassaf) the erosion risk is high near Qnat before transitioning to very high in the region between Mazraat Bani Saab and Mazraat Assaf. The road then transitions into an area with medium erosion risk as it moves towards the Bcharre-Batroun cadastral boundary. Figure 4-7 shows typical soil erosion near Mazraat Bani Saab halfway through Road 4 (Qnat– Mazraat Aassaf). Seismic risks in the study area exist, given that it lies along the 1,000-km-long left-lateral Levant fault system (LFS). This fault system is responsible for a significant amount of seismic events in the eastern Mediterranean (Hujeir et al., 2011). For the study area, the EZ-FRISK^{TM} model developed by Hujeir et al. (2011) predicts that the 10% probability of peak ground accelerations (PGA) exceedance in 100 years, ranges between 0.3 and 0.35 g. With these levels of seismic hazards, civil engineering projects such as bridges should adopt reinforcement (in reinforced concrete structures) of "high seismic hazard" as established in international codes of practice (Hujeir et al., 2011). With regards to landslides and rock fall risks, only Road 2 (Deir Mar Lichaa – Wadi Qadicha) appears to be vulnerable to rock fall risks (Figure 4-8).

Figure 4-6. Faults and erosion risk in the Bcharre district

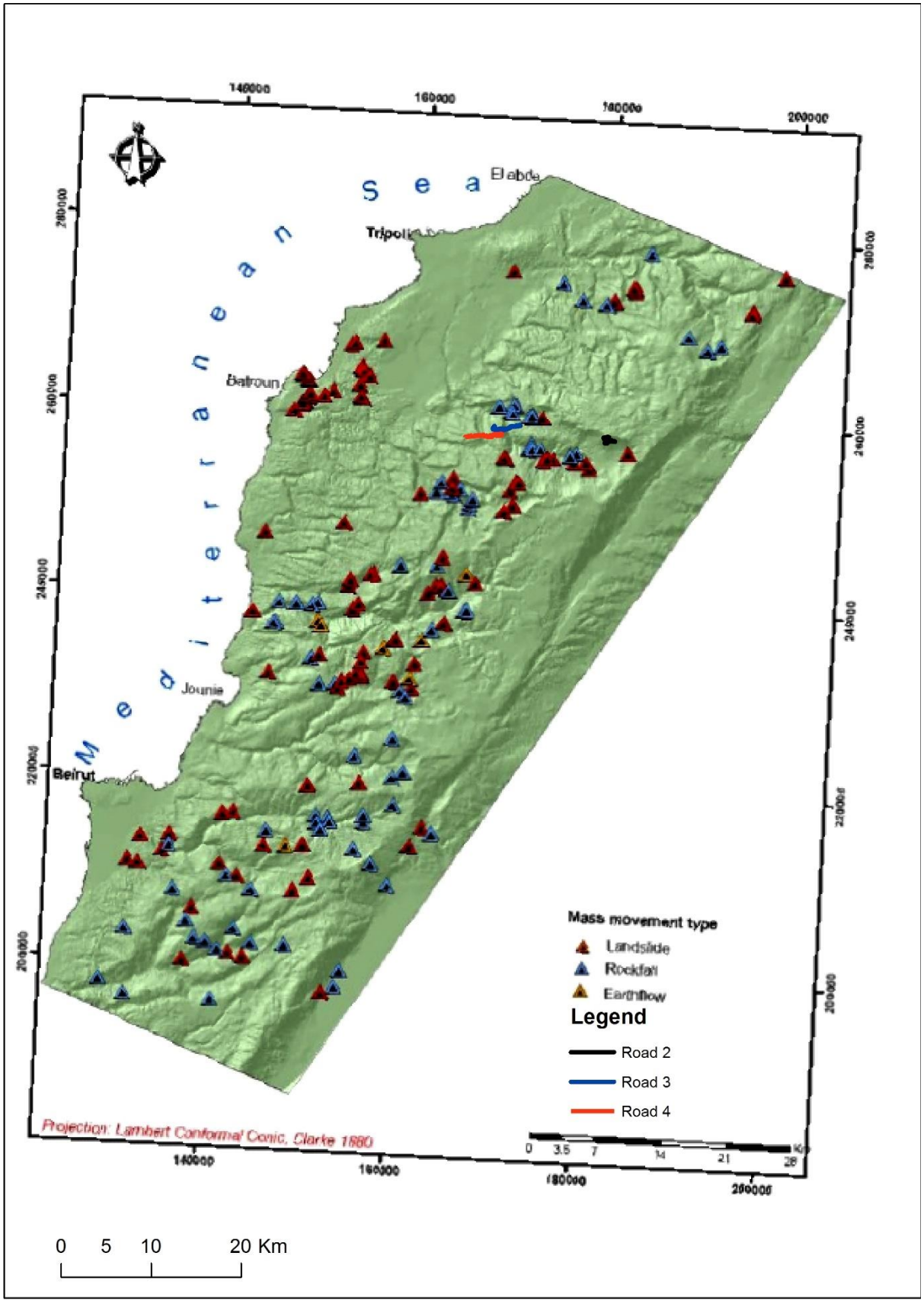


Source: CNRS Soil Erosion database and Faults database

Figure 4-7. Rock fall and soil erosion near Road 4 (Qnat - Mazraat Aassaf)

Road 4- Mazraat Bani Saab (34°14'55.0"N 35°53'28.7"E)
A. Maalouf & A. Chehab, (Jan, 2019)

Figure 4-8. Landslides, rockfall sites, and earthflows



Source: Adapted from Abdallah 2007

4.1.3 Hydrology

The study area is characterized by the presence of several springs, streams, and groundwater wells (Figure 4-9). The most important river in the Bcharre Caza is Nahr Abou Ali/ Qadisha River[12]. Road 2 (Deir Mar Lichaa - Wadi Qadisha) intersects the Qadisha River (also known as the Abou Ali River when it reaches Tripoli) at the Deir Mar Lichaa intersection towards Wadi Qadisha (Figure 4-10). Additionally, Road 4 (Qnat - Mazraat Aassaf) crosses a small stream at Mazraat Bani Saab that feeds into Wadi Asfour (Figure 4-11). Several studies have looked at the water quality of the Abou Ali/ Qadisha River. Jabali et al. (2018) reported no or very low polycyclic aromatic hydrocarbons (PAHs) concentrations in groundwater sampling locations across the basin, while considerable concentrations (ranging from 0 to 28.72 ng/mL) were detected in surface water at several locations in the lower parts of the river (Jabali et al. 2018). The water pollution in that section of the river is considered to be the lowest across the basin, given that it is in the headwaters (Jabali, 2017). In that study, seven surface water samples and 5 groundwater samples were collected in the upper section of the Abou Ali/ Qadisha River (in the region Bcharre-Ehden). Most of the PAH concentrations in the selected samples were found to be below detection limit or not detectable. Groundwater samples collected across the entire Abou Ali/ Qadisha River did not show concentrations of concern. Moreover, 5 surface water samples collected across the river were found to be contaminated by methomyl, alachlor, and endosulfanalpha with average concentrations of 1.78, 0.38, and 0.11 ng/ml respectively. A previous study by Massoud et al. (2006) reported relatively good water quality in the upper sections of the Abou Ali River/ Qadisha as can be seen in Table 4-2. Seasonal variations were largely significant in the upper sub-catchment due to runoff.

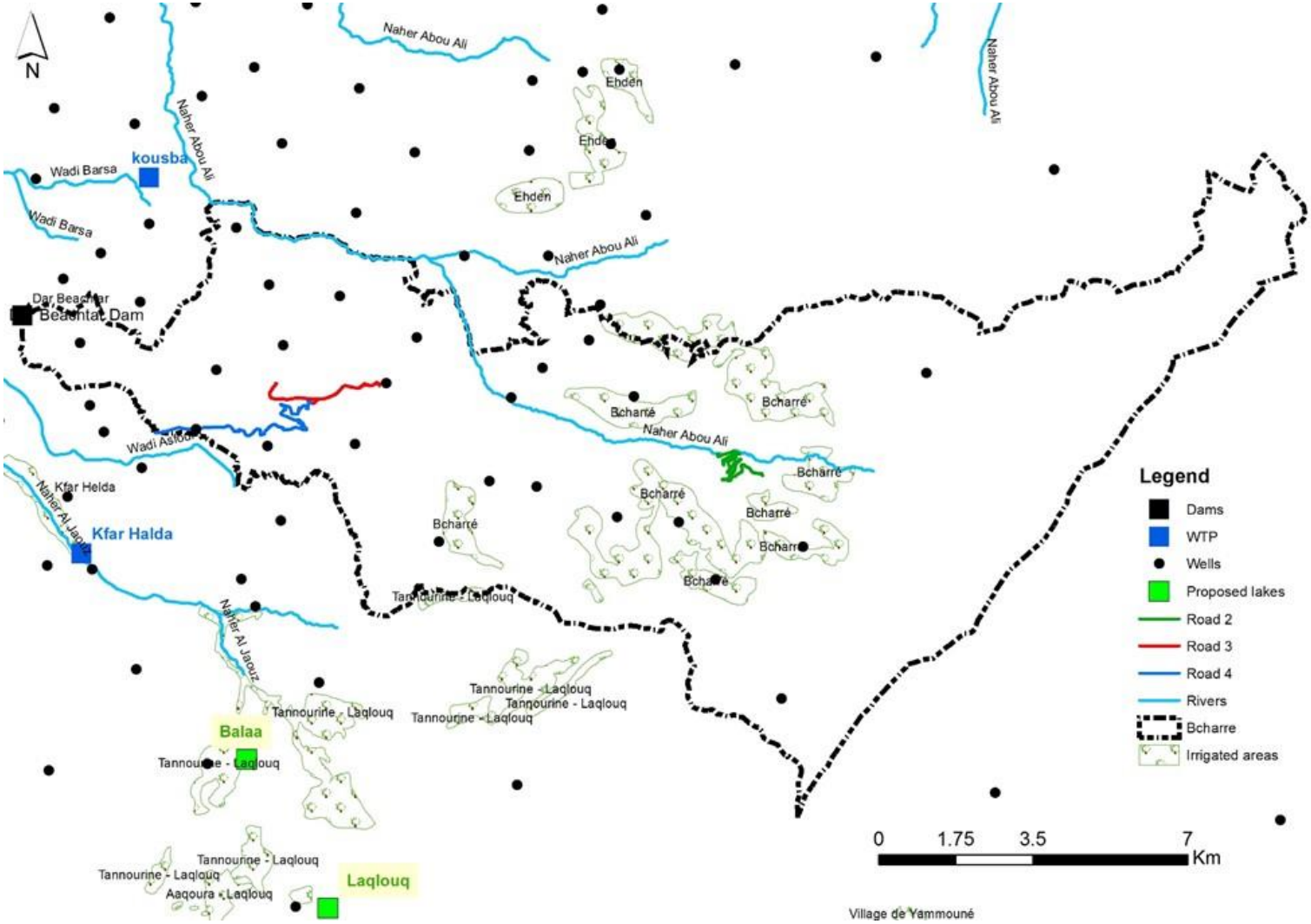
Table 4-2. Water quality in the Upper Abou Ali/ Qadisha River

Parameter	*Concentration (mg/L)*	
	Dry season	*Wet season*
DO	6.1 - 8.1	8.0 – 8.6
BOD_5	1.45 - 14.55	2.35 - 7.20
COD	112 - 163	13 - 19
Cl^-	18 - 35	12 – 27
NO_3^-N	2.4 – 3.4	1.8 – 3.2
NH_3–N	0 – 0.14	0.15 – 0.54
O–PO_4^{3-}	0.03 – 0.17	0.10 – 0.25
SO_4^{2-}	6 - 19	2 - 18

Source: Massoud et al., 2006

[12] The river is known as Qadisha River in Bcharre and ends as Abou Ali River in Tripoli.

Figure 4-9. Hydrology and water resources surrounding proposed roads in the Bcharre district



Source: GIS layers by MOEW 2012

Figure 4-10. Road 2 (Deir Mar Lichaa - Wadi Qadisha) crossing the Abou Ali/ Qadisha River

Road 2- Abou Ali/ Qadisha River (34°14'47.4"N 35°59'52.8"E)
A. Maalouf, A. Chehab (Oct, 2019)

Figure 4-11. A small stream near Road 4 (Qnat - Mazraat Aassaf) in the vicinity of Mazraat Bani Saab

Road 4- Mazraat Bani Saab (34°14'50.9"N 35°53'07.0"E)
A. Maalouf, A. Chehab (Jan, 2019)

On the other hand, PADECO ltd (2004) reported coliform contamination of the Abou Ali/ Qadisha River at 5 different locations (Table 4-3). Total coliform levels ranged between 97 and 470 CFU/ 100 mL and Fecal coliform levels ranged between 49 and 448 CFU/ 100 mL, indicating contamination with sewage (Table 4-4).

Table 4-3. Location of Abou Ali/ Qadisha River sampling sites

Sample ID	*Location*	*X (Km)*	*Y (Km)*	*Z (m)*	*Date*	*Description*
W1	El Challel-Bcharre	177,028	256,636	1387	31/07/2003	Bridge of Bcharre
W2	Ej Jisr- Bcharre	177,457	256,116	1380	31/07/2003	Restaurant Mississippi
W3	Qadisha Valley	174,387	256,271	1007	01/08/2003	Fish-breeding pond
W4	Deir Qozhaiya	168,723	260,435	1800	31/07/2003	Valley to Ehden
W5	Qozhaiya Electricity	170,810	260,180	940	01/08/2003	Tourza Bridge

(PADECO ltd, 2004a)

Table 4-4. Water quality results

Parameter	Units	W1	W2	W3	W4	W5	MOE (Guidance)	MOE (Maximal)	USEPA
Temperature	^{0}C	11.7	8.3	10.4	14	9	22	25	
Turbidity	NTU	16.1	2.9	9.2	3.9	3.6	-	-	1 NTU
Conductivity	(µS/cm@25C)	278	247	296	328	445	-	-	-
pH	-	7.88	7.87	7.96	7.97	7.7	-	6.9-8.2	6.5-8.5
OH Alkalinity	mg/L	0	0	0	0	0	-	-	-
HCO_3^-	mg/L	0	0	16	16	0	-	-	-
Ca^{++}	mg/L	40	36	48	48	56	-	-	-
Cl	mg/L	7	6	7	9	16	-	-	250mg/l
NH_4	mg/L	1.2	0.19	0.04	0.04	0.04	-	-	-
Total P	mg/L	0.68	0.19	0.26	0.22	0.26	-	-	-
Total N	mg/L	9	7	15	9	10	-	-	-
Na^+	mg/L	7	1	2	1	1	-	-	-
BOD	mg/L	10	2	2	2	2	-	-	-
COD	mg/L	33	20	2	2	2	-	-	-
TSS	mg/L	43	9	14	1	1	-	-	-
Fecal Coliforms	cfu/100mL	Numerous	49	448	200	300	-	-	0/100ml
Total Coliforms	cfu/100mL	Numerous	97	470	280	330	-	-	1/100ml
Color	CU	1	1	1	1	1	-	-	15 CU
Silica	mg/L	8.7	5	7	3.2	8	-	-	-
Oil content	mg/L	16.7	-	-	-	-	-	-	-
Discharge	m^3/sec	0.09	0.70	1.53	0.12	0.46			

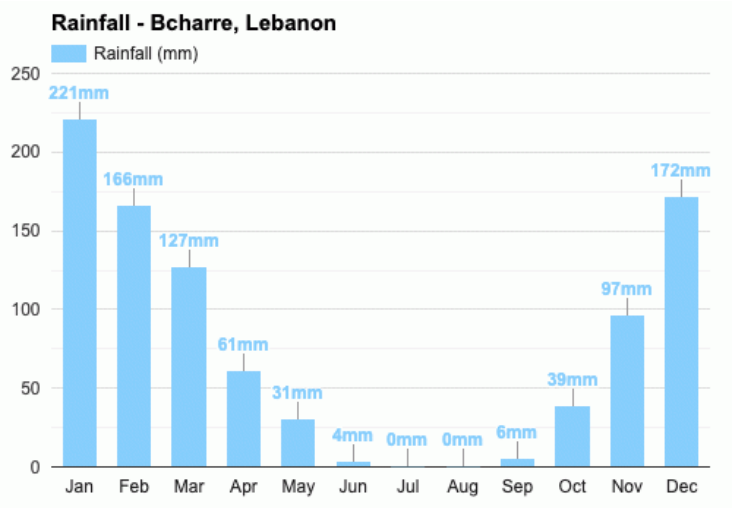
(PADECO ltd, 2004a)

4.1.4 Climate and meteorology

The climate and meteorological parameters play an important role in the transport and dispersion of pollutants in the atmosphere. Moreover, climate and meteorology play a role in the timing of construction activities and potential road closures during both the rehabilitation and operational phases. As such, meteorological data on precipitation, temperature, wind direction and speed are important for the assessment of environmental impacts. Wind speeds and wind directions are responsible for carrying pollutants from the proposed roads to nearby communities both during the rehabilitation and operation phases. On the other hand, precipitation controls the rates of runoff. Meteorological data for the study region are best represented through long term monitoring stations in that region. The closest stations to the proposed roads are in Bcharre and the Cedars.

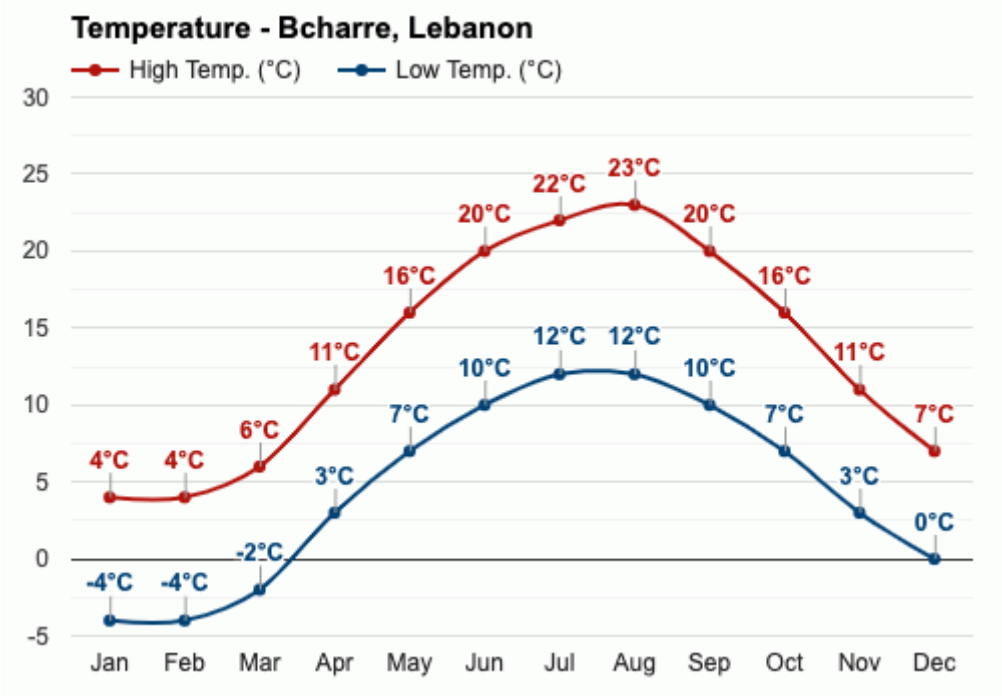
Long-term average representative precipitation and temperature for the Bcharre Caza are presented in Figure 4-12 and 4-13, respectively. While precipitation is negligible in the summer season between the months of June and September, the highest precipitation is recorded for the month of January. The total precipitation in Bcharre, like the rest of Lebanon, shows large variability across years and locations. The wettest month is the month of January with an average rainfall of 221 mm. The average annual precipitation is known to exceed 1,000 mm. In addition, at high elevations, snow is common and is expected to affect construction activities. As for temperature, the lowest are recorded in January (average at -4□C) and the highest in August (average at 23□C) (Figure 4-13). Across two snow seasons (1 November to 30 June 2014 - 2016) surface air temperature in the Cedars averaged -1.4 □C (Fayyad, 2017). The maximum snow cover duration between 2014 and 2016 was 160 days (Fayyad, 2017). With respect to wind, the closest weather station equipped with a functional anemometer is in Bcharre and is operated by LARI. The windrow for the year 2018 from that station is shown in Figure 4-14. Calm winds are predominant (0 to 0.5 m/s) blowing from the West (17 percent of the time) and South-West (35 percent of the time). Strong winds seldom exceed 25 m/s at the Cedars although during storm events, maximum wind gusts up to 40.1 m/s were reported by Fayad et al. (2017).

Figure 4-12. Average monthly rainfall values for Bcharre district



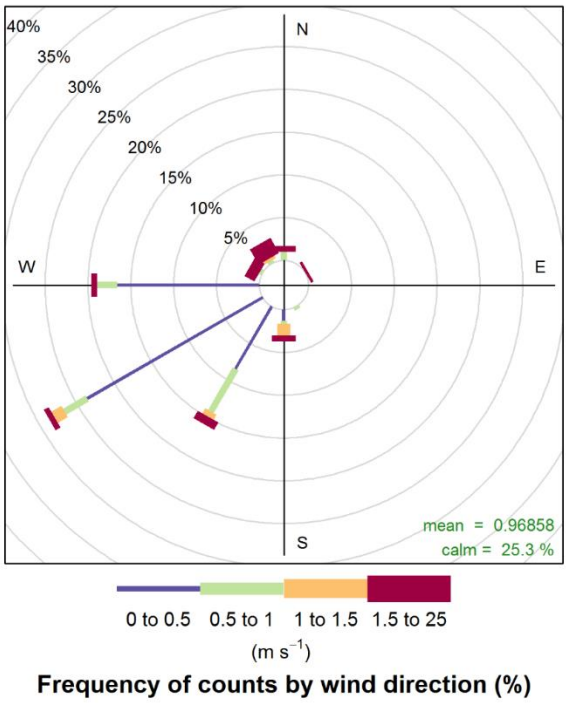
Source: https://www.weather-atlas.com/en/lebanon/bcharre-climate

Figure 4-13. Average monthly temperature values for Bcharre district



Source: https://www.weather-atlas.com/en/lebanon/bcharre-climate

Figure 4-14. Wind speed and wind direction from the Bcharre weather station for the year 2018



4.1.5 Ambient air quality and noise levels

Traffic emissions represent the main source of air pollution in the project area with generators constituting another source in residential areas at times of electricity disconnection. Major air pollutants induced by traffic include Carbon monoxide (CO), Nitrogen Oxides (NO_x), Sulfur oxides (SO_x), Hydrocarbons (HC), and Particulate matter (PM). These pollutants are associated with potential adverse health impacts with long-term exposure to atmospheric concentrations exceeding threshold limits. Air quality monitoring in Lebanon in general is weak and adhoc with no systematic continuous monitoring. It is based mostly on individual efforts at academic institutions with a recent effort through the MoE that acquired several stations spread throughout Lebanon, particularly in urban areas. Unfortunately, the stations have stopped because of lack of resources and the existing data is not reliable because of lack of equipment calibration, to the best of our knowledge.

Annual average ambient air quality data were reported by JICA (2018) for part of the Bcharre Caza (Figure 4-15). Data were obtained from data gathered from the MOE/ UNDP project, 'Air quality assessment in an East Mediterranean country: the case of Lebanon, 2014' which monitored criteria air pollutants. Data for Cells 4 and 5 are considered to be representative, being close to this study area in terms of distance (< 1 Km from Road 2: Deir Mar Lichaa – Wadi Qadisha) as well as prevalent socio-economic activities, i.e. mostly rural and light residential. Table 4-5 shows that the annual concentrations for all criteria air pollutants for cells 4 and 5 are below the national ambient air quality standards defined by MOE Decision 52/1.

Figure 4-15. Air quality cells as per the JICA (2018)

Source: JICA 2018

Table 4-5. Average annual ambient concentrations of air pollutants in the Bcharre district

Pollutant	*Annual average concentration (µg/m³)*		*National ambient air quality standards (MOE Decision 52/1)*
	Cell 4	*Cell 5*	
$PM_{2.5}$	16.6	14.8	80 µg/m³
PM_{10}	18.5	17.1	120 µg/m³
CO	232.7	212.5	10,000 µg/m³
SO_2	13.5	10.6	80 µg/m³
NO_2	17.6	13.2	100 µg/m³
O_3	78.9	81.6	100 µg/m³

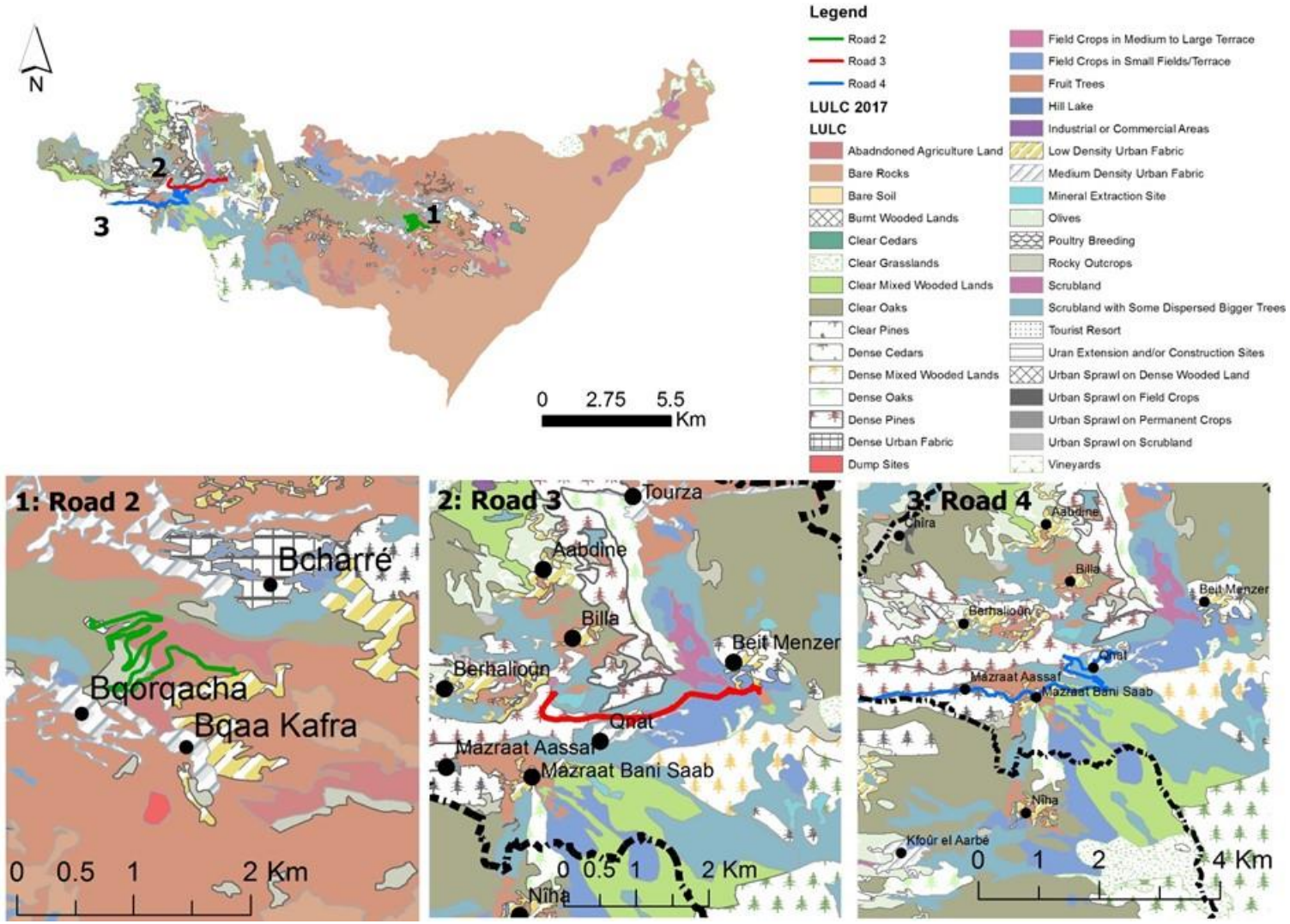
Source: JICA 2018

Similarly, vehicles and some generators in residential areas constitute the main source of noise. While no noise measurements are available along the proposed roads, various studies have been conducted on noise measurements in specific projects / studies although no systematic noise monitoring in the country exists. In the context of the proposed roads it is expected that the baseline average continuous A-weighted noise levels during the day time will vary between 41 to 81 dBA depending on time of day, traffic conditions and proximity to the roads, with an average of 61 dBA. This range was deduced from noise measurements conducted in 2017 along segments of a nearby rural road of similar nature in the Bcharre Caza (JICA 2018). Note that these levels exceed the national standards of 30-40 dBA for rural areas. However, as mentioned earlier, the national standards are very stringent and hard to meet along roads. Hence, it is more realistic to consider the FHWA (1997) noise criterion of 67 dBA for residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreational areas, playgrounds, parks.

4.1.6 Land use land cover

The land use and land cover in an area refers to both natural landscape and anthropogenic activities occupying the regions. The three proposed roads in the Bcharre Caza pass largely through rural areas. Figure 4-16 shows the main land use land covers of the Bcharre Caza as well as those in the immediate vicinity of the 4 proposed roads. Table 4-6 summarizes the main land use land cover within 50 m of the four proposed roads in the Bcharre Caza. Refer to Section 4.2 for more details on the biological environment.

Figure 4-16. Land use and land cover map of selected roads at Bcharre Caza



Source: CNRS 2017 LULC map

Table 4-6. Main land use land cover areas along proposed roads in the Bcharre district (within 50 meters)

Road	*Land use land cover*	*Area (m2)*	*Percent of area per road (%)*
Road 2: Deir Mar Lichaa – Wadi Qadisha	**Abandoned Agriculture Land**	**230,832**	**62**
	Clear Oaks	16,994	5
	Fruit Trees	**55,982**	**15**
	Low Density Urban Fabric	17,949	5
	Medium Density Urban Fabric	2,975	1
	Rocky Outcrops	**42,821**	**11**
	Urban Sprawl on Dense Wooded Land	7,308	2
	Total	*374,862*	*100*
Road 3: Beit Mounzir - Qnat	**Dense Pines**	**84222**	**24**
	Field Crops in Small Fields/Terrace	**150152**	**43**
	Fruit Trees	12809	4
	Low Density Urban Fabric	3317	1
	Medium Density Urban Fabric	**53418**	**15**
	Mineral Extraction Site	17490	5
	Olives	3938	1
	Scrubland with Some Dispersed Bigger Trees	**27101**	**8**
	Total	*352,447*	*100*
Road 4: Qnat - Mazraat Aassaf	Bare Rocks	11,233	2
	Clear Mixed Wooded Lands	58,129	9
	Clear Pines	**173,901**	**26**
	Dense Oaks	321	0
	Dense Pines	38,280	6
	Field Crops in Small Fields/Terrace	16,079	2
	Fruit Trees	50,352	8
	Low Density Urban Fabric	**86,613**	**13**
	Medium Density Urban Fabric	**67,681**	**10**
	Mineral Extraction Site	4,506	1
	Scrubland with Some Dispersed Bigger Trees	**149,008**	**22**
	Urban Sprawl on Permanent Crops	8,226	1
	Total	*664,329*	*100*

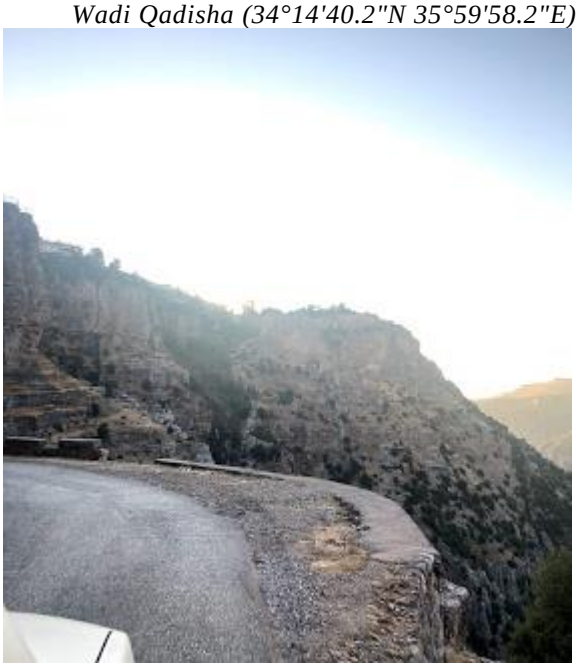
As evident from Figure 4-17, the beginning of Road 2 (Deir Mar Lichaa – Wadi Qadisha) is characterized by few residences and agricultural lands (fruit trees), close to the Deir Mar Lichaa intersection. As the road descent starts, abandoned agricultural terraces are evident, followed by rocky outcrops, steep slopes and narrow roads, which limit the area under cultivation, especially during the winter season (Figure 4-18). A tree coverage is evident from the middle of the road and towards its end, as it gets closer to the Qadisha Valley, with evergreens including cedars (Figure 4-19). Road 2 ends at a restaurant overlooking the Abu Ali River (Figure 4-20).

Figure 4-17. Aerial view of land use land cover along Road 2 (Deir Mar Lichaa – Wadi Qadisha)

Figure 4-18. Rocky outcrops and steep slopes along Road 2 (Deir Mar Lichaa – Wadi Qadisha)

Wadi Qadisha (34°14'40.2"N 35°59'58.2"E)

Wadi Qadisha (34°14'43.1"N 35°59'57.1"E)



Wadi Qadisha (34°14'31.2"N 36°00'06.1"E)

Wadi Qadisha (34°14'28.7"N 35°59'58.9"E)

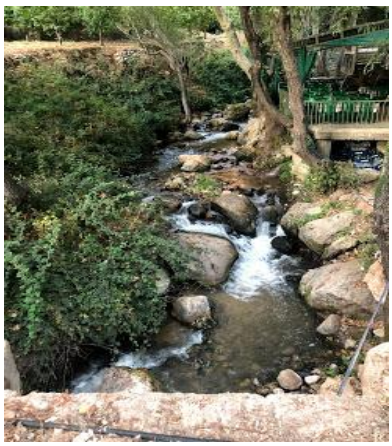
A. Maalouf, A. Chehab (Oct, 2019)

Figure 4-19. Typical trees along Road 2 (Deir Mar Lichaa – Wadi Qadisha)

Road 2-Bqerqacha (34°14'28.7"N 35°59'57.8"E)
A. Maalouf, A. Chehab (Oct, 2019)

Road 2-Wadi Qadisha (34°14'46.0"N 35°59'52.1"E)
A. Maalouf, A. Chehab (Oct, 2019)

Figure 4-20. Al-Nahr restaurant overlooking the Abu Ali River at the end of Road 2 (Deir Mar Lichaa – Wadi Qadisha)



Road 2- Abou Ali/ Qadisha River (34°14'47.4"N 35°59'52.8"E)
A. Maalouf, A. Chehab (Oct, 2019)

The land use cover along Road 3 (Beit Mounzir - Qnat) is predominantly field crops in small fields (43 percent) and scrublands (8 percent) along the stretch between Beit Mounzer and Qnat (Figure 4-22), followed by dense pine (24 percent) from Qnat onward towards Barhalyoun (Figure 4-21). The urban fabric along Road 3 (Beit Mounzir - Qnat) is of medium density and covers around 15 percent of the area.

Figure 4-21. Land cover along Road 3 (Beit Mounzir – Qnat)

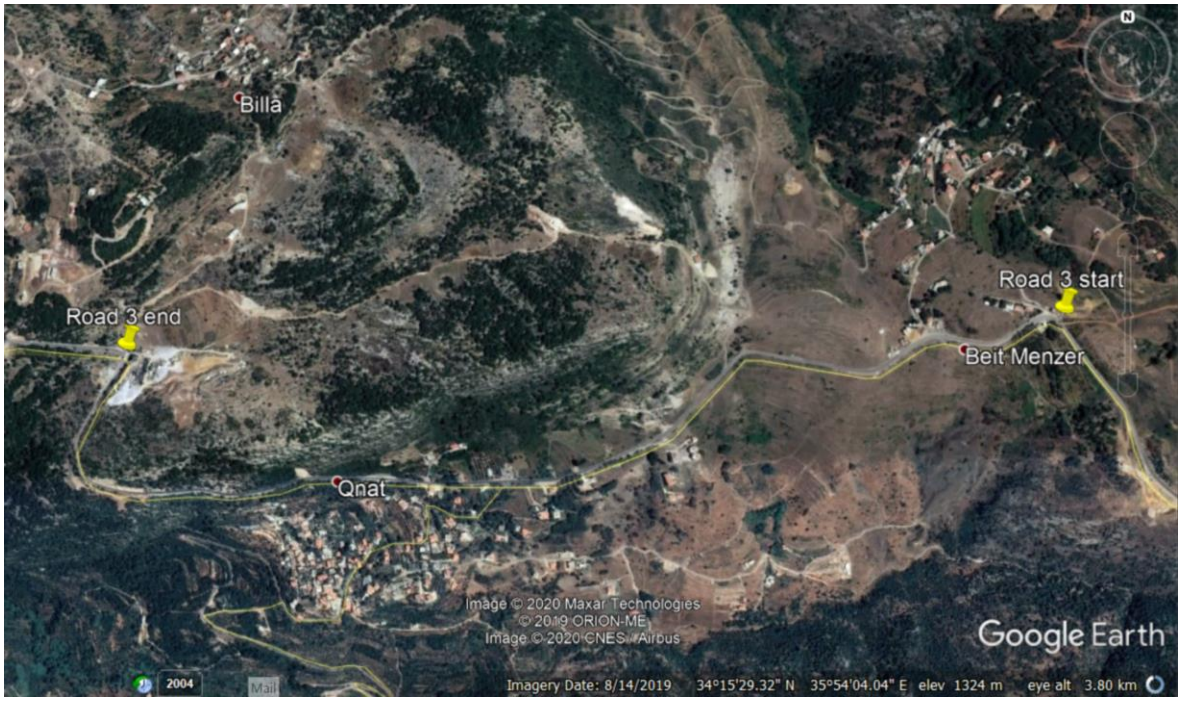


Figure 4-22. Typical vegetation along the first part of Road 3 (Beit Mounzir – Qnat)

Road 3- Qnat (34°15'21.6"N 35°54'10.4"E)
A. Maalouf, A. Chehab (Jan, 2019)

As for Road 4 (Qnat - Mazraat Aassaf) The land use land cover along consists mostly of clear pine forests (26 percent) and scrublands with some dispersed bigger trees (22 percent). Low and medium density urban fabric constitute 23 percent of the land cover land use up to 50 m from the road, corresponding to the towns of Qnat, Mazraat Bani Saab and Mazraat Assaf. Figure 4-23 shows the intermittent vegetative cover at the start of Road 4 (Qnat - Mazraat Aassaf) near Qnat. However, at the end of Road 4 near Mazraat Aassaf, the vegetative cover becomes denser as the urban fabric becomes lesser (Figure 4-24). Refer to Section 4.2 for more details on the biological environment.

Figure 4-23. Pine trees on the sides of Road 4 (Qnat - Mazraat Aassaf)

Road 4- Mazraat Bani Saab
(34°14'55.3"N 35°53'28.0"E)

Road 4-Mazraat Bani Saab
(34°14'58.4"N 35°53'17.0"E
A. Maalouf, A. Chehab (Jan, 2019)

Figure 4-24. Denser vegetation towards the end of Road 4 (Qnat - Mazraat Aassaf)

Road 4- Mazraat Assaf
(34°14'53.7"N 35°51'50.8"E)

Road 4-Mazraat Assaf
(34°14'54.3"N 35°51'56.2"E)
A. Maalouf, A. Chehab (Jan, 2019)

4.2 Biological Environment

As mentioned in the previous section, the roads in the Bcharre Caza pass through various land cover types that harbor different habitats. More specifically, Roads 3 (Beit Mounzir – Qnat) and 4 (Qnat - Mazraat Aassaf) pass through clear pine forests and scrublands and Road 2 (Deir Mar Lichaa – Wadi Qadisha) leads to the Qadisha Valley and reaches the Abu Ali River passing through the valley. Road 2 is around 3.5 km (as the crow flies) away from the Cedars of God Forest.

4.2.1 Flora

Biodiversity in this area can be characterized according to the distinct series of vegetation and their accompanying plant communities and plant groupings. In Bcharre, one can identify the following 3 vegetation zones: the Supramediterranean (1,000-1,500 m ASL), the Mediterranean mountains (1,500-1,800 m ASL) and the Oromediterranean (> 1,800 m ASL) (Abi-Saleh et al., 1996). The proposed roads in the Bcharre Caza lie in the Supramediterranean Zone, which is situated between 1,000 and 1,500-1,600 m on the western slopes of Mount Lebanon.

In Bcharre, the supramediterranean series of oak, *Quercus calliprinos* (common oak), is widespread covering many slopes in the lower elevations (1000-1500m). In general, the Qadisha Valley (along Road 2) is covered mainly by a community of *Quercus calliprinos* (common oak). Other species accompanying the *calliprinos* (common oak) are *Pistacia palaestinia* (Palestine terebinth), *Arbutus andrachne* (Eastern strawberry tree), *Cercis siliquastrum* (Juda's tree), and *Rhamnus* (buckthorn) sp. These are evident on the side of the valley under Deir Mar Lichaa. In the Qnat – Berhalioun area (Road 3 and Road 4) are pine trees, *Pinus brutia* (Calabrian pine) population (mainly), and *Quercus calliprinos* (common oak) where high density forests are evident, i.e. towards the end of both roads. In addition, to *Quercus calliprinos* (common oak), *Quercus infectoria* (Aleppo oak) is present at the higher elevations of the Qadisha valley (Road 2) as well as in Tourza/Beit Mounzir/Qnaiouer (Road 3). The *Quercus infectoria* (Aleppo oak) series is made up of *Cytisus syriacus* (common broom), *Juniperus oxycedrus* (prickly juniper), *Origanum ehrenbergii* (oregano), and *Andenocarpus* complicates. A third series of oak that is mostly present at altitudes of 1,200 m is *Quercus cerris* (Turkey oak). The tree grouping corresponds to small forests of *Quercus cerris* (Turkey oak) which include some other characteristic species like *Bromus bikfayensis* (Brome grass), *Carex phyllostachys*, *Lathyrus digitatus*, *Lathyrus niger* (blackening flat pea). These groups are most likely the most endemic in the Lebanese mountains because they do not appear to have any affinities with the other groups of *Q. cerris* (Turkey oak) in the Eastern Mediterranean. In addition to oak trees, the supramediterranean zone includes the series of *Pinus pinea* (Umbrella pine) found on sandstone. The tree grouping corresponds to forests which include the following species: *Cytisus syriacus* (common broom), *Adenocarpus complicatus,* and *Halimium umbellatum* (rock rose). The originality of these communities is marked by the endemism of their characteristic species, mainly *Cytisus syriacus* (common broom) and *Halimium*

umbellatum (rock rose). The herbaceous grouping corresponds to grasslands of *Tuberaria guttata* (spotted rock rose), *Aira elegans* (annual silver grass), and *Briza maxima* (rattlesnake grass). Grasslands of *Isoetes hystrix* (quillworts) develop in the lower humid areas of the zone (PADECO ltd., 2004a).

According to the field visit and the land cover land use map (Figure 4-16). The most predominant natural cover was clear oaks along Road 2 (Deir Mar Lichaa – Wadi Qadisha), dense pine along Road 3 (Beit Mounzir – Qnat), and clear pine along Road 4 (Qnat - Mazraat Aassaf).

4.2.2 Fauna

The Mount Lebanon range and the riversides are also considered rich in fauna. Species that are or might be present in the study area include: one species of land tortoise, terrapin and aquatic tortoise; 20 species of lizards of which one endemic (Lizard *Lacerta frastii carnivorous*) living at high altitudes (Bcharre); 13 species of non-venomous grass snakes, two species of venomous grass snakes, and two species of venomous vipers. (PADECO ltd., 2004a)

With regards to birds, according to the analysis of the national biodiversity report study team (MoA/UNEP, 1996), the forests and woods of Mount Lebanon provide shelter to 87 species, which is considered as an underestimation due to the difficulty to spot migratory birds in thick woods. None of the bird species are endemic. Three threatened bird species that might be found in the project area include Greater spotted eagle (*Aquila clanga*) Imperial eagle (*Aquila heliaca*) Lesser Kestrel (*Falcon aumanni*).

As for mammals, there are 52 reported mammal species in Lebanon. Seven species are already extinct. Figure 4-25 presents a list of species potentially found in the Bcharre district (PADECO ltd., 2004a).

Figure 4-25. Mammal species potentially found in Bcharre Caza and their threat status

Species	Common name	Places found	Status
Apodemus mystacinus mystacinus	Field mouse	Cedars	No apparent danger
Apodemus sylvaticus	Common field mouse	Bcharre	No apparent danger
Cricetulus migratorius cinerascens	Grey hamster	Bcharre	No apparent danger
Crocidura suaveolens	Lesser white-toothed shrew	Bcharre, Cedars	Rare
Eliomys melanurus	Black-tailed dormouse	Bcharre	No apparent danger
Hyaena hyaena syriaca	Striped hyaena	Zghorta	Vulnerable
Martes foina syriaca	Stone Martin	Hadath el Joubbe	Vulnerable
Microtus nivalis hermonis	Snow vole	Bcharre	No apparent danger
Microtus guentheri guentheri	Levant vole	Bcharre	Growing
Sciurus anomalus syriacus	Squirrel	Bcharre, Ehden	Very close to extinction
Sus scrofa lybicus	Wild boar	Hadath El Jobbe	Growing
Canis lupus pallipes	Wolf		Very close to extinction
Canis aureus syriacus	Jackal	Besharreh	Growing
Vulpes vulpes palaestina	Red fox	Besharreh	No apparent danger

Source: PADECO ltd., 2004a

4.2.3 Ecologically Sensitive Areas

Road 2 (Deir Mar Lichaa – Wadi Qadisha) is situated at the beginning of the Qadisha valley. While the natural areas that it crosses (50 m to both sides of the road) constitute only 16 percent, it is still worth noting that the Qadisha ecosystem is an important and rich ecosystem as evident from the following (El Haber, 2000):

- Flora taxa named after Lebanon in the Qadisha Valley: 26 species, 7 subspecies, and 9 varieties;
- A high degree of endemism in the valley
- Recorded data of flora in the Qadisha Valley: 912 species (32 % of Lebanese flora), 163 subspecies (5.6 %), and 118 varieties (4%);
- Status of plant taxa in Qadisha Valley: 74 taxa Endangered, 174 taxa Rare, 138 taxa Localized, and 37 taxa Sporadic
- Life span of Qadisha Valley flora: 291 Annual species, 43 Biennial species, 568 Perennials species, and 27 arborescent species.

As mentioned above, Road 2 (Deir Mar Lichaa – Wadi Qadisha) is around 4.5 Kms from the Forest of the Cedars of God that is situated in the Mediterranean mountain vegetation zone and is the innate land of Cedrus libani. Other associated trees include Quercus, Cupressus, Pinus, Abies, Populus, Platnaus, and Juniperus. The fauna described in this type of unique ecosystem ranges from the various types of birds (eagles, owls) to wild animals (boars, wolves, squirrels, rats, etc.) (PADECO ltd., 2004a).

4.3 Socio-economic Environment

4.3.1 Demographic Profile

Road 2 (Deir Mar Lichaa - Wadi Qadisha) serves mainly the tourists visiting the Qadisha valley, estimated by the Federation of Municipalities of Bcharre at 250,000 tourists in the summer season. It also serves about 10 families who are tenants of the Patriarch in Saydet and the nuns at Qannoubine Monastery, both of which only reside down the Valley in the summer for farming purposes. Road 3 (Beit Mounzir – Qnat) is a primary road in the Bcharre Caza that serves directly the villages of Beit Mounzir and Qnat and the whole of Bcharre Caza indirectly, linking the villages in the west of the Caza to those in the East. As for Road 4 (Qnat - Mazraat Aassaf), it is also a primary road, not only servicing the villages of Qnat, Mazraat Bani Saab and Mazraat Aassaf, but linking the Bcharre Caza to the Batroun Caza. Hence, when considering the demographic profile of the study area, the population of all the villages in the Bcharre Caza was considered, as presented in Table 4-5. In 2016, the total population in the Caza ranged from 21,135 in winter to 40,050 in summer. The Bcharre/ Cedars village alone lodges around 50 percent of the population in the Caza. The total number of households in the Caza is 80,010, with an average household holding around 2-3 persons, as per the winter population and 4-5 persons as per the summer population. The population in the villages that are directly served by the roads ranged between 530 in winter and 1973 in summer, within 395 households (Table 4-7).

Table 4-7. Population size in the Bcharre Caza in 2016

Village	*Population*		*Number of households*
	Winter	*Summer*	
Abdine	720	1029	206
Bane	284	709	142
Barhalioune	845	1207	241
Bazoune	348	1159	232
Becharre/ Cedars	10814	15448	3090
Beit Mounzir	**149**	**372**	**74**
Bella	56	282	56
Blaouza	377	1258	252
Bqakafra	739	1847	369
Bqorqacha	386	1287	257
Brissate	59	295	59
Dimane	198	990	198
Hadath El Jebbe	726	2421	484
Hadchite	3269	4670	934
Hassroune	1120	3732	746
Mazraat Assaf	**22**	**102**	**22**
Mazraar Bani Saab	**71**	**356**	**71**
Moghr el Ahwal	294	420	84
Qnat	**260**	**866**	**173**
Qnaywer	54	269	54
Tourza	316	1054	211
Wadi Qannoubine	**28**	**277**	**55**
Syrian refugees	2400	2400	
Total	*21135*	*40050*	*8010*

(Federation of Municipalities in Bcharre Caza, 2019)

As for the total number of officially registered Syrian refugees in the Bcharreh Caza, it was reported by the Federation of Municipalities in Bcharre Caza (2019) to be 2,400 in 2016. No camps were observed during the field visits. In addition, the municipalities indicated that Syrian Refugees are living in rented apartments. The total number of officially registered Syrian refugees in the villages in the immediate vicinity to the three roads was estimated at around 40 (UNHCR, 2018). No Palestinian camps are present in the Caza.

Around 53 percent of the population is between 15 and 64 years old and 10 percent is aged above 65 years. The average dependency ratio is high, reaching 56.9 %. School enrollment in the Bcharre Caza is 92.2 and the illiteracy rate among the population aged 10 years and above is 16 %. Moreover, 13% of the residents have a high school degree and 6% a university degree. (MOPH, 2016)

4.3.2 Social Activities

Besides being a summer destination for many visitors, the Bharre district offers a well know ski resorts during the winter as well as a series of open air festivals during the summer. Otherwise, social activities in relevant Bcharre villages are relatively limited to in or out of village visits between family or friends, picnics, church visits, periodic municipal or parliamentary elections, or other range of celebrations of births / anniversaries / weddings to condolences in funerals. Larger villages / towns may house a school or a clinic or an NGO. A detailed social survey at the level of each village was not conducted. To the extent available and accessible, some data was collected from reported literature and outlined below.

4.3.3 Economic Activities

Standard of living refers to the level of wealth, comfort, material goods, and necessities available to a certain socioeconomic class in a country. About half of the residents (45.4 percent) in the Bcharre caza are classified in the intermediate living index category, while 34.8 percent are classified as low and 19.8 percent as having high standard of living (CAS/ UNDP/ MOSA, 2004). The unemployment rate in the Bcharre Caza is 16.5 %, which is higher than the national average of 11.4 % (CAS & ILO, 2019). Around 5,500 Lebanese in the Bcharre Caza were categorized as ‘deprived’ as per the Living Conditions and Household Budget Survey (CAS/MOSA/UNDP, 2004 in JICA 2018).

PADECO ltd (2004) reported the employment by sector in the Bcharre Caza to be as follows: 22% commerce and construction, 29% government and community health and education, 27% financial, transportation and communication services (including some tourism-related services), 20% agriculture and farming and 2% in direct tourism services (hotels and restaurants). Agriculture consists primarily of fruit trees (mainly apples, citrus and pears, followed by olives, almond and

grapes). .More specifically to the proposed roads, the land use reflects on the economic and social fabric of the surrounding areas. As evident from the land cover land use map (Figure 4-16) and from Table 4-4, the predominant urban fabric along the roads ranges from low density along Road 2: Deir Mar Lichaa- Wadi Qadisha (5 percent) and Road 4: Qnat - Mazraat Aassaf (13 percent), to medium density along road 3: Beit Mounzir - Qnat (15 percent) and Road 4: Qnat - Mazraat Aassaf (10 percent). Hence, the urban coverage is highest along Road 4, reaching up to 26 percent. In terms of agricultural activities, field crops in small field terraces are predominant along Road 3: Beit Mounzir - Qnat (43 percent) with areas cultivated with fruit trees covering only 4 percent. Along Road 2: Deir Mar Lichaa- Wadi Qadisha, abandoned agricultural lands cover 62 percent of the area and fruit trees cover 15 percent. Road 4: Qnat - Mazraat Aassaf has the lowest coverage of cultivated land, reaching up to 10 percent of the area within 50 meters of the road. Besides a minority of remaining farmers, residents in the overall caza tend to work elsewhere in urban areas along the coastal region with many residing there and visiting their villages in the summer. Evidently, this is the case for most of the Lebanese villages, where income from agriculture is not adequate to maintain livelihood and has become a supplement rather than the main source of living.

The above was further ascertained by the field survey which revealed that Road 3 (Beit Mounzir – Qnat) is characterized by the presence of few scattered residences and shops along its length (Figure 4-26). As for Road 4 (Qnat - Mazraat Aassaf), it passes through the village of Qnat and along the villages of Bani Saab and Mazraat Aassaf, with some residential and religious buildings found. Figure 4-27 shows some residences on Road 4 (Qnat - Mazraat Aassaf) at its start just outside Qnat and Figure 4-28 shows a monastery at Mazraat Bani Saab towards the midst of the road.

Figure 4-26. Scattered residences on the sides of Road 3 (Beit Mounzir - Qnat)

Qnat (34°15'21.6"N 35°54'10.4"E)
A. Maalouf, A. Chehab (Jan, 2019)

Figure 4-27. Residences on the sides of Road 4 (Qnat - Mazraat Aassaf)

Road 4- Qnat (34°15'12.6"N 35°53'48.1"E)

Road 4- Qnat (34°15'13.6"N 35°53'48.5"E)
A. Maalouf, A. Chehab (Jan, 2019)

Figure 4-28. Monastery on Road 4 (Qnat - Mazraat Aassaf) near Mazraat Bani Saab

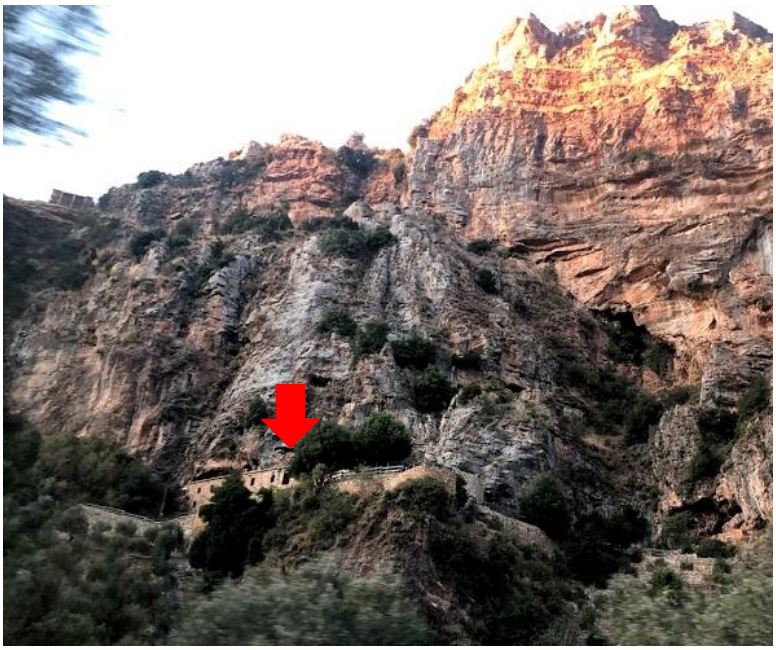
Mazraat Bani Saab (34°14'56.2"N 35°53'13.6"E)
A. Maalouf, A. Chehab (Jan, 2019)

As for Road 2 (Deir Mar Lichaa – Wadi Qadisha), it starts with a few restaurants at the intersection with the main road and ends with a few restaurants at the Abu Ali River (Figure 4-29). It is the main access road to the Qadisha Valley. The Qadisha valley is of historic religious and cultural significance. The Qadisha Valley's many natural caves have been used as shelters and for burials back as far as the Palaeolithic period. Since the early centuries of Christianity, the Valley has served as a refuge for those in search of solitude. Historians believe that the Qadisha Valley has had monastic communities continuously since the earliest years of Christianity. It was also at times a destination for Muslim mystics, or Sufis, who also visited it for meditation and solitude. The Qadisha Valley's structures are defined as religious property (Waqf), owned and controlled by the Maronite Patriarchate, the Maronite Ouadi Esshaya Order, and the Lebanese Mariamite Order. There is also land in the Qadisha Valley that is owned by the Municipality of Hadchit. The heritage houses at Saydet el Karm that are inhabited by tenant farmers are actually owned by the Patriarchate (PADECO ltd. 2004). The buildings of the Qadisha Valley are protected on Lebanon's General Register of Historic Monuments. The site was added to the UNESCO World Heritage list as a cultural landscape with important religious attributes in 1998, with the official name of the 'Wadi Qadisha (the Holy Valley) and the Forest of the Cedars of God (Horsh Arz el-Rab)'. The only religious monument situated directly along Road 2 (Deir Mar Lichaa-Wadi Qadisha), towards its end, is the Deir Mar Lichaa Monastery (Figure 4-30). The Mar Lichaa Monastery is one of the most popular landmarks in Qadisha Valley. The date of its first settlements is unknown. However, starting the 14th century, it was the residence of the Maronite bishops. The Maronite order was founded in this monastery between 1698 and 1700. The last hermit of Mar Lichaa, Antonios Tarabay, died in 1998. Other religious monuments are further down within the valley, and not in close vicinity to Road 2.

Figure 4-29. Restaurant at the end of Road 2 (Deir Mar Lichaa - Wadi Qadisha)

Bcharre (34°14'47.0"N 35°59'52.8"E)
A. Maalouf, A. Chehab (Jan, 2019)

Figure 4-30. Old Deir Lichaa Monastery along Road 2 (Deir Mar Lichaa - Wadi Qadisha)



Road 2- Deir Mar Lichaa (34°14'49.6"N 36°00'04.7"E)
A. Maalouf, A. Chehab (Jan, 2019)

Finally, the current average daily traffic (ADT) for the three proposed roads is summarized in Table 4-6. Traffic on these roads is considered low, with Road 3 exhibiting the highest ADT of 1965 vehicles per day on both sides. Note that on Road 2, although traffic volume appears to be low, it is concentrated over a 4-months during the tourism season in summer.

Table 4-8. Traffic indicators for Bcharre district proposed roads

Road code and villages	*Existing Traffic Volume (ADT)*	*Vehicle Fleet Composition*	*Vehicle Speed (kms/ hr)*
Bcharre Road 2 *Deir Mar Lichaa – Wadi Qadisha*	308	93.5% light vehicles | 6 % Medium | 0.5% Heavy	50
Bcharre Road 3 *Beit Mounzir - Qnat*	1965	82.5% light vehicles | 6.5 % Medium | 11% Heavy	50
Bcharre Road 4 *Qnat - Mazraat Aassaf*	307	81% light vehicles | 8.5 % Medium | 10.5% Heavy	50

4.3.3.1 Sensitive receptors

The Bcharre Caza includes six public schools (Bcharre Secondary Public School, Bcharre Public School for Girls, Tourza Mixed Public School, Barhalioun Mixed Public School, Hadsheet Intermediate Mixed Public School, Hasroun Mixed Public School), no primary healthcare center, and the Bcharre Governmental Hospital. None of them are located directly on the roads to be rehabilitated or within the villages directly linked by the roads under rehabilitation.

In summary, sensitive receptors that need to be considered along Bcharre Road 2 (Deir Mar Lichaa – Wadi Qadisha) include the restaurants at the beginning and end of the road, the Deir Mar Lichaa Monastery, the residents at the bottom of the Qadisha Valley who have no alternative roads, the tourists visiting the valley in the summer season, the Qadisha cultural and archaeological richness and natural ecosystem. As for Road 3 (Beit Mounzir - Qnat) and Road 4 (Qnat - Mazraat Aassaf), the sensitive receptors are limited to the residences, shops, and religious buildings scattered along the roads and the nearby pine forests and scrublands.

5 POTENTIAL ENVIRONMENTAL & SOCIAL IMPACTS

This chapter describes the environmental and social impacts that are likely to result from the rehabilitation of the roads. Due to the rehabilitation nature of the activities, the anticipated negative environmental and social impacts are expected to be minor to moderate during the rehabilitation phase and of temporary nature including dust, noise, waste generation, disruption to traffic and movement and possible damage to existing utilities; and of little consequence during the long-term operational phase. Such impacts can be minimized by implementing the environmental and social management plan.

5.1 Assessment methodology

The process of impact assessment is undertaken taking into consideration direct, indirect, planned or unplanned (accidental) impacts during the Project's rehabilitation and operation phases. Identified potential impacts are assessed for overall significance based on consequence and likelihood ranking where the impact significance is expressed as the product of the consequence and likelihood of occurrence of the activity as outlined below.

Significance = Consequence x Likelihood

Where "Consequence" is the resultant effect (positive or negative) of an activity's interaction with the legal, natural and/or socio-economic environments. "Likelihood" is the possibility that an impact will occur.

The assignment of the level of consequence and potential likelihood depends on the professional experience and judgment of the study team. This judgement followed the consequence categories defined in Table 5-1. The potential overall consequence is then combined with the "Likelihood" to give the impact significance as presented in Table 5-2, which illustrates the likelihood scores and the resulting significance based on consequence-likelihood interaction.

Table 5-1. Consequence scores

Consequence Score	*From Planned Activities*	*From Unplanned/ Accidental Activities*
5 (Severe)	Severe environmental damage or severe nuisance extending over a large area and continuous emission or permanent change over more than 5 years. Likely major breach in compliance resulting in prosecution. Stakeholders concern is triggered on an international level.	Certain (event likely to occur more than once on the facility)
4 (High)	Continuous emission or permanent change over less than 5 years leading to a major impact. Possible major regulatory noncompliance. Stakeholders concern is triggered on a national level.	Possible (could occur within the lifetime of the development)
3 (Medium)	Regular over short-term (less than 3 years) or intermittent over long-term (more than 3 years) leading to repeated breaches of statuary limit. Spontaneous recovery of limited damage within one year. Possible regulatory noncompliance. Stakeholders concern is triggered on a regional level.	Unlikely (event could occur within the life of 10 similar facilities, has occurred at similar facilities)
2 (Low)	Minor magnitude effect on the environment but no permanent effect. Regulatory terms or corporate policy set defined conditions. Stakeholders concern is triggered on a local level.	Remote (similar event has occurred somewhere with similar projects but not likely to occur with current practices and procedures)
1 (Negligible)	Local environmental damage within the fence and within systems with negligible severity. No specific statutory control. Stakeholders concern is triggered on an individual level.	Extremely remote (has never occurred within similar projects but theoretically possibly)
0 (None)	No impact.	-
+ (Positive)	Beneficial impact that enhances the environment. No public interest or improves aspect of community importance.	-

Table 5-2. Significance categories based on consequence-likelihood interaction

Significance = Consequence x Likelihood							
	Likelihood						
	5	*4*	*3*	*2*	*1*	*0*	
Consequence	*Certain*	*Possible*	*Likely*	*Unlikely*	*Extremely Remote*	*Will Not Occur*	*Significance*
5	25	20	15	10	5	0	Severe
4	20	16	12	8	4	0	Major
3	15	12	9	6	3	0	Moderate
2	10	8	6	4	2	0	Minor
1	5	4	3	2	1	0	Negligible
0	0	0	0	0	0	0	No Impact
+							Positive Impact

5.2 Potential positive impacts during rehabilitation

During rehabilitation, the REP is expected to have positive impacts on socio-economics. Being labor intensive, construction projects will result in job creation and in business opportunities for skilled and unskilled labor among local residents and Syrian refugees, such as construction labor and the supply of construction material and provision of food to the construction workers. Based on the past experience of construction work in the country, there is a higher probability of Syrians-refugees to apply and work in unskilled and low-skilled labor positions. The number of jobs created for roads rehabilitation within the Bcharre district could not be estimated at this stage.

5.3 Potential adverse impacts during the rehabilitation phase

5.3.1 Traffic

During the rehabilitation phase, traffic capacity along the roads under rehabilitation will be reduced temporarily, resulting in increased travel times. In addition to the impact of road detours, the transport of construction material to the sites and of construction waste from the sites will generate traffic due to truck-trips. Considering the worst-case scenario where none of the generated construction and excavation waste will be re-used on site, it was estimated that an average of two 20-m^3 trucks carrying construction material and one 16-m^3 trucks carrying construction waste will commute daily during the construction phase. This is not expected to have a significant impact on traffic congestion in the caza although traffic on Road 2 (Deir Mar Lichaa - Wadi Qadisha) during the rehabilitation phase is of concern particularly with the presence of construction machinery along the roads due to several factors, (1) there are no alternatives to this road to the valley and hence it has to remain accessible at all times, and (2) the road is narrow and delimited with rocky outcrops limiting the possibilities of detours along some stretches. In fact, this concern was raised during the public participation session, whereby stakeholders insisted on the need to maintain access to the

valley at all times. However, the road is heavily used during the summer season (around 250,000 tourists), while in winter, few tens of people access it regularly. Hence, proper scheduling of the works on this road will greatly reduce the impact. As for Road 3 (Beit Mounzir – Qnat) and Road 4 (Qnat - Mazraat Aassaf), they are in remote areas with relatively low traffic flow (Table 4-8) and limited sensitive receptors directly along the roads, the likelihood of occurrence of this impact is considered as 'possible' and the consequence is considered as 'medium' as it is regular over short-term. Hence, the overall significance of the impact on traffic during construction is considered to be moderate.

Figure 5-1. Difficult conditions along Road 2 (Deir Mar Lichaa - Wadi Qadisha)

Road 2- Wadi Qadisha (34°14'28.7"N 35°59'58.9"E)
A. Maalouf, A. Chehab (Oct, 2019)

5.3.2 Air quality

During the rehabilitation phase, air quality can be negatively affected, mainly due to emissions from the on-site usage of construction equipment and to particulate matter released as a result of shallow excavation and leveling works, transport vehicles delivering construction materials, and disturbances to material stockpiles by local winds and material handling.

Road rehabilitation in general is a source of dust emissions that may have temporary adverse impacts on local air quality. Dust emissions often vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing meteorological conditions. For this phase, it is expected that negative impacts on air quality will occur in and around the immediate

locality of the site under construction. However, dust emissions are not expected to be significant, especially that excavation activities are limited to 20 to 40 cm. In order to quantify this impact, construction emissions and corresponding ambient particulate matter levels can be estimated using simple models (Annex A). Results showed that the predicted total PM concentration at a road segment site is expected to range between 24.0 □g/m^3 under typical conditions, and 15,506 □g/m^3 under worst-case conditions. Hence, under typical conditions, the expected PM concentrations are below the national 24-hr standard (120 □g/m^3) within a 100 m wide corridor. As for worst-case conditions, the expected PM concentrations significantly exceed the national 24-hr standard. This impact is considered to be more significant along Road 2 (Deir Mar Lichaa - Wadi Qadisha) since the closed nature of the valley might limit dilution. As for Road 3 (Beit Mounzir – Qnat) and Road 4 (Qnat - Mazraat Aassaf), given the open nature of the land cover favoring dilution, as well as the limited number of sensitive receptors directly along those roads, the significance of such an impact is considered to be low. Furthermore, as stated, such an impact is temporary and can be minimized with proper management measures are adopted as outlined below.

In agricultural areas along Roads 2 (Deir Mar Lichaa - Wadi Qadisha) and Road 3 (Beit Mounzir – Qnat), emissions from construction equipment and excavation activities may deposit on nearby plants and vegetation along the road, causing a reduction in pigmentation in plant leaves at times, which could affect photosynthesis and plant growth rate. However, as mentioned above, dust emission rates are expected to be low, since road excavations are limited to 20-40 cm in depth. Furthermore, since these emissions are at ground level, large dust particles are not expected to be transported very far from the roads.

The overall impact on air quality during rehabilitation is temporary in nature and expected to be of low consequence. Hence, its significance is considered to be minor.

5.3.3 Noise

The use of heavy machinery during construction increases noise levels which may create stress on local inhabitants, workers, and tourists in the close vicinity to road works. Noise from construction is different from noise from other sources because it is caused by many types of equipment, and the resulting adverse effects are temporary since construction activities are relatively short term. In order to assess the extent of potential noise impacts during the rehabilitation of the proposed project, a noise model specific for construction operations can be applied (Annex B). The total L_{eq} for the site was estimated at 80.8 dBA. This noise level is slightly above the maximum noise levels measured in the vicinity of the site (55-80 dBA). It exceeds the FHWA standards for the Category B classified areas (67 dBA). However, this value was lower than the OSHA standard for an 8-hr exposure (90 dBA). In this case, the exposure of workers to noise during their work shift is acceptable. The simulated noise levels at different radii away from the site indicated clearly that

the daytime Lebanese standard for rural areas (30-40 dBA) will not be reached even at a radius of 2 km from the rehabilitation area. As for the FHWA standard, it is reached at a radius of 305 m. As such, residential units in the vicinity of the site will experience temporary periods of high noise levels, typical of any construction activity. The area that may be potentially impacted would typically be limited to a 305 m wide corridor along a road. Few sensitive receptors (residences, monasteries, restaurants) might be affected temporarily. The fauna and flora in the Qadisha valley in the vicinity of Road 2 (Deir Mar Lichaa - Wadi Qadisha) and in the pine forests along Road 3 (Beit Mounzir – Qnat) and Road 4 (Qnat - Mazraat Aassaf) may be temporarily impacted (Refer to section 5.3.4 on Biodiversity). Road 2: The likelihood of occurrence of this impact is considered to be 'certain' and its consequence is 'low' since it is temporary, intermittent and since few sensitive receptors are found along most roads. Accordingly, the significance of this impact is considered as moderate.

5.3.4 Biodiversity

Given that the project activities are limited to the rehabilitation of existing roads and do not include establishing new roads or road widening, direct negative effects on wildlife include the creation of a variety of emissions and disturbances such as noise, dust, light, and pollutants in the soil and vegetation. However, these impacts are temporary in nature and can be easily mitigated.

In fact, studies have shown that dust particles reduce the pigmentation in plant leaves (affect photosynthesis and growth rate of plants) and dust fall on open lands reduces their fertility (Supe et al, 2013). Similarly, noise from construction equipment influence animal behavior, altering activity patterns, and can cause stress, loss of reproductive success, and physiological disturbance. Normally, some animals may vacate the area, while, others may get used to the noise, depending on the species.

Impact on biodiversity is expected at the lower sections of Road 2 (Deir Mar Lichaa – Wadi Qadisha), as well as along Road 3 (Beit Mounzir – Qnat) and Road 4 (Qnat - Mazraat Aassaf) at the locations where they cross through dense pine and mixed forests. The likelihood of occurrence of this impact is considered to be 'possible' and its consequence is 'medium' since it is temporary and intermittent in nature. Hence, the overall impact on biodiversity is expected to be of moderate significance.

5.3.5 Construction and excavation waste

Waste generation is closely associated with the rehabilitation phase of the project. The generated wastes will result from the excavation and ground cleaning activities. The estimated volume of soil to be generated is around 5,500 m^3 composed mainly of asphalt, limestone, dolomite rock, and

residual soils. Other wastes that will arise as a normal part of extensive construction works include metals, plastics, packaging material, drilling mud, and blasting wastes. The potential viable options for reuse and disposal of such materials are discussed in the mitigation plan. Improper disposal of solid wastes from construction activities can potentially lead to the contamination of soils and watercourses. This impact's likelihood is 'certain' and its consequence is "medium", resulting in a "major" impact that requires adequate mitigation.

5.3.6 Water and Soil Quality

During the rehabilitation phase, runoff from site working areas may contain significant amounts of suspended particles and contaminants. Potential water pollution sources from construction activities include: runoff and erosion from site surfaces, drainage channels, earth working areas and stockpiles; wash water from dust control; in addition to fuel, oil, solvents and lubricants from maintenance of construction machinery and equipment, in case of improper or careless handling. Runoff containing significant amounts of asphalt and cement–derived material may cause primary chemical and physical effects such as increasing turbidity, change in color, and elevation in pH. Domestic sewage from construction workers is not expected to cause negative impacts since, as mentioned earlier, the Contractor will be encouraged to hire labor from the local community living in the Project area. In case this option is not available at the time of hiring, the Contractor will be required to rent an apartment for the unskilled workers in the Project area. In addition, the Contractor will have to service the on-site with portable cabin toilet. The porta cabin will be mobile and its placement depends on the length of the work zone. Accordingly, the Contractor will have to move it based on the progress of rehabilitation works. The Contractor should link the porta cabin toilet to the existing wastewater network. In case the network is not available within the work zone, the Contractor will need to link it to a polyethylene storage tank and the Supervising Consultant shall inspect it on a regular basis and ensure emptying the tank when filled into the nearest wastewater network. This impact is considered to have a 'possible' likelihood and a 'medium' consequence, resulting in a 'moderate' significance.

5.3.7 Resources consumption

The rehabilitation of the roads will require both fill and construction material as well as water. Table 5-3 provides an estimation of the quantities of material needed for the four roads.

Table 5-3. Estimated quantities of construction material based on the preliminary engineering design

		Construction Material needed			
Road	*Villages*	*Reinforced Concrete (m^3)*	*Reinforcing Steel (tonne)*	*Crushed Aggregate Base Course (m^3)*	*Asphalt Concrete (m^3)*
Road 2	*Deir Mar Lichaa - Wadi Qadisha*	88	8.8	2,112	1,320
Road 3	*Beit Mounzir - Qnat*	60	6	3,840	1,200
Road 4	*Qnat - Mazraat Aassaf*	1,301	13	2,216	1,540
	Total	**1,449**	**27.8**	**8,168**	**4,060**

Since the excavated material will not suffice for backfilling, additional amount of fill and other construction material will be needed. This will be mainly obtained from permitted/licensed quarries. Quarrying has a multitude of impacts such as landscape scarring, degradation of existing ecosystems, creation of holes and open craters that pose health and safety hazards, emissions (dust, noise, and vibrations), and transport of uncovered material which can pose hazard to road users.

As for freshwater, it will be used for construction activities (curing of concrete, moisturizing temporary stockpiles, etc.) and for cleaning and dust suppression. Water consumption varies with construction activities, number of workers per day, working days per year, etc. Although construction activities will consume moderate volumes of water, it will only be for a relatively short, finite period.

During the rehabilitation phase, total pavement reconstruction will require the use of several construction vehicles and equipment. According to (Salem et al., 2014), activities such as total asphalt reconstruction and pavement milling and overlay require an average of 73.81 MJ and 26.56 MJ of energy respectively per square meter of rehabilitated road. Table 5-4 presents an estimate of average energy consumption per proposed road assuming all the roads will require total asphalt rehabilitation. The total estimated energy consumption ranges between 5.2 and 7.3 x 10^6 MJ. The energy used during rehabilitation will contribute to the depletion of fossil fuel resources. However, the rehabilitation phase will be relatively short-term.

Table 5-4. Average energy consumption for total asphalt rehabilitation per road

Road Code	*Villages*	*Length (Km)*	*Width (m)*	*Surface area (m^2)*	*Energy consumption (MJoules)*
Road 2	*Deir Mar Lichaa - Wadi Qadisha*	4.43	5 - 7	22,150-31,010	1,634,891-2,288,848
Road 3	*Beit Mounzir - Qnat*	3.03	5 - 7	15,150-21,210	1,118,221-1,565,510
Road 4	*Qnat - Mazraat Aassaf*	6.58	5 - 7	32,900-46,060	2,428,349-3,399,689

This impact is considered as ‘certain’ to occur and of ‘low’ consequence, hence an impact of ‘moderate’ significance.

5.3.8 Existing infrastructure

Infrastructure such as water and sewage networks, telephone lines, and underground cables often exist under the road pavement. Random digging and milling of deteriorated road pavement, without prior investigation of possible existence of underground infrastructure, may interfere with existing infrastructure that is possibly serving nearby residents. Damage to infrastructure can cause several undesirable impacts such as cutting off water or internet supply, generation of bad smells, and attraction of water borne diseases and vectors due contaminated water accumulation etc.

This impact is considered as ‘likely’ to occur and of ‘medium’ consequence, hence an impact of ‘minor’ significance.

5.3.9 Landscape and visual intrusion

Visual intrusion at working sites is expected during the rehabilitation phase. In addition to soil erosion, excavation activities may result in the depletion of the vegetative cover on the side roads and an evident visual impact on the landscape. However, these impacts are expected to be minimal and temporary since the existing condition of the proposed roads does not require significant re-rehabilitation work. Accordingly, the likelihood of occurrence of this impact is considered as ‘possible’ with a ‘low’ consequence, resulting in impacts of minor significance.

5.3.10 Archaeology and cultural heritage

As mentioned in section **Error! Reference source not found.**, the main archaeological site in the project site is the Deir Mar Lichaa Monastery close to Road 2 (Deir Mar Lichaa-Wadi Qadisha). However, in case some unrecognized archaeological deposits were present, the impact of project execution varies with the nature of the construction activity. Areas where no disturbance of the ground is planned should not interfere with archeological deposits. The same is also true for areas where development is taking place over previously disturbed ground. As such, roads rehabilitation and improvement of transport infrastructure that already exists should not impact on preserved archeological deposits. However, the rehabilitation of culverts and the foundations for lighting gantries, may disrupt archaeological deposits, if present. This impact is considered as ‘likely’ to occur and of ‘medium’ consequence, hence an impact of ‘minor’ significance.

5.4 Potential Socio-economic impacts

During the rehabilitation phase. the proposed project will undoubtedly contribute positively from a socio-economic perspective through the creation of job opportunities and the investment in the

road infrastructure. This impact is considered as ‘certain’ to occur with ‘medium’ significance and hence is considered a ‘moderate’ positive impact. Concurrently, this phase can be associated with several potentially negative impacts of temporary nature as outlined below.

5.4.1 Social tensions

Potential social tensions and conflict over jobs or dissatisfaction with the allocation of project-generated jobs can often occur if not properly managed, leading to negative publicity, delays, political interferences as well as potential discrimination or harassment.. This impact is considered as ‘possible’ to occur with ‘medium’ significance and hence is considered a ‘moderate’ impact.

5.4.2 Child labor

Child labor is common occurrence amongst refugee and poor communities often resulting in a high potential for abuse and exploitation. While Lebanese law allows child work starting at the age of 13 under certain very specific and well controlled conditions, provisions under the mitigation / management plan will protect against child labor preventing its occurrence under this project through a transparent hiring process that maintains a registry of verification about work permits and age. This impact will not be allowed to happen with the proper implementation and monitoring of the verification process in place.

5.4.3 Labor influx

Contractors are expected to be sensitive to hire locally first both Lebanese and Syrians. Influx of additional labor is not expected because the Syrian workforce is already present in the area in good numbers. This labor influx may induce Sexual Abuse and Exploitation and Harassment (SEA/H). In the event contractors bring in additional workers from outside the area (with proper justification such as the lack of certain technical field workers), training and raising awareness activities coupled with the code of conduct stipulated under the management plan will help integrate the additional workers. This impact is considered as ‘possible’ to occur with ‘medium’ significance and hence is considered a ‘moderate’ impact.

5.4.4 Access to services

Access to roadside businesses (such as stores, gasoline stations), farmlands and recreational facilities, as well as access to roadside residences can be limited inducing extra inconvenience. In particular, the rehabilitation of roads may restrict the accessibility of few private buildings especially. While the expected rehabilitation period per district is about 15 to 18 months according to CDR, the few sensitive construction along the roads will experience a short construction period along small stretches that do not require beyond a few days of construction.

This impact is considered as ‘possible’ to occur with ‘medium’ significance and hence is considered a ‘moderate’ impact.

5.4.5 Health and safety impacts

Health and safety at construction sites are considered primarily in terms of potential exposure and accident occurrence (direct and indirect) to workers on-site, pedestrians, and vehicle operators or passengers. Construction activities pose potential risk on the safety of workers as well as the general public either through the possible danger from passing traffic or negligence-careless use of heavy equipment. Common causes of fatalities and serious injuries among workers include, pedestrian workers struck by passing traffic, by construction machinery, or by objects (tools, materials, parts of equipment, trees, etc.), equipment / vehicle rollovers, falls, overexertion, etc. Similarly, pedestrian passers-by may be at risk of injury getting struck by construction machinery or by objects. Passing traffic may also be at risk of accidents if not aware of presence construction site and road detours. This impact is considered as ‘possible’ to occur and of ‘medium’ consequence, hence an impact of ‘moderate’ significance.

5.4.6 Traffic disturbance

Increased travel times during the rehabilitation phase are expected and translates into inconvenience to the public and potential economic losses in the form of delays and forgone earnings. While the overall expected construction period per district is about 15 to 18 months according to CDR, the few sensitive locations along the roads will experience a shorter construction period with stretches that are relatively short and do not require beyond a few days of construction. This impact is considered as ‘possible’ to occur with ‘medium’ significance and hence is considered a ‘moderate’ impact.

5.5 Potential positive impacts during the operation phase

The REP is expected to have positive impacts on socio-economics and several environmental indicators (traffic; air quality; noise; visual intrusion; health and safety) as described below. Note that most indicators may exhibit both minor negative impacts as well depending on how they are examined.

5.5.1 Traffic and air quality

Improved traffic flow on rehabilitated roads will lead to improved fuel efficiency and better engine performance, thereby reducing vehicle emissions.

5.5.2 Landscape and visual intrusion

During operation, the impact is expected to be positive as the roads will be refurbished and will have an improved appearance.

5.5.3 Health and safety impacts

During operation, it is expected that, with proper rehabilitation and signage, the roads can be safer with less potential for accidents. Proper traffic management can reduce road safety risks.

5.5.4 Socio-economics

During operation, improved road conditions will improve accessibility of people (including tourists), goods and services. This will lead to an improvement in local economic and social development and enhanced livelihood opportunities in the remote rural areas the roads are servicing, due to reduced trip times and less traffic congestion. Road 4 is of importance as it links the Bcharre Caza to the Batroun Caza. It is expected to save significant travel time on commuters. Furthermore, the enhanced safety design of the rehabilitated roads will result in a reduction in traffic accidents. In addition, smoother road surfaces may lead to fewer vehicle repairs thereby resulting in longer vehicle life and lower maintenance expenditures.

5.6 Potential negative impacts during the operation phase

5.6.1 Air quality

During the operation phase, vehicle emission factors will be a function of the expected traffic conditions along the roads as well as the general characteristics of the vehicle fleet. Moreover, traffic redistribution will influence the exposure of residents to vehicular emissions. In the long term, improved road conditions will increase traffic volume through the road and result in increased pollutants emissions from vehicles. On the other hand, improved traffic flow leads to improved fuel efficiency and better engine performance, thereby reducing vehicle emissions. Hence the net impact could be slightly positive or slightly negative.

Table 5-5 presents the projected traffic volume on the proposed roads in 20 years. It is important to note that the increase in future flow, which amounts to around 81 percent, is attributed mostly to population growth. It is difficult to quantitate the contribution of the REP to this increase.

Table 5-5. Projected traffic volume along the Bcharre district proposed roads (20 years)

Road code and villages	*Existing Traffic Volume (ADT)*	*Future Traffic Volume ADT (20 Years)*	*Vehicle Fleet Composition*
Bcharre Road 2 Deir Mar Lichaa – Wadi	308	556	93.5% light vehicles | 6 % Medium | 0.5% Heavy

Qadisha			
Bcharre Road 3 *Beit Mounzir - Qnat*	1,965	3,549	82.5% light vehicles | 6.5 % Medium | 11% Heavy
Bcharre Road 4 *Qnat - Mazraat Aassaf*	307	554	81% light vehicles | 8.5 % Medium | 10.5% Heavy

The three roads were simulated using a line source Gaussian plume model (Annex A). The results showed that impacts would be minimal[13]; this is mainly due to the relatively low projected traffic volumes, and the high potential for atmospheric dispersion within the project area. The impact on air quality during the operation phase is confined in nature and expected to be of low consequence. Hence, its overall significance is considered to be minor.

5.6.2 Noise

At the operational level, vehicular traffic is the main source of noise emissions. Although the road rehabilitation maintained the existing design speed of 50 km/hr, improved road conditions allow higher traffic speed that can also increase noise levels along the roads. Noise levels are primarily a function of the car fleet characteristics, traffic volume and speed, as well as pavement surface design. A typical methodology to carry a quantitative assessment is outlined in Annex B. The area that may be potentially impacted by noise levels exceeding 67 dBA would typically be limited to a 7 m wide corridor along Road 3, where the future traffic projections are the highest (3,549 vehicle/day). For other roads, the projected increase in traffic is not expected to cause a significant increase in noise level that might reach unacceptable levels. It is important to note that the increase in future flow, is not directly attributed to the project, but will occur naturally due to population growth and tourism development. It is difficult to quantify the exact contribution of the REP to this increase. Accordingly, the noise impacts during the operation phase will be limited to the immediate buffer region along the road. The occurrence of this impact is considered to be 'likely' and its consequence is 'medium' since it is long-term, but few sensitive receptors are found along most roads. Accordingly, the significance of this impact is considered as minor. Note that in semi-urban areas, noise impacts are expected to be more significant and long term particularly that commercial and residential areas are located in the immediate vicinity of Road 4. These impacts are expected to materialize with increased development of the general area, irrespective of the road rehabilitation project.

[13] The maximum future CO concentration under the worst-case scenario in terms of meteorology was along Road 3, which has the highest projected traffic volume. It was estimated at 28.5 µg/m^3, which is well below the national ambient air quality standard for CO of 10,000 µg/m^3 for an 8-hr average. In fact, it was an improvement to the current CO emissions estimated at 40.7 µg/m^3.

5.6.3 Biodiversity

Impacts on biodiversity during the operation phase are expected to be limited as no additional roads are being built. Nevertheless, increase in traffic movement could result in an increase in road kills (i.e. mortality due to vehicular collisions). Animals that are attracted to roads or that need to cross them are more vulnerable. Furthermore, increased artificial night light might affect the natural behavior of many animal species. It can disturb development, activities and hormone-regulated processes, including the internal clock mechanism (Rich and Longcore, 2006). In addition, many species are attracted to, and disoriented by sources of artificial light (phototaxis phenomenon). However, lights won't be installed along all the road length. They will be limited to areas close to residents and areas where road safety warrants lighting. This will minimize the impact of light on biodiversity. Accordingly, the impact on biodiversity quality during the operation phase is expected to be 'likely' and of 'low' consequence. Hence, its overall significance is considered to be minor.

5.6.4 Water and soil quality

During the operational phase, road runoff can cause contamination to surface and ground waters, but this is relatively insignificant unless associated with a spill. In concept, it is unavoidable to transport hazardous goods (fuel, gasoline, industrial raw materials) on the roads when in operation. Thus, accidents may happen and accidental spills of hazardous materials may cause a serious problem to nearby water bodies as well as groundwater sources. Hence the significance of this impact is considered as minor but not much different than the existing conditions without the project implementation. In fact, it is expected that with proper rehabilitation and signage, the roads can be safer with less potential for accidents.

5.6.5 Resources Consumption

The project will require electrical power for supplying lighting and any traffic signals, if available. In general, the increase in energy demand will contribute to the depletion of fossil fuel resources, as well as to the emissions of greenhouse gas emissions. Water will be utilized for cleaning purposes, however, the required quantities during operation are not expected to contribute to the increase in the demand for water resources. Accordingly, impacts of the consumption of natural resources are considered as moderate for energy and negligible for water.

5.6.6 Visual amenity

Moderate light pollution is expected after improving the street lighting conditions. This might affect project surroundings, considering that some of the existing inhabited surroundings are residential. However, this impact is expected to be minor being 'likely' and of 'medium' significance.

5.6.7 Health and safety impacts

During operation, maintenance activities pose potential risk on the safety of workers as well as the general public either through the possible danger from passing traffic or negligence-careless use of heavy equipment. Furthermore, potential deaths, injuries, and damage to property resulting from car accidents are a public health problem and a cost to the economy but not much different than the existing conditions without the project implementation. In fact, it is expected that with proper rehabilitation and signage, the roads can be safer with less potential for accidents. Proper traffic management can reduce road safety risks. This is considered as 'likely' to occur with a 'medium' consequence, and hence is considered of minor significance.

5.7 Summary of environmental impact analysis

The rehabilitation phase of any development is known to have potential adverse environmental impacts on traffic, air quality, noise level, construction waste, water and soil quality, landscape and visual intrusion, resources consumption, damage to existing utilities, health and safety. Inadequate construction standards can increase environmental degradation. The potential environmental impacts during the rehabilitation phase of the project were assessed to range from minor to major negative, with the majority being moderate negative.

During operation, the rehabilitation of the road, combined with the natural increase in the vehicle fleet size, will ultimately increase traffic volume and hence, typical impacts associated with increased traffic will be inevitable in the long term. Yet, improved traffic flow on rehabilitated roads will lead to improved fuel efficiency and better engine performance, thereby reducing vehicle emissions. Refurbished roads will lead to improved landscape and visual intrusion, despite increase in light pollution. Finally, improved safety design of roads can reduce the potential for accidents.

The magnitude and significance of these impacts is not the same along all roads. Based on the field surveys and environmental and social assessment, Road 2 encompasses a more sensitive and diversified environment because it represents the access road to the Qadisha Valley and passes close to the Deir Mar Lichaa Monastery and in the vicinity of the Abou Ali/ Qadisha River. Table 5-6 summarizes the significance of impacts expected under the rehabilitation and operation phases. Negative impacts are mostly temporary or not significant in nature with similar size projects.

Table 5-6. Summary of potential impacts of proposed roads in Bcharre district

Potential Impact	*Rehabilitation phase*	*Operation phase*
Traffic	Moderate negative	Minor negative to Positive
Air quality	Minor negative	Minor negative to Positive
Noise	Moderate negative	Minor negative to Positive
Biodiversity	Moderate negative	Minor negative
Construction Waste	Major negative	Neutral
Soil and water	Moderate negative	Minor negative to Zero
Resources consumption	Moderate negative	Neutral
Existing infrastructure	Minor negative	Neutral to Positive
Visual Intrusion	Minor negative	Minor negative to Positive
Health and Safety	Moderate negative	Minor negative to Positive
Socio-Economic	Moderate negative to Positive	Positive
Archaeology / Cultural Heritage	Minor negative	Neutral
Expropriation/involuntary resettlement	Neutral	Neutral

5.8 Summary of socio-economic impact assessment

During the rehabilitation phase, the socio-economic impacts are expected to be positive in terms of providing job opportunities and moderately negative in terms of temporary increase in travel time, impeded accessibility to residences / businesses, and potential health and safety and social tensions. During the operation phase, the rehabilitation of roads is expected to have positive impacts by improving access to remote areas, reduced trip times, reduced traffic congestion and accidents, and enhanced livelihood opportunities.

6 MITIGATION OF ENVIRONMENTAL AND SOCIAL IMPACTS

Mitigation measures are typically recommended whenever the potential impact is moderately significant with the ultimate purpose to eliminate or reduce the potential negative impacts of the proposed project. Mitigation measures are highly dependent on the significance of the predicted impact, the nature of the impact (permanent vs. temporary), or the phase of the project (rehabilitation vs. operation). Possible measures to mitigate potential impacts described in the previous section are outlined below, particularly during the rehabilitation phase. The operation phase will experience mostly general socio-economic improvements which is the purpose of the project although minor impacts are inevitable such as the increase of noise and vehicle emissions due to traffic increase.

6.1 Environmental Mitigation Measures during Rehabilitation

6.1.1 Traffic

Traffic delays and congestions can be avoided by implementing the following mitigation measures:

- Scheduling transportation of construction material during off -peak traffic hours and during night time. Generally peak traffic hours are from 7 to 10 am and from 3 to 6 pm
- Developing routing strategies for construction-related traffic to avoid sensitive receptors
- Informing the public about the schedule of rehabilitation activities
- Maintaining access to roadside businesses and residences via detours and temporary access features
- Ensuring adequate warning, signing, delineation and channeling at least 500 m down and up-gradient from the construction site
- Providing personnel to manage traffic at the rehabilitation site, supported by Municipal police if needed
- Avoiding peak traffic times when laying asphalt
- Considering the use of small equipment and machinery and reliance on manual labor to avoid blockage of Road 2 (Deir Mar Lichaa-Wadi Qadisha), and ensure uninterrupted access of residents and farmers in Wadi Qadisha

Detour maps showing traffic management plans along a 2-lane 2-way single road (Figure 6-1) and a dual carriageway road (Figure 6-2) are presented below. Note that the traffic detour options presented in Figures 6-1 and 6-2 can be adopted only when the option is within the right of way of the proposed road.

Figure 6-1. Traffic management plan for a detour along a 2-lane 2-way single road

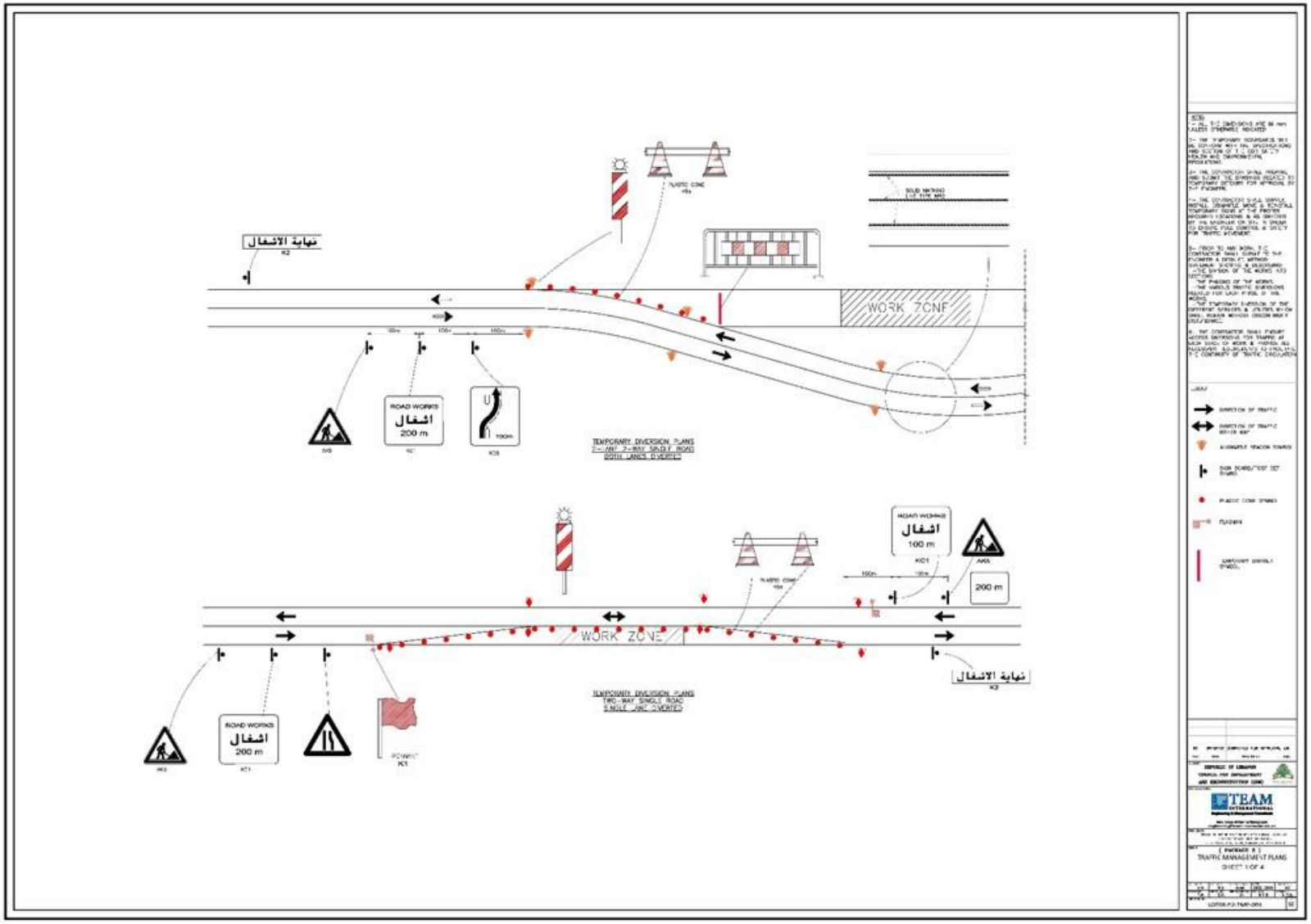
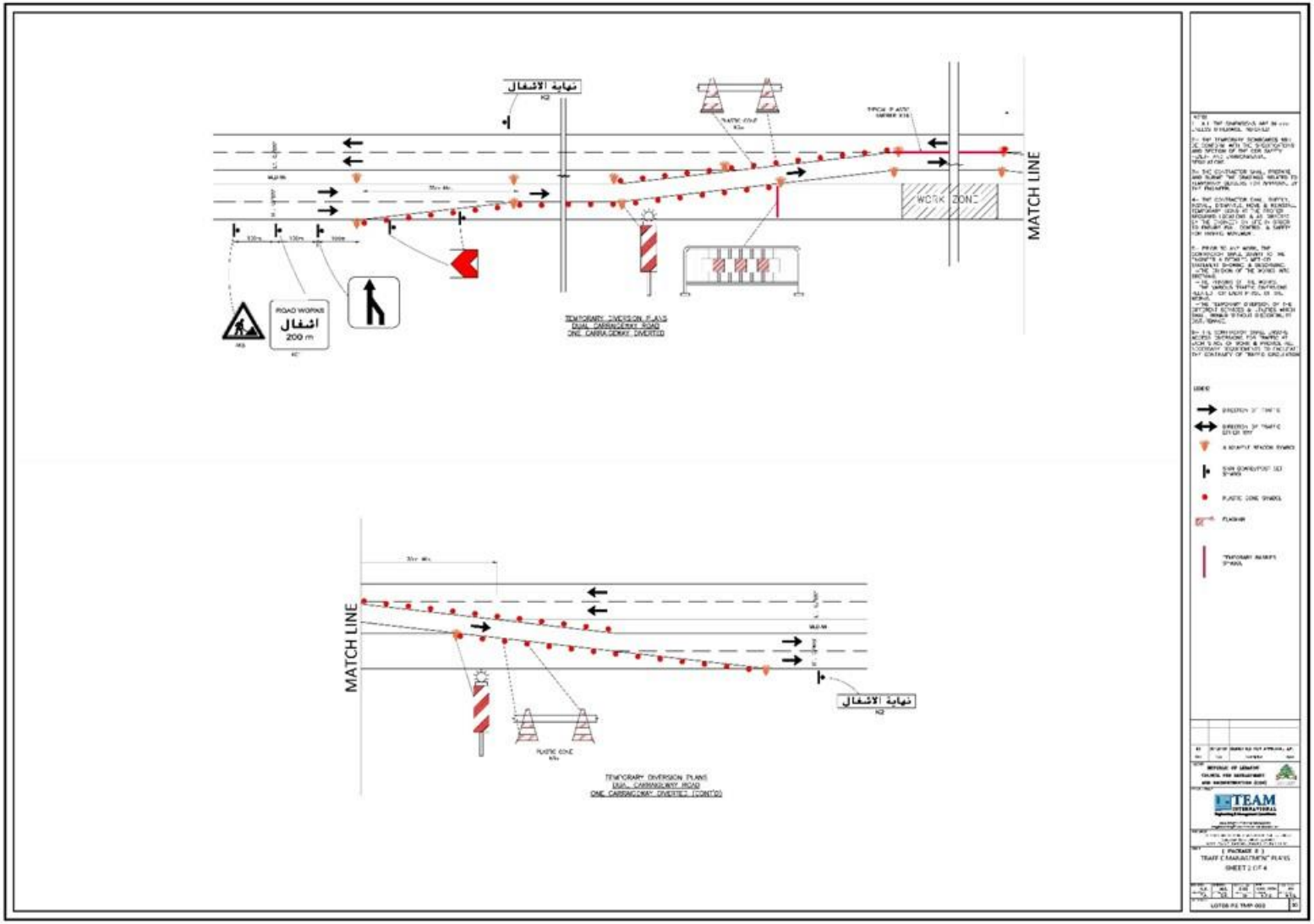


Figure 6-2. Traffic management plan for a detour along a dual carriageway road



6.1.2 Air quality

The impact of construction activities on air quality can be reduced by the use of well-maintained equipment as well as by appropriate water spraying for dust control during dry periods. Typical measures include:

- Ensuring adequate maintenance and repair of construction machinery and vehicles
- Maintaining good housekeeping practices that entail keeping the site and its surroundings clean
- Ensuring good quality of diesel fuel used with on-site equipment
- Turning off all equipment when not in use
- Sprinkling water on the construction site on windy days to hamper the generation of dust and its entrainment in the wind
- Ensuring that excavated soil and fine construction material that are stored on site are properly sited away from the dominant wind direction and that they are watered and/or covered entirely by impervious sheeting when not in use
- Proper handling of cement material
- Covering all vehicles hauling materials likely to give off excessive dust emissions
- Ensuring good fuel quality is used in trucks transporting construction material to and from site
- Ensuring optimum and regular transportation of construction materials to minimize storage of large heaps on-site and to minimize concentrated truck-trips.
- Restricting vehicle speeds to 25km/h on unpaved roads and trucks

6.1.3 Noise levels

To reduce the impacts of noise from construction activities, possible mitigation measures include the use of quiet equipment and noise mufflers, proper maintenance of equipment, and limiting noisy activities to normal daylight working hours.

6.1.4 Biodiversity

Induced negative impacts of road projects on biodiversity can be minimized by taking special care when passing through rich or critical natural ecosystems (valleys, forests, rivers...etc). Specific mitigation measures include:

- Careful rehabilitation work must be conducted where the road reaches Abu Ali / Qadisha river in Wadi Qadisha towards the end of road 2 to avoid damaging nearby ecosystems. For instance, isolate the stretch overlooking the Qadisha / Abu Ali river with a 2 meter blocked fence with access to pedestrians crossing the river at one point. Also, since many buses come down and up Road 2, it is critical to provide wider paved turns for such buses along the road.

- Workers' movement and activities should not infringe on the nearby ecosystems including agricultural areas.
- Workers should be instructed to protect flora and fauna when feasible as well as their habitats.
- Solid and liquid waste should not be dumped into the natural environment (See below).

6.1.5 Construction waste

While waste materials should be properly disposed of at suitable permitted locations to avoid contamination of soils and watercourses, permitted sites for construction waste disposal are rarely available in Lebanon. This is a chronic challenge and a weakness in environmental management throughout the country. As discussed during the public participation session, proper permits should be obtained through local municipalities whereby inert waste materials (excluding asphalt) can be used as filling material for local road reconstruction projects within the caza or disposed of at local sites like quarries, only if designated / approved for that purpose. If needed, these sites should be agreed upon between the municipalities, in coordination with the supervising consultant and CDR.

Similarly, lubricant/fuel waste are difficult to manage in Lebanon because of the lack for facilities for this purpose. To avoid damage to the natural environment there is a need to ensure proper handling of fuels, lubricants and other chemicals while maintaining construction equipment and prevent possible leakage of lubricants and fuel during periodic inspection and maintenance of equipment. It is mandatory to maintain equipment in dedicated repair shops.

6.1.6 Water and soil quality

The most appropriate mitigation measures to ensure minimal water quality impacts include provisions for proper surface drainage during both the rehabilitation and operation phases, and the minimization of on-site water and chemical usage (oil lubricants and fuel) and soil exposure time during the rehabilitation phase. These wastes when mixed with other construction waste are typically disposed of in open dumps or landfills. In addition, the contractor should adopt the following mitigation measures in order to minimize the effect on soil and water bodies during rehabilitation:

- Building materials, asphalt, oil and chemicals should be stored away from river banks in well controlled areas
- Any stockpiled construction material should be covered with an impermeable layer
- Diesel should be stored in designated tanks away from the road maintenance site and drainage ditches. Tanks are to be put on an elevated concrete base to prevent soil or water pollution in case of accidental spill at the specified storage location
- All refueling operations shall take place off-site, vehicles should be fueled up before arriving to the road section

- Each container should be marked with the correct technical name of the substance it contains
- Incompatible materials shall not be placed in common containment
- A spill response plan shall be in place and all workers should be trained on its implementation
- Used or waste fuel or other waste chemicals shall be stored in an isolated area until collected for off-site disposal by an approved waste contractor
- Waste material or water containing waste chemicals such as thinners, oil, and mineral spirits shall not be pumped or disposed of into storm water drains, sanitary sewers or into the ground.
- Vehicle and equipment wash-down should only be done in designated areas away from the road under rehabilitation to protect water and soil quality in the area
- A collection system shall be provided under any machinery or equipment that may leak hydrocarbons (e.g. mobile generator)
- All operations involving the use of concrete should be carefully controlled to avoid leaching into water sources.
- Contractor to provide mobile/portable cabin toilet linked to the existing wastewater network. When the latter is absent within the work zone, the toilet is linked to a polyethylene storage tank that is emptied when full into the nearest wastewater network.

More specifically, for soil manipulation the following measures are recommended:

- Installation of retaining walls before starting with drainage ditch excavations to block soil erosion
- Excavations for drainage channels should be carried out in complete precision and resulting excavated soil should be stored and transported to offsite locations for disposal due to possible contamination.
- Reduce the time excavated drainage channels remain unsupported
- Keep vegetation clearing to a minimum and encourage re-vegetation immediately after construction activity finishes, at sites where vegetation is removed,
- Place geotextile silt traps as appropriate

Note that the Contractor will have to service the on-site with portable cabin toilet for the workers. The porta cabin will be mobile and its placement depends on the length of the work zone. Accordingly, the Contractor will have to move it based on the progress of rehabilitation works. The Contractor should link the porta cabin toilet to the existing wastewater network. In case the network is not available within the work zone, the Contractor will need to link it to a polyethylene storage tank and the Supervising Consultant shall inspect it on a regular basis and ensure emptying the tank when filled into the nearest wastewater network.

6.1.7 Resources consumption

To mitigate quantities of water consumed, the following mitigation measures are recommended:

- Dry clean-up methods should replace wet cleaning methods whenever practical (sweeping, dust collection vacuum, wiping…etc.), while taking into consideration dust generation
- Signs near water-using appliances should be installed to encourage water conservation
- Appropriate plastic sheeting or waterproof paper should be used to cover the concrete after water curing to preserve moisture and reduce the evaporation that leads to less water quantities used

To mitigate energy consumption:

- Turn off equipment when not in use
- Regularly maintain machinery and generators and operate them in an efficient manner
- Do not leave vehicles idle for long periods
- Site offices shall be well insulated to retain heat or cool, utilize energy efficient bulbs and energy efficient cooling systems.

To mitigate the use of construction material:

- Reuse excavated material whenever feasible
- Accept construction material only from permitted/licensed quarrying sites

6.1.8 Existing infrastructure

To avoid damaging any possible existing infrastructure, road plans and elevation for each road that requires pavement reconstruction, and that should have accounted for the location of the existing utilities, should be obtained from the concerned team and incorporated in the planning prior to commencement of any rehabilitation works. Procedures for rapid notification of the concerned municipality/ ministry, in the case of disruption of any existing utility, should be prepared along, with requirements for immediate assistance with re-instatement, and close follow-up with concerned authorities.

6.1.9 Visual intrusion

To mitigate for visual intrusion, possible measures consist of:

- Documenting existing conditions prior to initiation of the works
- Preserving existing vegetation when feasible
- Restoring depleted vegetative cover by replanting with endemic trees (pine, oak, etc.) where cutting is necessary during rehabilitation.
- Clearance of all equipment, spoil heaps, and other materials after rehabilitation

6.1.10 Archaeology and Cultural Heritage

Special attention should be paid during rehabilitation works along Road 2 (Deir Mar Lichaa-Wadi Qadisha), where groundwork is being executed (channel and culvert construction). In the case of chance finds, the following procedures should be followed:

- An archaeologist shall be consulted and/or called to the site for a determination regarding significance.
- Any cultural resources identified shall be protected to the maximum extent feasible.
- Work in the immediate site vicinity should cease until such time the archaeologist can formulate an appropriate mitigation or data recovery plan and implement the plan as determined necessary

Damage to cultural sites shall be avoided and no works shall be conducted near cultural sites unless schedule and type of works are coordinated with the concerned authorities.

6.2 Environmental Mitigation Measures during Operation

6.2.1 Air quality

The long-term impacts from the operation of the road can only be mitigated within the framework of a countrywide plan for air quality, fuel quality and vehicle fleet maintenance, which is beyond the scope of this project.

6.2.2 Noise levels

During the operation of the road, the provision of speed limit signs at critical locations can minimize noise emissions from moving vehicles, particularly in the sections where there are sensitive receptors. Bitumen based noise absorbent material can be added for surfaces on the sections adjacent to residential areas and sensitive receptors (Wadi Qadisha). Such materials will reduce the noise to the surrounding areas by about 5 dB, compared with other road surfaces. Finally, roads should be periodically and regularly maintained for good working conditions.

6.2.3 Biodiversity

Bird-friendly light sources are recommended on public roads, to decrease the number of casualties among nocturnally migrating birds (Poot et al, 2008) and to disturb less natural vegetation (flowering, seed setting, and germination) and the local fauna (Rich and Longcore 2006). Animal crossing signage are recommended along Road 2 (Wadi Qadisha) to minimize road kills of animals.

6.2.4 Water and soil quality

The most appropriate mitigation measures to ensure minimal water quality impacts include maintenance of surface water drainage systems. In addition, vehicles hauling hazardous materials should inform administrative departments, and cannot run on the road unless they get permits. Furthermore, such vehicles should be provided with obvious markings and can stop only at designated locations.

6.2.5 Resource consumption

In order to mitigate resource consumption during the operation phase, consider:

- Using water-efficient equipment during maintenance operations to avoid excessive and overuse of water
- Rehabilitating street lighting to minimize energy consumption.

6.2.6 Visual intrusion

In order to mitigate light pollution during the operation phase, consider:

- Choosing a type of light that is least likely to cause light pollution
- Ensuring that the light source has the minimum intensity required
- Ensuring that lights are turned off when not needed (manually or automatically)

6.2.7 Health and safety

During road maintenance activities, the contractor will be required to comply with the standard safety, health and environmental regulations of the CDR and the WB. These regulations include measures for providing pedestrian walk ways, installing proper warning signs, providing protective clothing and equipment. The guidelines will be included within the bid specifications and maintenance contracts. The supervising consultant will have the responsibility of ensuring the implementation of these guidelines. As for mitigating road accidents, proper road management, road maintenance, and signage coupled with speed control and enforcement of international road safety standards and practices can reduce accidents.

6.3 Socioeconomic Mitigation Measures During Rehabilitation

As indicated above, while the proposed project will create some positive socio-economic impacts through job opportunities and investment in infrastructure, several potential negative impacts that are temporary in nature, were identified in the impact assessment and require attention in the mitigation plan as outlined below.

6.3.1 Social tensions

in order to avoid the risk of social tensions and conflict over job-sharing / dissatisfaction with allocation of project generated jobs, it is recommended to develop and communicate clear criteria for job selection and allocation, with attention to ratio of Syrian and Lebanese community workers, non-discrimination and fair treatment of all workers including equal wages/benefits and working conditions, types of positions and jobs restricted to Lebanese citizens, and consideration also for sub-group allocations within different communities.

Employment opportunities were discussed during the consultation process for both Lebanese and Syrian workers. The latter contributes significantly in the construction sector throughout Lebanon including the Bcharre District. Besides private entities, the municipalities are resorting to Syrian labor in this sector in particular. There appears to be a clear split in job types between the two communities. The delineation line is between skilled jobs (mainly taken by the Lebanese workforce) and unskilled labor (filled primarily by Syrian workers). This split has resulted in a control of potential tensions or conflict between the communities.

A grievance mechanism should be established for the public to file their complaints particularly during the rehabilitation phase. The effectiveness of this mechanism is ensured when public complaints are closely monitored and can reach multiple stakeholders simultaneously including the contractor, supervising consultant, PIU at CDR, the local relevant municipalities, and workers. The GRM is applicable for communities and for workers (both Lebanese and Syrian workers) with the option to remain anonymous when filing a grievance to encourage workers to speak out without potential fear of repercussions. Close monitoring of complaints is imperative alongside a transparent documentation process of timely response undertaken.

6.3.2 Child labor

Child labor under this project will not be allowed through a transparent hiring process that maintains a registry of verification about work permits and age. Particular attention is essential to prevent child labor by maintaining and monitoring a labor registry for age verification process prior to hiring potential workers.

6.3.3 Labor influx

While labor influx from outside the region is not expected because the local workforce seems to be available according to the municipalities, training and raising awareness are necessary including a well-defined and distributed code of conduct for of workers. Contractors are expected to be sensitive to hire locally first both Lebanese and Syrians. In the event contractors bring in additional workers from outside the area (with proper justification such as the lack of certain technical field workers), training and raising awareness activities coupled with the code of conduct stipulated

under the management plan will help integrate the additional workers. Moreover, the Contractor should give workers training and awareness sessions on SEA/H to prevent and eliminate all forms of violence against women and girls.

6.3.4 Access to services

Being temporary in nature, the impacts on residents can be minimized by providing alternative access to residences and roadside businesses and shortening the construction period by making financial resources readily available to contractors coupled with penalty and incentive clauses in the contract.

6.3.5 Health and safety impacts

Proper mitigation measures can significantly reduce health and safety risks during the rehabilitation phase. The CDR has developed site health and safety guidelines for contractors (Annex C) involved in construction projects. The contractor will be required to comply with these guidelines as well as the WB guidelines which include measures for providing pedestrian walk ways, installing proper warning signs, providing protective clothing and equipment. Contractors will equally be obliged to maintain a site construction insurance plan that covers all workers in case of injury or accidents during construction. The guidelines will be included within the bid specifications and construction contracts. The supervising consultant will have the responsibility of ensuring the implementation of these guidelines. During operation, proper road management, signage and maintenance can prevent or reduce accidents.

6.3.6 Traffic disturbance

During the rehabilitation phase, the impacts of increased travel times can be minimized by providing alternative access to residences and roadside businesses and by adopting traffic management plans to ensure a safe and efficient movement of traffic during rehabilitation (Refer to 6.1.1 on mitigation of traffic delays during rehabilitation) as well as by informing the public about the schedule of construction activities. It is also preferable that the road rehabilitation be implemented outside the summer season in areas where villagers depend on summer businesses.

6.4 Social Mitigation Measures During Operation

Since no negative socio-economic impacts were identified during the operation phase, no mitigation measures are needed.

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

7.1 Institutional Setup and Capacity Building

7.1.1 National Institutions

Effective mitigation and monitoring plans require the presence of adequate capacity for environmental management at the national level. For the REP, the CDR plays a major role in ensuring the implementation of environmental mitigations by:

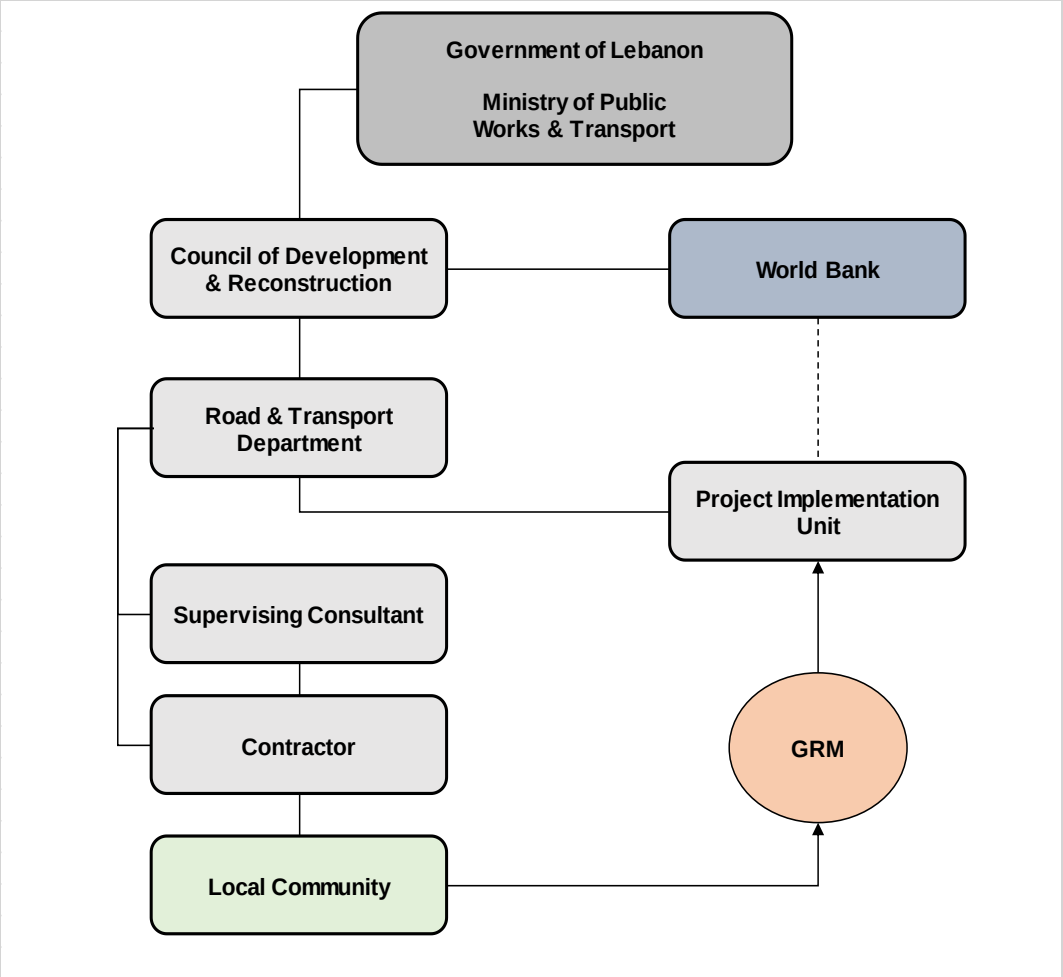
- Supervising design works at the design stage and ensuring that contracts for design works bear clauses requiring Design Teams to plan for and allocate resources for impact mitigation.
- Ensuring that ESMPs are integrated wholly into design reports.
- Ensuring that Technical Specifications of Contracts for Civil works will bear clauses binding respective contractors to undertake impact mitigation as per the Design Report, in line with the World Bank Safeguards Procedures for Inclusion in the Technical Specifications of Contracts
- Monitoring activities of contractors to ensure delivery as per contracts through its field officers and mainly through dedicated supervision consultants

The Project Implementation Unit (PIU) at the CDR will be responsible for providing the overall policy direction, technical assistance, review and endorsement of environmental and social assessment and management plans, capacity building for effective safeguards management to the implementing agencies, monitoring of environmental compliance and progress reporting to the World Bank. The responsibility of day to day planning, implementation and supervision of environmental/social safeguards by the PIU will be coupled with the role of focal point(s) for environmental and social safeguards who will be in charge of ensuring timely and sound application of the ESMPs to the planned investments. The environmental/social focal points will work closely with the PIU environmental/social consultant to ensure harmonization and coordination of activities according to the ESMP requirements. In addition, at the field level, it is expected that the PIU will require the engineering and technical firms to recruit specialized staff in environment, social development and health and safety to conduct continuous supervision on field activities and prepare non-compliance reports on which the PIU will investigate and take action. In this context, the PIU may also conduct periodic field supervision to check on compliance with the ESMP mitigation measures.

As for the contractors, they are required to implement mitigation measures during the rehabilitation phase as per the signed Contract for Civil Works. Implementation of the ESMPs will largely be the contractor's responsibility and therefore the contractor will have to nominate qualified environmental, health and safety consultant and a social development consultant (if needed) in order to ensure compliance with the ESMPs during rehabilitation.

During the operation phase, the contractor will still be bound to undertake impact mitigation alongside routine repair for a one-year Defect Liability Period. Beyond the Defect Liability Period, all mitigation will fall on the Municipality. Figure 7-1 below illustrates the institutional setup for project implementation.

Figure 7-1. Institutional setup for project implementation



7.1.2 Training

In the context of the proposed project that encompasses simple rehabilitation activities, environmental management during the rehabilitation and operation activities are relatively simple to ensure environmental protection. This can be accomplished through competent personnel with appropriate educational and professional background and instituting a periodic training program and site-specific plans that are adequate for protecting the general public and the environment as well as contributing to the mitigation of potential environmental impacts. Thus, contractors personnel who will be involved in the construction of the proposed project as well as personnel who will be involved in monitoring activities from the supervising Consultant may attend an environmental training workshop prior to the initiation of project activities. Relevant staff from the

concerned municipalities are encouraged to attend, as they will be indirectly supervising the works on the ground. The objective of this training is to ensure appropriate environmental awareness, knowledge and skills for the implementation of environmental mitigation measures. Environmental training sessions will be conducted twice a year for a period of one day during the construction phase. The training program will emphasize on pollution prevention measures and techniques during both phases. The cost and schedule of this training program will be 2,000 USD per day including material preparation. Repeat workshops will be at 1,000 USD per day. The training program will cover at least the following topics:

- Environmental laws, regulations, and standards
- Pollution health impacts
- Pollution prevention measures
- Sampling techniques and environmental monitoring guidelines (air, noise, water)
- Protection of cultural heritage in developmental projects
- Traffic and pedestrian safety measures
- Code of conduct for laborers and interactions with nearby communities
- Awareness sessions about internal GRM for workers

7.1.3 Reporting

Progress reporting on safeguards compliance will take place as indicated in the ESMF (CDR, 2018) and listed below:

- Contractor's environmental compliance reports to the Environmental Supervision Consultant on monthly basis;
- Environmental Supervision Consultant reviews and approves the contractor reports and submits to the PIU at the CDR Roads and Transport Department on monthly basis
- PIU environmental/social progress reports to the WB, on a quarterly basis..

7.2 Mitigation Plans

While the road rehabilitation is associated with some potential negative impacts, most of them can be alleviated. Table 7-1 and

Table 7-2 present a summary of environmental and Table 7-3 of social mitigation measures that should be adopted to eliminate or minimize these impacts. They are presented in two parts namely during the rehabilitation (Table 7-1) and Operation phases (Table 7-2). Note that for a project of this relatively small scale at the individual road level and restricted to rehabilitation with the confines of the existing right of way, it is most effective to include the supervision and cost of the mitigation measures within the activities of the contractor (an on-site engineer responsible for HSE implementation amongst other tasks) and the supervising consultant (an on-site engineer responsible for HSE supervision amongst other tasks). Upon public complaint, a third party (consultant) can also be appointed by CDR to conduct periodic checks on the overall implementation of mitigation measures.

7.2.1 Environmental Mitigation Plan

Table 7-1. Environmental Mitigation Plan for the Bcharre district roads during the rehabilitation phase

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility of mitigation*	*Responsibility of direct supervision*	*Estimated Cost*
Traffic delays and congestion	❑ Schedule transportation of construction materials during off - peak traffic hours and during night time. Generally peak traffic hours are from 7 to 10 am and from 3 to 6 pm. ❑ Develop routing strategies for construction-related traffic to avoid sensitive receptors ❑ Inform the public about the schedule of rehabilitation activities ❑ Maintain access to roadside businesses and residences via detours and temporary access features ❑ Ensure adequate warning, signing, delineation and channeling at least 500 m down and up-gradient from the construction site. ❑ Provide personnel to manage traffic at the rehabilitation site, supported by Municipal police if need be ❑ Avoid peak traffic times when laying asphalt and to the extent feasible, schedule construction activities outside the peak summer visitation season while always keeping part of the road accessible particularly the road to wadi Qadisha, the only access road for nearly 250000 people in the summer.	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks
Air emissions	❑ Ensure adequate maintenance and repair of construction machinery and vehicles; ❑ Maintain good housekeeping practices that keep the site and its surroundings clean ❑ Ensure good quality of diesel fuel used with on-site equipment ❑ Turn off all equipment when not in use ❑ Sprinkle water on the construction site on windy days to hamper the generation of dust and its entrainment in the wind ❑ Ensure that excavated soil and fine construction material that are stored on site are properly sited away from the dominant wind direction and that they are watered and/or covered entirely by impervious sheeting when not in use ❑ Handle cement material properly	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility of mitigation*	*Responsibility of direct supervision*	*Estimated Cost*
	❑ Keep hauling routes free of dust and regularly cleaned ❑ Ensure good quality of fuel is used in trucks transporting construction material to and from site ❑ Ensure optimum and regular transportation of construction materials to minimize storage of large heaps on-site and to minimize concentrated truck-trips. ❑ Cover all vehicles hauling materials likely to give off excessive dust emissions; ❑ Restrict vehicle speeds to 25km/h on unpaved roads and trucks			
Increased noise levels	❑ Use quiet/well-maintained equipment ❑ Regularly maintain equipment and turn them off when not in use ❑ Use operational noise mufflers ❑ Limit construction activities to working hours designated by decision number 2/163 – 31/1/1995	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks
Biodiversity	❑ Conduct careful rehabilitation work where the road reaches Abu Ali / Qadisha river to avoid damaging nearby ecosystems: Isolate the stretch overlooking the Qadisha / Abu Ali river with a 2 meter blocked fence with access to pedestrians crossing the river at one point. Also, since many buses come down and up Road 2, it is critical to provide wider paved turns for such buses along the road ❑ Control workers' movement and activities to avoid infringing on the nearby ecosystems including agricultural areas. ❑ Instruct workers to protect flora and fauna when feasible as well as their habitats. ❑ Prohibit dumping of solid and liquid waste into the natural environment ❑ Install animal crossing signage on Road 2 in the Qadisha wadi	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility of mitigation*	*Responsibility of direct supervision*	*Estimated Cost*
Generation of construction waste	❑ Minimize the generation of construction waste ❑ Adequately sort construction waste to remove any hazardous substances ❑ Reuse inert waste materials as filling material for road reconstruction where feasible ❑ Establish an arrangement with the municipality and the North Lebanon Governor to secure suitable locations for construction waste disposal	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks
Pollution of soil and water resources	❑ Minimize usage of chemicals (lubricants, oil, solvents) ❑ Ensure the proper storage of building materials, asphalt, oil and chemicals on-site in well- controlled areas and away from river banks ❑ Do not discharge wastewater into river or on soils ❑ Do not discharge waste oil into rivers or on soils ❑ Contractor to provide mobile/portable cabin toilet linked to the existing wastewater network. When the latter is absent within the work zone, the toilet is linked to a polyethylene storage tank that is emptied when full into the nearest wastewater network. ❑ For vehicles and equipment, the Contractor will have to rent a land within the Project area. This land should be fenced and used for parking purpose only. The Contractor shall not perform any repair on site and is obliged to execute vehicles and equipment maintenance in a repair shop preferably located within the Project area. ❑ Waste material or water containing waste chemicals such as thinners, oil, and mineral spirits shall not be pumped or disposed of into storm water drains, sanitary sewers or into the ground. ❑ Cover any stockpiled construction material covered with an impermeable layer. ❑ Store diesel in designated tanks away from the road maintenance site and drainage ditches. Place it on an elevated concrete base to prevent soil or water pollution in case of accidental spill at the specified storage location.	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility of mitigation*	*Responsibility of direct supervision*	*Estimated Cost*
	❑ Conduct all refueling operations off-site. Fuel vehicles up before arriving to the road section. ❑ Decrease water usage ❑ Maintain surface water drainage ❑ Ensure that in the event of any fuel or chemical spills, the affected area is attended to and that the top soil is removed for disposal. A spill response plan shall be in place and all workers should be trained on its implementation. ❑ Control over vehicle hauling hazardous materials ❑ Clean the site periodically ❑ Each receptacle should be marked with the correct technical name of the substance it contains. ❑ Incompatible materials shall not be placed in common containment. ❑ Used or waste fuel or other waste chemicals shall be stored in an isolated area until collected for off-site disposal by an approved waste contractor. ❑ Vehicle and equipment wash-down should only be done in designated areas away from the road under rehabilitation to protect water and soil quality in the area. ❑ Control all operations involving the use of concrete to avoid leaching into water sources. ❑ Provide bins on-site for the disposal of non-construction related wastes ❑ Work with the municipality to include the site on the current solid waste collection route ❑ Minimize soil exposure time ❑ Install retaining walls before starting with drainage ditch excavations to block soil erosion ❑ Carry out excavations for drainage channels in complete precision and transport resulting excavated soil to offsite locations for proper disposal in case of contamination. ❑ Reduce the time excavated drainage channels remain unsupported			

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility of mitigation*	*Responsibility of direct supervision*	*Estimated Cost*
	❑ Keep vegetation clearing to a minimum and encourage re-vegetation immediately after construction activity finishes, at sites where vegetation is removed, ❑ Place geotextile silt traps as appropriate			
Resources consumption	❑ Replace wet cleaning methods with dry clean-up methods whenever practical (sweeping, dust collection vacuum, wiping…etc.), while taking into consideration dust generation. ❑ Install signs near water-using appliances to encourage water conservation. ❑ Use appropriate water proof sheeting to cover the concrete after water curing to preserve moisture and reduce the evaporation that leads to decrease water quantities used ❑ Turn off equipment when not in use ❑ Regularly maintain machinery and generators and operate them in an efficient manner. ❑ Do not leave vehicles idle for long periods. ❑ Site offices shall be well insulated to retain heat or cool, utilize energy efficient bulbs and energy efficient cooling systems. ❑ Reuse excavated material whenever feasible ❑ Accept construction material only from permitted/licensed quarrying sites	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks
Existing infrastructure	❑ Obtain road plans and elevation for each road ❑ Develop procedures for rapid notification of the concerned municipality/ ministry, in the case of disruption of any existing utility, along, with requirements for immediate assistance with re-instatement, and close follow-up with concerned authorities	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility of mitigation*	*Responsibility of direct supervision*	*Estimated Cost*
Visual intrusion	❑ Document existing conditions prior to initiation of the works ❑ Preserve existing vegetation when feasible ❑ Restore depleted vegetative cover by replanting with endemic trees (pine, oak, etc.) where cutting is necessary during construction. ❑ Clearance all equipment, spoil heaps, and other materials after construction ❑ Ensuring that the street light source has the minimum intensity needed.	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks
Health and safety	❑ Follow CDR's and WB's safety, health and environmental regulations and guidelines ❑ Ensure the construction sites are completely enclosed and restrict entrance to construction personnel ❑ Create buffer zones around the site and provide pedestrian walk ways ❑ Ensure traffic by-passes in working areas ❑ Install clear warning signs ❑ Provide adequate loading and off-loading space within the site itself ❑ Provide appropriate personal protective equipment to construction workers, including helmets and earmuffs) ❑ Provide on-site first aid kit with adequate content (ex. including antiseptic fluid, gauze, cotton etc. and other items that are needed to deal with any cuts and bruises) ❑ Provide accident insurance for workers	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks

Table 7-2- Environmental Mitigation Plan for the Bcharre district roads during the operation phase

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility*	*Responsibility of direct supervision*	*Estimated Cost*
Traffic congestion & delays	❒ Maintain road safety infrastructure	❑ MOPWT	❑ Municipality	Included as part of the construction and supervision activities for a one-year Defect Liability Period during operation.
Noise	❒ Provide speed limit signs at critical locations and enforce speed limit ❒ Regularly maintain the roads	❑ MOPWT ❑ Municipalities	❑ MOPWT ❑ Municipalities	Included as part of the construction and supervision activities for a one-year Defect Liability Period during operation.
Biodiversity	❒ Refer to rehabilitation phase ❒ Maintain lighting source ❒ Maintain speed bumps and signage	❑ MOPWT ❑ Municipalities	❑ MOPWT ❑ Municipalities	Included as part of the construction and supervision activities for a one-year Defect Liability Period during operation.
Water and soil quality	❒ Maintain surface water drainage systems ❒	❑ MOPWT ❑ Municipalities	❑ MOPWT ❑ Municipalities	Included as part of the construction and supervision activities for a one-year Defect Liability Period during operation.
Resource consumption	❒ Using water-efficient equipment during maintenance operations to avoid excessive and overuse of water.	❑ MOPWT ❑ Municipalities	❑ MOPWT ❑ Municipalities	Included as part of the construction and supervision activities for a one-year Defect Liability Period during operation.
Visual intrusion	❒ Ensuring that lights are turned off by a timer or manually when	❑ MOPWT	❑ MOPWT	Included as part of the construction and

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility*	*Responsibility of direct supervision*	*Estimated Cost*
	they are not needed.	❑ Municipalities	❑ Municipalities	supervision activities for a one-year Defect Liability Period during operation.
Health and safety	❒ Follow CDR's and WB's safety, health and environmental regulations during maintenance works ❒ Proper road management, signage and maintenance	❑ MOPWT ❑ Municipalities	❑ MOPWT ❑ Municipalities	Included as part of the construction and supervision activities for a one-year Defect Liability Period during operation.

7.2.2 Social Mitigation Plan

Table 7-3. Social Mitigation Plan for the Bcharre district roads during the rehabilitation phase

Potential Impacts	*Proposed Mitigation Measures*	*Responsibility*	*Responsibility of direct supervision*	*Estimated Cost*
Socio-economics	❑ Inform the public about the schedule of construction activities ❑ Provide alternative access to residences and roadside businesses ❑ Adopt traffic management plans to ensure a safe and efficient movement of traffic ❑ Develop and communicate clear criteria for job selection and allocation, with attention to ratio of Syrian and Lebanese community workers, types of positions and jobs restricted to Lebanese citizens, and consideration also for sub-group allocations within communities. ❑ Ensure work permit requirements are satisfied in accordance to the Ministry of Labor regulations ❑ Maintain labor registry and age verification record to protect against potential child labor ❑ Ensure non-discrimination and fair treatment such as equal wages/benefits and working conditions among workers ❑ Establish and ensure that GRM is applicable for communities and for workers (both Lebanese and Syrian workers) to file their complaints. Provide the option of anonymity under the GRM ❑ Maintain a site construction insurance plan that covers all workers in case of injury or accidents during construction ❑ Provide workers with the necessary training and awareness raising session on issues related to SEA/H	❑ Contractor	Supervision Consultant	Included as part of the construction and supervision activities. Contractor on-site engineer for HSE implementation amongst other tasks Consultant on-site engineer responsible for HSE supervision amongst other tasks

7.3 Monitoring Plan

7.3.1 Monitoring Plan Implementation

Monitoring should be conducted to evaluate the impact analysis, check on the implementation and the effectiveness of mitigation measures, respond to unanticipated environmental and social impacts, and improve environmental and social controls. Since the project is a category B, monitoring activities for such projects rely primarily on visual observation and photographic

documentation although measurements of certain indicators (traffic count, air / water quality and noise level) can be conducted when public complaints are raised. The project supervising consultant holds the direct responsibility of monitoring activities during the rehabilitation phase to ensure the implementation of the mitigation plan by the contractor. Upon public complaints, a third party (consultant) can also be appointed by CDR to conduct periodic monitoring with measurements of environmental indicators depending on the nature of the complaint. Table 7-4 presents a summary of monitoring indicators / activities during the rehabilitation phase.

During the operation phase, regular monitoring activities become more part of the duties and responsibilities of local municipalities and stakeholders. Similar to the rehabilitation phase, upon public complaints, a third party (consultant) can also be appointed by CDR to conduct periodic monitoring with measurements of environmental indicators depending on the nature of the complaint. (Table 7-5).

Table 7-4. Environmental and Social Monitoring Plan for the Bcharre district roads during the rehabilitation phase

Impact	*Monitoring activities*	*Responsibility*	*Frequency/ Duration*	*Location*	*Methods*	*Estimated Cost*[1]
Traffic	Continuous supervision with periodic photographic documentation of mitigation measures (congestion, traffic disruption, speed limits, working hours, the presence of a traffic police and construction worker at detours)	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Air quality	Continuous supervision with periodic photographic documentation of mitigation measures (vehicle and excavation emissions, turning off of equipment not in use, equipment maintenance, type of fuel used on site and in hauling trucks, speed limits, cleanliness of site, water spraying, storage conditions of soil and fine construction material, working hours, schedule of material transportation	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
	Total Suspended Particles (TSP), PM_{10}, $PM_{2.5}$ (wherever feasible), SOx, NOx and CO	Supervising Consultant	Upon public complaint	At site and at sensitive receptors within 100 m from site	1-hr measurements, and visual observation of dust dispersion (scale and direction)	2000$/event

Noise	Continuous supervision with periodic photographic documentation of mitigation measures (equipment mufflers, equipment maintenance, equipment turned off when not in use, speed limits, working hours) and measurements of indicators in case of public complaints	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
	L_{eq}, L_{min} and L_{max}	Supervising Consultant	Upon public complaint	At site and at sensitive receptors within 100 m from site	Single sample per location (average 1hr reading-15min intervals) during morning (7-8am), evening (1-2pm) and night (4-5pm)	500$/ event
Biodiversity	Continuous supervision with periodic photographic documentation of mitigation measures (worker movement and activity, waste disposal, etc.)	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Construction and other solid waste	Continuous supervision with periodic photographic documentation of mitigation measures while maintaining a record of waste generation, collection, segregation, storage, transportation and disposal in terms of type, quantity, and disposal location of generated waste	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Runoff water/ drainage	Continuous supervision with periodic photographic documentation (chemical usage, chemical and material storage, water usage, wastewater discharge from mobile/portable toilets and storage tanks into existing or nearest sewage network. bins for solid waste disposal, oil spill management) while checking on culverts particularly following rainfall events	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks

	Water quality analysis	Supervising Consultant	Upon public complaint	At nearby river/ stream	Totals suspended solids, BOD, COD, Oil and grease	1000$/ event
Resource consumption	Continuous supervision with periodic photographic documentation of reuse of excavated material, water and energy conservation practices and design elements	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Existing infrastructure	Continuous supervision with periodic photographic documentation of excavation and response to disruption of underground utilities	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Visual intrusion	Continuous supervision with periodic photographic documentation of excavation and re-planting / re-vegetation while checking on culverts particularly following rainfall events	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Health and Safety	Continuous supervision with periodic photographic documentation (PPE, site enclosure, buffer zones, warning signs, first aid kit, accident insurance), while maintaining a record of injuries / accidents specifying cause and location	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks
Socio-economic	Continuous supervision with periodic photographic documentation of mitigation measures while maintaining a record of employment and grievance, sharing construction schedule with the public, access to roadside businesses and residences, and grievance record	Supervising Consultant	Daily	At rehabilitation site	Visual observation and photographic documentation	Consultant on-site engineer responsible for HSE supervision amongst other tasks

Table 7-5. Environmental and Social Monitoring Plan for the Bcharre district roads during the operation phase (up to one year after project completion)

Impact	*Monitoring activities*	*Responsibility*	*Frequency/ Duration*	*Location*	*Methods*	*Estimated Cost*
Air quality	Total Suspended Particles (TSP), PM_{10}, $PM_{2.5}$ (wherever feasible), SOx, NOx and CO	Supervising Consultant	Upon public complaint	At site and at sensitive receptors within 100 m from site	1-hr measurements, and visual observation of dust dispersion (scale and direction)	2000$/event
Noise	L_{eq}, L_{min} and L_{max}	Supervising Consultant	Upon public complaint	At site and at sensitive receptors within 100 m from site	Single sample per location (average 1hr reading-15min intervals) during morning (7-8am), evening (1-2pm) and night (4-5pm)	500$/ event
Water	Totals suspended solids, BOD, COD, Oil and grease	Supervising Consultant	Upon public complaint	At nearby river/ stream	Single sample analytical analysis	1000$/ event

7.3.2 Documentation and Reporting

During the rehabilitation phase, the Supervising Consultant shall submit a monthly report about the monitoring activities to various stakeholders including the CDR and the municipalities. These reports shall be made readily available or accessible to the public upon submittal. The content of a typical report should mirror the indicators of the mitigation plan with proper photographic documentation and actions taken in the event of accidents, concerns or complaints. The report would include an executive summary in Arabic for the use of the municipalities.

7.3.3 Guidelines for Health and Safety Plan during rehabilitation

During rehabilitation, the contractor shall abide by the CDR Safety, Health, and Environmental Regulations for Construction Projects (Annex C) as well as the WBG Environmental Health and Safety General Guidelines.

8 CONSULTATION, DISCLOSURE AND GRIEVANCE REDRESS MECHANISM

8.1 Public Consultation

A public consultation meeting was conducted on December 13, 2019 at the Federation of Municipalities in the Bcharre Caza in Dimane. Due to the snowy weather conditions, the number of attendees was 15, including heads of municipalities or their representative in the Bcharre district as well as a representative of NGOs and cooperatives in the district. Four of the attendees were females. The complete attendance list is presented in Annex D.

Figure 8-1. Public participation session with Bcharre Caza stakeholders

The session started with a welcome note from Mr. Fady Keirouz, the head of the Bcharre Municipality and the Deputy Head of the Federation of Municipalities of the Bcharre Caza. This was followed by a presentation by Dr. Mutasem El-Fadel, the environmental expert from TEAM International who explained the components of the overall REP, displayed the layout of the selected roads in the Bcharre Caza, and discussed the proposed ESMP. Dr. El-Fadel also gave contact numbers for the TEAM and CDR for any further questions or future complaints or grievances. Dr. El-Fadel emphasized that the selected roads have been approved by a Ministerial Decision

following much discussions with various stakeholders at many levels, and hence they cannot be changed at this stage. The main issues raised by the attendees were as follows.

- The selection criteria applied for road selection are not clear.
- Some sections of the proposed roads that have recently undergone rehabilitation works. Could the allocated budget be transferred to additional works along those roads?
- Lighting is preferred along the roads and not within the towns where there is usually lighting.
- During the rehabilitation works of Road 2, the contractor should ensure that parts of the road remain accessible as this road is the only access road to Wadi Qadisha.
- Rehabilitation works on this road should not be scheduled during the peak season of tourist visits in the summer, which extends from June until mid-September. Furthermore, the works on this road should be expedited and preferably completed within 2 months.
- Also, since many buses come down and up Road 2, it is critical to provide wider paved turns for such buses along the road
- Construction waste may be re-used by other contractors in the area (such as Hamid Keirouz), depending on the status of their projects. Milled asphalt should be sorted and handled alone. It should not be used for backfilling.
- Contractor to give priority employment to local people from the towns where the roads rehabilitation is taking place.
- Enforcing construction schedule in a timely fashion.
- Employment opportunities were discussed for both Lebanese and Syrian workers. The latter contributes significantly in the construction sector throughout Lebanon including the Bcharre District. Besides private entities, the municipalities are resorting to Syrian labor in this sector in particular. There appears to be a clear split in job types between local communities. The delineation line is between skilled jobs (mainly taken by the Lebanese workforce) and unskilled labor (filled primarily by Syrian workers). This split has resulted in a control of potential tensions or conflict between the communities.

A side discussion took place with female attendees towards the end of the meeting. It revealed similar and consistent concerns as outlined above.

As for NGOs Consultation, this ESMP has targeted them according to their position in Lebanon. They consist of two levels as follows:

a) Local NGOs: they are specific to each Caza. Their mission is to address different concerns and issues among the local society including social, economic, gender equality, environment, poverty, women empowerment, etc. Local NGOs were invited to the public hearings. Table 8-1 represents the name of the invited NGOs and their field of activity. Those local NGOs may play a role of advocates to reduce projects' social and environmental risks.

Table 8-1. Contacts with local NGOs and stakeholders

Organization	*Person*	*Position*	*Comments*	*Phone*
Union of Cooperatives in Bcharre	Nathalie Bou Younes	Director	Attended the public participation session Syrian labour available in Bcharre district and paid mostly in cash	+961 3 820585
Al-Arz Association	Leila Jeajea	Co-Founder	Syrian labour available in Bcharre district and paid mostly in cash	+961 3 581802
	Youssef Tawk	Director	Syrian labour available in Bcharre district and paid mostly in cash	+961 3 540585
	Bassam Jeajea	Director	Syrian labour available in Bcharre district and paid mostly in cash	+961 3 223428
Center for Development, Democracy, and Governance (CDDG)	Marc Zeinoun (Koura & Bcharre)	Director	Syrian labour available in Bcharre district and paid mostly in cash	+961 3 883535
Rene Mouawwad Foundation	Natasha Marashelian	Director, Main Office, Beirut	Works throughout Lebanon including the Bcharre district. Had many sub-contractors with construction activities Syrian labour available in Bcharre district and paid mostly in cash	+961 3 850 692

a) International NGOs: they are covering the whole country and their consultation will be applied to all the ESMPs of the REP. They provide relief and developmental aid to many developing countries. They support the society in responding to crises and helps people whose lives and livelihoods are shattered by conflict and disaster to survive, recover and gain control of their future. When the crisis in Syria erupted in early 2011, numerous International NGOs responded to the humanitarian crisis and worked directly with the Syrian in Lebanon by providing aid and responding to their critical situation.

   This ESMP consulted International NGOs (see Table 8-2) to inform them about the Project, disseminate it, ask them to circulate its impacts and activities among Syrian and tell them that they can inquire about additional information and/or submit a complaint (if any) by

contacting the Grievance Redress Mechanism (GRM) Unit on 01980096 ext:317 or send an Email to rstephan@cdr.gov.lb or register by hand an official letter at the CDR .

In Bcharre Caza, the total number of registered Syrian is 40 individuals (UNHCR, 2018). They were contacted through the International NGOs to seek their feedback about the Project. Accordingly, this ESMP did not receive any concern about the Project.

Table 8-1: Consulted International NGOs and their Activities

NGO Name	Contacts	Intervention Sector(s)	Comments
ANERA Lebanon	Mrs. Dima Zayat Deputy Country Director T: 01382590 (ext: 105) M: 70051813 E: dzayat@aneralebanon.org	• Children & Youth • Development • Education • Relief Services • Water sanitation and hygiene	Mrs. Zayat received the Project information sheet and explained that recently Anera operations in Lebanon have grown substantially to cope with the Syrian crisis. they have six offices throughout Lebanon. She welcomed the idea of the Project and will disseminate it across her organization.
ACTED	Mr. Jack French Deputy Country Director T: 01324331 M: 79160375 E: jack.french@acted.org	• Development • Infrastructure & Services Rehabilitation • Labor & Livelihoods • Shelter • Water sanitation and hygiene	Mr. French received the Project information sheet and explained that ACTED is working with Syrian in Beirut and northern districts of Mount Lebanon (Baabda, Metn, Keserwane and Jbeil), as well as in Akkar District. He welcomed the idea of the Project and will disseminate it across his organization.
Danish Refugee Council (DRC)	Mr. Rickard Hartmann Country Director T: 01339052 (ext: 201) E: rickard.hartmann@drc.ngo	• Direct Assistance • Protection • Shelter • Community Empowerment and Livelihoods	Mr. Hartmann received the Project information sheet and explained that DRC is working with Syrian on many sectors in different locations across Lebanon including Beirut, Tripoli, Kobayat and Zahle. He welcomed the idea of the Project and will disseminate it across his organization.

8.2 Grievance Redress Mechanism

The ESMP revealed mostly minor to moderate environmental and social impacts associated with the project activities particularly during the rehabilitation phase. While these impacts were discussed during the Public Consultation meeting, certainly not all potential stakeholders were or can be reached during this process. Therefore, an accessible Grievance Redress Mechanism (GRM) is warranted whereby various stakeholders can voice their concerns during all phases of the project implementation phases: pre- rehabilitation, rehabilitation, and operation. The GRM should be designed to permit a timely resolution of concerns, assuring stakeholders that their grievances have been heard and that the institutionalized mechanism will yield a fair and impartial outcome.

The CDR has developed the GRM for the REP and it was shared with the participants during public participation. There are two mechanisms for filing a grievance, one for the surrounding communities and one for the workers. Anonymous grievances will be addressed in both levels and the maximum anticipated time needed to close a GRM case is 45 days.

8.2.1 GRM for Communities

The GRM will be accessible to all relevant stakeholders who can use this mechanism to send their suggestions, concerns and complaints related to the PIU. The complaints, suggestions and concerns can be sent by email, mail, phone (through a hotline), in person and other means such as a grievance compliant logging sheet where grievances are registered in writing and maintained as a database. The phone number, e-mail address, and address for receiving complaints will be disclosed among the population and will be posted at the rehabilitation sites in Bcharre Caza, before commencement of project implementation. Moreover, the information on how to access the GRM should be available through billboards, CDR website, etc.

The GRM levels of the project are the following:

- Level 1: If any person has any complaint, concern or suggestion regarding the project implementation, he or she can lodge an oral or written grievance through e-mail (GRM.REP@cdr.gov.lb), phone call or text message (01980096 ext:317), or website link (http://www.cdr.gov.lb/study/RoadsEmp/RoadsEmp.htm) to the site engineer or manager of the roads to be rehabilitated in Batroun Caza. In case an oral complaint is made, it should be written on paper by the receiving unit. The above issue will be resolved within a maximum duration of one week.
- Level 2: If the person is not satisfied with the action of the site manager's Office, he or she can bring the complaint to the attention of the Environmental and Social Specialist of the PIU for the project through e-mail (rstephan@cdr.gov.lb), phone call or text message (01980096 ext:317), or website link

(http://www.cdr.gov.lb/study/RoadsEmp/RoadsEmp.htm). The issue shall be resolved within a maximum of two weeks.

- Level 3: If the person is not satisfied with the decision of the Environmental and Social Specialist of PMU, he or she can bring the complaint to the attention of the PMU Director's Office through e-mail (elieh@cdr.gov.lb), phone call or text message (01980096 ext:159), or website link (http://www.cdr.gov.lb/study/RoadsEmp/RoadsEmp.htm). Once the PIU Director receives the complaint, it needs to be resolved within a maximum of two weeks.

Meanwhile, it is recommended that the aggrieved party is consulted and be informed of the course of action being taken, and when a result may be expected.

Moreover, reporting of the complaints to the PIU should be done regularly. The designated person at each level should report to the PIU on the number and subject of new complaints received, and the status of the already existing complaints, if any. The report should also inform the PIU of complaints that could not be resolved at the lower levels and are being elevated to the PIU Director's attention. The PIU aggregates information received into a status report each quarter, indicating the number and subject of complaints. The quarterly status report also provides up-to-date information on the number and subject of complaints that have been resolved, and the manner in which they have been resolved. This information will be shared with the Bank.

The Complaints Register form (refer to Annex E) includes the following:

i) details and nature of the complaint
ii) the complainant name and their contact details
iii) date
iv) Corrective actions taken in response to the complaint.

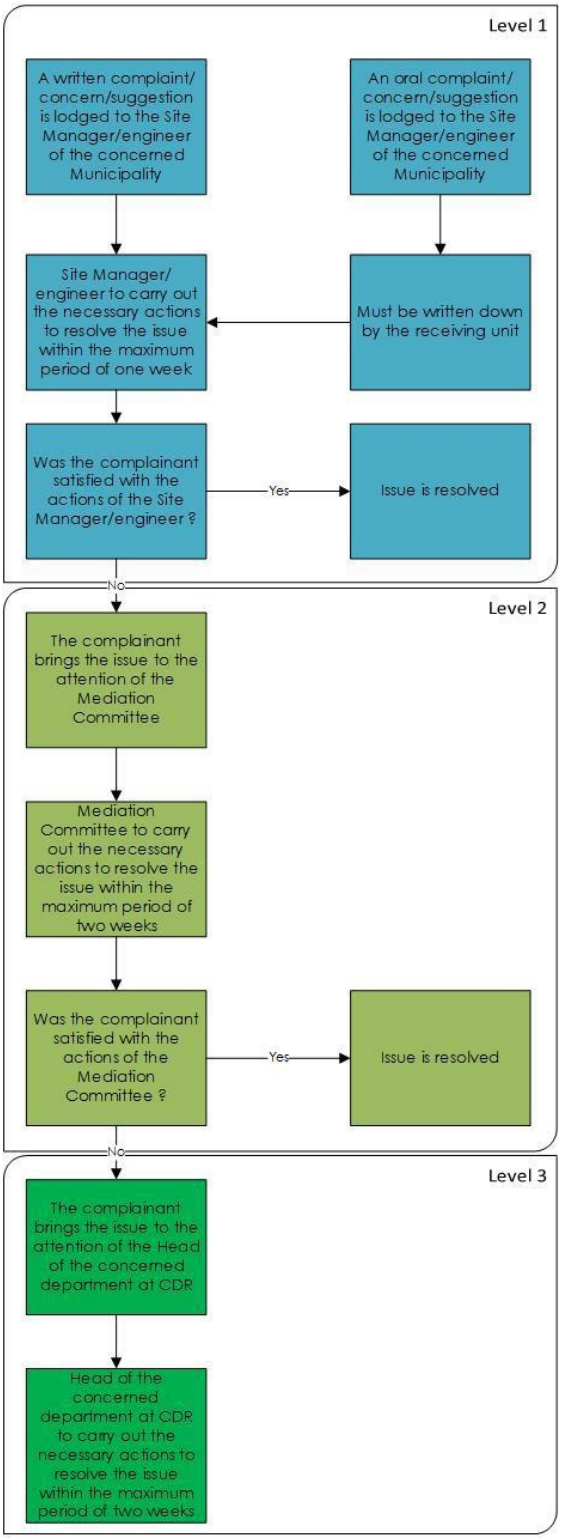
The GRM does not exclude the formal legal process of the national law. If a grievance remains unresolved following application of the project GRM process, the affected person can initiate legal proceedings in accordance with national law and may have recourse to the Appeals Court as warranted.

Figure 8 1 (overleaf) presents a detailed flowchart describing the process of grievance starting form reception of grievance to implementation of corrective measures.

8.2.2 GRM for Workers

A GRM for internal employees, namely the laborers onsite are also necessary. It aims to allow labors to report any wrongdoings in their favor or important concerns they might have. This internal GRM is similar in nature to the one previously discussed (in terms of accessibility, reporting means, etc…). The only main difference is the contact people for each level. In this context, the first level involves reporting to the health and safety officer and has a duration of one week. The second level involves reporting to the PMU Director and should be resolved within one weeks. It also follows the Complaints Register form (refer to Annex E).

Figure 8-2. Typical grievance redress mechanism for the REP



Source: CDR, 2018

9 CONCLUSION

The ESMP revealed that the REP within the Bcharre Caza will have positive socio-economic impacts both during rehabilitation, through the creation of jobs for both skilled and unskilled workers, and during operation by improving accessibility to the villages in the caza as well as livelihoods. However, its implementation is associated with a variety of environmental and social impacts that are reversible and can be controlled through mitigation measures all while ensuring proper environmental monitoring during both the rehabilitation and operation phases. The ESMP outcome is consistent with the ESMF (CDR, 2018) that concluded that the REP activities are not expected to have significant environmental impacts and equally no anticipated impacts on physical and cultural resources or natural habitats, no involuntary resettlement, and no land acquisition.

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ANNEXES

A. Methodology for estimating impact on air quality

B. Methodology for estimating impact on noise levels

C. CDR Safety, Health, and Environmental Regulations

D. Public Participation

E. Complaints Register form

Annex A –Methodology for estimating impact on air quality

Construction phase

Heavy construction is a source of dust emissions that may have substantial temporary impact on local air quality. Road construction is an example of a construction activity with high emissions potential. Emissions during the construction of a road in general, and the REP in particular, are a function of the excavation scheme, building demolition and the machinery used on-site. Emissions will consist primarily of particulate dust matter released as a result of earth removal activities, and to a lesser extent of emissions from the on-site usage of heavy construction equipment. Dust emissions often vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing meteorological conditions. A large portion of the emissions results from equipment traffic over temporary roads at the construction site. For this phase, it is expected that negative impacts on air quality will occur in and around the immediate vicinity of the site under construction. In order to quantify this impact, the total construction emissions and the corresponding ambient particulate matter concentration were estimated as described below.

Step 1: Estimation of the total construction emissions using the area wide method.

In this method, the quantity of particulate matter emissions from construction operations is considered proportional to the area being worked and to the level of construction activity. Emissions from heavy construction operations are positively correlated with the silt content of the soil (particles with a diameter <75 micrometers [µm]), as well as with the speed and weight of the average vehicle, and negatively correlated with the soil moisture content. An approximate aerial emission factor (EF) for the construction activities that is used in the estimation of total emissions (USEPA, 1995) is:

EF = 0.3 Kg/m^2/month of activity[14]

Assuming the road rehabilitation will take place in phases and that a 500 m road section will be rehabilitated per phase, the temporal emission factor for the total construction area of 2500-3500 m^2 and a duration of 2 month of activity, considering 22 working days/month and 8 hours/day of work is:

S = 0.3 □ (2500-3500) /(2 x 22 □ 8 □ 3600)
S = 0.000592- 0.000829 Kg/s = 592,000-829,000 □g/s

Note that a better method is to estimate construction emissions for a particular construction site, the construction process be broken down into component operations, each involving traffic and material movement. However, due to the random nature of construction activities, and lack of design data, the extent of PM impact cannot be quantified using this method.

Step 2: Summary of key meteorological parameters with regard to air pollution dispersion namely, mixing height, inversion height, and mean annual wind speed (Table A1).

Table A1. Summary of key meteorological parameters

Parameter	*Typical scenario*	*Worst case scenario*
Mixing height	1,000[a] m	1 m
Average wind speed	1[b] m/sec	0.5 m/sec
Wind direction	west	west

[a] De Nevers, 1995
[b] Refer to the windrose in Figure 4-13.

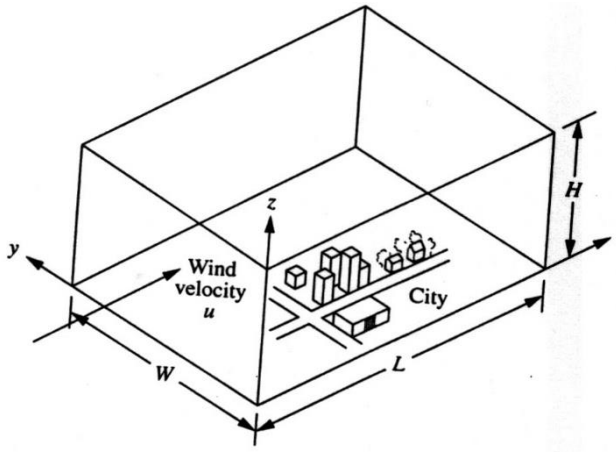
[14] The value is most applicable to construction operations with (1) medium activity level, (2) moderate silt contents, and (3) semiarid climate.

Step 3: Application of the Fixed Box Model to calculate ground-level concentration of PM

To compute the air pollutant concentration using this model, the site was represented by a parallelepiped and the following simplifying assumptions were made (DeNevers, 1995)

- The mixing of pollutants occurs within a layer of height H, confined from above by a layer of stable air.
- The concentration of pollutant in the entire city is constant and uniform, and equals to c.
- The wind velocity is constant and independent of time, elevation, and height above the ground.
- The concentration of pollutant entering the city (at x = 0) is constant, and equals to the base line measured PM concentration, b.
- No pollutant enters or leaves the top of the box, nor the sides that are parallel to the wind direction.
- The destruction rate inside the box is zero.

Figure A1. Rectangular city in a fixed box model



$$c = b + \frac{SL}{WLuH} \qquad \text{(A1)}$$

Where, c = Concentration of PM in the entire site (□g/m^3)
b = Background PM concentration (□g/m^3)
S = Emission rate of PM (□g/s)
L = Site length (m)
W = Site width (m)
H = Mixing height (m)
u = Wind speed (m/s)

The input data for the site under study are summarized in Table A2, taking into consideration two scenarios: the typical scenario and the worst-case scenario.

Table A2. Input data for the box model

Parameter	*Typical scenario*	*Worst case scenario*
W	107 m	55 m
L	500 m	1000 m
H	1,000 m	1 m
b	18.5 □g/m^3	18.5 □g/m^3
u	1 m/s	0.5 m/s
S	592,000 □g/s	829,000 □g/s

By direct substitution of the values in Equation A1, the predicted total PM concentration at a road segment site is expected to range between 24.0 □g/m^3 under typical conditions, and 15,506 □g/m^3 under worst-case conditions. For typical conditions, the expected PM concentrations are below the national 24-hr standard (120 □g/m^3) and WHO 24-hr guideline (50 □g/m^3). As for worst-case conditions, the expected PM concentrations significantly exceed the national 24-hr standard and WHO 24-hr guideline. Note that this impact is typically temporary and

confined to the immediate site vicinity, particularly if proper management measures are adopted as described below in the impact mitigation.

Operation phase

During the operation phase, air emissions in the project area will be a function of the anticipated traffic volumes, in addition to the vehicle fleet attributes. In order to assess the potential magnitude of the project on the ambient air quality in the project area, the road was modeled using a line source Gaussian plume model, as described below.

Step 1: calculation of uniform emission rate along the road 'q'

Current and projected vehicle volumes are presented in Table A3. The design speed along the proposed roads is 50 km/hr.

Table A3. Current and future traffic projections and fleet characteristics

Road code and villages	*Existing Traffic Volume ADT*	*Future Traffic Volume ADT (20 Years)*	*Vehicle Fleet Composition*
Road 2: Deir Mar Lichaa – Wadi Qadisha	308	556	93.5% light vehicles | 6 % Medium | 0.5% Heavy
Road 3 Beit Mounzir - Qnat	1965	3549	82.5% light vehicles | 6.5 % Medium | 11% Heavy
Road 2 Deir Mar Lichaa – Wadi Qadisha	307	554	81% light vehicles | 8.5 % Medium | 10.5% Heavy

Pollutant emissions from vehicles vary depending on vehicle characteristics, and ambient conditions such as temperature, humidity, altitude, and wind. Emission factors are strongly influenced by the average speed. These factors increase sharply at low average speed, typical of highly congested stop and go urban driving. Emissions are minimized in free-flow traffic at moderate speed, as expected to be along the proposed highway. The major characteristics of the Lebanese fleet that were used in the calculation of pollutant emissions include an average fleet age of 14 years and a value of 10% of the fleet subject to regular inspection and maintenance.

The equations for emission factors of the Lebanese fleet as a function of speed as described by Sbayti (2000), using MOBILE5B and regression analysis, were deduced for the years 2019 and 2039[15], as shown below in Table A4.

Table A4. Vehicular emissions at different speeds (Sbayti, 2000)

Year	*Pollutant*	*Equation*	*Speed (mph)*	*EF (g/mile)*
2019	CO	$EF = 701.61S^{-0.8697}$	31	35.4
2039	CO	$EF = 268.15S^{\square 0.8657}$	31	13.7

Where EF is the emission factor in g/mile, and S the average speed in mph.

[15] The emission factors for the year 2015 under the do-nothing scenario in terms of emissions reduction were used. For 2019, the emission factor was assumed to be equivalent to the 2015 emission factor under the 'basic conditions' strategy. For 2039, , the emission factor was assumed to be equivalent to the 2015 emission factor under the 'advanced inspection and maintenance' strategy.

A uniform emission rate q, in □g/m-sec, along the road length can be estimated as follows:

q = EF*vehicle volume

Accordingly, current and future emission rates along the proposed roads are presented in Table A5.

Table A5. Current and future traffic projections and fleet characteristics

Road code	*Existing Traffic Volume ADT (vehicle/day)*	*2019 Emission rate q (□g/m-sec)*	*Future Traffic Volume ADT (20 Years) (vehicle/day)*	*2039 Emission rate q (□g/m-sec)*
Road 2 Deir Mar Lichaa – Wadi Qadisha	308	78.4	556	54.9
Road 3 Beit Mounzir - Qnat	1965	500.4	3549	350.2
Road 2 Deir Mar Lichaa – Wadi Qadisha	307	78.2	554	54.7

Step 2: calculation of dispersion coefficients '$\square_z$' and '$\square_y$'

The general equations for the dispersion coefficients as given by Cooper (1996) are,

$\square_y = aX^b$

$\square_z = cX^d + f$

Where a, b, c, d, and f are constants that are dependant on the stability class and on downwind distance X as given in Table A6.

Table A6. Constants for calculating dispersion coefficients as a function of downwind distance and atmospheric stability

			X< 1 km			*X> 1 km*		
Stability class	*a*	*b*	*c*	*d*	*f*	*c*	*d*	*f*
A	213	0.894	440.8	1.941	9.27	459.7	2.094	-9.6
B	156	0.894	106.6	1.149	3.3	108.2	1.098	2
C	104	0.894	61	0.911	0	61	0.911	0
D	68	0.894	33.2	0.725	-1.7	44.5	0.516	-13
E	50.5	0.894	22.8	0.678	-1.3	55.4	0.305	-34
F	34	0.894	14.35	0.74	-0.35	62.6	0.18	-48.6

Tables A7 and A8 present the values of dispersion coefficients at different downwind distances, for various stability classes.

Table A7. $\square_y$ at different downwind distances, for various stability classes

Stability class	*Downwind distance (m)*									
	100	*200*	*300*	*400*	*500*	*600*	*700*	*800*	*900*	*1000*
A	29.49	54.79	78.73	101.82	124.31	146.31	167.93	189.22	210.23	231.00
B	19.91	37.00	53.17	68.76	83.95	98.81	113.41	127.79	141.98	156.00
C	13.27	24.67	35.45	45.84	55.96	65.87	75.61	85.19	94.65	104.00
D	8.68	16.13	23.18	29.97	36.59	43.07	49.43	55.70	61.89	68.00
E	6.45	11.98	17.21	22.26	27.18	31.99	36.71	41.37	45.96	50.50
F	4.34	8.06	11.59	14.99	18.30	21.54	24.72	27.85	30.94	34.00

Table A8. σ_z at different downwind distances, for various stability classes

Stability class	*Downwind distance (m)*									
	100	*200*	*300*	*400*	*500*	*600*	*700*	*800*	*900*	*1000*
A	14.32	28.66	51.86	83.72	124.07	172.81	229.86	295.12	368.54	450.07
B	10.86	20.07	30.03	40.50	51.37	62.57	74.06	85.79	97.75	109.90
C	7.49	14.08	20.37	26.47	32.44	38.30	44.08	49.78	55.42	61.00
D	4.55	8.64	12.17	15.39	18.39	21.22	23.94	26.54	29.06	31.50
E	3.49	6.36	8.78	10.95	12.95	14.83	16.60	18.30	19.93	21.50
F	2.26	4.01	5.54	6.93	8.24	9.48	10.67	11.82	12.92	14.00

Step 3: Model scenarios

For each future traffic volume two scenarios will be considered in order to calculate the expected CO concentrations. The first scenario (worst case scenario) will consider the minimum wind speed (1 m/sec) and the highest stability class (class F), in this scenario the dispersion coefficients will be minimum, thus higher ground level concentrations will be encountered. On the other hand, the second scenario will consider the maximum wind speed (4 m/sec) and the most unstable class (class A); this will represent a high degree of dispersion, therefore minimum ground level concentrations.

Step 4: Model application

Vehicle emissions were modeled using a line source Gaussian model (Figure A1) which is basically an infinite array of point sources.

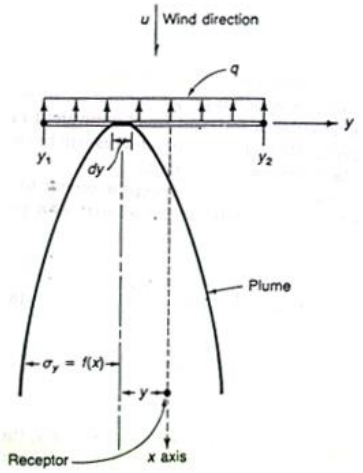


Figure A1. Finite line source Gaussian plume model

The general equation for a finite line source is:

$$C = \frac{q}{2\pi u \sigma_z \sigma_y}\left(\exp\frac{-(z-H)^2}{2\sigma_z^2} + \exp\frac{-(z-H)^2}{2\sigma_z^2}\right)\int_{y_1}^{y_2}\exp\left(-\frac{1}{2}\frac{y^2}{\sigma_y^2}\right)dy \qquad \text{(A2)}$$

Where,
- C = Concentration of pollutant ($\mu g/m^3$)
- q = Uniform emission rate (μg/m-sec)
- σ_z, σ_y = Dispersion coefficients
- z = Receptor height (m)
- H = Source height (m)
- u = Wind speed (m/s)

For an infinite line source (y_1 □ to □ and y_2 □ to □), ground level receptor (z=0), and H =0 (for most vehicles), equation A2 becomes:

$$C = \frac{2q}{\sqrt{2\pi}\left(u\sigma_z\sigma_y\right)} \qquad \text{(A3)}$$

Figures A2 to A9 present the expected downwind CO concentrations during the operation phase of the three proposed roads for the years 2019 and 2039 under the typical and worst-case scenarios.

Figure. A2. CO concentrations at various downwind distances
Road 2 (Deir Mar Lichaa - Wadi Qadisha) in 2019

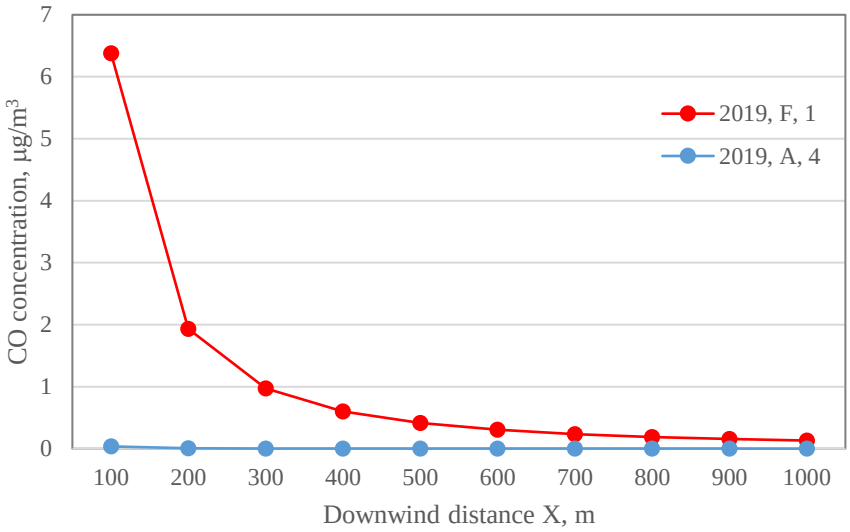


Figure. A3. CO concentrations at various downwind distances
Road 2 (Deir Mar Lichaa - Wadi Qadisha)

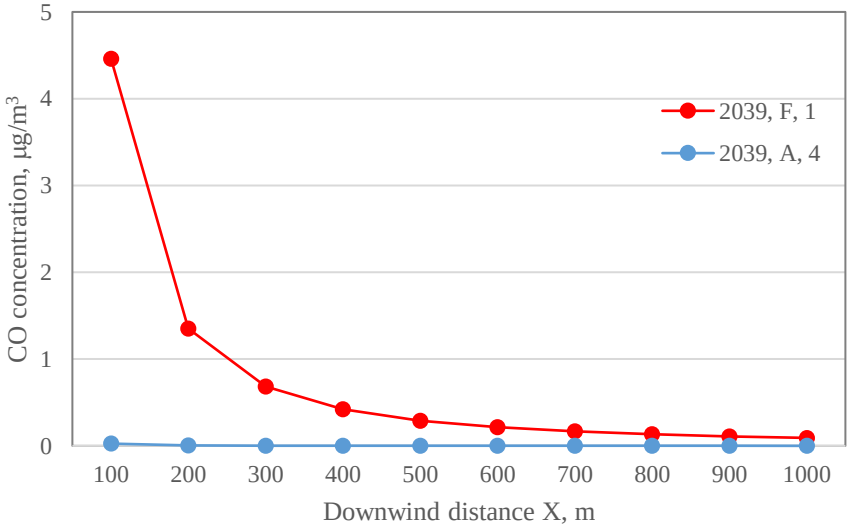


Figure. A4. CO concentrations at various downwind distances along Road 3 (Beit Mounzir - Qnat) in 2019

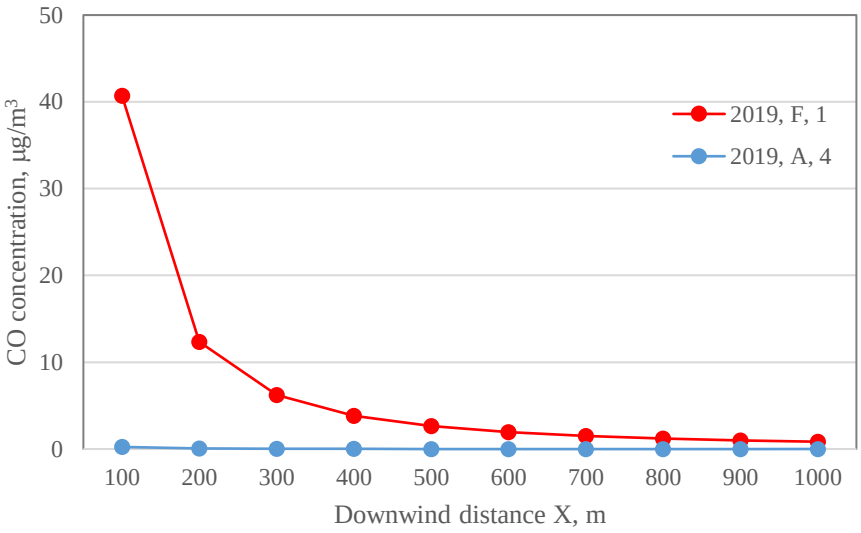


Figure. A5. CO concentrations at various downwind distances Road 3 (Beit Mounzir - Qnat) in 2039

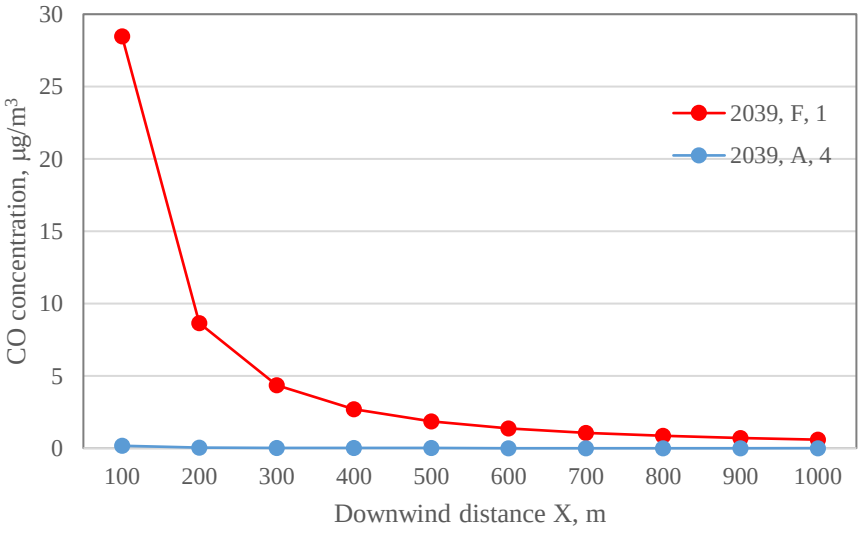


Figure. A6. CO concentrations at various downwind distances
Road 4 (Qnat - Mazraat Aassaf) in 2019

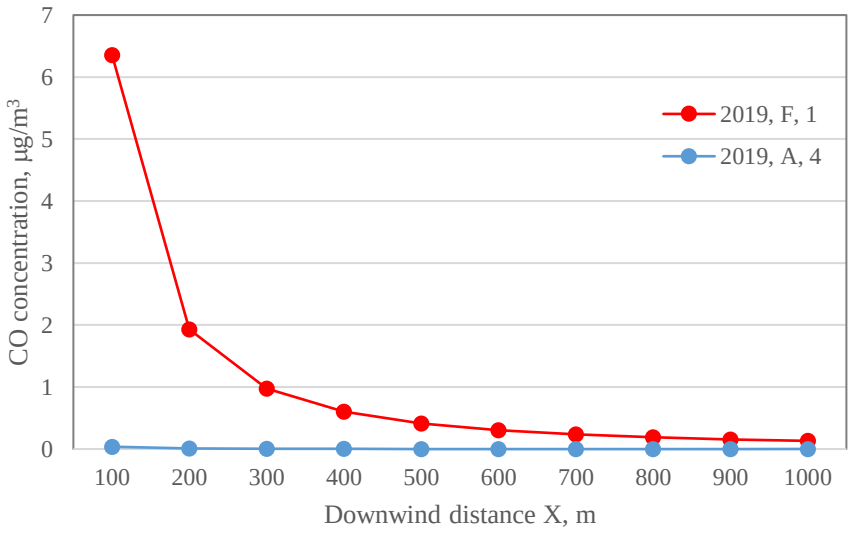
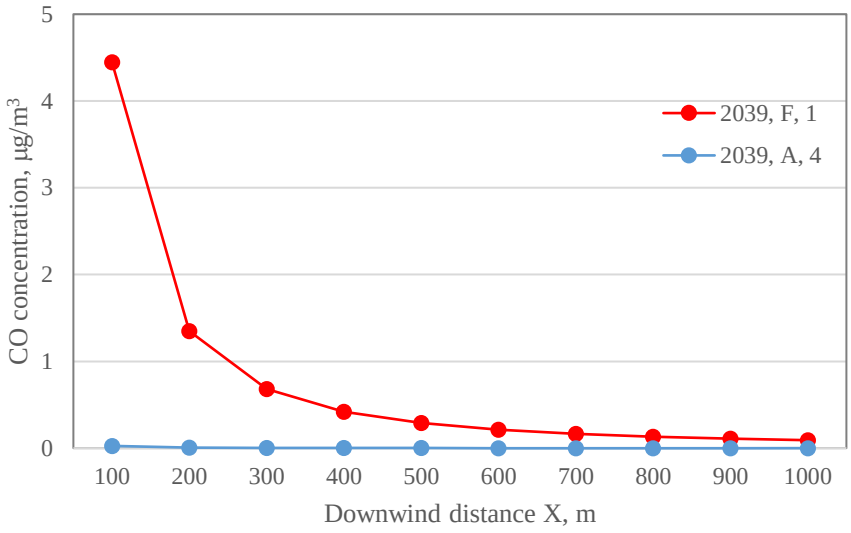


Figure. A7. CO concentrations at various downwind distances
Road 4 (Qnat - Mazraat Aassaf) in 2039



Annex B – Typical methodology for estimating impact on noise levels

Construction phase

Noise levels during the construction phase are a function of the construction scheme and the machinery used on-site. Table B1 shows typical energy-equivalent noise levels associated with various work phases at a building construction site, when all pertinent equipment are present.

Table B1. Typical noise levels at construction sites (USEPA *cited in* Canter, 1996)

Phase	*Noise level (dBA)*
Ground clearing	84
Excavation	89
Foundations	78
Erection	87
Finishing	89

The first step in the noise quantification was the determination of the total site L_{eq} from various operations as expressed in Equation B1.

$$\mathbf{L_{eq} = 10Log[\frac{1}{T}\sum_{i=1}^{N} T_i (10)^{L_i/10}]} \quad \text{(B1)}$$

Where L_i = L_{eq} for the ith phase (Table B1)
T_i = Total time duration for the ith phase
T = Total time of operation from the beginning of the initial phase (i=1) to the end of the final phase (i=N)
N = Number of phases

Noise levels during the construction phase are a function of the construction scheme and the machinery used on-site. Table B1 shows typical energy-equivalent noise levels associated with various work phases at a road construction site, when all pertinent equipment is present.

Noise from construction operations is different from noise from other sources for two main reasons:

- It is caused by many types of equipment.
- The resulting adverse effects are temporary because the operations are relatively short term.

In order to assess the extent of potential noise impacts during the construction of the proposed REP, a noise model specific for construction operations was applied. It allows the preparation of sound contours for construction noise.

Taking into consideration the five construction phases listed in Table B1, with each having an estimated average duration of 1 week for a 500 m stretch of road, the total L_{eq} for the site was estimated at 80.8 dBA. This noise level is slightly above the maximum noise levels measured in the vicinity of the site (55-80 dBA). It exceeds both the WBG noise standard for residential areas (55 dBA) the FHWA standards for the Category B classified areas (67 dBA). However, this value was lower than the OSHA standard for an 8-hr exposure (90 dBA). In this case, the exposure of workers to noise during their work shift is acceptable.

To determine the propagation of noise levels at various radial distances from the construction site, L_{eq} was corrected using Equation B2:

$$\mathbf{L_{eq}adjusted = -20Log(x + 250) + 48} \quad \text{(B2)}$$

The resulting noise levels at different radii away from the site are presented in Figure B1.

Figure B1. Noise levels at different radii around the site

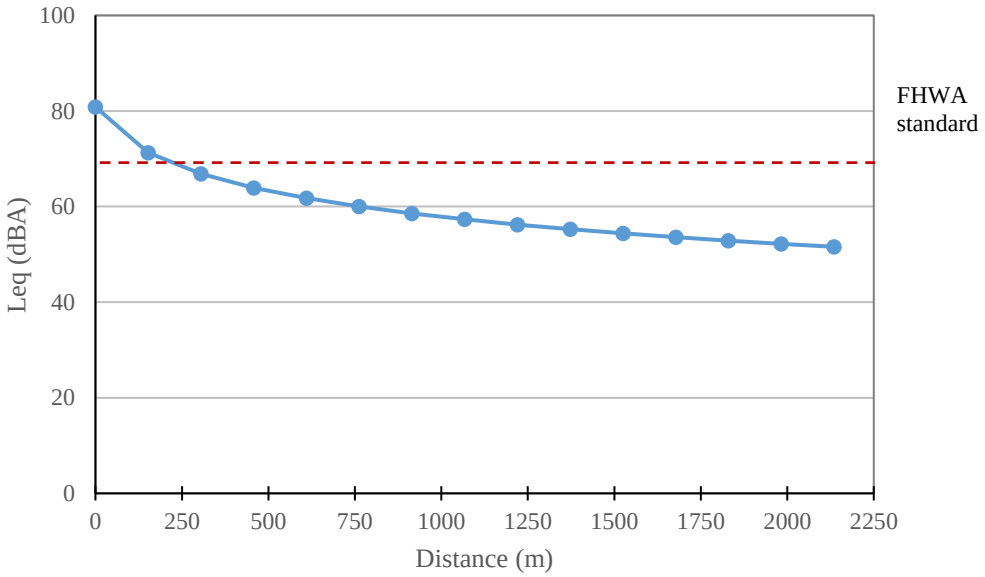
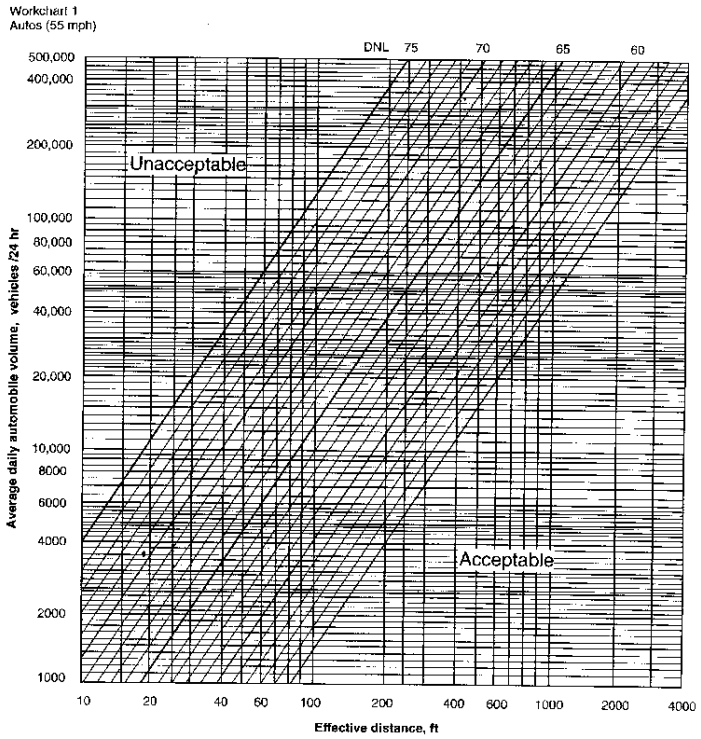


Figure B1 shows that the daytime Lebanese standard for rural areas (30-40 dBA) cannot be reached even at a radius of 2 km from the construction area. The FHWA standard (67 dBA), it is reached at a radius of 305 m.

Operation phase

At the operational level, noise levels at distances adjacent to roads can be estimated using Figure B2 by U.S. Department of Housing and Urban Development (Canter, 1996). The Day-Night Average Sound Level (DNL) noise metric is used to reflect a person's cumulative exposure to sound over a 24-hour period, expressed as the noise level for the average day of the year on the basis of annual vehicle operations. DNL is equivalent to Leq.

Figure B2. Typical noise levels adjacent to roads and highways



Annex C. CDR Safety, Health, and Environmental Regulations

STANDARD BIDDING DOCUMENTS

Safety, Health and Environmental Regulations

Council for Development and Reconstruction
Beirut, Lebanon

June 1996

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Conditions of Contract **Appendix 1**

Safety, Health and Environmental Regulations

Council for Development and Reconstruction
Beirut, Lebanon

Issue June 1996

Appendix 1

Safety, Health and Environmental Regulations

Table of Contents

1	The reference to "Drafting Notes" should **not** be incorporated in the bidding documents; include following page.

Appendix 1

Safety, Health and Environmental Regulations

Table of Contents

Drafting Notes[2]

[2] These drafting notes are intended to assist those preparing the Safety, Health and Environmental Regulations. **These drafting notes should not be incorporated in the bidding documents.**

1 These CDR Safety ... Regs, Issue June 96 (c:\wp51\docs\Safety\CDRRegs) can be used with all CDR Standard Conditions of Contract.

2 The CDR Safety, Health and Environmental Regulations are in two parts:

- PART I - General Safety, Health and Environmental Regulations;
- PART II - Supplementary Safety, Health and Environmental Regulations.

3 PART I, General Safety, Health and Environmental Regulations, together with the front cover page and pages i to iii, shall be included as printed, **without amendment**.

The pages of PART I are set up for, and should be photocopied on, double sided paper.

4 PART II, Supplementary Safety, Health and Environmental Regulations, will comprise changes, modifications and additional requirements to PART I, applicable to the Sector and/or the contract for which the Regulations are being prepared. PART II should be prepared by the Consultant responsible for preparation of the bidding documents in conjunction with the SIU.

PART II has priority over PART I (see Preamble).

If no changes, modifications or additional requirements are included in PART II, the page for PART II should be included with the addition of the following below the Table of Clauses:

"NONE"

The name of the contract should be added to the footer of pages, PART II.

5 In PART I, the amounts to be witheld in the event of non-compliance (Sub-Clause 3.2.2) are expressed in USD. PART II includes provision for contracts in currencies other than USD (eg Lebanese Pounds).

6 The Regulations should be included as Appendix 1 to the Conditions of Contract[3].

Sample clause for inclusion in the Conditions of Contract[3]:

X Safety, Health and Environmental Regulations

X.X The Contractor shall comply with the requirements of CDR Safety, Health and Environment Regulations. The regulations and requirements, and specific measures and actions available to the Employer and the Engineer in the event of non-compliance by the Contractor, are attached as Appendix 1 to these Conditions of Contract.

[3] The positioning and numbering of the above Clause varies according to the Conditions of Contract being

used:

- for CDR Integrated Conditions of Contract for Works of Civil Engineering Construction: Part I - Standard Conditions, Sub-Clause 19.1;
- for CDR Conditions of Contract for Works of a Civil Engineering Construction: Part II - Conditions of Particular Application, Sub-Clause 78.1;
- for CDR Standard Bidding Documents, Procurement of Works, Smaller Contracts: Section 3, Conditions of Contract, Clause 19.2.

For other Conditions of Contract the Sub-Clause should be positioned and numbered as appropriate.

7 Throughout the Regulations the term "Engineer" is used.

However, in the CDR Standard Bidding Documents, Procurement of Works, Smaller Contracts the term "Engineer" is replaced by "Project Manager".

When "Engineer" is used in the bidding documents, the first alternative page iii "Preamble" should be included. When "Project Manager" is used in the bidding documents, the second alternative page iii, "Preamble", should be included.

Preamble

The Safety, Health and Environmental Regulations are in two parts:

PART I - General Safety, Health and Environmental Regulations;

PART II - Supplementary Safety, Health and Environmental Regulations.

PART II shall have priority over PART I.

Preamble

The Safety, Health and Environmental Regulations are in two parts:

PART I - General Safety, Health and Environmental Regulations;

PART II - Supplementary Safety, Health and Environmental Regulations.

PART II shall have priority over PART I.

Whenever the term "Engineer" is used in these Safety, Health and Environmental Regulations, it shall be construed as meaning "Project Manager" as defined in the Conditions of Contract.

Part I

General Safety, Health and Environmental Regulations

Table of Clauses

Part I

General Safety, Health and Environmental Regulations

1 Introduction

1.1 The prevention of injury and/or illness to site personnel and the public, damage to the Works and to public and private property, protection of the environment, and compliance with applicable laws, are primary objectives of CDR (the Employer). Because of the importance CDR places on meeting these objectives, selected minimum requirements are outlined in these Safety, Health and Environmental Regulations with which Contractors shall comply while working on CDR contracts. Given that these Regulations cannot cover every eventuality, the Contractor shall be expected to exercise good judgement in all such matters, even though not mentioned in these Regulations, and shall take any and all additional measures, as required or necessary, to meet his responsibility for safety, health and environmental matters during the period of the Contract.

CDR and its representatives shall not be held liable for any actions taken by the Contractor that are attributed to following the minimum requirements stated hereinafter.

1.2 The Contractor shall, throughout the execution and completion of the Works and the remedying of any defects therein:

(a) have full regard for the safety of all persons on the Site and keep the Site and the Works in an orderly state appropriate to the avoidance of danger to any person;

(b) know and understand all laws governing his activities along with any site requirements and work site hazards. Such information shall be communicated by the Contractor to his personnel and subcontractors;

(c) take all necessary measures to protect his personnel, the Employer's personnel, other persons, the general public and the environment;

(d) avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of carrying out the Works.

2 Compliance with Regulations

2.1 The Contractor shall comply with the requirements of these Safety, Health and Environmental Regulations and all other applicable regulations or requirements under Lebanese laws, laid down by relevant authorities or issued by the Employer or the Engineer concerning safety, health and the environment, in force or introduced or issued from time to time during the period of the Contract.

In so far as these Regulations are applicable, they shall apply to sites and personnel outside the Site associated with the performance of the Contract.

2.2 The Regulations equally apply to subcontractors and all other parties engaged by the Contractor and their personnel. The Contractor shall ensure all such parties are fully aware of and comply with the Regulations.

2.3 The Contractor shall comply with all notifications and written or verbal instruction regarding safety issued pursuant to these Regulations by the Employer, Engineer or relevant authorities within the time specified in the notification or instruction.

Whenever the Contractor is required to obtain the approval, agreement, permission, etc of the Engineer, such approval, agreement, permission, etc shall not relieve the Contractor of his responsibilities and obligations under these Regulations or the Contract.

2.4 The Contractor shall adopt a positive approach, awareness and responsibility towards safety, health and the environment, and take appropriate action, by:

(a) ensuring the Regulations are enforced and followed by the Contractor's personnel. Any failure by the Contractor's personnel to follow the Regulations, shall be regarded as a failure by the Contractor.

(b) paying attention to possible injury to unauthorised persons entering the site, particularly children.

2.5 Whenever in these Regulations the Contractor is required to provide test certificates for equipment and personnel or to comply the relevant authorities' requirements and no independent test facilities are available or no relevant authorities exist in Lebanon, the Contractor shall provide:

a) in lieu of independent test certificates:

- for equipment - details of the tests and the date of the tests that have been carried out by the Contractor and a written statement that the Contractor has satisfied himself that the item of equipment is fit and safe for use;

- for personnel - details of the training and experience and a written statement that the Contractor has satisfied himself that the person has the required level of competency;

b) in lieu of relevant authorities' requirements - details of the Contractor's own rules, regulations, requirements and procedures regarding safety, health and the environment.

If the Engineer is dissatisfied with the details provided by the Contractor, the Contractor shall provide further details or carry out further tests or provide further written statements as may be reasonably required by the Engineer.

When the Engineer has satisfied himself regarding the Contractor's own rules, regulations, requirements and procedures provided in accordance with (b) above, such rules, etc shall be deemed to form part of these Regulations and to which Clause 3 shall equally apply.

3 Failure to Comply with Regulations

3.1 General

3.1.1 Should the Contractor fail to comply with any of the Regulations or requirements:

(a) the Engineer may suspend the Works or part of the Works until the Contractor has taken necessary steps, to the satisfaction of the Engineer, to comply with the regulations or requirements.

(b) the Employer may, following written notice to the Contractor, carry out themselves or arrange for another contractor to carry out such measures as they consider appropriate on behalf of the Contractor. Any such actions by the Employer shall not affect or diminish the Contractor's obligations or responsibilities under the Contract.

(c) the Engineer may, following written notice to the Contractor, deduct from payments to the Contractor the amounts stipulated in Sub-Clause 3.2. Such notice shall specify:

(i) the nature of the failure or failures;

(ii) the period after the date of the notice within which the Contractor shall remedy each failure; and

(iii) the amount to be deducted.

Such suspension of payment will remain in force until such time as the Contractor has rectified the breach or breaches to the satisfaction of the Engineer. No interest shall be paid on the suspended payments.

3.1.2 Failure to comply with the Regulations or requirements shall be considered a breach of contract by the Contractor and may result in termination of the Contract by the Employer.

3.1.3 In the event of the Employer or Engineer taking action based on Sub-Clause 3.1.1(a) or (b) or 3.1.2, the Contractor shall not be entitled to any additional costs or extension to the Contract Completion Date.

3.1.4 All costs incurred by the Employer pursuant to Sub-Clause 3.1.1(b) and the deductions from payments imposed on the Contractor by the Engineer under Sub-Clause 3.1.1(c) shall be deducted from amounts otherwise due to the Contractor.

3.2 Deductions from Payments

3.2.1 Failures by the Contractor to comply with the Regulations or requirements are classified as follows:

D1 - breaches of Sub-Clause 5.6 (personal protective equipment);
D2 - breaches of Clause 7 (work in Public Areas);
D3 - breaches other than D1 and D2.

3.2.2 The basic deduction from payment for each classification in Sub-Clause 3.2.1, is as follows:

for D1 - $2000;
for D2 - $10000;
for D3 - $5000.

3.2.3 Deductions from payments will be applied as follows:

(a) for the first breach of each regulation or requirement - the basic deduction. If the same or similar breaches occur in different situations or locations at the same time, the Engineer may apply deductions for each situation or location; this will not apply to breaches related to personal protective equipment.

(b) for a second or subsequent breach of the same Regulation or requirement or failure to rectify a previous failure within the time specified by the Engineer - twice the basic deduction.

4 General Requirements

4.1 Preamble

4.1.1 All references to safety shall be deemed to include health and the environment.

4.2 Safety Officer

4.2.1 The Contractor shall appoint a competent Safety Officer who shall be responsible for safety, health and the environment. The Safety Officer shall be given sufficient time by the Contractor to carry out his duties; minimum requirements shall be as follows:

Workforce on Site of over 250	-	full time Safety Officer;
Workforce on Site of 100-250	-	50% of Safety Officer's time;
Workforce on Site below 100	-	as required for the Works but a minimum of 5 hours per week of Safety Officer's time where more than 20 workers.

4.2.2 The Contractor shall provide the Safety Officer with appropriate identification, including a white hard hat with red cross symbol and a identification badge. The appointment of the Safety Officer shall be in writing and copied to the Engineer. The appointment shall include specific instructions to enforce these Regulations and delegated authority to take any action, measure or to issue instructions regarding their enforcement. All persons on Site shall be made aware of the name and authority of the Safety Officer and instructed to comply with any instruction or direction on safety matters, verbal or in writing, issued by the Safety Officer.

4.2.3 The Safety Officer shall be provided with a mobile phone or other similar means of communication. The Safety Officer shall be accessible and available at all times including outside normal working hours.

4.3 Safety Training

4.3.1 The Contractor shall provide safety induction training for all site personnel upon starting on site.

4.3.2 The Contractor shall provide safety refresher/reinforcement training at regular intervals for his staff.

4.4 Safety Meetings

4.4.1 The Contractor shall hold regular safety meetings to provide safety instructions and receive feedback from site personnel on safety, health and environmental matters. A weekly Safety Meeting shall be chaired by the Safety Officer and minutes shall be taken of the meeting. The meeting/minutes shall cover all relevant issues including actions to be taken. A copy of the minutes shall be given to the Engineer. The Safety Officer should attend the Contractor's weekly site meetings and "Safety" should be an item on the agenda.

4.5 Safety Inspections

4.5.1 The Safety Officer shall make regular safety inspections of the work site. The Safety Officer shall prepare a report of each inspection. This report shall include details of all breaches of these Regulations and any other matters or situations relating to safety found during the inspection, instructions issued by the Safety Officer and actions taken by the Contractor. A copy of the Safety Officer's inspection reports shall be given to the Engineer.

4.6 Control of Substances Hazardous to Health

4.6.1 Hazardous materials shall be stored in approved safety containers and handled in a manner specified by the manufactures and/or prescribed by relevant Authorities (see Sub-Clause 2.5).

4.6.2 Only properly trained and equipped personnel shall handle hazardous materials.

4.7 Potential Hazards

4.7.1 The Contractor shall inform employees of potential hazards, take appropriate steps to reduce hazards and be prepared for emergency situations.

4.7.2 The Contractor shall make an assessment of every operation involving hazardous substances. The assessment shall be recorded on a Hazardous and Flammable Substances Assessment Method Statement which shall be submitted to the Engineer prior to the delivery and use of the substance on Site.

4.8 Accident Reporting

4.8.1 The Contractor shall report all accidents and dangerous occurrences to the Engineer. The Contractor shall prepare a report on each accident or dangerous occurrence and a copy of the

report, together with witness statements and any other relevant information, shall be submitted to the Engineer. A reportable accident or dangerous occurrence shall include any accident to any person on Site requiring medical attention or resulting in the loss of working hours or any incident that resulted, or could have resulted, in injury, damage or a danger to the Works, persons, property or the environment.

4.8.2 In the event of an accident or dangerous occurrence, the Contractor shall be responsible for completing all statutory notifications and reports. Copies of all statutory notifications and reports shall be passed to the Engineer.

4.8.3 All accidents and dangerous occurrences shall be recorded in a Site Accident Book. The Site Accident Book shall be available at all times for inspection by the Engineer.

4.8.3 The Contractor shall immediately rectify any situation or condition that could result in injury, damage or a danger to the Works, person, property or the environment. If the situation or condition cannot be corrected immediately, the Contractor shall provide temporary barriers and appropriate warning signs and devices and/or take other appropriate action necessary for the protection of persons, property and the environment.

4.9 Notices, Signs, Etc

4.9.1 All safety, health, environmental and other notices and signs shall be clearly displayed and written in both Arabic and either English or French. All requirements, instructions, procedures, etc issued by the Contractor concerning these Regulations shall be printed in both Arabic and English and displayed and readily available to Contractor's personnel.

4.10 First Aid and Medical Attention

4.10.1 The Contractor shall have comprehensive First Aid Kit(s) on Site at all times. First Aid Kits shall be conveniently located and clearly identifiable.

4.10.2 The Contractor shall have one employee on site trained in first aid for every 25 employees. Such persons shall be provided with appropriate identification, including a red hard hat with a white "red cross" symbol and a identification badge.

4.10.3 The Contractor shall make contingency arrangements for calling a Doctor and transporting injured persons to hospital. The telephone numbers of the emergency services and the name, address and telephone number of the Doctor and nearest hospital shall be prominently displayed in the Contractor's site office.

4.11 Employee Qualifications and Conduct

4.11.1 The Contractor shall employ only persons who are fit, qualified and skilled in the work to be preformed. All persons shall be above the minimum working age.

4.11.2 Contractor's personnel shall use the toilet facilities provided by the Contractor.

4.11.3 The Contractor shall ensure:

(a) that no firearms, weapons, controlled or illegal substances or alcoholic beverages are brought onto the Site and that no personnel under the influence of alcohol or drugs are permitted on Site.

(b) that all personnel obey warning signs, product or process labels and posted instructions.

(c) that drivers or operators of vehicles, machinery, plant and equipment follow the rules for safe operations. Drivers shall wear seat belts and obey all signs and posted speed limits.

5 Safety Requirements

5.1 Personal Protective Equipment

5.1.1 The Contractor shall provide personal protective equipment, including hard hats, safety glasses, respirators, gloves, safety shoes, and such other equipment as required, and shall take all measures or actions for the protection and safety of Contractor's personnel.

5.1.2 Non-metallic hard hats shall be worn at all times by all personnel at the worksite with the exception of those areas where the Engineer has indicated it is not necessary to do so.

5.1.3 Safety glasses shall meet international standards and be available for use and worn in specified worksite areas. As a minimum, safety glasses shall be worn for the following types of work: hammering, chipping, welding, grinding, use of electrically powered or pneumatic equipment, insulation handling, spray painting, working with solvents, and other jobs where the potential of an eye injury exists. Face shields and/or monogoggles shall be worn where possible exposure to hazardous chemicals, cryogenic fluids, acids, caustics, or dust exists and where safety glasses may not provide adequate protection.

5.1.4 When handling acids, caustics, and chemicals with corrosive or toxic properties, suitable protection, such as acid suits or chemical resistant aprons and gloves, shall be worn to prevent accidental contact with the substance.

5.1.5 Personnel shall not be permitted to work whilst wearing personal clothing or footwear likely to be hazardous to themselves or others.

5.1.6 The wearing of safety shoes with steel reinforced toes is recommended for all Contractor's personnel on site. In all cases, Contractor's personnel shall wear substantial work shoes that are commensurate with the hazards of the work and the worksite area.

5.1.7 Hearing protection, including muffs, plugs or a combination thereof, shall be provided for all personnel operating in areas where the noise level exceeds 90 decibels. Such protection shall also be provided for operators working with equipment exceeding such a level. This may include equipment such as excavators, shovels, jackhammers, saws, drills, grinders, and the like are being used.

5.1.8 The Contractor shall encourage employees to wear substantial work gloves whenever practical and safe to do so.

5.2 Fire Protection and Prevention

5.2.1 The Contractor shall comply with fire protection instructions given by the Authorities having jurisdiction in regard to fire protection regulations.

5.2.2 The Contractor shall, upon moving on site, provide to the Engineer and the Authorities a fire prevention and evacuation plan. This shall include drawing(s) showing the fire assembly points. The fire prevention and evacuation plan and drawing(s) shall be updated from time to time as the Works progress. The Contractor shall ensure all personnel are fully informed on escape routes and assembly points and any changes thereto.

5.2.3 Fuel storage will not be permitted in construction work areas. Contractors may establish fuel storage tanks in special areas set aside for the purpose and approved by the Engineer. Storage tanks shall be adequately bunded to control spillage. Fire extinguishers shall be provided and installed in a suitable nearby location.

5.2.4 Highly combustible or volatile materials shall be stored separately from other materials and as prescribed by relevant authorities and under no circumstances within buildings or structures forming part of the permanent Works. All such materials shall be protected and not exposed to open flame or other situations which could result in a fire risk.

5.2.5 No combustible site accommodation shall be located inside or within 10 metres of a building or structure forming part of the permanent Works, Where units have to be used in these circumstances, they shall be constructed of non-combustible materials and have a half-hour fire rating inside to outside and outside to inside. Non-combustible furniture shall be used where practical.

5.2.6 All temporary accommodation and stores shall be provided with smoke detectors and fire alarms.

5.2.7 Smoking shall be banned in high risk areas.

5.2.8 Expanded polystyrene with or without flame retarding additive, polythene, cardboard and hardboard shall not be used as protection materials.

5.2.9 Plywood and chipboard shall only be used as protection on floors. Vertical protection shall be non-combustible. Debris netting and weather protection sheeting shall be fire retardant.

5.2.10 When using cutting or welding torches or other equipment with an open flame, the Contractor shall provide a fire extinguisher close by at all times. All flammable material shall be cleared

from areas of hot works, or work locations prior to welding or oxy/gas burning operations. All hot works shall cease half an hour before the end of a work shift to allow for thorough checking for fires or smouldering materials. Where appropriate, areas of hot works are to be doused in water before the shift ends.

5.2.11 An adequate number of fire extinguishers of types suited to the fire risk and the materials exposed shall be provided. These shall be placed in accessible, well-marked locations throughout the job site. Contractor's personnel shall be trained in their use. Extinguishers shall be checked monthly for service condition and replaced or recharged, as appropriate after use.

5.2.12 Only approved containers shall be used for the storage, transport and dispensing of flammable substances. Portable containers used for transporting or transferring gasoline or other flammable liquids shall be approved safety cans.

5.2.13 Fuel burning engines shall be shut off while being refuelled.

5.2.14 Adequate ventilation to prevent an accumulation of flammable vapours shall be provided where solvents or volatile cleaning agents are used.

5.2.15 Flammables shall not be stored under overhead pipelines, cable trays, electrical wires, or stairways used for emergency egress.

5.2.16 Paints shall be stored and mixed in a room assigned for the purpose. This room shall be kept under lock and key.

5.2.17 Oily waste, rags and any other such combustible materials shall be stored in proper metal containers with self-closing lids and removed every night to a safe area or off site. Every precaution shall be taken to prevent spontaneous combustion.

5.3 Electrical Safety

5.3.1 All temporary electrical installations, tools and equipment shall comply with current regulations dealing with on-site electrical installations.

5.3.2 The Contractor shall establish a permit-to-work system for work on or in proximity to energized circuits of any voltage. Contractor's personnel shall not commence work on such circuits unless a permit to work has been issued and adequate safety measures have been taken and the work operation has been reviewed and approved by the Engineer.

5.3.3 Only authorised personnel shall be allowed to work or repair electrical installations and equipment.

5.3.4 Portable tools and equipment shall be 110 volt, unless otherwise agreed by the Engineer.

5.3.5 When portable or semi-mobile equipment operates at voltages in excess of 110 volts, the supply shall be protected by a Residual Current Device (RCD) regardless of any such device fitted to the equipment. The RCD must have a tripping characteristic of 30 milliamps at 30 milliseconds maximum.

5.3.6 All static electrically powered equipment, including motors, transformers, generators, welders, and other machinery, shall be properly earthed, insulated, and/or protected by a ground fault interruption device. In addition, the skin of metal buildings and trailers with electric service shall be earthed. Metal steps, when used, shall be securely fixed to the trailer.

5.3.7 Lampholders on festoon lighting shall be moulded to flexible cable and be of the screw in type. Clip on guards shall be fitted to each lamp unit.

5.3.8 All tungsten-halogen lamps shall be fitted with a glass guard to the element. These lamps must be permanently fixed at high level.

5.3.9 Electrical equipment shall be periodically inspected and repaired as necessary by competent persons.

5.3.10 Any work on electrical equipment and systems shall be made safe through locking, tagging, and/or isolation of the equipment before work commences. Prior to the start of the work, the equipment or systems shall be tested to insure that they have been properly de-energized and isolated.

5.3.11 Electrical repair work on energized systems shall be avoided whenever possible.

5.3.12 Electrical trouble shooting shall be conducted only after getting written approval of the Engineer.

5.3.13 Unauthorized personnel shall not enter enclosures or areas containing high voltage equipment such as switch gear, transformers, or substations.

5.4 Oxygen/Acetylene/Fuel Gases/Cartridge Tools

5.4.1 Compressed oxygen shall never be used in the place of compressed air.

5.4.2 Flash-back (Spark) arrestors shall be fitted to all gas equipment.

5.4.3 Liquid Petroleum Gas (LPG) cylinders shall not be stored or left in areas below ground level overnight. Cylinders must be stored upright.

5.4.4 The quantity of oxygen, acetylene and LPG cylinders at the point of work shall be restricted to a maximum of one day's supply. Cylinders shall be kept in upright vertical rack containers or be safely secured to a vertical support.

5.4.5 Cartridge tools shall be of the low velocity type. Operators must have received adequate training in the safe use and operation of the tool to be used.

5.5 Scaffolding/Temporary Works

5.5.1 No aluminum tube shall be used, except for proprietary mobile towers, unless otherwise agreed with the Engineer.

5.5.2 Drawings and calculations shall be submitted to the Engineer, prior to commencement of work on site, for all Temporary Works, including excavations, falsework, tower cranes, hoists, services and scaffolding. Design shall conform to international standards.

5.5.3 The Engineer will not approve Temporary Work designs but the Contractor shall take account of any comments on such designs made by the Engineer.

5.5.4 The Contractor shall inspect and approve all Temporary Works after erection and before access, loading or use is allowed. Completed and approved Temporary Works shall be tagged with a scaff-tag or similar safety system and the Safe Structure insert displayed. For scaffolding, one tag shall be displayed every 32 m2 of face area. A central record system shall be kept on all Temporary Work. Temporary Works shall be inspected weekly and similarly recorded.

5.5.5 All mobile scaffold towers shall be erected in accordance with the manufacture's instructions and a copy of these shall be submitted to the Engineer prior to any use on site. Additionally, all towers shall be erected complete with access ladder, safety rails and kick boards whatever the height.

5.5.6 The Contractor shall repair or replace, immediately, any scaffold including accessories, damaged or weakened from any cause.

5.5.7 The Contractor shall ensure that any slippery conditions on scaffolds are eliminated as soon as possible after they occur.

5.5.8 All scaffolds used for storing materials, for brick or block laying, for access to formwork or for any other purpose where materials may accidentally fall, shall be provided with wire mesh guards or guards of a substantial material, in addition to kick boards.

5.6 Use of Ladders

5.6.1 Manufactured ladders shall meet the applicable safety codes for wood or metal ladders. Metal ladders shall not be used where there is any likelihood of contract with electric cables and equipment. All metal ladders shall be clearly marked: "Caution - Do not use around electrical equipment".

5.6.2 Job made ladders shall not be permitted.

5.6.3 Extension or straight ladders shall be equipped with non-skid safety feet, and shall be no more than 12 m in height. The maximum height of a step ladder shall be 2 m. Ladders shall not be used as platforms or scaffold planks.

5.6.4 Ladders rungs and steps shall be kept clean and free of grease and oil.

5.6.5 Extension and straight ladders shall be tied off at the top and/or bottom when in use. Only one person shall be allowed on a ladder at a time.

5.6.6 Defective ladders shall be taken out of service and not used. Ladders shall not be painted and shall be inspected for defects prior to use.

5.7 Elevated Work

5.7.1 The Contractor shall provide all personnel, while working at an elevated position, with adequate protection from falls. Details of such protection shall be submitted to and approved by the Engineer.

5.7.2 The Contractor shall carry out daily inspections of all elevated work platforms. Defects shall be corrected prior to use.

5.7.3 Roofing & Sheet Material Laying

(a) A Method Statement detailing the procedures to be adopted shall be submitted to and agreed with the Engineer prior to commencement of work on site.

(b) Mobile elevating work platforms or the equivalent shall be used to install roofing and sheet materials wherever practicable and a suitable base is available.

5.7.4 Erection of Structures

(a) A Method Statement detailing the procedures to be adopted shall be submitted and agreed with the Engineer prior to commencement of work on site.

(b) Safety harnesses and lines shall be provided by the Contractor for use by the erection personnel and worn at all times.

(c) Mobile elevating work platforms or the equivalent shall be used to erect structures wherever practicable and a suitable base is available.

5.7.5 Mobile Elevating Work Platforms

Operators shall be trained in the safe use of such platforms and hold a current Certificate of Competence (see Sub-Clause 2.5).

5.7.6 Hoists

(a) A copy of the current Test Certificate (see Sub-Clause 2.5) shall be submitted to the Engineer before any hoist (personnel or material) is brought into operation on the site. Where the range of travel is increased or reduced a copy of the revised Test Certificate shall be submitted.

(b) Each landing gate shall be fitted with a mechanical or electrical interlock to prevent movement of the hoist when any such gate is in the open position.

(c) Safety harnesses must be worn and used by personnel erecting, altering and dismantling hoists.

5.7.7 Suspended Cradles

(a) Suspended cradles shall be installed, moved and dismantled by a specialist contractor.

(b) Suspended cradles shall comply with local regulations.

(c) All powered suspended cradles shall incorporate independent safety lines to overspeed braking devices and independent suspension lines for personal safety harness attachment.

5.8 Use of Temporary Equipment

5.8.1 The safe design capacity of any piece of equipment shall not be exceeded, nor shall the equipment be modified in any manner that alters the original factor of safety or capacity.

5.8.2 Mobile equipment shall be fitted with suitable alarm and motion sensing devices, including backup alarm, when required.

5.8.3 The Contractor shall ensure that the installation and use of equipment are in accordance with the safety rules and recommendations laid down by the manufacturer, taking into account the other installations already in place or to be installed in the future.

5.8.4 The Contractor shall inspect Equipment prior to its use on the Works and periodically thereafter to ensure that it is in safe working order. Special attention shall be given to such items as cables, hoses, guards, booms, blocks, hooks and safety devices. Equipment found to be defective shall not be used and immediately removed from service, and a warning tag attached.

5.8.5 Natural and synthetic fibre rope made of material such as manila, nylon, polyester, or polypropylene shall not be used as slings if approved by the Engineer.

5.8.6 Only trained, qualified and authorized personnel shall operate equipment. All drivers and operators shall hold a current Certificate of Training Achievement for the equipment being used (see Sub-Clause 2.5).

5.8.7 A safety observer shall be assigned to watch movements of heavy mobile equipment where hazards may exist to other personnel from the movement of such equipment, or where equipment could hit overhead lines or structures. The observer shall also ensure that people are kept clear of mobile equipment and suspended loads.

5.8.8 When mobile or heavy equipment is travelling onto a public thoroughfare or roadway, a flagman shall insure that traffic has been stopped prior to such equipment proceeding. While the mobile or heavy equipment is travelling on a public roadway, a trailing escort vehicle with a sign warning of a slow-moving vehicle that is dangerous to pass shall be provided.

5.8.9 Cranes:

(a) The Contractor shall give a minimum of 48 hours notice to the Engineer prior to bringing a mobile crane on site.

(b) No cranes shall be erected on the site without the prior approval of the Engineer. The Engineer may direct the Contractor as to locations where cranes may not be located. The Contractor shall take such directions into account when submitting his proposals for crane location points, base footings, pick up points and swing radius. Compliance with any such direction shall not entitle the Contractor to any extension of the Period of Completion or to any increase in the Contract Price.

(c) Safety harnesses shall be worn and used at all times by personnel engaged on the erection, alterations and dismantling of tower cranes.

(d) The Contractor shall provide a copy of the current Test Certificate (see Sub-Clause 2.5) to the Engineer before any crane (tower or mobile) is brought into operation on the Site.

(e) All lifting tackle must hold a current Test Certificate (see Sub-Clause 2.5). All lifting tackle must be thoroughly examined every 6 months and an inspection report raised.

(f) All fibrous/web slings shall be destroyed and replaced 6 months after first use.

(g) All crane drivers/operators shall hold a Certificate of Training Achievement for the class of crane operated (see Sub-Clause 2.5).

(h) All banksman/slingers shall hold a Training Certificate from a recognized training agency (see Sub-Clause 2.5).

(i) Only certified slingers/banksmans shall sling loads or guide crane/load movement.

(j) The maximum weekly working hours of a crane driver or banksman shall be restricted to 60 hours.

(k) Under no circumstances, shall a crane or load come within 4 m of any energized overhead power line or other critical structure.

5.9 Locking-out, Isolating, and Tagging of Equipment

5.9.1 Equipment that could present a hazard to personnel if accidentally activated during the performance of installation, repair, alteration, cleaning, or inspection work shall be made inoperable and free of stored energy and/or material prior to the start of work. Such equipment shall include circuit breakers, compressors, conveyors, elevators, machine tools, pipelines, pumps, valves, and similar equipment.

5.9.2 Where equipment is subject to unexpected external physical movement such as rotating, turning, dropping, falling, rolling, sliding, etc., mechanical and/or structural constraints shall be applied to prevent such movement.

5.9.3 Equipment which has been locked-out, immobilized, or taken out of service for repair or because of a potentially hazardous condition shall be appropriately tagged indicating the reason it has been isolated and/or taken out of service.

5.9.4 Where safety locks are used for locking out or isolating equipment, the lock shall be specially identified and easily recognized as a safety lock.

5.10 Installation of Temporary or Permanent Equipment

5.10.1 During installation and testing the Contractor's specialist engineer shall be in attendance.

5.10.2 All control mechanism panel and wiring diagrams shall be available and printed in both Arabic and either English or French.

5.11 Laser Survey Instruments

5.11.1 Details of the types and use of laser instruments shall be submitted and agreed with the Engineer.

5.12 Working in Confined Spaces

5.12.1 Confined spaces, including tanks, vessels, containers, pits, bins, vaults, tunnels, shafts, trenches, ventilation ducts, or other enclosures where known or potential hazards may exist, shall not be entered without prior inspection by and authorisation from the Site Safety Officer and the issuance of a Hazardous Work Permit.

5.12.2 Prior to entering the confined space, the area shall be completely isolated to prevent the entry of any hazardous substances or materials which could cause an oxygen deficient atmosphere. All equipment that could become energized or mobilized shall be physically restrained and tagged. All lines going into the confined space shall be isolated and/or blanked.

5.12.3 Personnel working in a confined space where emergency escape or rescue could be difficult, shall wear a safety harness attached to a lifeline.

5.12.4 A qualified attendant(s), trained and knowledgeable in job-related emergency procedures, shall be present at all times while persons are working within the confined space. The attendant shall be capable of effecting a rescue, have necessary rescue equipment immediately available, and be equipped with at least the same protective equipment as the person making entry.

5.12.5 All equipment to be used in a confined space shall be inspected to determine its acceptability for use. Where a hazard from electricity may exist, equipment utilized shall be of low voltage type.

5.12.6 The atmosphere within the confined space shall be tested to determine it is safe to enter. Acceptable limits are:

- oxygen: 19.5% lower, 22% higher;
- flammable gas: not to exceed 10% of lower explosion limit;
- toxic contaminants: not to exceed the permissible exposure limit.

(c) erect warning notices around the area affected that blasting operations are in progress,

(d) carry out a thorough search of buildings and the area affected prior to blasting,

(e) ensure that blasting is only carried out by experienced shot firers. Priming, charging, stemming and shot firing shall be carried out with greatest regard for safety and in strict accordance with the rules and regulations of the relevant authorities (see Sub-Clause 2.5).

(f) ensure that explosive charges are not excessive, charged boreholes are properly protected and proper precautions are taken for the safety of persons and property,

5.14.7 The Contractor shall maintain an up-to-date inventory of all explosives and explosive devices and shall submit a monthly report to the Engineer, detailing the use of all explosives by date and location.

5.15 Excavation and Trenching

5.15.1 An excavation permit signed by the Engineer must be issued before excavation proceeds in any work location. The Contractor shall investigate and identify the location of existing services by study of the drawings, a visual/physical study of the site, sweeping by appropriate detection equipment and where necessary hand excavation of trial holes.

Following this investigation, the Contractor shall submit a written request for an excavation permit to the Engineer.

The Engineer will return the permit signed and dated to indicate:

- services which are to be maintained.
- services which are to be isolated.
- any special precautions to be taken.

A sample Excavation Permit is given in Appendix 1.

5.15.2 The issue of an Excavation Permit by the Engineer shall not relieve the Contractor of his responsibilities under the Contract.

5.15.3 The side of all excavations and trenches exceeding 1.3 meters in depth which might expose personnel or facilities to danger resulting from shifting earth shall be protected by adequate temporary supports or sloped to the appropriate angle of repose.

5.15.4 All excavations, slopes and temporary supports shall be inspected daily and after each rain, before allowing personnel to enter the excavation.

5.15.5 Excavations 1.3 metres or more in depth and occupied by personnel shall be provided with ladders as a means for entrance and egress. Ladders shall extend not less than 1 metre above the top of the excavation.

3.15.6 The Contractor shall provide adequate barrier protection to all excavations. Barriers shall be readily visible by day or night.

5.15.7 Excavated or other materials shall not be stored at least 0.65 metres from the side of excavations.

5.16 Concrete Reinforcement Starter Bars

5.16.1 The Contractor shall ensure concrete reinforcement starter bars are not a danger to personnel. Where permitted by the Engineer, starter bars shall be bent down. Alternatively, the starter bars shall be protected using either hooked starters, plastic caps, plywood covers or other methods agreed with the Engineer.

6 Environmental and Health Requirements

6.1 Protection of the Environment

6.1.1 The Contractor shall be knowledgeable of and comply with all environmental laws, rules and regulations for materials, including hazardous substances or wastes under his control. The Contractor shall not dump, release or otherwise discharge or dispose of any such material without the authorisation of the Engineer.

6.1.2 Any release of a hazardous substance to the environment, whether air, water or ground, must be reported to the Engineer immediately. When releases resulting from Contractor action occur, the Contractor shall take proper precautionary measures to counter any known environmental or health hazards associated with such release. These would include remedial procedures such as spill control and containment and notification of the proper authorities.

6.2 Air Pollution

6.2.1 The Contractor, depending on the type and quantity of materials being used, may be required to have an emergency episode plan for any releases to the atmosphere. The Contractor shall also be aware of local ordinances affecting air pollution.

6.2.2 The Contractor shall take all necessary measures to limit pollution from dust and any wind blown materials during the Works, including damping down with water on a regular basis during dry climatic conditions.

6.2.3 The Contractor shall ensure that all trucks leaving the Site are properly covered to prevent discharge of dust, rocks, sand, etc.

6.3 Water Pollution

6.3.1 The Contractor shall not dispose of waste solvents, petroleum products, toxic chemicals or solutions in the city drainage system or watercourse, and shall not dump or bury garbage on the Site. These types of waste shall be taken to an approved disposal facility regularly, and in accordance with requirements of relevant Authorities. The Contractor shall also be responsible to control all run-offs, erosion, etc.

6.4 Solid Waste

6.4.1 General Housekeeping

(a) The Contractor shall maintain the site and any ancillary areas used and occupied for performance of the Works in a clean, tidy and rubbish-free condition at all times.

(b) Upon the issue of any Taking-Over Certificate, the Contractor shall clear away and remove from the Works and the Site to which the Taking-Over Certificate relates, all Contractor's Equipment, surplus material, rubbish and Temporary Works of every kind, and leave the said Works and Site in a clean condition to the satisfaction of the Engineer. Provided that the Contractor shall be entitled to retain on Site, until the end of the Defects Liability Period, such materials, Contractor's Equipment and Temporary Works as are required by him for the purpose of fulfilling his obligations during the Defects Liability Period.

6.4.2 Rubbish Removal and Disposal

(a) The Contractor shall comply with statutory and municipal regulations and requirements for the disposal of rubbish and waste.

(b) The Contractor shall provide suitable metal containers for the temporary storage of waste.

(c) The Contractor shall remove rubbish containers from site as soon as they are full. Rubbish containers shall not be allowed to overflow.

(d) The Contractor shall provide hardstandings for and clear vehicle access to rubbish containers.

(e) The Contractor shall provide enclosed chutes of wood or metal where materials are dropped more than 7 metres. The area onto which the material is dropped shall be provided with suitable enclosed protection barriers and warning signs of the hazard of falling materials. Waste materials shall not be removed from the lower area until handling of materials above has ceased.

(f) Domestic and biodegradable waste from offices, canteens and welfare facilities shall be removed daily from the site.

(g) Toxic and hazardous waste shall be collected separately and be disposed of in accordance with current regulations.

(h) No waste shall be burnt on Site unless approved by the Engineer.

6.4.3 Asbestos Handling and Removal

The Contractor shall comply with all local regulations regarding the handling of asbestos materials. In the absence of local regulations, relevant International Standards shall apply.

6.4.5 Pest Control

The Contractor shall be responsible for rodent and pest control on the Site. If requested, the Contractor shall submit to the Engineer, for approval, a detailed programme of the measures to be taken for the control and eradication of rodents and pests.

6.5 Noise Control

6.5.1 The Contractor shall ensure that the work is conducted in a manner so as to comply with all restrictions of the Authorities having jurisdiction, as they relate to noise.

6.5.2 The Contractor shall, in all cases, adopt the best practicable means of minimizing noise. For any particular job, the quietest available plant/and or machinery shall be used. All equipment shall be maintained in good mechanical order and fitted with the appropriate silencers, mufflers or acoustic covers where applicable. Stationary noise sources shall be sited as far away as possible from noise-sensitive areas, and where necessary acoustic barriers shall be used to shield them. Such barriers may be proprietary types, or may consist of site materials such as bricks or earth mounds as appropriate.

6.5.3 Compressors, percussion tools and vehicles shall be fitted with effective silencers of a type recommended by the manufacturers of the equipment. Pneumatic drills and other noisy appliances shall not be used during days of rest or after normal working hours without the consent of the Engineer.

6.5.4 Areas where noise levels exceed 90 decibels, even on a temporary basis, shall be posted as high noise level areas.

7 Additional Requirements for Work in Public Areas

7.1 General

7.1.1 These additional requirements shall apply to all works carried out in Public Areas.

7.1.2 Public Areas are defined as areas still used by or accessible to the public. These include public roads and pavements, occupied buildings and areas outside the Contractor's boundary fencing.

7.1.3 All work in Public Areas shall be carried out to minimise disturbance and avoid dangers to the public.

7.1.4 Before commencing work, the Contractor shall ensure that all necessary resources, including labour, plant and materials, will be available when required and that the works will proceed without delays and be completed in the shortest possible time. Periods of inactivity and slow progress or delays in meeting the agreed programme for the works, resulting from the Contractor's failure to provide necessary resources or other causes within the control of the Contractor, will not be accepted. In the event of such inactivity, slow progress or delays, the Contractor shall take immediate action to rectify the situation, including all possible acceleration measures to complete the works within the agreed programme. Details of the actions and acceleration measures shall be submitted to the Engineer. If the Engineer is dissatisfied with the Contractor's proposals, the Contractor shall take such further actions or measures as required by the Engineer. All costs incurred shall be the responsibility of the Contractor.

7.2 Method Statement

7.2.1 The Contractor shall submit to the Engineer a method statement for each separate area of work in Public Areas. The Method Statement shall include:

(a) a general description of the Works and methodology of how it will be carried out.

(b) details of the measures and temporary works to minimise disturbance and safeguard the public. These shall include temporary diversions, safety barriers, screens, signs, lighting, watchmen and arrangements for control of traffic and pedestrians and advance warning to be given to the public.

(c) details of temporary reinstatement and maintenance of same prior to final reinstatement.

(d) for works involving long lengths of trenches or works to be completed in sections, the lengths or sections of each activity (eg up to temporary reinstatement, temporary reinstatement, final reinstatement) to be carried out at any one time.

(e) details of the availability of necessary resources (labour, plant, materials, etc) to complete the work.

(f) a programme showing start and completion dates and periods for all activities of each length or section, including temporary works, and the works overall.

(g) such further information as necessary or required by the Engineer.

7.2.2 The Contractor shall not commence work, including temporary works, until approval of the Contractor's Method Statement by the Engineer.

7.2.3 Method Statements shall be updated based on actual progress or as and when required by the Engineer.

7.3 Closure of Roads, Etc

7.3.1 The closure or partial closure of roads, pavements and other public areas will only be permitted if approved by the Engineer and Relevant Authorities. The Contractor shall detail for each closure the extent of area to be closed, the reasons and duration of the closure and, where appropriate, proposed diversions.

A sample Street Closure Permit is given in Annex 2.

7.4 Trench and Other Excavations

7.4.1 The requirements covering trench and other excavations will depend on the location and type of the excavation and the potential risks to the public.

7.4.2 The following guidelines apply particularly to trenches but shall also apply to other types of excavations:

(a) before commencing work the Contractor shall:

- notify the Engineer on the location and duration of the work. An excavation permit signed by the Engineer must be issued in accordance with Sub-Clause 5.15.1 before excavation proceeds in any work location.;
- obtain permission from relevant authorities including the police when required. The Contractor's attention is drawn to the requirements of Legislative Decree No 68 dated 9 September 1983, issued by the President of the Republic of Lebanon, and in particular to the provisions therein regarding prior notification by the Contractor to and the issue of excavation licenses by the Director of Roads or the Head of the Municipal Authority concerned, as applicable, before the commencement of excavations within the limits of streets, roads and other areas defined under the said Decree.
- erect all temporary works such as barriers, warning signs, lighting, etc;
- have available adequate materials for temporary supports to sides of excavations and necessary labour, plant and materials to complete the work within the shortest possible time;

(b) in carrying out the works the Contractor shall, unless otherwise permitted or required by the Engineer:

- not open more than one excavation within a radius of 250 metres;
- limit the length of trench excavation open at one time to 150 metres;
- maintain and alter or adapt all temporary works including supports to sides of excavations;
- remove all surplus excavated material the same day it is excavated;
- complete the works, including final reinstatement within ten days;
- where final reinstatement is not achieved within the required time, to carry out temporary reinstatement;
- ensure that any temporary reinstatement is maintained at the correct level until final reinstatement is achieved.

7.4.3 The above guidelines shall not relieve the Contractor of his obligations and responsibilities.

7.5 Safety Barriers

7.5.1 Safety barriers shall be provided to the perimeter of work areas and to trench and other types of excavations and to existing openings such as manholes, drawpits and the like. When exposed to the public, safety barriers shall be provided to both sides of trenches and around all sides of openings.

7.5.2 The Contractor shall provide details of the type or types of safety barriers for each excavation for the approval of the Engineer prior to commencing work. No work shall commence until the safety barriers are in place.

7.5.3 The type of safety barrier used shall be appropriate to the particular location and the potential risks to the public. Examples of different types of safety barriers are given below:

- Type 1 - excavated material;
- Type 2 - non-rigid barrier of rope or florescent tape strung between metal rods driven into the ground;
- Type 3 - rigid barrier of timber, steel or concrete. Such barriers could be in the form of horizontal rail(s) or sheet material secured to posts driven or concreted into the ground.

7.5.4 The following are guidelines on the type of safety barriers that could be used in differing situations. They apply particularly to trenches but also apply to other types of excavations, existing openings and to the perimeter of work areas:

- areas not subject to vehicular traffic - Types 1 or 2;

- roadways (low traffic speed) - Types 1 or 2;
- roadways (high traffic speed) - Types 1 or 3.

7.5.5 The above examples of the types of barriers and the guidelines on situations in which they could be used shall not relieve the Contractor of his obligations and responsibilities.

8 Contractor's Site Check List

8.1 A sample Contractor's Site Check List is included in Annex 3. This is included to assist contractors should they wish to introduce such a system as part of their site management procedures. The list is not exhaustive and further items will need to be added by the Contractor.

8.2 The list is issued for guidance only, and does not, in any way, revise or limit the requirements covered elsewhere in these Regulations.

Annex 1

Sample Excavation Permit

To: ..... (Engineer)

From: ..... (Contractor) Date: .....

CDR Contract No: .....
Request for Excavation Permit No: .....

Please give approval for excavation to proceed in the following area:

Work to start on:

Existing services have been checked and identified by:

Drawings # Physical Survey #

Catscan # Trial Holes Excavation #

Signed (Contractor): .....

Approval of Engineer

The above excavation may proceed, subject to the following:

Services to be maintained:

Services to be isolated before work proceeds:

Other matters:

Signed (Engineer): .....

Date: .....

Annex 2

Sample Street Closure Permit

To: ..... (Engineer)

From: ..... (Contractor) Date: .....

CDR Contract No: .....
Request for Street Closure Permit No: .....

Please give approval for the closure of the following street(s) from ..... to ..... (*dates*)

Street(s):

Reasons:

Proposed diversions:

Signed (Contractor): .....

Approval of the Engineer

The above street(s) may be closed for the periods stated subject to the following conditions:

Approval has been given by relevant authorities and the police;

Other:

Signed (Engineer): .....

Date: .....

Annex 3

Sample Contractor's Site Check List

Safe Access:

- arrangements for visitors and new workers to the site
- safe access to working locations
- walkways free from obstructions
- edge protection to walkways over 2m above ground
- holes fenced or protected with fixed covers
- tidy site and safe storage of materials
- waste collection and disposal
- chutes for waste disposal, where applicable
- removal or hammering down of nails in timber
- safe lighting for dark or poor light conditions
- props or shores in place to secure structures, where applicable

Ladders:

- to be used only if appropriate
- good condition and properly positioned
- located on firm, level ground
- secure near top. If not possible, to be secured near the bottom, weighted or footed to prevent slipping
- top of ladder minimum 1 metre above landing place

Scaffolding:

- design calculations submitted
- proper access to scaffold platform
- properly founded uprights with base plates
- secured to the building with strong ties to prevent collapse
- braced for stability
- loadbearing fittings, where required
- uprights, ledgers, braces and struts not to be removed during use
- fully boarded working platforms, free from defects and arranged to avoid tipping or tripping
- securely fixed boards against strong winds
- adequate guard rails and toe boards where scaffold 2m above ground
- designed for loading with materials, where appropriate
- evenly distributed materials
- barriers or warning notices for incomplete scaffold (ie not fully boarded)
- weekly inspections and after bad weather by competent person
- record of inspections

Excavation:

- underground services to be located and marked and precautions taken to avoid them
- adequate and suitable timber, trench sheets, props and other supporting materials available on site before excavation starts
- safe method for erecting/removal of timber supports
- sloped or battered sides to prevent collapse
- daily inspections after use of explosives or after unexpected falls of materials
- safe access to excavations (eg sufficiently long ladder)
- barriers to restrict personnel/plant
- stability of neighbouring buildingsrisk of flooding
- materials stacked, spoil and vehicles away from top of excavations to avoid collapse
- secured stop blocks for vehicles tipping into excavations

Roof work:

- crawling ladders or boards on roofs more than 10 degrees
- if applicable, roof battens to provide a safe handhold and foothold
- barriers or other edge protection
- crawling boards for working on fragile roof materials such as asbestos cement sheets or glass. Guard rails and notices to same
- rooflights properly covered or provided with barriers
- during sheeting operations, precautions to stop people falling from edge of sheet
- precautions to stop debris falling onto others working under the roof work

Transport and mobile plant:

- in good repair (eg steering, handbrake, footbrake)
- trained drivers and operators and safe use of plant
- secured loads on vehicles
- passengers prohibited from riding in dangerous positions
- propping raised bodies of tipping lorries prior to inspections
- control of on-site movements to avoid danger to pedestrians, etc
- control of reversing vehicles by properly trained banksmen, following safe system of work

Machinery and equipment:

- adequate and secured guards in good repair to dangerous parts, eg exposed gears, chain drives, projecting engine shafts

- correct pins used in the props
- timberwork in good condition
- inspection by competent person, against agreed design before pouring concrete

Risks to the Public:

- ientify all risks to members of the public on and off site, eg materials falling from scaffold etc., site plant and transport (access/egress) and implement precautions, eg scaffold fans/nets, banksmen, warning notices etc
- barriers to protect/isolate persons and vehicles
- adequate site perimeter fencing to keep out the public and particularly children. Secure the site during non-working periods
- make safe specific dangers on site during non-working periods, eg excavations and openings covered or fenced, materials safely stacked, plant immobilised, ladders removed or boarded

Fire - general:

- sufficient number and types of fire extinguishers
- adequate escape routes, kept clear
- worker awareness of what to do in an emergency

Fire - flammable liquids:

- proper storage area
- amount of flammable liquid on site kept to a minimum for the day's work
- smoking prohibited; other ignition sources kept away from flammable liquids
- proper safety containers

Fire - compressed gases, eg oxygen, LPG, acetylene:

- properly stored cylinders
- valves fully closed on cylinders when not in use
- adopt "hot work" procedures
- site cylinders in use outside huts

Fire - other combustible materials:

- minimum amount kept on site
- proper waste bins
- regular removal of waste material

Noise:

- assessment of noise risks
- noisy plant and machinery fitted with silencers/muffs
- ear protection for workers if they work in very noisy surroundings

Health:

- identify hazardous substances, eg asbestos, lead, solvents etc and assess the risks
- use of safer substances where possible
- control exposure by means other than by using protective equipment
- safety information sheets available from the supplier
- safety equipment and instructions for use
- keep other workers who are not protected out of danger areas
- testing of atmosphere in confined spaces; provision of fresh air supply if necessary. Emergency procedures for rescue from confined spaces

Manual handling:

- avoid where risk of injury
- if unavoidable, assess and reduce risks

Protective clothing:

- suitable equipment to protect the head, eyes, hands and feet where appropriate
- enforce wearing of protective equipment

Welfare:

- suitable toilets
- clean wash basin, hot/warm water, soap and towel
- room or area where clothes can be dried
- wet weather gear for those working in wet conditions
- heated site hut where workers can take shelter and have meals with the facility for boiling water
- suitable first aid facilities

Work in Public Areas

- all risks to the public identified
- method statement approved
- road closures approved
- temporary diversions in place
- safety barriers erected/maintained
- safety signs and lighting installed/maintained
- labour, materials, plant and other resources sufficient to meet programme
- temporary reinstatement completed and properly maintained

- permanent reinstatement completed at earliest possible date

Part II

Supplementary Safety, Health and Environmental Regulations

Clause No.

Sub-Clause 3.2.2 of Part I specifies deductions in USD. If the currency of payments for a contract is NOT USD, one of the following two alternative Sub-Clause should be included in Part II.

Alternative 1 should be included when the currency of payments is specified in the Contract (eg Lebanese Pounds). The amounts included in Alternative 1, for D1, D2 and D3, should be stated in the appropriate currency of payment based on the equivalent in that currency of the USD amounts in Part I.

Alternative 2 should be included when the currency of payments is not known at time of preparing the bidding documents (eg in the CDR Standard Bidding Documents for Smaller Contracts, the payment currency or currencies are specified by the Bidder as part of his Bid).

If the currency of payment is USD, neither of the alternatives need to be included in Part II.

Alternative 1

3.2.2 Delete text, and replace with the following:

The basic deduction from payment for each classification in Sub-Clause 3.2.1, is as follows:

for D1 - _____ *[insert currency and amount]*;
for D2 - _____ *[insert currency and amount]*;
for D3 - _____ *[insert currency and amount]*.

Alternative 2

3.2.2 Add second paragraph as follows:

The deductions in paragraph 1 of this Sub-Clause, shall be in the currency or currencies to be paid to the Contractor. The amount in each currency shall be based on the USD amounts in PART I and the exchange rates for the payment currency or currencies stated in the Contract.

Annex D. Public Participation

D1. List of attendees

TEAM INTERNATIONAL Engineering & Management Consultants

لائحة حضور جلسة مشاركة العامة لمشروع الطرق والعمالة في لبنان

المكان: مبنى اتحاد البلديات - الديمان

الزمان: 13/12/2019

الإسم الثلاثي	البلدة	المنصب/ المهنة	الجنس	العمر	الهاتف	البريد الإلكتروني
1. فادي سليم [illegible]	بشري	مختار بشري	☒ ذكر ☐ أنثى	☐ أقل من 20 ☐ 20-30 ☐ 30-40 ☒ 40-50 ☐ أكثر من 50	٠٣٦١١١٧٢	fadyhdiuc240@hotmail.com
2. سعد كرم	بشري	عضو مجلس بلدية بشري لجنة الهندسة	☒ ذكر ☐ أنثى	☐ أقل من 20 ☐ 20-30 ☐ 30-40 ☒ 40-50 ☐ أكثر من 50	03-321283	assaad.ke@bcharri.gov.lb
3. دانيال غصن	الديمان	منطقة في اتحاد بلديات قضاء بشري	☐ ذكر ☒ أنثى	☐ أقل من 20 ☒ 20-30 ☐ 30-40 ☐ 40-50 ☐ أكثر من 50	70-364090	ghosn_daddan@hotmail.com
4. شربل البايع	بزي	مهندس البلدية في بشري ومهندس اتحاد بلديات قضاء بشري	☒ ذكر ☐ أنثى	☐ أقل من 20 ☒ 20-30 ☐ 30-40 ☐ 40-50 ☐ أكثر من 50	70/173564	sharbelalbayeh@gmail.com

مبنى اتحاد البلديات - الديمان

13/12/2019

الإسم الثلاثي	البلدة	المنصب/ المهنة	الجنس	العمر	الهاتف	البريد الإلكتروني
5. ريتا الحلوني عليطا	عبرين	امينة سر	☐ ذكر ☑ أنثى	☐ أقل من 20 ☐ 20-30 ☑ 30-40 ☐ 40-50 ☐ أكثر من 50	06/990915 03/427160	Abdinemuni@hotmail.com
6. ناتالي بو يونس	بشري	مديرة تجمعات تعاونيات بشري	☐ ذكر ☒ أنثى	☐ أقل من 20 ☐ 20-30 ☒ 30-40 ☐ 40-50 ☐ أكثر من 50	03820585	nathalie.tgjhr@hotmail.com
7. فرادي كيروز	بشري	رئيس بلدية بشري نائب رئيس الاتحاد	☑ ذكر ☐ أنثى	☐ أقل من 20 ☐ 20-30 ☐ 30-40 ☑ 40-50 ☐ أكثر من 50	03/299791	freddy.keirouz@gmail.com
8. محمد شهاب	Team Intl.	مهندس	☒ ذكر ☐ أنثى	☐ أقل من 20 ☐ 20-30 ☐ 30-40 ☐ 40-50 ☒ أكثر من 50	03061469	mshehab56@gmail.com
9. خضر محمد كروم	تيم انترناشيونال	مهندس طرق	☑ ذكر ☐ أنثى	☐ أقل من 20 ☐ 20-30 ☐ 30-40 ☐ 40-50 ☑ أكثر من 50	71672230	karroumk@gmail.com

TEAM INTERNATIONAL Engineering & Management Consultants

13/12/2019

مبنى اتحاد البلديات - الدوير

الإسم الثلاثي	البلدة	المنصب/ المهنة	الجنس	العمر	الهاتف	البريد الإلكتروني
.10			☒ ذكر ☐ أنثى	☐ أقل من 20 ☐ 20-30 ☐ 30-40 ☐ 40-50 ☒ أكثر من 50	٠٣٤٥٨٦٢	
.11			☒ ذكر ☐ أنثى	☐ أقل من 20 ☐ 20-30 ☐ 30-40 ☒ 40-50 ☐ أكثر من 50	03-326488	
.12			☒ ذكر ☐ أنثى	☐ أقل من 20 ☐ 20-30 ☐ 30-40 ☒ 40-50 ☐ أكثر من 50	03/512278	amono_79@hotmail.com
.13	CDR	PIU	☐ ذكر ☐ أنثى	☐ أقل من 20 ☐ 20-30 ☐ 30-40 ☒ 40-50 ☐ أكثر من 50	03-214499	SMOAWAD@CDR-GOV.COM
.14			☐ ذكر ☐ أنثى	☐ أقل من 20 ☐ 20-30 ☐ 30-40 ☐ 40-50 ☐ أكثر من 50		

Powerpoint Presentation

مشروع الطرق والعمالة في لبنان

THE WORLD BANK

خطة الإدارة البيئية والاجتماعية

Lot 5 -قضاء بشري

جلسة مشاركة العامة

مبنى الحاج الشديات ـ التبدان
المركز التصيفي للبطريركية المارونية
في 13 تشرين الأول 2015

TEAM INTERNATIONAL

نقاط حوار الجلسة

- المقدمة
- أهداف اللقاء
- الجهات المعنية بالمشروع
- وصف المشروع
- الوضع الحالي
- الآثار البيئية والاجتماعية الإيجابية للمشروع
- الآثار البيئية والاجتماعية السلبية المحتملة للمشروع
- الإجراءات التخفيفية المقترحة
- أسئلة ومناقشة

مقدمة

- تتمتع شبكة الطرق في لبنان بنطاق وتغطية كافيين بشكل عام

- نسبة كبيرة من تلك الطرق في حالة سيئة
- خاصة في المناطق الريفية التي تعتبر فيها حالة شبكة الطرق أدنى مستوى من حالة الطرقات على المستوى الوطني ككل
- ما يؤدي إلى إعاقة التنمية المحلية والاقتصادية

مقدمة

- مشروع الطرق والعمالة في لبنان
  - تخطيط مجلس الانماء والاعمار للتنفيذ
  - تمويل من البنك الدولي
- يشمل أعمال تأهيل عدة طرق في بلدات من كافة الأقضية اللبنانية
- يهدف إلى تحسين كفاءة قطاع الطرق من خلال
  - تحديد أولويات أعمال الطرق
  - تحسين تقنيات إدارة شبكة الطرق والسلامة العامة

1. أهداف اللقاء

- إعلام الرأي العام بالمشروع لإبداء ملاحظاتهم وفقاً لسياسة ضمانات البنك الدولي (سياسة تشغيلية رقم 4.01)
- عرض لأهم الآثار البيئية والإجتماعية والتدابير التخفيفية المرتبطة بتنفيذ المشروع
- مناقشة خطة الإدارة البيئية والإجتماعية للمشروع

2. الجهات المعنية بالمشروع

الجهة	الصفة
البنك الدولي	ممول المشروع
مجلس الانماء والاعمار	إدارة وتنفيذ
TEAM International	استشاري هندسي
البلديات المعنية وزارة الأشغال العامة المديرية العامة للطرق والمواصلات	

3. وصف المشروع

المكون الأول:
إعادة تاهيل الطرق وصيانتها

- الأهداف

✓ إعادة تاهيل وصيانة الطرق الأساسية والثانوية والثالثة، تحسين ترابط خطوط النقل وخلق وظائف مباشرة وغير مباشرة؛

✓ إعادة بناء الطبقات الأساسية
✓ طبقات إضافية من الأسفلت
✓ أعمال تصريف المياه
✓ أعمال تثبيت الانحدارات
✓ جدران الدعم
✓ تحسينات على جوانب الطرق التي تمر عبر البلدات (الأرصفة وإزاحة الأشجار)

3. أهداف المشروع

- تحسين كفاءة الإنفاق في قطاع الطرق من خلال تحديد الأولويات
- تحسين ترابط نظام النقل على طول طرق معينة
- خلق فرص عمل قصيرة الأجل
- تحسين تقنيات إدارة الطرق

3. وصف المشروع

المكون الثالث:
بناء القدرات ودعم التنفيذ

- الأهداف:

✓ بناء قدرات الهيئات اللبنانية في تخطيط وإدارة قطاع الطرق.

✓ المساهمة في تدريب وبناء قدرات المقاولين والعاملين على المشاريع حول تقنيات حديثة محسّنة لبناء الطرق وصيانتها.

3. وصف المشروع

المكون الثاني:
تحسين القدرة على الاستجابة لطوارئ الطرق

- الأهداف:

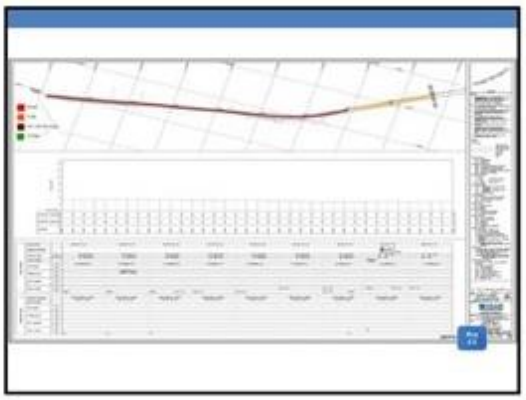
✓ تحسين القدرات على التعامل مع الطوارئ المتعلقة بالطرق، ولا سيما خلال عواصف الثلوج والظروف المناخية الشديدة

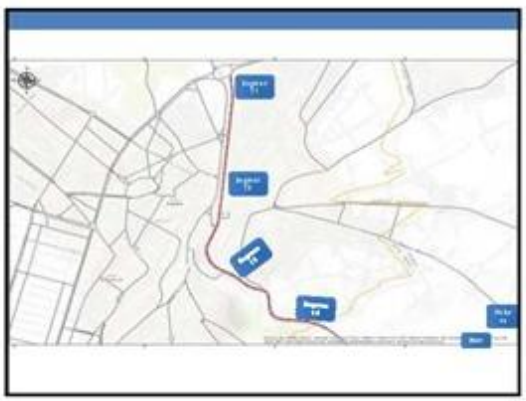
✓ مراجعة إجراءات الطوارئ الحالية والقدرة على التخطيط والاستعداد للحالات المناخية الشديدة، بما في ذلك التوقيت المناسب في تعبئة المعدات وإرسالها عند الحاجة (إزالة وناقلة ثلوج ورشاشات ملح ومركبات دفع رباعي)

تأهيل الطرقات في قضاء بشرّي

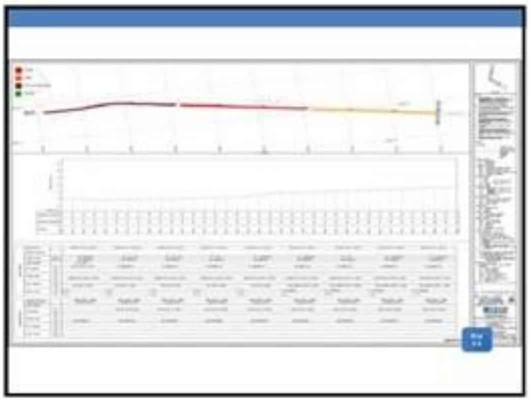
الوضع الحالي

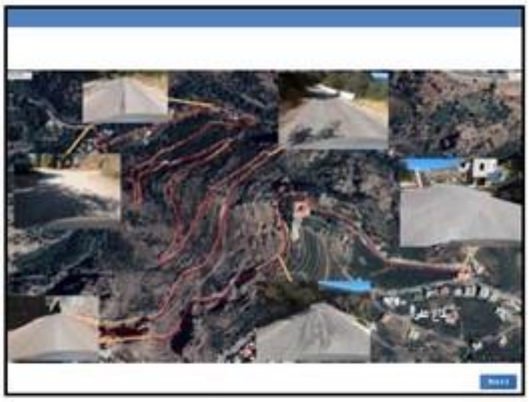
الإجراءات التخطيطية | الرصد والمراقبة | تقوية القدرات المؤسساتية

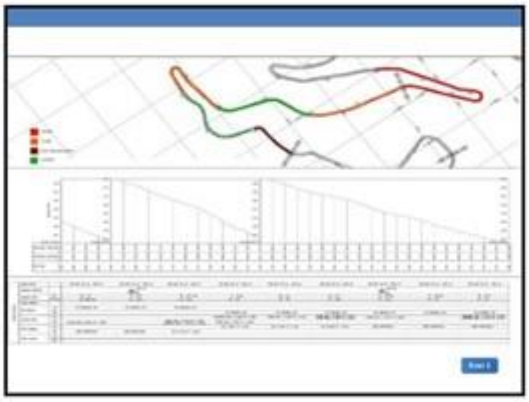


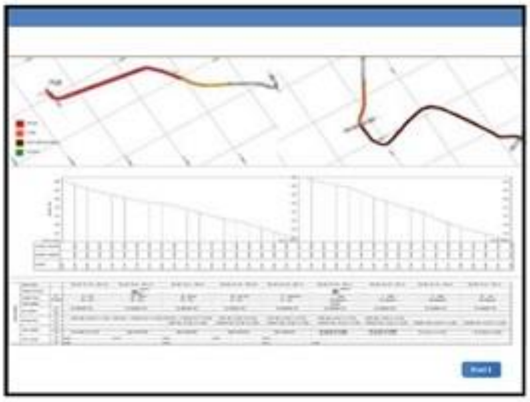


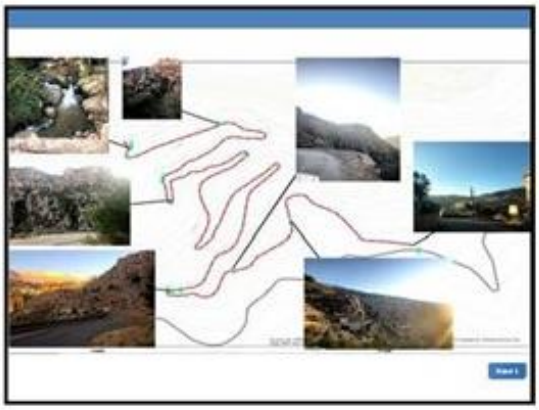

4. الوضع الحالي: الطرق المقترحة في قضاء بشرّي
الرمز | الطول (كم) | اسم الطريق
R2 | 11 | تقاطع طريق بشري - تنورين / دير ليشع باتجاه وادي قاديشا
R3 | 11 | بيت منذر - قنات
R4 | 6 | قنات - مزرعة بني صعب



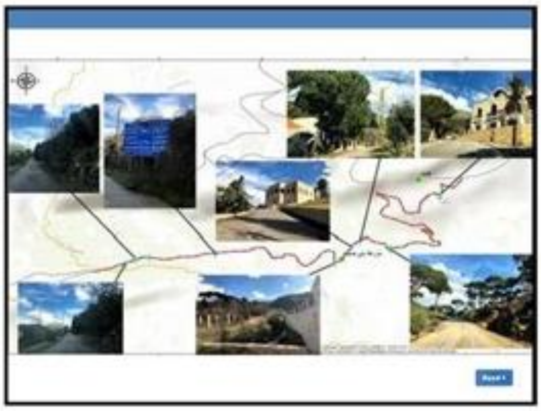









Qnat
Beit Mouza




5. الآثار البيئية والاجتماعية الإيجابية للمشروع
تحسين حالة الطرق
الحد من الحوادث المرورية
خلق فرص العمل للمقيمين المحليين
مشاركة أوسع ومنافع للمرأة والشباب
فهم أفضل للوضع البيئي والاجتماعي الحالي


6. الآثار البيئية والاجتماعية السلبية المحتملة للمشروع
بشكل مؤقت
التلوث الضوضائي
تلوث الهواء
نزع الغطاء النباتي الطبيعي
الصحة والسلامة المهنية
المخلفات الصلبة
عدم القدرة على الوصول الى طرق معتادة
الآثار على البنية التحتية القائمة


6. الآثار البيئية والاجتماعية المحتملة للمشروع
الأثر | مرحلة الإنشاء | مرحلة التشغيل
حركة السير | --/- | ++/+
نوعية الهواء | - | -/+
ضوضاء | --/- | -/+
مخلفات الإنشاء و الأشغال | -- | 0
المياه | --/- | +/0
نزع الغطاء النباتي الطبيعي | - | 0
الصحّة والسلامة العامة | - | -/+
الأثار الإقتصادية و الإجتماعية | +/- | ++/+

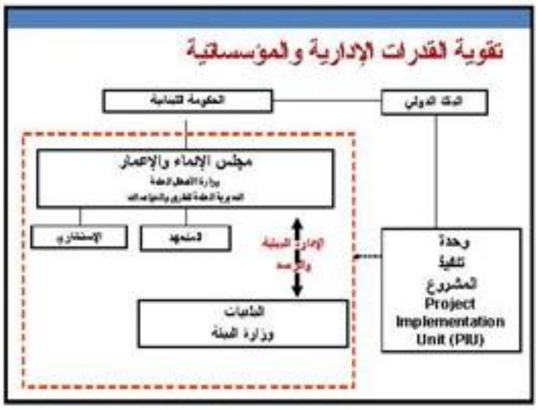

7. الإجراءات التخفيفية المقترحة (1)
الأثر
الإجراءات التخفيفية
حركة السير
إعداد خطة للحركة المرورية على الطرق قبل أعمال البناء لتحديد جميع عمليات تحويل الطرق الممكنة للحد من حركة المرور والازدحام
إعداد طرق بديلة و جسور مؤقتة لعبور أصحاب المحلات و السكان المتضررين
تنظيم حركة المرور
نوعية الهواء
رش المياه للحد من إنبعاثات الغبار
توجيه مصادر الانبعاثات بعيداً عن المساكن المحيطة
ضوضاء
استعمال حواجز صوتية
حصر الأعمال المسببة للضوضاء بساعات العمل النهارية
زرع الأشجار في المناطق الحساسة


7. الإجراءات التخفيفية المقترحة (3)
الإجراءات التخفيفية
الأثر
السلامة العامة
الآثار الاقتصادية والاجتماعية


7. الإجراءات التخفيفية المقترحة (2)
الإجراءات التخفيفية
الأثر
المياه


7. خطّة الرصد والمراقبة
- المراقبة الدوريّة من خلال الملاحظة البصرية والتوثيق الفوتوغرافي
- يتمّ قياس بعض المؤشّرات (عدد مرور السيّارات، نوعيّة المياه، نوعيّة الهواء، مستوى الضوضاء، الخ) عندما تثار الشكاوى من قبل العامّة
- مسؤوليّة المراقبة تقع على عاتق المهندس في الموقع من قبل الإستشاري، والمسؤول عن الإشراف على الصحّة والسلامة والبيئة من بين مهام أخرى مناطة إليه
- عندما تثار الشكاوى من قبل العامّة من الممكن قيام مجلس الإنماء والإعمار بتعيين إستشاري بيئي محايد للقيام بقياس المؤشّرات والتحقيق بالشكاوى


7. الإجراءات التخفيفية المقترحة- المسؤوليّات
- خلال الإنشاء
- مسؤوليّة تطبيق الإجراءات التخفيفيّة
- المتعهّد
- مجلس الإنماء والإعمار
- البلديّات المعنيّة
- مسؤوليّة مراقبة تطبيق الإجراءات التخفيفيّة
- مهندس في الموقع من قبل الإستشاري، مسؤول عن الإشراف على الصحّة والسلامة والبيئة من بين مهام أخرى مناطة إليه
- خلال التشغيل
- مسؤوليّة تطبيق ومراقبة تطبيق الإجراءات التخفيفيّة
- البلديّات المعنيّة


تقوية القدرات الإدارية والمؤسساتية
الحكومة اللبنانية
البنك الدولي
مجلس الإنماء والإعمار
الإستشاري
المتعهد
البلديات
وزارة البيئة
وحدة
تنفيذ
المشروع
Project
Implementation
Unit (PIU)


7. خطّة الرصد والمراقبة
الإجراءات
المؤشر

أسئلة ومناقشة عامة

يمكنكم إبداء رأيكم عبر التراسل مع شركة:
TEAM International
هاتف: (00961) (1) 804095
فاكس: (00961) (1) 804034
بريد الكتروني: engineering@team-international.com

أو عبر التراسل مع مشروع وحدة العمالة في مجلس الإنماء والإعمار
هاتف: 01-980096
مقسم: 317
بريد الكتروني: rstephan@cdr.gov.lb

تقوية القدرات

- تدريبات بيئية للمتعهدين والمقاولين حول:

- القوانين والنوائح والمعايير البيئية
- الآثار الصحية للتلوث
- تدابير منع التلوث
- تقنيات أخذ العينات وإرشادات المراقبة البيئية (الهواء، الضوضاء، المياه)
- حماية التراث الثقافي في المشاريع التنموية
- تدابير سلامة المرور والمشاة

شكـــــراً
لحضوركم
ومشاركتكم

ANNEX E - Complaints Register form

Name, phone and address of Complainant	Date of the complaint	Complaint issue and action taken	Corrective Action	Name of employer/ representative notified of complaint	Type of Complaint	Date of close out