Republic of Lebanon - Council for Development and Reconstruction

Road and Employment Project (REP)

Environmental and Social Management Plan (ESMP)
Final Report

LOT 1: Caza of Metn

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Abbreviations and Acronyms

CDR	Council for Development and Reconstruction
CoC	Code of Conduct
CoM	Council of Ministers
DLIPS	Department of Labour Inspection, Prevention and Safety
EHS	Environment Health and Safety
ESMP	Environmental and Social Management Plan
EIA	Environmental Impact Assessment
EMoP	Environmental Monitoring Plan
ESMF	Environmental and Social Management Framework
EU	European Union
GBV	Gender Based Violence
GDP	Gross Domestic Product
GOL	Government of Lebanon
GRM	Grievance Redress Mechanism
IFC	International Finance Cooperation
IUCN	International Union for Conservation of Nature and Natural Resources
ILO	International Labour Organization
LULC	Land Use Land Cover Map
MoA	Ministry of Agriculture
MOE	Ministry of Environment
MoIM	Ministry of Interior and Municipalities
MoL	Ministry of Labour
MOPH	Ministry of Public Health
MOPWT	Ministry of Public Works and Transportation
MoSA	Ministry of Social Affairs
NGOs	Non-Governmental Organizations
OP	Operational Plan
OHS	Occupational Health and Safety
PAPs	Project Affected Persons
PAs	Protected Areas
PHS	Public Health and Safety
PIU	Project Implementation Unit
PM	Particulate Matter
REP	Roads and Employment Project
SAP	Safeguards Action Plan
SEA	Sexual Exploitation and Abuse
SH	Sexual Harassment
UNESCO	United Nations Educational, Scientific and Cultural Organization
WB	World Bank
WBG	World Bank Group
WEF	World Economic Forum
WWTP	Waste Water Treatment Plant

EXECUTIVE SUMMARY

Introduction

Lebanon Roads and Employment Project (REP), funded by the World Bank (WB), aims to improve the roads conditions and traffic safety by rehabilitation of road networks in Lebanon, especially in rural lagging regions, and to create job opportunities for displaced Syrians and Lebanese citizens through the labor-intensive works of rehabilitation.

The project works will be executed on the main road network which is under the jurisdiction of the Ministry of Public Works and Transportation (MoPWT). In this context, the Lebanese Council for Development and Reconstruction (CDR) will implement Lebanon REP on behalf of the government/MoPWT.

Considering that the anticipated civil works will result in environmental and social impacts, an Environmental and Social Management Plan (ESMP) shall be prepared under the requirements of OP4.01 that classifies the project as Category B to limit potential implications. Accordingly, Dar Al Handasah Nazih Taleb & Partners developed in this report a specific ESMP for Metn Caza.

The objective of the ESMP is to identify and assess the potential environmental and social impacts of REP and consult relevant stakeholders to prepare a management plan that includes mitigation measures for the expected social and environmental risks and a monitoring plan, as well as to define responsibilities in the operationalization of the ESMP.

Project Description

The project covers classified roads in 25 Cazas throughout Lebanon with an expected total length of 835 km. Four of the proposed roads fall in Metn Caza.

This ESMP is specific to four selected roads for rehabilitation in Metn with a total length of 21.4 km:

- **Metn Road 1a (Metn R1a):** consists of two sections or alignments intersecting at Zeghrine that have a combined length of 9.80 km.
  - Section 1: El Mhaidce - Chouaya – Zeghrine- Choueir
  - Section 2: Zeghrine – Chouaya -Ain El Teffaha- Chrine
- **Metn Road 2a (Metn R2a)**: consists of a single alignment with a total length of 2 km. The road passes through El-Mtaileb, Mazraet Beit Chaar and Mazraet Yachouh.
- **Metn Road 3 (Metn R3)**: consists of two sections or alignments intersecting at Kornet El Hamra that have a combined length of 7.30 km.
  - Section 1: Mazraet Yachouh –Kornet el Hamra - El Freike – Chaouié-Knaitré et Mar Gergess Bhurdok- Beit Chebab
  - Section 2: Kornet el Hamra- Hebouss, Ain Aar
- **Metn Road 4 (Metn R4)**: located in Baskinta and consists of a single alignment with a total length of 2.30 km

Road upgrading activities are limited to maintenance, minor construction, as well as to traffic management and regulation. In the case of Metn Caza, rehabilitation activities to be performed vary between Metn R1a, Metn R2a, Metn R3 and Metn R4; depending on the current state of each surveyed road. In summary, activities to be performed in Metn Caza include pavement works (complete reconstruction when needed and milling and overlay for roads that are in better condition); improvement and installation of drainage facilities, construction of retaining walls installation of safety barriers, marking and signing, and fixing of lighting poles. Rehabilitation works will involve 142 workers and require a total of 18 months.

Legal Framework

This ESMP was conducted in accordance with the World Bank safeguards and the Lebanese laws and regulations namely Law No. 444 (2002) about Environmental Protection.

Two World Bank safeguards policies apply to Lebanon Roads and Employment Project: OP 4.01 Environmental Assessment and OP 4.12 Involuntary Resettlement. Given that the planned project will mainly focus on the rehabilitation of roads, the work in these areas will be done under OP 4.01.

Despite that OP 4.12 was triggered by this project, in the case of Metn and in accordance with site-specific plans, no involuntary resettlement or land acquisition will take place. In other words, there will be no displaced persons by the project activities (this includes locals and Syrian refugees).

Consultation

Consulting with the main stakeholders and ensuring they agree on sensitive issues improves the chances that the project will not be subject to last-minute dispute.

This ESMP was publicly consulted where two public participation meetings were arranged for Metn Caza. The first public participation meeting was held at the Municipality of Choueir on Thursday December 12, 2019 addressing Metn R1a and Metn R4, whereas the second meeting was held at the Mar Elias Church Theatre in Antelias on Monday December 16, 2019 addressing Metn R2a and Metn R3. The number of attendees was 24 for both meetings of which 7 were women. During the two meetings, attendees were informed about the project objectives, the identified natural, economic, and social resources of importance in the area, the project's possible environmental and social risks, the planned mitigation measures and Grievance Redress Mechanism (GRM).

During the meeting of Choueir, the female attendees (four women) were mainly worried about the access to schools along Metn R1a during the rehabilitation phase of the project. In this context, the consultant explained that the ESMP provided guidelines in this respect. The contractor will communicate with the concerned municipalities and disseminate the project work schedule. In other words, the nearby communities will be informed of the exact timing of activities prior to the commencement of works. Further, the rehabilitation works should not be performed during peak traffic hours (e.g. works can take place when students are already at school). It is also suggested to perform works that are not noisy at night to ensure that access to surrounding schools is not hindered.

During the second meeting held at Antelias, attendees were mainly worried as the project will not involve widening of roads. According to them, the selected roads, namely Metn R2a and Metn R3, have several sections with critical width. Thus, they doubt that adding safety features can solve the safety problems witnessed in the area. However, for others, including the Mayor of Freike, basic pavement works would be crucial to increase the safety conditions within their towns. In this context, the Consultant and CDR representative explained that the survey showed that road width at some sections is very narrow and varies between 5.5 and 6 meters. However, widening of these sections requires land expropriation, which is not within the scope of REP.

During both meetings, attendees were worried about the monitoring process of rehabilitation works. In this context, the consultant and CDR representative explained the monitoring process for this project and highlighted the role of municipalities and local communities in monitoring the process of work during rehabilitation. Further, the CDR explained that this ESMP includes a GRM to ensure the management of any project-related complaints. This GRM was communicated to the attendees.

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 covering 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 Syrian in Lebanon by providing aid and responding to their critical situation.

Baseline assessment

The environmental and social assessment recorded the existing conditions within the project area including physical, biological, and socioeconomic conditions prior the project implementation and operation. Baseline data and field surveys were conducted to describe the status of the following environmental receptors: air quality, water quality, soil quality, geological conditions, climate and meteorology, natural habitats and biodiversity, land-use/land-cover, acoustic environment, cultural resources, and socio-economic conditions (employment opportunities, labor influx, social tensions, labor induced Sexual Exploitation and Abuse (SEA) Sexual Harassment (SH), occupational health and safety).

The geology of the studied roads was investigated for outcropping formations, subsurface stratigraphy, structure (faults, folds, seismic, etc.), hydrogeology (groundwater and sea water intrusions) and hydrology (surface water). Assessments showed that Metn roads mostly fall on a karstic limestone formation. The system is characterized by a significant amount of groundwater flowing in channels, faults and, fractures. The transmissivity of these formations is generally high and the water table is shallow. In other words, the studied roads in Metn lie on permeable formations which expose the groundwater aquifers to possible contamination.

Air quality is also an essential component in assessing social wellbeing and health status of a community. The study relied on UNDP/MoE project “Air quality assessment in an East Mediterranean country: the case of Lebanon” and showed that the levels of CO, SO_2, O_3, NO_2, and PM_{10} are within the national limit values (Decision 52/1 dated 1996) confirming that the

studied areas for the four roads do not include major air polluting activities.

Regarding natural habitats and biodiversity, given the nature of the project, the direct influence area concerns existing roads. Consequently, a rapid biological assessment has been carried out to draw the ecological profile of the adjacent areas to the concerned roads. The field investigation did not aim for an exhaustive inventory of the biodiversity of the project area but a general overview of present species (mainly flora) and habitats. The assessment showed that Metn R2a does not involve rich ecosystems. Metn R2a involves a path that is already under anthropogenic influences and does not involve any sensitive habitat. The road is mainly bordered by human settlements, industries, lines of cultivated trees, or degraded ecosystems with low vegetation cover. In this context, the area does not provide an important habitat for a large variety of animals. Similarly, Metn R4 is mainly bordered by agricultural lands, houses, and small shops. The overall ecosystem is impacted with a resulted monotonous vegetation cover (involving resilient species). However, some adjacent areas to Metn R1a and Metn R3 consist of maquis ecosystems that are intermixed with agricultural and fragmented lands. Maquis ecosystems constitute a dynamic hideout for numerous reptiles, mammals, and birds. Specifically, section 1 of Metn R1a road is bordered by maquis ecosystems (on rocky terrain) when passing through Chouaya and a small segment of section 1 of Metn R3 in Beit Chabeb is surrounded by maquis ecosystem (intact green patch dominated by oak trees). Finally, particular biotopes (i.e. riparian habitats) were encountered namely along Metn R3 and Metn R4, as they are rich in water channels. Riparian habitats are important refuge for amphibians, birds and reptiles and need special attention.

Finally, a socio-economic survey was conducted in the project area to map the demographic, social, and economic baseline conditions at the level of Metn Caza. A set of social indicators were investigated including Metn's demographic profile (age and gender distribution), employment and livelihood, the availability of public and private education and health institutions, the global level of education (educational attainment) and standards of public health, access to public utility and community services, land use patterns, archeology and cultural heritage, and impacts of the Syrian crisis. The assessment allowed drawing conclusions regarding the project's potential impacts on the socioeconomic conditions of the study area. The end segment of the Metn R1a section 1, Metn R2a, Metn R3 section 1 and first segment (0+000 to 0+900) of Metn R3 section 2 are mostly urbanized. These roads are surrounded by numerous sensitive receptors such as churches, schools and agricultural lands (Metn R1a section 2) as well.

Impacts Evaluation

The purpose of this section is to identify and quantify all potential impacts, both adverse and beneficial, of the project on the existing environment during both rehabilitation and operational phases. The assessment studied the impacts of the proposed project on air quality, water quality, soil quality, acoustic environment, visual intrusion, land-use/land- cover and socio-economic impacts.

Regarding the operation phase, the assessment entails the "**Defects Liability Period'** during which the Contractor is responsible for maintenance activities.

Given that the project aims to upgrade existing roads, the environmental impacts are expected to include dust raised during rehabilitation, increase in noise pollution derived from rehabilitation machinery, degradation of water quality, disruption to traffic movement, potential damage to existing utilities, and disturbance of local biodiversity. During the rehabilitation phase, impacts

on air and water quality have been evaluated as direct and irreversible. The rehabilitation phase requires the use of many heavy machinery and equipment which are usually associated with impacts on air quality. Dust and odor emissions are expected to be high during this phase. Moreover, potential impacts on water quality from rehabilitation activities are aligned with accidental spillages and contaminated storm water runoff.

Finally, in addition to the expected temporary disturbance of the natural ecosystems (noise pollution and potential soil and water contamination), direct destruction of vegetation and population might occur if waste (excavated materials) was discharged directly into the roadside shrub-lands and riparian ecosystems. However, given that the concerned roads generally involve paths that are already under anthropogenic influences, the potential impacts of the project on the local biodiversity are expected to be limited to disturbance of the natural ecosystems and local fauna (noise and light pollution) when roads are surrounded by maquis ecosystems (short segments in Metn R3 and Metn R1a (section 1), potential illegal dumping and discharge of wastes into streams (involves all Metn roads), and dust accumulation on nearby vegetation and agricultural lands (mainly Metn R4).

Potential social risks related to the project include (1) labor influx (in case the contractor doesn't recruit labor from the surrounding community) and potential risk of labor induced SH towards female workers and SEA towards women in the surrounding community (due to the close proximity of residents and schools to the roads to be rehabilitated); (2) Potential risk of child labor; (3) Poor labor conditions; (4) Dissatisfaction with job allocation; (5) Risk of under-participation or underemployment of women; (6) Nuisance and traffic disturbance; and (7) Temporary obstruction of access routes to sensitive receptors which is expected to be high specifically for Metn R2a (residential and commercial areas), Metn R1a (section 1, involving schools), and Metn R3 (highly populated and surrounded by schools).

Whereas, the potential positive impacts of the project are to create direct and indirect short-term jobs for Lebanese and Syrians living in the surrounding community and enhance the economic development and livelihood opportunities.

Once roads are rehabilitated, the project is expected to improve drainage systems (less runoff water), road safety conditions, reduce traffic accidents and traffic congestion, and ultimately enhance livelihood opportunities. On the other hand, the main expected environmental impacts on water and soil could result in from maintenance activities during the "**Defects Liability Period' (**during which the Contractor is responsible for maintenance activities**),** if activities were not managed properly.

Development of the ESMP

An ESMP is essential to ensure that the identified impacts are maintained within the allowable levels, unanticipated impacts are mitigated at an early stage, and the expected project benefits are realized. Thus, to mitigate the identified impacts/risks, the prepared ESMP for roads in Metn Caza was prepared before initiating any civil works. The aim of this ESMP is to assist in the systematic and prompt recognition of problems, encouraging effective actions to correct them and ultimately achieve the goal of good environmental and social performance. A sound understanding of environmental priorities and policies, properly managing the project, acknowledging the regulatory requirements and keeping updated operational information are fundamental to ensure the effective and satisfactory environmental performance.

A proper management plan was provided for specific concerns regarding the roads in Metn, as shown in the conducted environmental and social assessment. The plan includes measures and equipment to control exhaust emissions, dust and odor emissions, and soil manipulation activities during the rehabilitation phase. Moreover, proper measures and guidelines on the control of accidental spills of construction material were provided to prevent soil contamination. Any accidental spillage of wastewater onto open ground can easily infiltrate the karstic limestone and is highly likely to pollute water present in the subsurface. Moreover, any discharge of wastewater into the winter channels will mainly lead to adverse impacts to the downstream "Wadi Antelias" and "Naher el Kaleb" river.

Regarding biodiversity, recommendations are provided to guide the project contractor in reducing the negative impacts on natural habitats and biodiversity. Mitigation actions suggested in this ESMP include recommendations regarding rehabilitation work and solid waste management in order to avoid degrading the sites or disturbing the local fauna. Although the concerned roads are mainly under anthropogenic influences, contractors must be careful during the rehabilitation work so that the direct impacts (direct destruction) on ecosystems and associated fauna would be minimal. Waste management plan must be adopted to avoid soil and water contamination that could have irreversible impacts on biodiversity. In other words, rehabilitation debris should not be dumped into the natural habitat (e.g. streams and water channels encountered in Metn Caza along the studied roads).

The social risks of this project can be mitigated through periodic monitoring of labor conditions, specific required clauses within contracts that aim to protect workers, and the Code of Conduct (CoC) for Gender Based Violence (GBV) issues. This ESMP guides the contractor (1) to preferably hire local workers, (2) not to hire individuals below the legal working age in accordance with the labor law of Lebanon, and (3) to ensure proper compliance and implementation of the CoC. Similarly, close coordination with the affected municipalities is recommended in relation to road obstruction issues. In addition, a robust GRM must be clearly communicated to all project-affected persons before and during project implementation.

Further, the ESMP generated key project indicators to monitor project implementation success. It is designed to guarantee effectiveness in the measurement of major project outcomes and outputs based on measurable indicators. The risk of environmental and social impacts can be monitored (e.g. monitoring of solid waste disposal and wastewater discharge, monitoring of underage labor, and monitoring of worker behaviors during the rehabilitation work.). Project monitoring will be undertaken by the implementing agency (CDR) to ensure the project is being implemented in line with the proposed objectives and is on track to achieve expected results. Project progress reports will be prepared by CDR and submitted to the Bank for review.

Finally, a multi-layer GRM was established for the concerned roads in Metn Caza. GRM will ensure that any complaint is identified and handled properly and within specified timeline.

Conclusion

Assessments showed that the proposed project has potential implications, both adverse and beneficial, on the concerned environmental and social issues. In this context, the contractor shall be committed to putting in place several measures to mitigate the negative environmental, safety,

health, and social impacts associated with the development cycle of the project, adhering to WB social and environmental standards and policies.

ملخص تنفيذي

مقدمة

يهدف مشروع الطرق والعمالة في لبنان الممول من البنك الدولي إلى تحسين أحوال الطرق والسلامة المرورية من خلال إعادة تأهيل شبكة الطرق في لبنان، وخاصة في المناطق الريفية النائية، كما ويهدف إلى خلق فرص عمل للمواطنين اللبنانيين والنازحين السوريين من خلال مشاركة العمالة في أعمال إعادة التأهيل.

سيتم تنفيذ أعمال المشروع ضمن شبكة الطرق الرئيسية الخاضعة لسلطة وزارة الأشغال العامة والنقل. في هذا السياق، سينفّذ مجلس الإنماء والإعمار المشروع بالنيابة عن الحكومة / وزارة الأشغال العام والنقل.

تجدر الإشارة إلى أن الأعمال المتوقعة قد تؤدي إلى آثار بيئية واجتماعية سلبية مرافقة لأعمال التنفيذ، وعليه وجب إعداد خطة إدارة بيئية واجتماعية وفقًا لمتطلبات سياسة العمليات في البنك الدولي رقم (OP4.01)، والتي تصنف المشروع على أنه الفئة B وذلك من أجل الحد من التداعيات الممكن حدوثها وتخفيف الأثار السلبية وتطوير الأثار الإيجابية. وبناءً على ذلك ، طورت شركة دار الهندسة نزيه طالب وشركاه في هذا التقرير خطة إدارة بيئية واجتماعية مخصصة لتأهيل الطرقات ضمن قضاء المتن.

إن الهدف من خطة الإدارة البيئية والاجتماعية هو تحديد وتقييم التأثيرات البيئية والاجتماعية المحتملة للمشروع والتباحث مع الأطراف المعنيين لإعداد خطة إدارة تتضمن تدابير وسبل التخفيف من المخاطر الاجتماعية والبيئية المتوقعة، كما وتطوير خطة رصد ومراقبة، بالإضافة إلى تحديد المسؤوليات في تفعيل خطة الإدارة البيئية والاجتماعية.

وصف المشروع

يشمل المشروع الطرق المصنفة في ٢٥ قضاء في جميع أنحاء لبنان بطول إجمالي يصل إلى حوالي ٨٣٥ كم تقريباً، بحيث يوجد أربعة طرق مقترحة في قضاء المتن.

تم تطوير خطة الإدارة البيئية والاجتماعية مخصصة لأعمال التأهيل ضمن هذه الطريق في قضاء المتن بطول إجمالي يصل إلى حوالي ٢١,٤ كم تقريبا، مقسمة على الشكل التالي:

- طريق المتن المسمى **1a (Metn R1a)** بحيث يمتد على قسمين يتقاطعان عند زغرين بطول إجمالي يبلغ ٩,٨ كم تقريباً. إن القسم الاول من الطريق يمر عبر المحيدسة - شوايا - زغرين – شوير، أما القسم الثاني فيمر عبر الزغرين - شوايا - عين التفاحة - شرين.
- طريق المتن المسمى **2a (Metn R2a)** بحيث يمتد طريق واحد بطول إجمالي يبلغ ٢ كم تقريباً. إن ال الطريق يمر عبر المطيلب – مزرعة بيت الشعار – مزرعة ياشوع.
- طريق المتن المسمى **3 (Metn R3)** بحيث يمتد على قسمين يتقاطعان عند قرتة الحمرا بطول إجمالي يبلغ ٧,٣ كم تقريباً. إن القسم الاول من الطريق يمر عبر مزرعة يشوع - قرنة الحمرا - الفريك - الشوية - قرنات ومار جرجس بحردوك - بيت شباب، أما القسم الثاني فيمر قرنة الحمرا – حبوس – عين عار.
- طريق المتن المسمى **4 (Metn R4)** بحيث يمتد طريق واحد بطول إجمالي يبلغ ٢,٣ كم تقريباً ضمن منطقة بسكنتا.

تقتصر أعمال تطوير الطرق على الصيانة وبعض أعمال الإنشاء البسيطة، وكذلك على إدارة وتنظيم حركة المرور. في قضاء المتن، تتنوع أنشطة إعادة التأهيل بين طريق المتن المسمى 1a وطريق المتن المسمى **2a**وطريق المتن المسمى 3 وطريق المتن المسمى ٤ ؛ نظراً لحالة الحالية للطرق التي تم مسحها.

لذلك فإن الأنشطة التي يتعين القيام بها في قضاء المتن تشمل أعمال الرصف الإسفلتي (على مثال رصف كامل الطريق عند الحاجة وإزالت الأسفلت القديم) ؛ أعمال الإنارة (إعادة تأهيل أعمدة الإضاءة وتوفير أعمدة جديدة عند الحاجة) ، وتحسين وتركيب مجاري الصرف الصحي، وبناء الجدران الدعم، وتركيب حواجز الأمان، ووضع العلامات وإشارة المرور. سوف توفر أعمال إعادة التأهيل فرص عمل لحوالي ١٤٢ عاملاً وسوف تتطلب جوالي ١٨ شهراً لإنهاء الأعمال.

سوف يتم تنفيذ خطة الإدارة البيئية والاجتماعية وفقًا لسياسات البنك الدولي وبحسب القوانين والأنظمة اللبنانية ، ولا سيما القانون رقم ٢٠٠٢/٤٤٤ (قانون حماية البيئة).

إن مشروع الطرق والعمالة في لبنان يتبع سياستان وقائيتان من سياسات البنك الدولي هما سياسة التقييم البيئي رقم (OP 4.01) وسياسة إعادة التوطين القسري (غير الطوعي) رقم (OP 4.12). وحيث أن المشروع المنوي إنشائه يركز بشكل رئيسي على إعادة تأهيل الطرق موجودة سابقاً، فإنه سوف يتم العمل في إتباع سياسة العمليات المرتبطة بالتقييم البيئي رقم (.OP 4.01).

وفقاً لمكونات مشروع التأهيل في قضاء المتن فإنه لن تتم إعادة التوطين القسري أو إستملاك أراضي. وعليه، فلن يكون هناك أي نازحين و/أو مهجرين بسبب أنشطة المشروع (وهذا يشمل السكان المحليين واللا جئيين السوريين) مما لا يتطلب تطبيق سياسة إعادة التوطين القسري (غير الطوعي) رقم (OP 4.12).

مشاورة العامة

إن الهدف الرئيسي للتشاور مع أصحاب العلاقة المعنيين هو التأكد من مدى موافقتهم على القضايا الحساسة لأجل تحسين فرص عدم تعرض للمشروع وخلق نزاعات تؤدي لتوقفة و/او إلغائه.

تمت المناقشة والتباحث في خطة الإدارة البيئية والاجتماعية بشكل علني مع المعنيين بحيث تم ترتيب اجتماعين للمشاركة العامة في قضاء المتن. عُقد أول اجتماع للمشاركة العامة في بلدية الشوير يوم الخميس الموافق ١٢ ديسمبر ٢٠١٩ بشأن المتن R1aوR4 Metn ، في حين عُقد الاجتماع الثاني على مسرح كنيسة مار الياس في أنطلياس يوم الاثنين الموافق ١٦ ديسمبر ٢٠١٩ حول المتن R2a و.Metn R3 . بلغ عدد الحاضرين في الاجتماعيين ٢٤ شخص، بحيث كان منهم ٧ نساء. تم إبلاغ الحضور بأهداف المشروع خلال الاجتماعات وتم عرض الموارد الطبيعية والاقتصادية والاجتماعية المحددة ذات الأهمية في المنطقة، كما والمخاطر البيئية والاجتماعية المحتملة للمشروع وإجراءات التخفيف المخطط لها وآلية معالجة المظالم.

خلال الإجتماع الأول في بلدية الشوير، كانت عدد النساء الحاضرات (أربع سيدات) وقد أبديهنا قلقهن بشكل أساسي من قدرة الوصول إلى المدارس على إمتداد مرحلة إعادة تأهيل المشروع. وفي هذا السياق، أوضح الإستشاري بأن خطة الإدارة البيئية والاجتماعية قد طورة مبادئ توجيهية في هذا الصدد لتفادي مشاكل مرتبطة بسهولة الوصول، كما وسيقوم النتعهد بالتواصل مع البلديات المعنية ونشر جدول أعمال المشروع. كما وسيتم إبلاغ المجتمعات المحلية المجاورة بالتوقيت الدقيق للأنشطة قبل بدء الأعمال. وتم التأكيد على عدم تنفيذ أية أعمال إعادة التأهيل خلال ساعات الذروة المرورية (على سبيل المثال ، يمكن أن تتم الأعمال عندما يكون الطلاب في المدرسة وليس ضمن فترات الوصول و/أو الذهاب). وأيضًا عدم القيام بأعمال صاخبة في الليل.

أما في الاجتماع الثاني الذي عقد في انطلياس، فقد كان المشاركون قلقين بشكل رئيسي حول كونه لا يتضمن أعمال توسيع طرقات. وأن الطرق المختارة هي Metn R2a وMetn R3 ضمنها عدة أقسام بعرض ضيق. كما وشكك عدد من الحاضرين بأن إضافة ميزات السلامة يمكن أن تحل مشاكل السلامة التي تشهدها المنطقة. أما بالنسبة للآخرين، بما في ذلك رئيس بلدية الفريك، فإنهم يجدون أعمال الرصف الأساسية عامل أساسي لزيادة شروط السلامة. وعليه، أوضح الإستشاري وممثل مجلس الإنماء والإعمار بأن المسح أظهر أن عرض الطريق في بعض الأقسام ضيق للغاية ويتراوح بين ٥,٥ و ٦ أمتار، إلا أن توسيع هذه الأقسام يتطلب مصادرة الأراضي وهو ليس ضمن مكونات الشروع.

خلال الاجتماعين، أبدا الحاضرون قلقهم بشكل رئيسي من فعالية خطة المراقبة، مما أوجب تقديم شرح من قبل الشركة الإستشارية بمساعدة ممثل مجلس الإنماء والإعمار عن عملية المراقبة لهذا المشروع، كما وتم التذكير بدور البلديات والمجتمعات المحلية في المراقبة خلال مرحلة إعادة تأهيل المشروع لزيادة نسبة الفعالية. علاوة على ذلك، أوضح ممثل مجلس الإنماء والإعمار أن خطة الإدارة البيئية والاجتماعية تتضمن آلية لمعالجة الشكاوى من أجل ضمان متابعتها بشكل صحيح ومرضي.

وصف البيئة المحيطة بالمشروع

تمت دراسة البيئة الفيزيائية والكيميائية والبيولوجية والاجتماعية والاقتصادية ضمن منطقة المشروع في الوضع الحالي وقبل تنفيذ المشروع. إذ قام فريق العمل بجمع البيانات الأساسية وإجراء المسح الميداني للعناصر البيئية التالية: جودة الهواء وجودة المياه وجودة التربة والظروف الجيولوجية ووضع المناخ والأرصاد الجوية والموائل الطبيعية والتنوع البيولوجي واستخدام الأراضي / الغطاء الأرضي ونسبة الضوضاء والموارد الثقافية والظروف الاجتماعية الاقتصادية (فرص العمل وتوفر اليد العاملة والمشاكل الاجتماعية والاستغلال و/أو الانتهاك الجنسيين الناجمين عن العمل والتحرش الجنسي والصحة والسلامة المهنية).

نصت الدراسة على أن الوضع الجيولوجي ضمن الطرق المقترحة لناحية الطبقات الصخرية المتكشفة والطبقات الجوفية والتكوينات التكتونية (فوالق ، طيات ، الوضع الزلزالي ، إلخ) ، الهيدروجيولوجيا (المياه الجوفية ومياه البحر) والهيدرولوجيا (المياه السطحية والأنهر). أظهرت الدراسات بأن التكوينات الصخرية البارزة في منطقة الدراسة وحولها تنتمي إلى الحقبة الزمنية الجيولوجية المسماه الحجر الجيري الكارستي. تتميز هذه الطبقات بكميات كبيرة من المياه الجوفية المتدفقة عبر الشقوق والكسور الناتجة عن عوامل التعرية والتجويه وبالأخص على المرتفعات. إن قابلية انتقال المياه ضمن هذه الطبقات هي عالية بشكل عام والمياه الجوفية موجودة على أعماق قريبة من السطح. بعبارة أخرى فإن الطرق المدروسة في المتن تقع على تشكيلات قابلة للنفاذ تعرض طبقات المياه الجوفية إلى تلوث محتمل.

تعتبر جودة الهواء أيضًا عنصرًا أساسيًا في تقييم الرفاهية الاجتماعية والحالة الصحية للمجتمع. اعتمدت الدراسة على معطيات مشروع برنامج الأمم المتحدة الإنمائي / وزارة البيئة "تقييم جودة الهواء في دولة شرق البحر الأبيض المتوسط: الوضع في لبنان"، والتي أظهرت أن مستويات أحادي أكسيد الكربون وثاني أكسيد الكبريت والأزون وثاني أكسيد النيتروجين و نسبة تطاير الغبائرPM10 هي ضمن القيم الحدية الوطنية (المحددة بموجب القرار ١/٥٢ بتاريخ ١٩٩٦). تجدر الإشارة إلى أن الأنشطة الرئيسية ضمن أعمال التأهيل لن تشمل أعمال تؤدي لتلوث الهواء.

فيما يتعلق بالموائل الطبيعية والتنوع البيولوجي، ونظرًا لطبيعة المشروع، فإن منطقة التأثير المباشر تتعلق بالطرق القائمة حيث تم إجراء تقييم بيولوجي سريع لرسم الصورة البيئية للمناطق المجاورة للطرق المعنية. لم يكن البحث الميداني يهدف إلى جرد شامل للتنوع البيولوجي في منطقة المشروع بل إلى إلقاء نظرة عامة على الأنواع الحالية (بشكل رئيسي النباتات) والموائل. أظهر التقييم أن المتن R2a لا يشمل النظم البيئية الغنية ويحتوي على مسار يخضع بالفعل لتأثيرات بشرية ولا يتضمن أي مواطن بيئية حساسة. يحد الطريق بشكل أساسي ، التجمعات البشرية أو المواقع الصناعة أو الأشجار المزروعة، كما وبعض النظم البيئية المتدهورة ذات الغطاء النباتي القليل. وعليه، لا تتضمن المنطقة موئلاً طبيعية ذات أهمية لمجموعة كبيرة ومتنوعة من الحيوانات.

وبالمثل ، يحد المتن R4 بشكل أساسي الأراضي الزراعية والمنازل والمحلات التجارية الصغيرة، مما جعل النظام البيئي العام يتميز بغطاء نباتي ضئيل. ومع ذلك، فإن بعض المناطق المجاورة لمنطقة المتن R1a و Metn R3 تتكون من أنظمة بيئية مختلطة مع الأراضي الزراعية. تشكل الأنظمة البيئية مخبأ ديناميكي للعديد من الزواحف والثدييات والطيور وعلى وجه التحديد الجزء الاول من طريق المتن R1a الذي يحده النظم البيئية (على التضاريس الصخرية) عند المرور عبر شويا ويحيط جزء صغير من القسم الاول من طريق Metn R3 في منطقة بيت شباب بنظام إيكولوجي (رقعة خضراء ننتشر فيها أشجار البلوط). وأخيرًا، تم اكتشاف نظائر حيوية معينة (أي الموائل النهرية) على طول المتن طريق المتن R3 وR4 لأنها غنية بالقنوات المائية. تعتبر الموائل النهرية ملاذًا هامًا للبرمائيات والطيور والزواحف وتحتاج إلى عناية خاصة.

أخيرًا ، تم إجراء مسح اجتماعي اقتصادي في منطقة المشروع لرسم خرائط لخط الأساس الديمغرافي والاجتماعي والاقتصادي على مستوى قضاء المتن. تم التحقيق في مجموعة من المؤشرات الاجتماعية بما في ذلك ملامح قضاء المتن الديموغرافية (العمر والجنس) ، والعمالة وسبل العيش ، وتوافر التعليم العام والخاص والمؤسسات الصحية ، والمستوى العالمي للتعليم (التحصيل العلمي) ومعايير الصحة العامة ، والوصول إلى المرافق العامة والخدمات المجتمعية وأنماط استخدام الأراضي وعلم الآثار والتراث الثقافي وآثار الأزمة السورية.

سمح التقييم باستخلاص استنتاجات بشأن الآثار المحتملة للمشروع على الظروف الاجتماعية والاقتصادية لمنطقة الدراسة. على وجه الخصوص، الجزء الأخير من طريق المتن R1a 1 والطريق R2a و القسم الاول من الطريق R3 والجزء (٠ + ٠٠٠ إلى ٠ + ٩٠٠) من طريق المتن R3 القسم الثاني التي تمر بمعظمها ضمن مناطق حضرية. وتحيط بهذه الطرق العديد من المناطق الحساسة مثل الكنائس والمدارس والأراضي الزراعية.

وصف الأثار المحتملة للمشروع

إن الهدف من هذا القسم هو تحديد وتقدير جميع الآثار المحتملة، السلبية والإيجابية للمشروع على الوضع البيئي خلال مرحلتي إعادة التأهيل والتشغيل. ولذلك تم دراسة تقييم آثار المشروع المقترح على جودة الهواء وجودة المياه وجودة التربة وجودة الهواء ونسبة الضوضاء والتلوث النظري واستخدام الأراضي / الغطاء الأرضي والآثار الاجتماعية والاقتصادية.

فيما يتعلق بمرحلة التشغيل ، يستلزم التقييم "فترة الضمان" التي يتحمل خلالها المقاول مسؤولية أنشطة الصيانة.

كون المشروع يهدف بشكل أساسي إلى تحديث الطرق القائمة، فمن المتوقع أن تشمل الآثار البيئية الغبار الناتج أثناء أعمال إعادة التأهيل وزيادة التلوث الضوضائي الناتج عن آلات البناء وتدهور جودة المياه وتعطيل حركة المرور والأضرار المحتملة للمرافق القائمة واضطراب التنوع البيولوجي.

وعليه فإنه تم تقييم الآثار خلال مرحلة إعادة التأهيل على نوعية الهواء والماء على أنها مباشرة ولا يمكن عكسها. تتطلب مرحلة إعادة التأهيل استخدام العديد من الآلات والمعدات الثقيلة التي ترتبط عادة بالتأثيرات على جودة الهواء مما يؤدي إلى توقع حدوث انبعاثات للغبار والروائح المزعجة خلال هذه المرحلة. أما الآثار المحتملة على جودة المياه من أنشطة إعادة التأهيل فهي مرتبطة بحدوث تسرب ملوثات عرضية وعند جريان المياه السطحية.

بالإضافة إلى بعض الاضطراب المؤقتة المتوقعة على الأنظمة البيئية الطبيعية (التلوث الضوضائي والتلوث المحتمل للتربة والمياه)، فإنه قد يحدث تأثير سلبي مباشر على النباتات والسكان إذا تم إلقاء النفايات (الحفريات) بشكل مباشر ضمن الأراضي على جانبي الطريق وعند النظم البيئية الشاطئية. إلا أنه ونظرًا لأن الطرق المقترحة تتضمن عمومًا نشاطات بشرية، فإن من المتوقع أن تقتصر التأثيرات المحتملة للمشروع على التنوع البيولوجي المحلي عبر حدوث اضطراب للنظم البيئية الطبيعية والحيوانات المحلية عندما تكون الطرق محاطة بالغابات والنظم الإيكولوجية هلى مثال أجزاء قصيرة في طريق المتن R3و R1a القسم الاول. كما وقد تنتج تأثرات سلبية من جراء إلقاء الردميات والنفايات بشكل غير قانوني في الجداول والأنهار (بالأخص الطريق R4) والتي يمكن أن تؤدي إلى تدمير مباشر للتنوع البيولوجي المحلي والموائل الطبيعية (بما في ذلك مواقع التكاثر للبرمائيات) وأخيرًا تراكم الغبار على النباتات والأراضي الزراعية المجاورة.

تشمل المخاطر الاجتماعية المحتملة المتعلقة بالمشروع:
(١) تدفق اليد العاملة (في حالة عدم توظيف المقاول للعمالة من المجتمع المحيط بها) والمخاطر المحتملة تجاه العاملات من النساء في المجتمع المحيط (بسبب قرب السكان والمدارس من الطرق المراد إصلاحها) ؛ (٢) الخطر المحتمل لعمل الأطفال ؛ (٣) ظروف العمل السيئة ؛ (٤) عدم الرضا عن تخصيص الوظائف ؛ (٥) خطر نقص مشاركة المرأة أو قلة تقدير دور النساء ؛ (٦) الإزعاج بشكل عام وإضطراب المرور ؛ (٧) عرقلة مؤقتة لسهولة الوصول إلى المواقع الحساسة، خاصة المناطق السكنية والكنائس على طول طريق متن R2a وطريق متن R1a (؛القسم الاول بالأخص المدارس) وطريق المتن R3 (بالأخص المناطق المؤهلة والمحيطة بالمدارس).

أما من الناحية الإيجابية فإنه من المتوقع أن تخلق الآثار الاجتماعية الإيجابية للمشروع فرص عمل قصيرة الأجل للسكان المحليين واللاجئين السوريين الذين سيقومون بأنشطة إعادة التأهيل.

بمجرد إتمام أعمال التأهيل، فإنه من المتوقع أن يؤدي المشروع إلى تحسين ظروف السلامة على الطرق والحد من حوادث المرور وازدحام المرور وفي نهاية المطاف تعزيز فرص كسب العيش. من ناحية أخرى ، يمكن أن تنتج الآثار البيئية المتوقعة الرئيسية على المياه والتربة من أنشطة الصيانة خلال "فترة الضمان" التي يتحمل خلالها المقاول مسؤولية أنشطة الصيانة إذا لم تتم إدارتها بشكل صحيح.

خطة الإدارة البيئية

تعتبر خطة الإدارة البيئية والاجتماعية ضرورية لضمان الحفاظ على التأثيرات المحددة ضمن المستويات المسموح بها وتخفيف الآثار السلبية غير المتوقعة في مرحلة مبكرة وتحقيق فوائد المشروع المتوقعة. وبالتالي فإنه من أجل التخفيف من الآثار السلبية و/أو المخاطر المحددة، فقد تم إعداد خطة الإدارة البيئية والاجتماعية لطريق المتن قبل الشروع في أي أعمال مدانية. إن الهدف

من خطة الإدارة البيئية والاجتماعية هو المساعدة في التعرف السريع على المشكلات وتشجيع الإجراءات الفعالة لتصحيحها وتحقيق الهدف من تطبيق الخطة البيئية والاجتماعية في نهاية المطاف. إن الفهم السليم للأولويات والسياسات البيئية وإدارة المشروع بشكل صحيح وتحديد المتطلبات التنظيمية وتحديث المعلومات المتعلقة بفترة التشغيل هي أمور أساسية لضمان الأداء البيئي الفعال والمرضي.

قد تم توفير خطة إدارة مناسبة لمتطلبات محددة ضمن مشروع طرق المتن الموضحة في التقييم البيئي والاجتماعي الذي تم إجراؤه. تتضمن الخطة تدابير ومعدات للتحكم في انبعاثات العوادم وانبعاثات الغبار والروائح وأنشطة معالجة التربة خلال مرحلة إعادة التأهيل. علاوة على ذلك، تم توفير التدابير التوجيهية المناسبة للسيطرة على التسربات العرضية لمواد البناء لمنع تلوث التربة والمياه الجوفية.

إن أي تسرب عرضي لمياه ملوثة (كالصرف الصحي و/أو الزيوت و/أو الوقود) على أرض مفتوحة يمكن أن يتسلل بسهولة عبر الطبقات الجيرية الكارستية ويسبب تلوث للمياه الجوفية الموجودة في باطن الأرض. كما وأن أي تصريف لمياه ملوثة إلى القنوات الشتوية سيؤدي بشكل رئيسي إلى تأثيرات ضارة على مجرى "وادي إنطلياس" و" نهر "الكلب" ضمن قضاء المتن.

فيما يتعلق بالتنوع البيولوجي ، يتم تقديم التوصيات لتوجيه مقاول المشروع في الحد من الآثار السلبية على الموائل الطبيعية والتنوع البيولوجي. تضمنت إجراءات التخفيف المقترحة في خطة الإدارة البيئية والاجتماعية توصيات بشأن أعمال إعادة التأهيل والجداول الزمنية وإدارة النفايات الصلبة لتجنب تدهور المواقع أو إزعاج الحيوانات المحلية. يجب أن يلتزم المقاولون بالحذر أثناء أعمال إعادة التأهيل حتى تكون الآثار المباشرة على الأنظمة البيئية والحيوانات المرتبطة بها ضئيلة. يجب اعتماد خطة إدارة النفايات لتجنب تلوث التربة والمياه التي يمكن أن يكون لها آثار لا رجعة فيها على التنوع البيولوجي. وبشكل أخص، لا يجب إلقاء بقايا حفريات في الموائل الطبيعية (مثل الجداول المائية والقنوات المائية في قضاء المتن على طول الطرق المؤهله).

يمكن التخفيف من المخاطر الاجتماعية لهذا المشروع من خلال المراقبة الدورية لظروف العمل والبنود المحددة المطلوبة ضمن العقود لحماية العمالة وتجنب العنف القائم على نوع الجنس . توجد الخطة القواعد السلوكية البيئية والاجتماعية للمقاول على النحو التالي:
(١) الأفضل توظيف عمال محليين ، (٢) عدم توظيف أفراد دون سن العمل القانوني وفقًا لقانون العمل في لبنان (٣) ضمان الامتثال والتنفيذ المناسبين لقواعد السلوك وبالمثل ، يوصى بالتنسيق الوثيق مع البلديات المتضررة فيما يتعلق بقضايا عرقلة الطرق. بالإضافة إلى ذلك ، يجب إبلاغ آلية معالجة المظالم بوضوح لجميع الأشخاص المتأثرين بالمشروع أثناء تنفيذ المشروع وقبله.

علاوة على ذلك، أنتجت خطة الإدارة البيئية والاجتماعية مؤشرات رئيسية للمشروع لرصد نجاح تنفيذ المشروع وهي مصممة لضمان الفعالية في قياس النتائج الرئيسية للمشروع على أساس مؤشرات قابلة للقياس. يمكن رصد مخاطر الآثار البيئية والاجتماعية (مثل مراقبة التخلص من النفايات الصلبة وتصريف مياه الصرف الصحي ومراقبة العمالة القاصرة ومراقبة سلوكيات العمال أثناء أعمال إعادة التأهيل.). ستقوم مجلس الإنماء والإعمار بمراقبة المشروع لضمان تنفيذ الخطة بما يتماشى مع الأهداف المقترحة وأنه يسير على الطريق الصحيح لتحقيق النتائج المتوقعة. كما وسيقوم بإعداد التقارير المرحلية للمشروع وتقديمها إلى البنك الدولي للمراجعة.

وأخيراً ، تم إنشاء آلية معالجة المظالم متعددة البنود للطرق المعنية في قضاء المتن. بحيث تتضمن تحديد أي شكوى والتعامل معها بشكل صحيح وضمن الجدول الزمني المحدد.

الخلاصة

أظهرت التقييمات أن للمشروع المقترح آثارا محتملة، سلبية وإيجابية على حد سواء على كافة الأطر الاجتماعية والبيئية . وعليه، يجب أن يلتزم المعتهد بتنفيذ التدابير التخفيفية للآثار السلبية البيئية والاجتماعية والصحية والسلامة العامة والاجتماعية المرتبطة بعمل المشروع مع الالتزام بالمعايير والسياسات الاجتماعية والبيئية للبنك الدولي

1. Introduction

1.1 Project Background

The Roads and Employment Project (REP) funded by the World Bank (WB) aims to improve the efficiency of road sector expenditures through the prioritization of road works and the improvement of road asset management techniques.

The project will have the following components:

- Component 1: Roads Rehabilitation and Maintenance
- Component 2: Improving Road Emergency Response Capacity
- Component 3: Capacity Building and Implementation Support

This ESMP report only deals with the first component of the REP project. This includes the rehabilitation and maintenance of primary, secondary, and tertiary roads, including road safety and spot improvements. The investments under this component will improve transport connectivity and create jobs for Lebanese and Syrians.

A set of criteria were decided upon to objectively select the roads to be rehabilitated. The main criteria are pavement and road safety condition; traffic level; road functional classification; fairness in road distribution between different towns; and finally, potential for job creation and other socioeconomic benefits.

The project covers classified roads in 25 Cazas[1] throughout Lebanon with an expected total length of 835 km and grouped into six lots as follows:

- Lot 1: roads in Cazas of Jbeil, Kesrouane and El Maten.
- Lot 2: roads in the Cazas of Aley, Baabda, Chouf and Zahle.
- Lot 3: roads in the Cazas of Bent jbeil, Hasbaya, Jezzine, Marjaoun, Nabatiye, Rachaya, Saida, Sour and Bekaa West.
- Lot 4: roads in the Cazas of Akkar, Minieh-Danniyeh and Zgharta.
- Lot 5: roads in the Cazas of Batroun, Bcharre, Koura and Tripoli.
- Lot 6: roads in the Cazas of Baalbeck and Hermel.

The maintenance and rehabilitation activities include asphalt overlays, drainage works, base and subbase reconstruction on selected sections, slope stabilization works, retaining walls, road safety activities (edge safety barriers, marking, signing, etc...) as well as roadside improvements.

Considering that the anticipated civil works will result in environmental and social impacts, an environmental and social management plan (ESMP) shall be prepared under the requirements of OP4.01, that classifies the project as Category B. Accordingly, Dar Al Handasah Nazih Taleb & Partners will develop an Environmental and Social Management Plan for Lot 1 and Lot 2 as it

[1] Caza is a synonym of District: Second largest administrative division below the national level. Each governorate is divided into districts or cazas (REACH, 2015). Lebanon is divided into six administrative regions (called Governorate or Mouhafaza) and 25 sub-regions (called Caza) not including Beirut.

was assigned by the CDR to prepare all the tender documents needed for the rehabilitation of roads included in these lots under CDR contracts No.20373 and No.20374.

This report is the specific ESMP for Metn Caza (LOT 1) and is structured as follows:

Executive Summary
Chapter 1 – Introduction;
Chapter 2 – Existing Policies and Regulatory Framework
Chapter 3 –Description of the Proposed Project
Chapter 4 – Description of the Environment and Social Context
Chapter 5 –Potential Environmental and Social Impact
Chapter 6 – Mitigation of Environmental and Social Impacts
Chapter 7– Environmental and social Management and Monitoring Plan
Chapter 8 – Consultation, Disclosure and GRM
Chapter 9–Conclusion
References
Annexes

1.2 Project Rationale

According to the World Economic Forum's (WEF) Competitiveness Index 3, Lebanon's infrastructure is the second main restriction to growth and its supply and quality is substantially below various sets of comparator countries. This situation can further threaten the country's delicate political, social, and economic situation. As the influx of Syrian refugees continues to increase, the capacity of the existing and deteriorating infrastructure will no longer be appropriate to meet the excess demand, and pressing public investments will be needed. In other words, road rehabilitation needs have been heightened by the influx of Syrian refugees, which has substantially increased traffic demand and the utilization of the road network.

More specifically, according to the Global Competitiveness Report of the World Economic Forum in year 2018, Lebanon ranked as the 127th for quality of roads out of 140 studied countries, and achieved a very low score of 2.6 out of 7. Moreover, in terms of road connectivity, Lebanon ranked 95th and achieved a poor connectivity score index of 48.7 out of 100 (Schwab, 2017). In terms of road conditions, approximately 95% of the roads are paved but lack proper maintenance. In Lebanon, road traffic injuries are growing to be a public health and developmental concern. Yearly, more than 1,000 people are killed due to road conditions, where one-third of the mortality cases happen to pedestrians, motorcyclists, and other vulnerable groups (Choueiri et al., 2013). Moreover, Lebanon has one of the highest per capita rates of road accidents in the world. The World Health Organization estimated that the total number of road traffic fatalities in 2015 to be 1,088, and their associated economic cost is between 3 percent and 5 percent of GDP (World Bank, 2017).

To deal with increasing road traffic and safety challenges, the Lebanese Government announced the implementation of "Road and Employment Project" which aims to improve transport connectivity and to create direct and indirect jobs for Lebanese and Syrians.

However, infrastructure projects can exert a substantial strain on the environment and natural resources. Sustainable infrastructure designs are the only solution to reduce the built-up pressure and promote the well-being of local communities. With sustainable practices and proper waste

management plans enforced, the burden on the environment can be reduced. Sustainable construction can generally be defined and achieved by satisfying the following criteria: increase the lifetime; limit material consumption; use durable materials; and; consider the environmental impact of the construction process (Hoeckman et al, 2012). Similarly, the socio-economic effects of infrastructure projects can be reduced through transparency and fair compensation processes (Morris, 2007). In this context, integrating environmental and social issues and concerns in development plans and strategies would be crucial in the context of Lebanon's commitment to sustainable development. This ESMP is prepared for economic decisions and development to go hand in hand with environmental and social protection. Accordingly, the developed ESMP should be viewed as a decision-making instrument for growth and environmental protection and should not be considered as a development restraint.

1.3 Report Objectives

The main aim of this study is to bring into focus all the environmental and social aspects that could affect directly and indirectly the project area and the society. This study will enable the project developers and the authorities to consider the potential environmental and social consequences, and accordingly ensure that mitigation measures, monitoring plans, and contingency strategies are provided to mitigate these identified negative impacts.

This ESMP for Metn Caza was developed in accordance with environmental laws and regulations in Lebanon and WB guidelines to ensure that all environmental and social requirements related to the project are properly implemented by the selected contractor during the rehabilitation phase of the project and by the concerned municipalities and MoPWT during the operation of the project.

The specific objectives of this ESMP are to:

1. Establish an environmental and socio-economic baseline
2. Set the Legal, Institutional, Standards & Policies Frameworks
3. Conduct an inclusive public consultation session that takes into consideration the views of PAPs to feed into project design
4. Identify potential social and environmental impacts caused by the project
5. Manage the various environmental and social impacts by specifying several project specific mitigation measures, as stated in the Environmental and Social Management Framework (ESMF) document prepared by CDR;
6. Achieve feasible and applicable mitigation measures during all the project's phases;
7. Provide appropriate compensation for any loss caused by project implementation;
8. Emphasize, improve, and enhance the positive outcomes of the project;
9. Guide on creating short term jobs for communities within a gender workforce equality environment;
10. Identify the responsible authorities and assign roles for different organizations in the efficient implementation of this ESMP.
11. Ensure transparency throughout the project preparation and implementation
12. Implement a robust GRM that is clearly communicated to all project-affected people.

1.4 Methodology

This ESMP report was prepared by Geoflint s.a.r.l at the request of Dar Al Handasah Nazih Taleb & Partners, as a fulfillment of the environmental and social requirements stated in component 1 (Road Rehabilitation and Maintenance) of the REP project.
The report (1) provides the relevant information regarding the environmental and social baseline conditions prevailing along the chosen roads to be rehabilitated in Metn (Metn R1a, Metn R2a, Metn R3 and Metn R4 that are part of Lot1 and have a total length of 21.4 km, refer to Figure 1-1), (2) discusses the project activities, (3) identifies the possible adverse impacts during both roads rehabilitation and operation, and (4) sets out an ESMP for the four roads within Metn Caza to alleviate or prevent any likely negative impacts on the local environment.

The methods used for data collection and stakeholders' engagement are elaborated in this chapter.

1.4.1 Collection of Environmental and Social Baseline Information

Baseline data (environmental and social baseline information) were collated in conjunction with the project design concept and plans to highlight issues and opportunities identified within the site location and to inform the project proponents about any constraints or potential impacts.

Available data was collected from concerned municipalities, literature review, and field survey and side meetings when needed for the social assessment.

Meteorological data, which play a vital role in transport and dispersion of air pollutants, were investigated and collected in shape of a statistical distribution of weather conditions over a period of time. Also, the ambient air quality for the targeted areas was acquired from the Ministry of Environment (MoE) in order to assess the social wellbeing and health status of the communities. In addition, water quality of nearby water resources was investigated in order to accurately assess the potential impacts of the rehabilitation works. The geology, hydrogeology and seismicity of the targeted areas were studied in order to identify any viable water resources and define the level of seismic hazards of the area.

Site visits were conducted for road, social, acoustic environment and natural habitat assessments. Regarding natural habitat assessment, a single field visit was set for each road (given the limited timeframe of this study). The field investigation did not aim for an exhaustive inventory of the biodiversity of the project area but a general overview of present species (mainly flora) and key habitats. This general approach allows the identification of the conservation status of the natural habitats. Walking transects were recognized to obtain an understanding of the vegetation communities in the area and record existing species. Knowing that a single visit is not enough, the study had to consider some species as potentially present and it was difficult to perform a complete faunal survey. Further, Land Use Land Cover (LULC) maps were generated for the concerned areas.

Regarding the social assessment, socio-economic information about the area was obtained from several national sources and studies, as well as from the Ministry of Social Affairs (MoSA), and informal meetings with municipal council members during the field visits. Moreover, sensitive receptor maps were generated for the concerned roads in Metn for a better understanding of the project potential social implications.

1.4.2 Methodlogy for Stakeholders Engagement

According to Bourne (2016), every stakeholder and every stakeholder community is unique and has their own distinct set of expectations and perceptions. Engaging with and influencing such diverse parts within a community through a traditional "one-size-fits-all" approach is no longer deemed effective. As a result, an operative communication strategy was set, accounting for the complexity of the people whose support and involvement are vital to project success.

Multiple communication means were used to secure stakeholder involvement. The aim was that project's stakeholders become aware of the project's components and results, and that they get prepared to have the needed involvement in the work.

The Stakeholder Circle methodology was used as it provides a flexible approach for defining the stakeholder community, and recognizing the information and communication needed to influence each stakeholder's prospects and actions.

The five steps to the Stakeholder Circle methodology (Bourne, 2016) were conducted and are listed below.

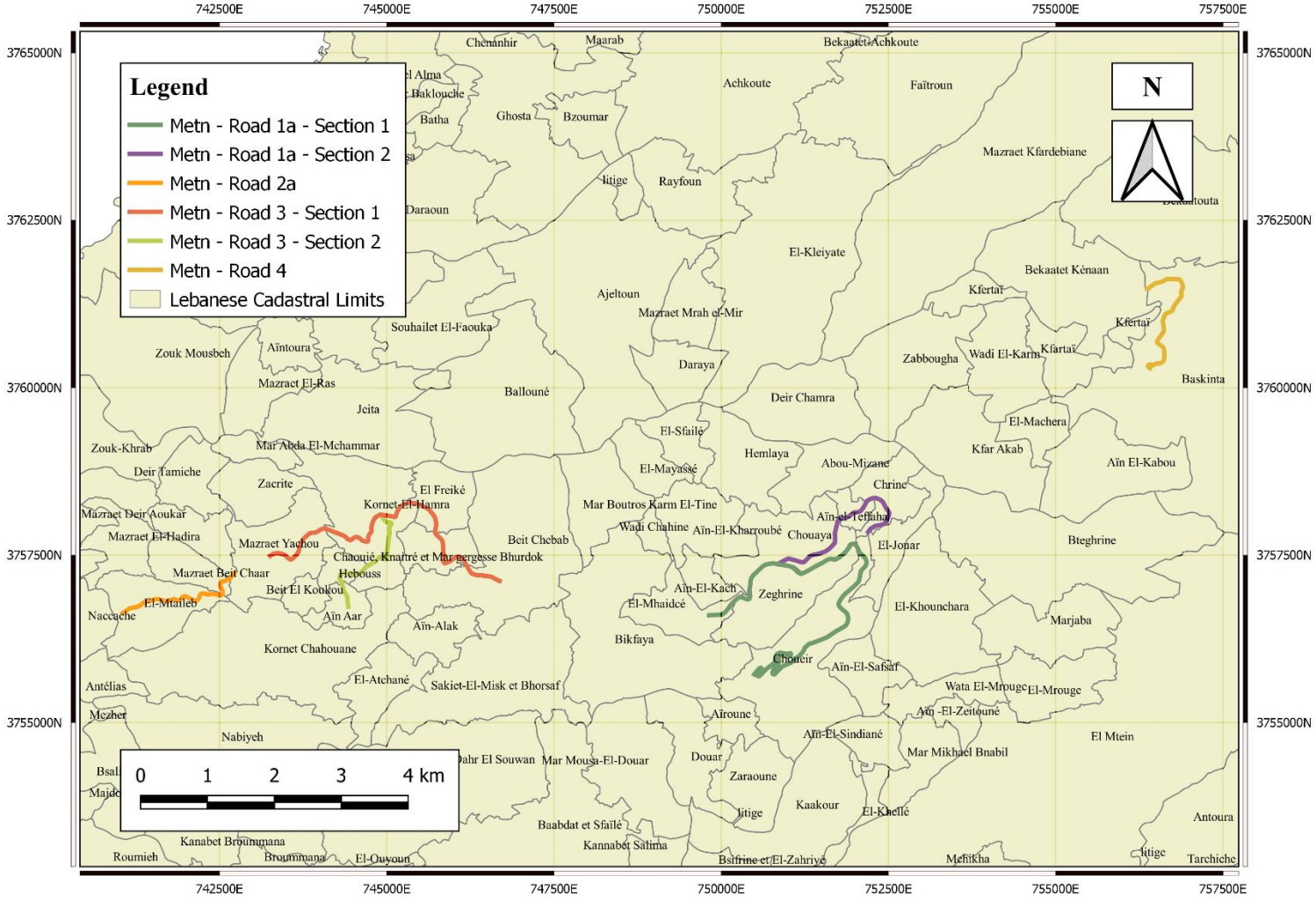
1. Identification of all stakeholders
2. Prioritization to determine who is important
3. Visualization to understand the overall stakeholder community
4. Engagement through effective communications
5. Monitoring the effect of the engagement.

The aim was to understand stakeholders' needs, identify support from the key positive stakeholders, and reduce opposition from negative stakeholders.

Subsequently, a directed communication with the identified important stakeholders was conducted. The aim was to make as much information as possible easily accessible. Additional different channels to deliver information were used (this includes formal and informal channels).

Emails and direct phone calls to personalize the direct communication with identified stakeholders were adopted. Further, formal invitation letters were sent to these stakeholders for the arranged two public meetings in Choueir and Antelias.

Figure 1-1 Lot 1 – Roads Key Plan Drawing (Metn roads)



Source: Geoflint s.a.r.l. & Dar Al Handasah Nazih Taleb & Partners, 2019

2. Existing Policies, Legal and Administrative Framework

The environmental, economic and social implications of the proposed project must be addressed within the context of applicable legal and policy framework impacting the decision-making process at the national, regional and international levels. More specifically, the ESMP is conducted in accordance with the World Bank Safeguards and national and international laws/regulations that are related to social and environmental impact assessments (EIAs).

The project must comply with environmental regulations, labor and occupational health and safety laws to avoid adverse impacts on the environment, health and safety of workers and affected communities. More specifically, it must comply with Lebanese Labor laws, ILO Labor standards, applicable collective agreements and international Human rights conventions.

2.1 Applicable Legal and Regulatory Framework

This section detailing the applicable legal provisions aims to provide a review of relevant national and international legal instruments as well as legislation, regulations, and policy documents, which are applicable to the proposed project in the Republic of Lebanon. The following table presents an overview of the main Lebanese environmental legislations dealing with the management of natural resources, solid waste and wastewater as well as air quality and pollution control. Moreover, laws, decisions in relation labors, human rights and biodiversity are elaborated in this section as well.

Table 2-1 National Applicable Legal Framework

Relevant Sector	Legislation	Date	Brief Description	Relevance to The Project
Environment	Decree 2761	19/12/1933	Guidelines related to Wastewater Management and Disposal	Wastewater generated by the project activities should be managed and disposed of according to this decree. This decree provides guidelines related to wastewater management and disposal to avoid pollution caused by the discharge of liquid waste illegally into water streams and valleys.
	Decree 8735	23/081974	All generated rehabilitation solid wastes are to be properly collected, handled and disposed	Solid wastes generated by project activities should by managed according to guidelines set in this decree.
	Law 558	24/071996	Law for the protection of forests	The requirements of the law shall be adhered to for the protection of forests.
	Decision 52/1	29/06/1996	Environment quality standards and criteria for air, water and soil pollution. Revised standards for water, air and soil pollution (partly updated in Decision 8/1 dated 30/1/2001).	Decision 52/1 was referenced in the study to specify the National Standards for Environmental Quality and the Environmental Limit Values for Air and Water. The described decision (Annex 12 in decision 52/1) was used for monitoring air emissions.
	Decision 8/1	30/01/2001	Amendment to part of MoE Decision 52/1 dated 29/6/1996. National Standards for Environmental Quality (NSEQ) that covered air and liquid emissions for all sectors.	This decision will be used to monitor air and water quality during implementation of project activities.

	Law 444	29/07/2002	Environment Protection Law: Fundamental principles and public rules (7 parts, 68 articles), Organization of environmental protection, Environmental information system and participation in the management and protection of the environment, Environmental Impact Assessment, Protection of environmental media, Responsibilities and fines, Other regulations (miscellaneous, institutional).	It is essential for the proposed project as the protection of the environment is a must throughout all of the steps of the project.
	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 77	13/04/2018	Water Resources Law	Penalizes unauthorized discharges or disposal of any kind of waste in water resources
	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 80	10/10/2018	Integrated Solid Waste Management which sets integrated solid waste management principles and provides guidelines for the management of waste.	Solid waste generated during the project should be managed in accordance with Law 80, which includes limiting quantities generated when possible, as well as properly disposing of any generated waste.

Health and safety	Law 64	12/8/1988	Protection against hazardous wastes that could harm air, water, biodiversity, soil, and people.	Precautionary measures should be taken to limit any potential damage from generated hazardous wastes (if any)
	Decree 11802	30/01/2004	Occupational health and safety decree	The occupation health and safety conditions during the rehabilitation period should comply with this decree.
Labor Laws	Labor Law	23/09/1946	Labor Law that sets basic labor rights in Lebanon including minimum working age, working and resting hours etc.…	It protects employees from any sort of violations dictated in this law
	Law 335	2/8/2001	This law is the ratification of ILO convention No. 182: The agreement required the ratifying country to take immediate and effective measures to prohibit the worst forms of labor and eliminate it and specify the types of work that harm the health, safety or ethical behavior of children and their location.	Does not allow the employment of children and protects them from engaging in any work activities that could harm their health and safety.
	Law 400	5/6/2002	This law is the ratification of ILO convention No. 138: This agreement aims to develop a general instrument on the subject of minimum age for employment to gradually replace the instruments applied in specific economic sectors, aiming to completely eliminate child labor	Minimum age of employment on tasks and works that pose risks or hazards to health and safety
	Decree 8987	29/09/2012	Prohibition of employment of minors under the age of 18 in work	Adhere to the requirements of this decree with regards to employment for this project.

			that may harm their health, safety or morals	
	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.
Traffic	Law 243	22/10/2012	Aims at the elimination of any kind of traffic violations such as: exceeding the speed limit, driving without a license or driving under any substance alternating the normal mental and physical state.	All transportation vehicles utilized during project implementation should abide by the general rules specified in Law 243.
General	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
	Decree 340	01/03/1943	The text of Article 522 of the Lebanese Penal Code, applies to cases of assault of women, by force, violence, and manipulations which are acts that affect a woman's dignity, physical health, psychological state, and moral integrity.	This law was mentioned as the project may hold risks on women during rehabilitation work.
	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.
	Law 58	29/05/1991	Law of properties and expropriation	Despite that no expropriation activities will be done; this law is added because OP 4.12 was triggered by the project
	Law 53	14/09/2017	Abolishment of article 522 of the penal code that exempts a rapist	This law was mentioned as the project may hold risks on women

			from punishments if he marries a victim	during rehabilitation works (influx of workers (men) to the concerned area).

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 arelimited to the affairs of the ministry that promulgated it.Ministerial Decisions are subject specific.

2.2 Institutional Framework

Institutional and Implementation Arrangements

The project works will be executed on the main road network which is under the jurisdiction of the Ministry of Public Works and Transport (MoPWT). MoPWT is in charge of the construction and maintenance of the main road network, consisting of the primary, secondary, and tertiary roads.

In Lebanon, donor-funded road works projects are implemented by CDR upon the request of the Council of Ministers (CoM). Therefore, in the context of REP project, CDR will execute the project on behalf of the government/MoPWT.

The main national institutions that are in relation to this project and their corresponding mandates are presented in the table below.

Table 2-2 National Institutions in relation to REP project

Institutions	Roles and Responsibilities
MoPWT	MoPWT is responsible for the management of public roads, and for developing a sustainable strategy for the transportation sector within the urban and rural areas. • MoPWT will work closely with CDR during project implementation to ensure that important decisions on road (selection priorities, road designs, equipment specifications, and road asset management) are well coordinated. • MoPWT will be responsible to manage the rehabilitated roads upon the completion of the project.
CDR	The Council for Development and Reconstruction is a public institution established through Decree No. 5 dated 31st January 1977. CDR's main responsibilities is to: • Coordinate with relevant government agencies and with the relevant government agencies, particularly MoPWT, regarding roads priorities, technical aspects, and project's requirements. • Monitor the project. In particular, every six months CDR must submit to the Bank project progress reports summarizing all project aspects and progress achieved in project implementation.
Municipalities[2]	• Municipalities are responsible for their municipal area. According to Decree 118/1977, municipalities are responsible for supervising projects' implementation in their municipal territories. In this context they were consulted for this project.
Ministry of Environment (MoE)	• MoE is responsible for planning and monitoring of environmental issues. • MoE is in charge of protecting the environment in general, setting regulations and standards, and advising on implementing projects and programs in a sustainable manner. Accordingly, this ESMP must comply with the Lebanese environmental standards and regulations issued by MoE.
Ministry of Agriculture (MoA)	• MoA is responsible for monitoring all activities related to forestry and agriculture. It regulates the introduction of new species in agriculture and livestock, protects, supervises and manages natural resources and provide technical assistance whenever necessary. • The REP will not involve the construction of new roads or widening of existing ones (i.e. no tree cutting will occur). However, in the context of building retaining walls, if the contractor had to cut native trees, the MoA must be consulted. Tree cutting permits are provided by MoA.

[2] Concerned Municipalities in Metn Caza Metn R1a: El Mhaidce - Chouaya – Zeghrine- Choueir- Zeghrine – Chouia-Ain El Teffaha Chrine / Metn R2a : El-Mtaileb – Mazraet Beit Chaar - Mazraet Yachouh / Metn R 3:Mazraet Yachouh –Kornet el Hamra - El Freike – Chaouié- Knaitré et Mar Gergess Bhurdok- Beit Chebab-Kornet el Hamra- Hebouss, Ain Aar / Metn R4:Baskinta

Ministry of Labour (MoL)	• MoL is responsible for all labour and employment issues. Labour inspection is the responsibility of the Department of Labour Inspection, Prevention and Safety (DLIPS) under the Labour Relations Authority of the MoL. • DLIPS supervises the implementation of all laws, regulations, decrees and rules pertaining to the terms and conditions of employment, and the protection of workers in the workplace, including the provisions of international labour Conventions ratified. Labour inspectors ensure the supervision of compliance with regulations regarding conditions of employment and protection of workers including occupational safety and health. This ESMP must be in accordance with labor laws, regulations and conventions.

In addition to the national public insititutions, the local community represented by the Non-Governmental Organizations (NGOs) were consulted r (Refer to **Error! Reference source not f ound.** and 8-2 in section 8.1).

2.3 Environmental Standards

The National emission levels for wastewater effluent, ambient noise and ambient air quality are provided in this section.

Wastewater Discharge Targets

The allowable contaminants concentration for wastewater when discharged into the sewage network, sea or surface water are indicated in the MoE decision 8/1 dated 30/1/2001. The table below shows a list of allowable contaminants concentrations.

Table 2-3 The allowable contaminants concentration for wastewater when discharged into different bodies

Contaminants	Surface Water	Sewage Network	Sea Water
pH	6 – 9	6 – 9	6 – 9
BOD mg/l	25	125	25
COD mg/l	125	500	125
temperature Co	30	35	35
Total nitrogen mg/l	30	60	30
Total phosphorus mg/l	10	10	10
Oil and grease mg/l	30	50	30
Mercury mg/l	0.05	0.05	0.05
Total suspended solids mg/l	60	600	60
Total coliform bacteria (Most Probable Number/100 ml)	2,000	-	2,000

Air Emissions Targets

The maximum allowable limits for outdoor air pollutants are specified in Annex 14 of the MoE Decision No. 52/1 dated 1996. The table below shows the list of allowable criteria pollutants concentrations.

Table 2-4 Maximum allowable limits for outdoor air pollutants

Pollutants	Maximum Limit (µg/m^3)	Exposure duration
Sulphur dioxide (SO_2)	350	1 hr
	120	24 hrs
	80	1 yr
Nitrogen dioxide (NO_2)	200	1 hr

	150	24 hrs
	100	1 yr
Ozone (O_3)	150	1 hr
	100	8 hrs
Carbon monoxide (CO)	30,000	1 hr
	10,000	8 hrs
Total Suspended Particles (TSP)	120	24 hrs
PM_{10}	80	24 hrs
Lead (Pb)	1	1 yr
Benzene	5 ppb	1 yr

Noise Emissions Targets

The expected noise pollution levels should not exceed the values listed in the MoE Decision 52/1 dated 1996. The limited; values are presented in the table below.

Table 2-5 Sound pressure limits according to MoE Decision 52/1, 1996

Phase	Sound Pressure Level dB(A)
Working Location (less than 8 working hrs.)	90
Working Location (requires good speech hearing)	80

Therefore, the maximum national standard of 90 (dB) for occupational noise exposure limits should not exceed an average duration of 8 hours working days. If the limits are higher than the acceptable limits, then the exposure duration should be reduced as mentioned in the table below.

Table 2-6 Noise exposure limits

Sound Pressure Level dB(A)	*Exposure Duration (hrs.)*
95	4
100	2
105	1
110	0.5
115	0.25

Moreover, the following table indicates the Lebanese noise guidelines in different zones and at different periods of the day.

Table 2-7 Lebanese noise guidelines for different zones (MoE 52/1, 1996)

Area classification	Maximum accepted noise level dB(A)		
	Day[1]	Evening[2]	Night[3]
Residential area with few construction sites, activities or on a 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
(1) 7 a.m. to 6 p.m. (2) 6 p.m. to 10 p.m. (3) 10 p.m. to 7 a.m.			

2.4 World Bank Policies and Guidelines

2.4.1 Safeguard Policies

In addition to the Lebanese legislation, two World Bank safeguards policies apply to Lebanon Road and Employment Project (1) OP 4.01 Environmental Assessment and OP 4.12 and (2) Involuntary Resettlement.

OP 4.01 Environmental Assessment.

The ESMP for the selected roads in Metn should comply with the safeguard policy of the World Bank, specifically, the OP/BP 4.01 regarding Environmental Assessment. The OP 4.01 is triggered as the project could have impacts on the environment due to the rehabilitation of roads infrastructures and associated civil works.

Under the requirements of OP4.01, the proposed project is classified as Category B (impacts are localized, short-term, and reversible and have no severe effects on the environment). Simple and low/moderate cost mitigation measures will be sufficient to restore the potential damage or keep it to the lowest possible) since the environmental impacts are expected to be minimal, during the rehabilitation phase, and can be mitigated via an environmental management plan.

OP 4.12 Involuntary Resettlement

Despite that OP 4.12 was triggered by this project, in the case of Metn and in accordance with site specific plans, no involuntary resettlement or land acquisition will take place. In other words, the project will be implemented primarily within the existing "right of way" there will be no displaced persons by the project activities (this includes local and Syrian refugees).

2.4.2 Consultations and Disclosure Policy

Transparency is essential to building and maintaining communal dialogue, and increasing public awareness about the WBG's development role and mission. It is also critical for enhancing good governance, accountability, and development effectiveness.

Openness promotes engagement with stakeholders, which, in turn, improves the design and implementation of projects and policies, and strengthens development outcomes. In this context, a formal consultation process with the public took place during the preparation of this ESMP for Metn Caza. The first public participation meeting was held at the Municipality of Choueir on Thursday December 12, 2019 addressing Metn R1a and Metn R4, whereas, the second meeting was held at the Mar Elias Church Theatre in Antelias on Monday December 16, 2019 addressing Metn R2a and Metn R3.

This ESMP will be disclosed on CDR's and concerned municipalities' website.

2.4.3 Useful Guidelines and Manuals

This ESMP was based on Environment Health and Safety (EHS) Guidelines that are referred to in the WB's Environmental and Social Framework. The EHS Guidelines contain the performance

levels and measures that are normally acceptable to the WB Group, and that are generally considered to be achievable.

The management plan must meet as well the IFC Performance Standard 6 (PC6) in relation to Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC, 2012). Finally, guidelines from World Bank handbook on roads and environment were used for this ESMP.

2.5 Gap Analysis

The only national Decree 8633 in relation to social and environmental impact assessment does not impose any environmental study for road rehabilitation projects, however, WB guidelines impose conducting an ESMP for such projects.

Some of the WB's policies and emission limits are more stringent than those of the Lebanese Government. The Lebanese wastewater emission standards are less strict than World Bank standards (Table 2-10), but more strict for ambient air quality and similar for noise (Table 2-8and Table 2-9). In this context, the stricter limits will prevail.

Table 2-8 Comparison of ambient air quality standards between Lebanese and WB standards

Pollutants	Lebanese Standards		WHO Standards	
	Maximum Limit ($\mu g/m^3$)	Exposure duration	Maximum Limit ($\mu g/m^3$)	Exposure duration
Sulfur dioxide (SO_2)	350	1 hr	500	10 mins
	120	24 hrs	20	24 hrs
	80	1 yr	-	-
Nitrogen dioxide (NO_2)	200	1 hr	200	1 hr
	150	24 hrs	-	-
	100	1 yr	40	1 yr
Ozone (O_3)	150	1 hr	-	-
	100	8 hrs	100	8 hrs
Carbon monoxide (CO)	30,000	1 hr	30,000	1 hr
	10,000	8 hrs	10,000	8 hrs
Total Suspended Particles	120	24 hrs	-	-
$PM_{2.5}$	-	-	25	24 hrs
	-	-	10	1 yr
PM_{10}	80	24 hrs	50	24 hrs
Lead (Pb)	1	1 yr	0.5	1 yr
Benzene	5 ppb	1 yr	1.7	1 yr

Benzo[a]Pyrene (BaP)	-	-	0.00012	1 yr
Arsenic (As)	-	-	0.0066	1 yr
Cadmium (Cd)	-	-	0.005	1yr
Nickel (Ni)	-	-	0.025	1 yr

Table 2-9 Comparison of allowable noise level standards between Lebanese and WB standards

region type (receptor)	limit for ambient noise levels dB(A)					
	Day time (7 a.m. - 6 p.m.)		Evening time (6 p.m. - 10 p.m.)		Night time (10 p.m. - 7 a.m.)	
	Lebanese standards	WB standards	Lebanese standards	WB standards	Lebanese standards	WB standards
commercial an administrative area in town centers	55-65	70	50-60	70	45-55	70
residential areas with some construction sites or along a main road	50-60	55	45-55	55	40-50	45
urban residential areas	45-55	-	40-50	-	35-45	-
residential suburbs with slight traffic	40-50	55	35-45	55	30-40	45
industrial area	60-70	70	55-65	70	50-60	70
rural residential areas, public gardens and hospitals	35-45	-	30-40	-	25-35	-

Table 2-10 Comparison of allowable wastewater discharge levels standards between Lebanese and WB standards

Parameters/pollutant	Wastewater Effluent Pollutants Threshold			
	Lebanese requirements			WB requirements
	Surface Water	Sewage Network	Sea Water	
pH	6 – 9	6 – 9	6 – 9	6 – 9
BOD mg/l	25	125	25	30

COD mg/l	125	500	125	125
temperature Co	30	35	35	-
Total nitrogen mg/l	30	60	30	10
Total phosphorus mg/l	10	10	10	2
Oil and grease mg/l	30	50	30	10
Mercury mg/l	0.05	0.05	0.05	0.01
Total suspended solids mg/l	60	600	60	50
Total coliform bacteria (Most Probable Number/100 ml)	2,000	-	2,000	400

2.6 International treaties and conventions

The main international treaties and conventions in relation to REP are listed in this section.

Table 2-11 International Treaties and Conventions in relation to REP.

Date	Convention/Agreement	Status	Relevance to Project
1992	United Nations Framework Convention on Climate Change.	Covered by Law No. 359 dated 11th August 1994.	This project must control activities that release green-house gases such as emissions from machineries used (most of which rely on fuel) and excavation activities, among others. (Refer to section 5.3.1.3)
1992	Rio de Janeiro Convention on Biological Diversity.	Covered by Law No. 360 dated 11th August 1994.	This project should abide by this convention to avoid or control activities that may pose a threat on biodiversity at all levels, since improvement of roads sometimes leads, directly or indirectly, to the loss and degradation of natural habitats and biodiversity (refer to section 5.3.1.6).

Table 2-12 Labors conventions

ILO Convention	Name	Entry into force	Ratification Date	Description	Relevance to Project

ILO no. 29	**Convention Concerning Forced or Compulsory Labor**	01/05/1932	25/06/1977	Its object and purpose are to suppress the use of forced labor in all its forms irrespective of the nature of the work or the sector of activity in which it may be performed. With some exceptions such as military service.	This project should abide by this convention to protect employees from being forced into any type of work activity that they do not want to engage in.
ILO no. 105	**Abolition of Forced Labor Convention**	17/01/1959	25/06/1977	Aims at the elimination of forced labor and cancels certain forms of forced labor still allowed under the Forced Labor Convention of 1930	This project should comply with the guidelines of this convention in order to protect employees from being forced into any type of work activity without their will.
ILO no. 111	**Discrimination (Employment and Occupation) Convention**	15/06/1960	25/06/1977	Enable legislation which prohibits all discrimination and exclusion on any basis including of race/color, sex, religion, political opinion, national or social origin in employment.	This project should abide by this convention to ensure a healthy environment between the employees and between the employer and employees in the work place by enforcing equality and respect between them.
ILO no. 122	**Employment Policy Convention**	09/07/1965	25/06/1977	Aim at ensuring that there is freedom of choice of employment and the fullest possible opportunity for each worker to qualify for, and to use his skills and endowments in, a job for which he is well suited, irrespective of race, color, sex, religion, political opinion, national extraction or social origin.	This project should comply with the guidelines of this convention to ensure that employees are given the right opportunities, based on their qualifications, irrespective of their origin, affiliations.
ILO no. 138	**Minimum Age Convention for Admission to Employment and Work**	19/06/1976	25/06/1977	It stipulates that States should progressively raise the minimum age to a level consistent with the fullest physical and mental development of young	This project should abide by this convention in order to abolish the employment of

				people. It establishes 15 as the minimum age for work in general and 18 as the minimum age for hazardous work.	children below the specified minimum age.

3. Description of the Proposed Project

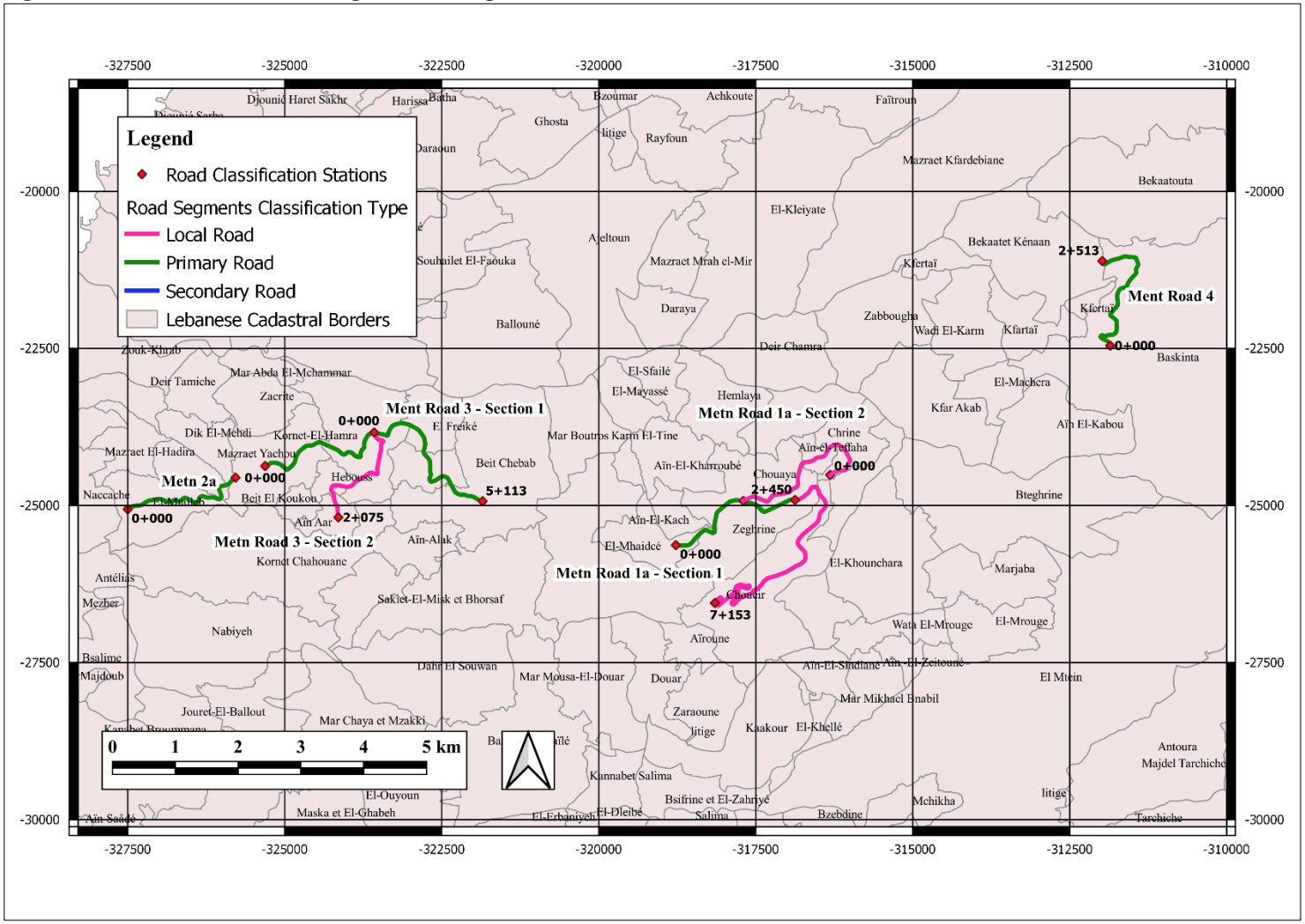
The first element of the REP includes the rehabilitation and maintenance of primary, secondary, and tertiary roads, including road safety and spot improvements. As mentioned before, the subject of this report is the selected roads for rehabilitation in Metn Caza.

Four roads with a total length of 21.4 km will be rehabilitated in Metn caza (Table 3-1).

Table 3-1 Roads to be rehabilitated within Metn Caza

Caza	Road Code	Cadastral Borders	Length (km)	Road Classification (refer to Figure 3-1)
Metn	1a	El Mhaidce - Chouaya - Zeghrine - Chrine - Ain El Teffaha - Choueir	9.80	Primary & Local
	2a	El-Mtaileb - Mazraet Beit Chaar - Mazraet Yachouh	2	Primary
	3	Mazraet Yachouh - Ain Aar - Hebouss - Kornet el Hamra - El Freike - Chaouié, Knaitré et Mar Gergess Bhurdok - Beit Chebab	7.30	Primary & Local
	4	Baskinta	2.30	Primary

Figure 3-1 Classification of road segments among Metn roads



Source: & Dar Al Handasah Nazih Taleb & Partners, process by Geoflint, 2019

3.1 Roads Location and Classification

3.1.1 Metn R1a (El Mhaidce - Chouaya - Zeghrine - Chrine - Ain El Teffaha - Choueir)

Metn R1a is located in Metn Caza and consists of two sections or alignments intersecting at Zeghrine that have a combined length of 9.80 km.

- Section 1 starts at El-Mhaidce, at an elevation of 962 m, passes through Chouaya and very briefly through Zeghrine, and continues upward until it ends in Choueir, at an elevation of 1,225 m.
- Section 2 starts at Zeghrine (at 1030 m), descends to an elevation of 936 m while passing through Chouaya and Ain El Teffaha, and re-ascends to end in Chrine (at 982 m).

The road is classified as a primary road for around 2.5 km and local road for the remaining part that passes through residential and other less populated areas, where primary roads have a roadway width varying between 8 m and 10 m, and local sections have a width varying between 4 m and 6 m, as shown in Table 3-2. Refer to Figure 3-1 for road classification and Figure 3-2 for the road alignment.

Table 3-2American Association of State Highway and Transportation Officials AASHTO 2018

Classification	Width (m)
International Roads	10-14
Local Roads	4-6
Primary Roads	8-10
Primary Roads (highways)	10-14
Secondary Roads	5-8

Figure 3-2 Satellite image showing Metn R1a alignments with surveyed stations

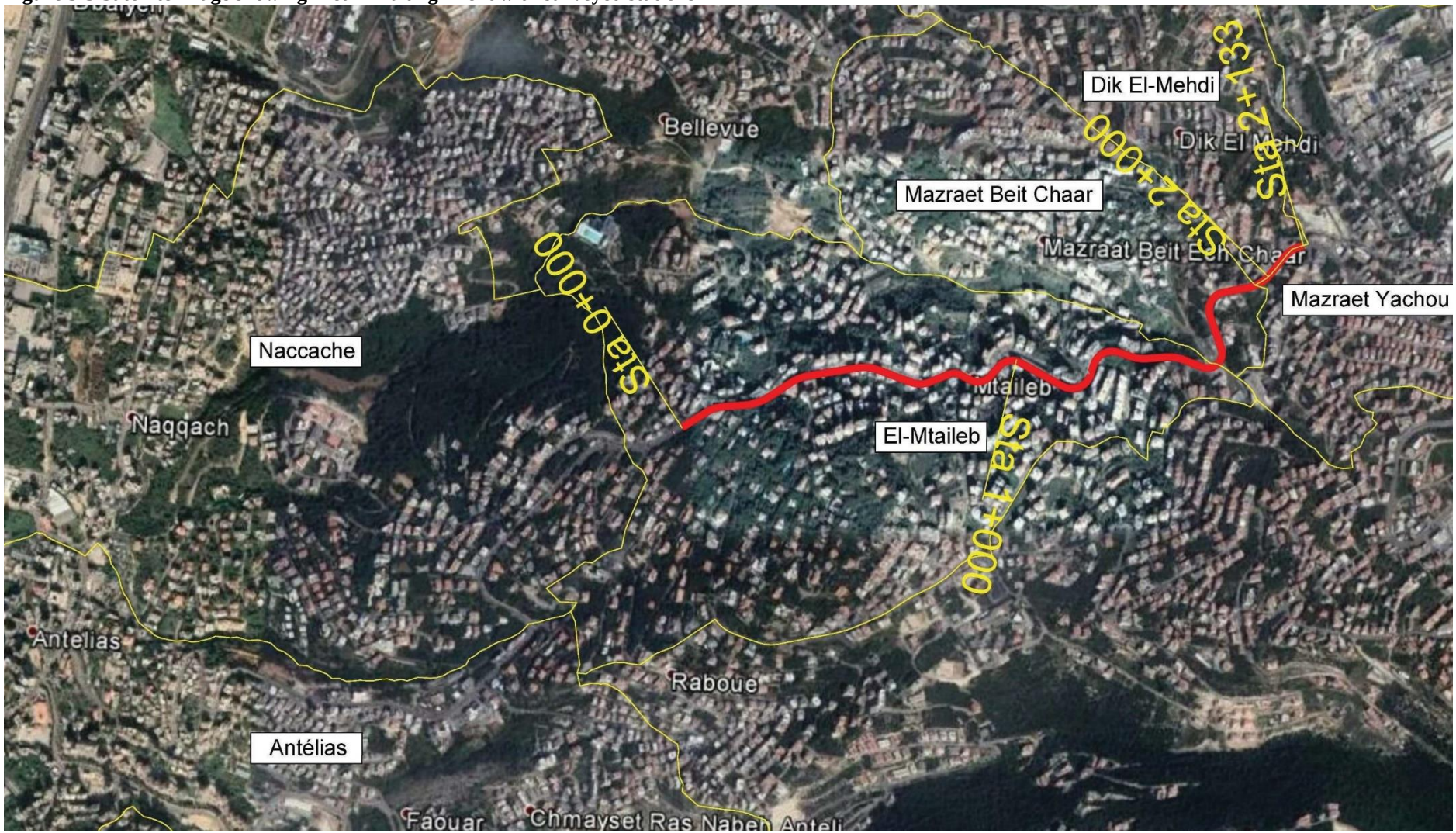
Source: Dar Al Handasah Nazih Taleb & Partners, 2019

3.1.2 Metn R2a (El-Mtaileb - Mazraet Beit Chaar - Mazraet Yachouh)

Metn R2a is located in Metn Caza and consists of a single alignment with a total length of 2 km. It starts at El-Mtaileb at an elevation of 239 m, passes through Mazraet Beit Chaar, and continues ascending until it ends at the boundary between Dik El Mehdi and Mazraet Yachouh, at an elevation of 388 m.

The road passes through residential and commercial areas and is classified as a primary road (Figure 3-2). Refer to Figure 3-3 for the road alignment.

Figure 3-3 Satellite image showing Metn R2a alignment with surveyed stations



Source: & Dar Al Handasah Nazih Taleb & Partners, 2019

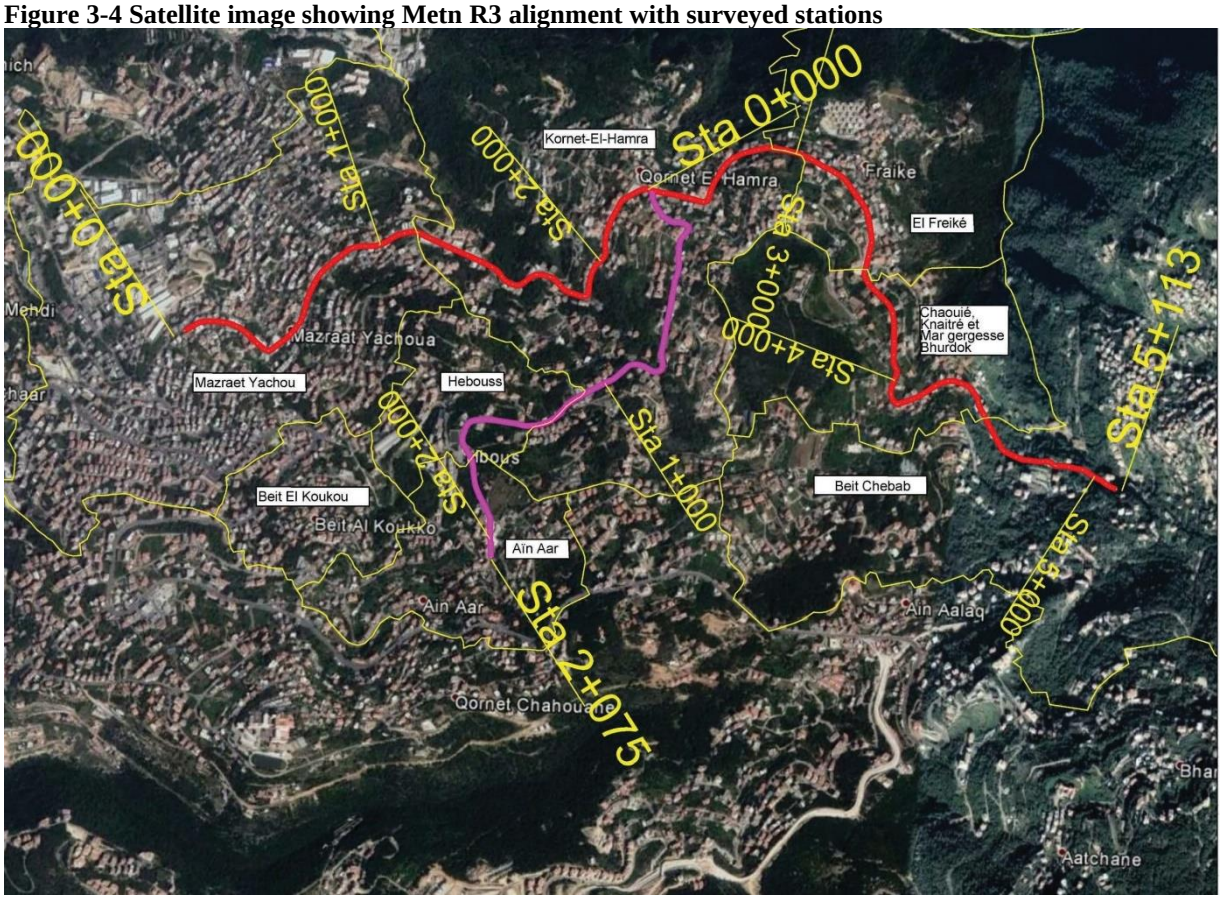
3.1.3 Metn R3 (Mazraet Yachouh - Ain Aar - Hebouss - Kornet el Hamra - El Freike - Chaouié, Knaitré et Mar Gergess Bhurdok - Beit Chebab)

Metn R3 is located in Metn Caza and consists of two sections or alignments intersecting at Kornet El Hamra that have a combined length of 7.30 km.

- Section 1 starts at Mazraet Yachouh, at an elevation of 390 m, passes through Kornet el Hamra, El Freike, Chaouié- Knaitré et Mar Gergess Bhurdok, and continues upward until it ends in Beit Chebab, at an elevation of 594 m.
- Section 2 starts at Kornet El Hamra (at 476 m), passes through Hebouss, and continues ascending to end in Ain Aar (at 597 m).

The road is classified as a primary road for approximately 5 km and as a local road for the remaining part (Figure 3-1), that passes through residential areas and other less populated areas. Refer to Figure 3-4 for the road alignment.

Figure 3-4 Satellite image showing Metn R3 alignment with surveyed stations



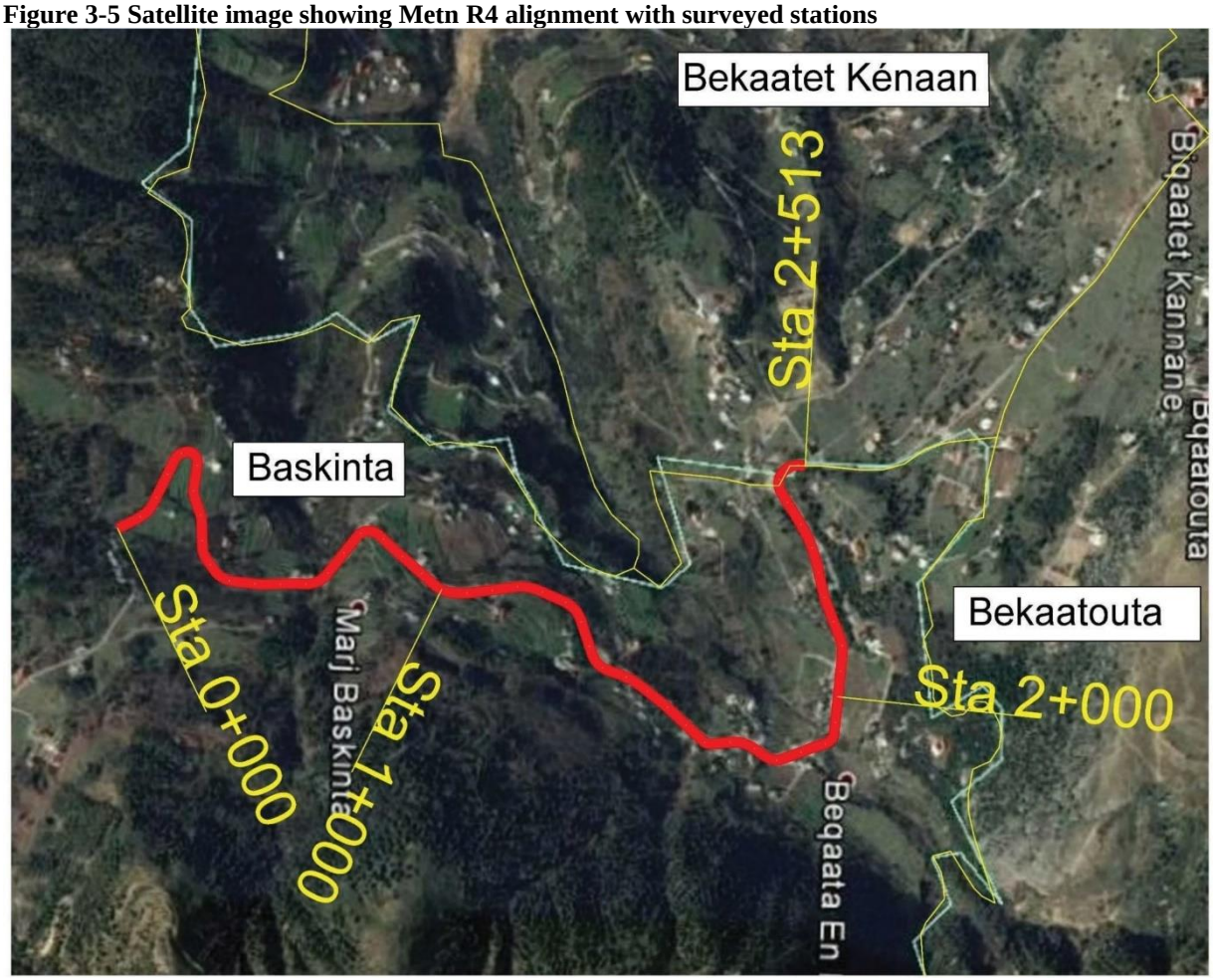
Source: & Dar Al Handasah Nazih Taleb & Partners, 2019

3.1.1 Metn R4 (Baskinta)

Metn road 4 is located in Baskinta and consists of a single alignment with a total length of 2.30 km. It starts at Metn's Caza limit at an elevation of 1,170 m, moving inwards within Baskinta as it descends to 1,139 m and then gradually ascending until it ends at an elevation of 1,210 m.

The road passes through residential and other less populated areas and is classified as a primary road (Figure 3-1). Refer to Figure 3-5 for the road alignment.

Figure 3-5 Satellite image showing Metn R4 alignment with surveyed stations



Source: & Dar Al Handasah Nazih Taleb & Partners, 2019

3.2 Project Activities

3.2.1 Metn R1a

The road cross sections and safety conditions assessment are provided in a separate technical report provided by the engineers (Dar Al Handasah Nazih Taleb).

In summary, some sections of the road have a narrow width (around 3.5m in section 1) which classifies this road as very critical from the safety point of view. The improvement of this section requires widening the existing road from the cut side, however the existing project is limited to road rehabilitation which excludes road widening activities. Section 1 consists of primary and local roads and of urban and rural areas while section 2 comprises of a rural, local road throughout. Both sections have a single carriageway.

Moreover, regarding the safety assessment:

- The sight distance in the horizontal alignment is not respected at some curves
- A lack of safety barriers is observed all throughout the road as well as the need to build new retaining walls, footwalls and slope protection on the cut side of the road.
- Some relevant intersections will need proper signing and marking to organize traffic circulation and pedestrian paths.
- The absence of signing and marking all over the road is well noticed.

As for pavement conditions, both sections require milling and overlay all throughout, barring the final part of section 1 in Choueir which is deemed to have its pavement in a good condition. For relevant data regarding this road, refer to Table 3-3, Table 3-4, and Figure 3-6.

Table 3-3 Existing road condition survey – Metn R1a Section 1

Beg	End	Cadaster Location	Road Classification	Urban / Rural	Existing Road Width (m)	Single / Dual Carriageway	Traveled Way Width (m)	Cross-Sections Assessment	Pavement Assessment	Road Safety Assessment
0+000	1+500	El Mhaidce / Chouaya	Primary	Rural	≈ 7	Single	7	Acceptable	Milling & Overlay	Need Safety Barrier
1+500	4+800	Chouaya/Choueir	Primary / Local	Rural	≈ 6	Single	6	Acceptable	Milling & Overlay	Need Safety Barrier
4+800	5+400	Choueir	Local	Urban	3.5 - 5	Single	4 - 5	Critical width ≈3.5m	Milling & Overlay	Need Safety Barrier
5+400	7+156	Choueir	Local	Urban	6 - 8	Single	6 - 8	Acceptable	Good Condition	Need Safety Barrier

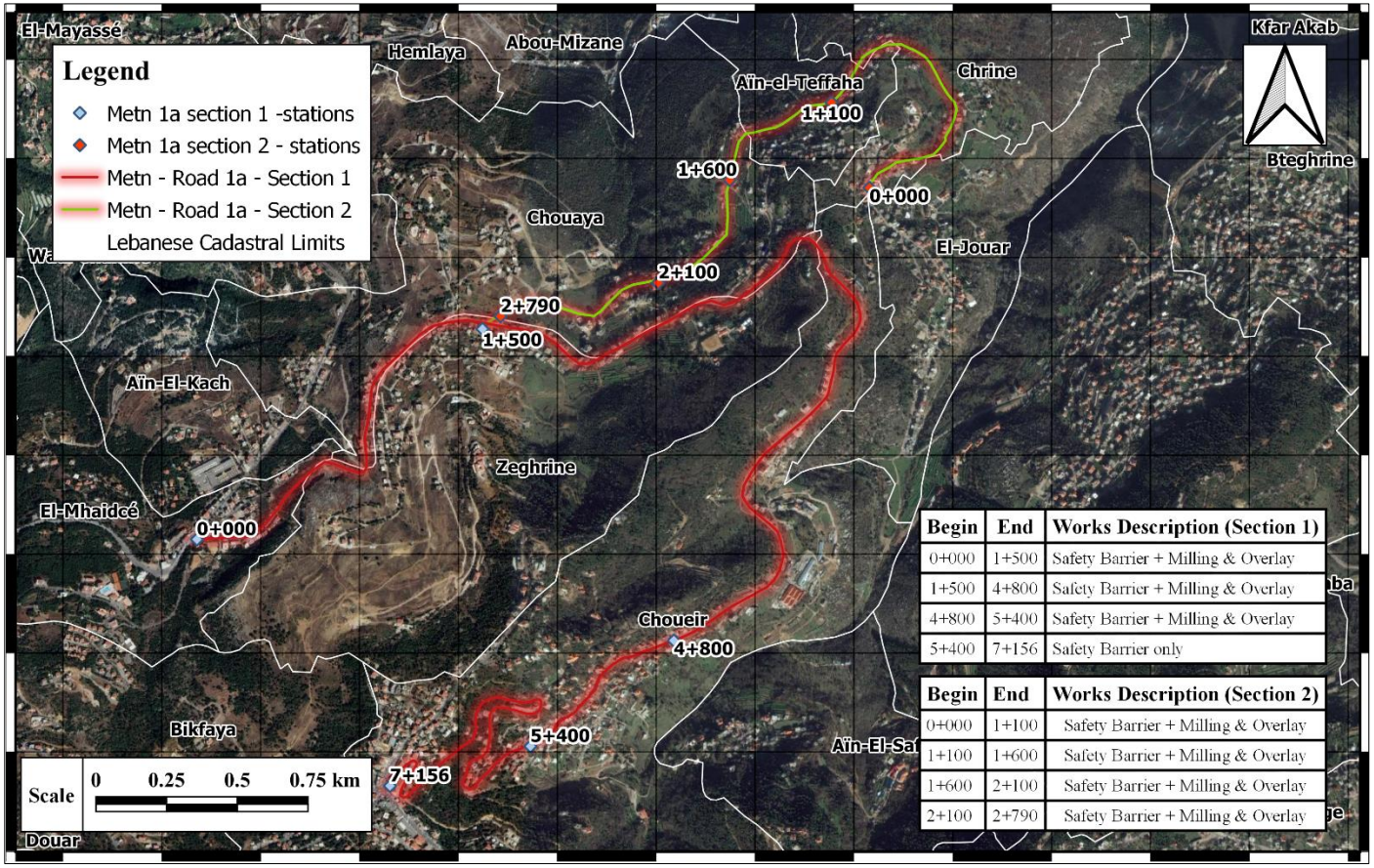
Source: Dar Al Handasah Nazih Taleb & Partners

Table 3-4 Existing road condition survey – Metn R1a Section 2

Beg	End	Cadaster Location	Road Classification	Urban / Rural	Existing Road Width (m)	Single / Dual Carriageway	Traveled Way Width (m)	Cross-Sections Assessment	Pavement Assessment	Road Safety Assessment
0+000	1+100	Chrine / Ain El Teffaha	Local	Rural	4	Single	4	Critical width ≈4m	Milling & Overlay	Need Safety Barrier
1+100	1+600	Ain El Teffaha/ Chouaya	Local	Rural	6	Single	6	Acceptable	Milling & Overlay	Need Safety Barrier
1+600	2+100	Chouaya	Local	Rural	4.5 - 7	Single	4 - 7	Critical width	Milling & Overlay	Need Safety Barrier
2+100	2+790	Chouaya	Local	Rural	≈ 5.5	Single	≈ 5.5	Acceptable	Milling & Overlay	Need Safety Barrier

Source: Dar Al Handasah Nazih Taleb & Partners

Figure 3-6 Work stations along with road rehabilitation activities along Metn R1a (sections 1 and 2) alignment



Begin	End	Works Description (Section 1)
0+000	1+500	Safety Barrier + Milling & Overlay
1+500	4+800	Safety Barrier + Milling & Overlay
4+800	5+400	Safety Barrier + Milling & Overlay
5+400	7+156	Safety Barrier only

Begin	End	Works Description (Section 2)
0+000	1+100	Safety Barrier + Milling & Overlay
1+100	1+600	Safety Barrier + Milling & Overlay
1+600	2+100	Safety Barrier + Milling & Overlay
2+100	2+790	Safety Barrier + Milling & Overlay

Source: Geoflint s.a.r.l. & Dar Al Handasah Nazih Taleb & Partners, 2019

3.2.2 Metn R2a

In summary, the road safety condition is very critical at the location of all intersections.
All intersections need redesign, knowing that this road is primary and have high traffic volume.
Furthermore, the absence of signing and marking all over the road is well noticed.

As for pavement conditions, the road generally requires milling and overlay throughout its length.

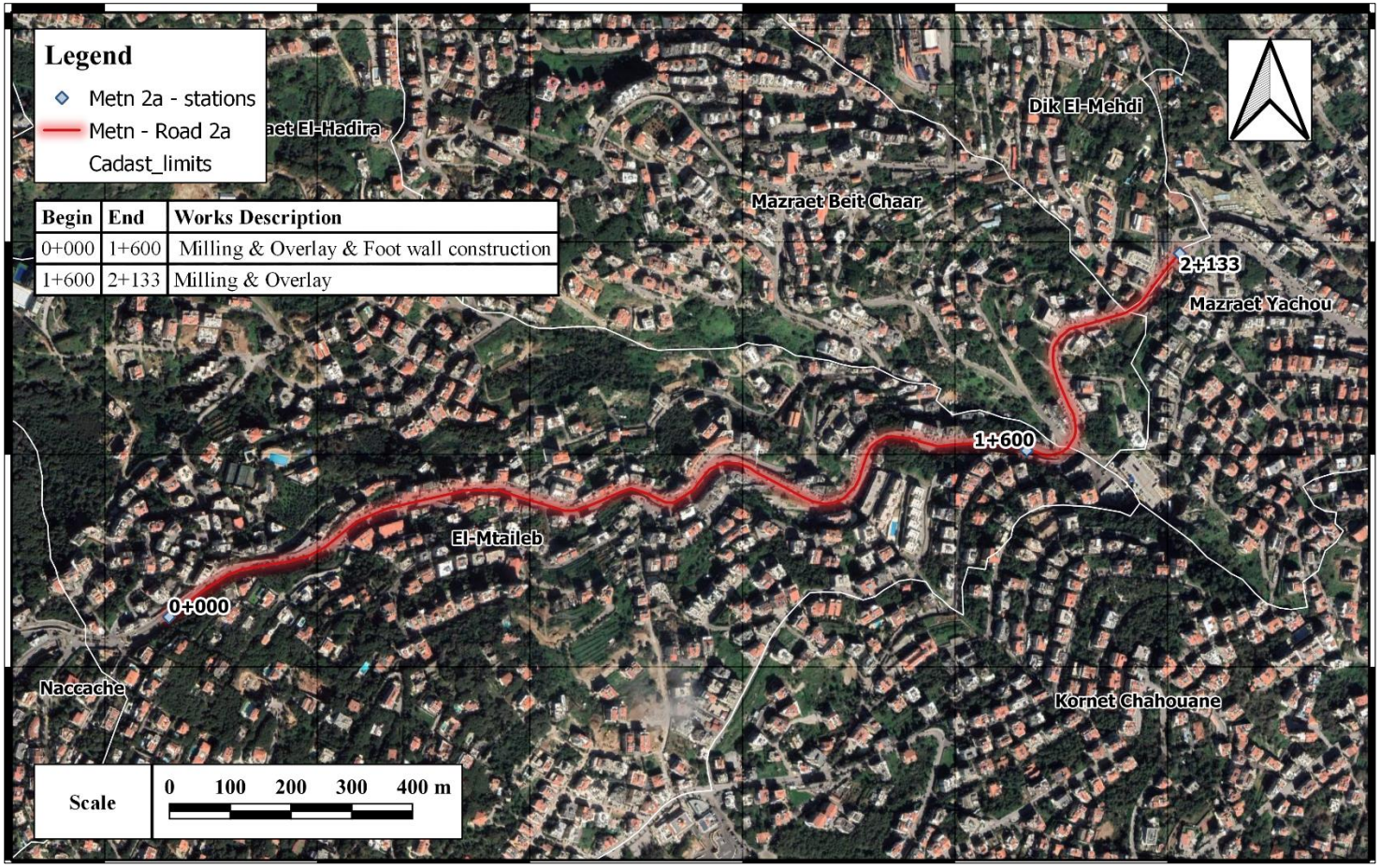
For relevant data regarding this road, refer to Table 3-5 and Figure 3-7.

Table 3-5 Existing road condition survey – Metn R2a

Beginning	End	Cadaster Location	Road Classification	Urban / Rural	Existing Road Width (m)	Single / Dual Carriageway	Traveled Way Width (m)	Cross-Sections Assessment	Pavement Assessment	Road Safety Assessment
0+000	1+600	Mtaileb	Primary	Urban	14	Single	10	Acceptable	Milling & Overlay	Critical Intersections
1+600	2+133	Mazraet Beit Chaar	Primary	Urban	14	Single	10	Acceptable	Milling & Overlay	Critical Intersections

Source: Dar Al Handasah Nazih Taleb & Partners

Figure 3-7 Work stations along with road rehabilitation activities along Metn R2a alignment



Source: Geoflint s.a.r.l. & Dar Al Handasah Nazih Taleb & Partners, 2019

3.2.3 Metn R3

In summary, some sections of the road have a narrow width which classifies this road as very critical from the safety point of view. The improvement of this section requires widening the existing road from the cut side, however the existing project is limited to road rehabilitation which excludes road widening activities. Section 1 is classified as a primary, urban road while section 2 comprises of a local road passing through urban and rural areas. Both sections have a single carriageway.

Moreover, regarding the safety assessment:

- The sight distance in the horizontal alignment is not respected at some curves.
- A lack of safety barriers is observed at some locations.
- The absence of signing and marking all over the road is well noticed.

As for pavement conditions, some milling and overlay is required on section 1 while section 2 is in a worse condition as it requires, in addition to milling and overlay works, pavement reconstruction in some areas.

For relevant data regarding this road, refer to Table 3-6, Table 3-7, and Figure 3-8.

Table 3-6 Existing road condition survey – Metn R3 Section 1

Beg	End	Cadaster Location	Road Classification	Urban / Rural	Existing Road Width (m)	Single / Dual Carriageway	Traveled Way Width (m)	Cross-Sections Assessment	Pavement Assessment	Road Safety Assessment
0+000	1+200	Mazraet Yachou	Primary	Urban	6-7	Single	6-7	Acceptable	Good Condition	Need Slope Protection
1+200	2+300	Kornet el Hamra	Primary	Urban	5.5-6	Single	5.5-6	Critical width at some locations	Good Condition	Need Safety Barrier
2+300	2+900	Kornet el Hamra	Primary	Urban	5-5.5	Single	5-5.5	Critical width	Good Condition	Need Safety Barrier
2+900	3+700	El Freike	Primary	Urban	5.5-6	Single	5.5-6	Critical width	Milling and Overlay	Need Safety Barrier
3+700	5+100	Chaouié, Knaitré et Mar Gergess Bhurdok, Beit Chebab	Primary	Urban	5.5-6	Single	5.5-6	Critical width	Milling and Overlay	Need Safety Barrier

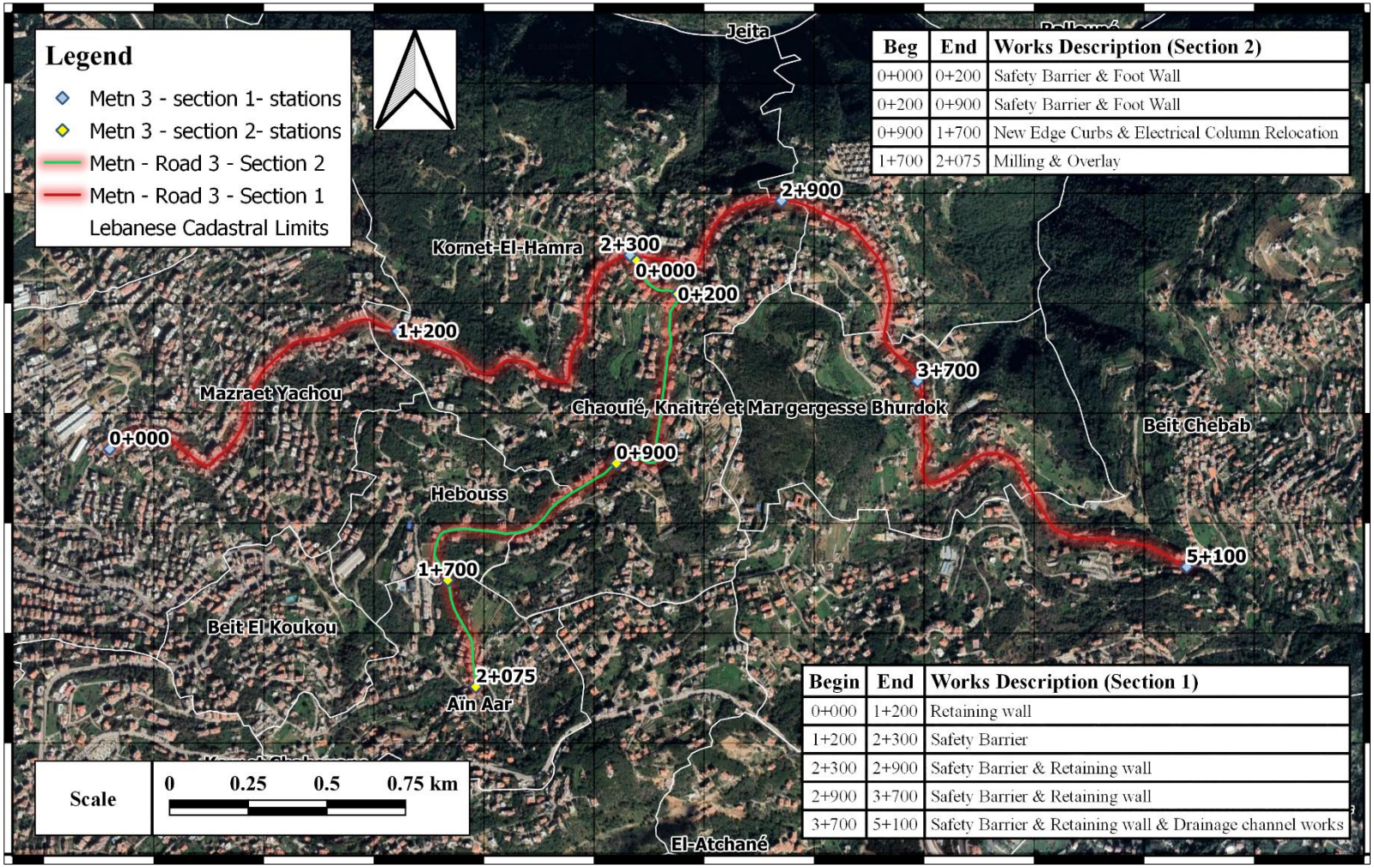
Source: Dar Al Handasah Nazih Taleb & Partners

Table 3-7 Existing road condition survey – Metn R3 Section 2

Beg	End	Cadaster Location	Road Classification	Urban / Rural	Existing Road Width (m)	Single / Dual Carriageway	Traveled Way Width (m)	Cross-Sections Assessment	Pavement Assessment	Road Safety Assessment
0+000	0+200	Kornet el Hamra	Local	Urban	4.5-5.5	Single	4.5-5.5	Critical width	Milling and Overlay	Need Safety Barrier
0+200	0+900	Kornet el Hamra	Local	Urban	5.5-6	Single	5.5-6	Acceptable	Reconstruction	Need Safety Barrier
0+900	1+700	Kornet el Hamra / Hebouss	Local	Rural	6-6.5	Single	6-6.5	Acceptable	Reconstruction	Need Slope Protection
1+700	2+075	Ain Aar	Local	Rural	6.5-7	Single	6.5-7	Acceptable	Milling and Overlay	Acceptable

Source: Dar Al Handasah Nazih Taleb & Partners

Figure 3-8 Work stations along with road rehabilitation activities along Metn R3 (sections 1 and 2) alignment



Beg	End	Works Description (Section 2)
0+000	0+200	Safety Barrier & Foot Wall
0+200	0+900	Safety Barrier & Foot Wall
0+900	1+700	New Edge Curbs & Electrical Column Relocation
1+700	2+075	Milling & Overlay

Begin	End	Works Description (Section 1)
0+000	1+200	Retaining wall
1+200	2+300	Safety Barrier
2+300	2+900	Safety Barrier & Retaining wall
2+900	3+700	Safety Barrier & Retaining wall
3+700	5+100	Safety Barrier & Retaining wall & Drainage channel works

Source: Geoflint s.a.r.l. & Dar Al Handasah Nazih Taleb & Partners, 2019

3.2.1 Metn R4

In summary, the road is a bit narrow (critical width) at some locations. The sight distance in the horizontal alignment is not respected at some curves. A lack of safety barriers is observed along the road as well as the need to build new retaining walls, footwalls and slope protection on the cut side of the road.

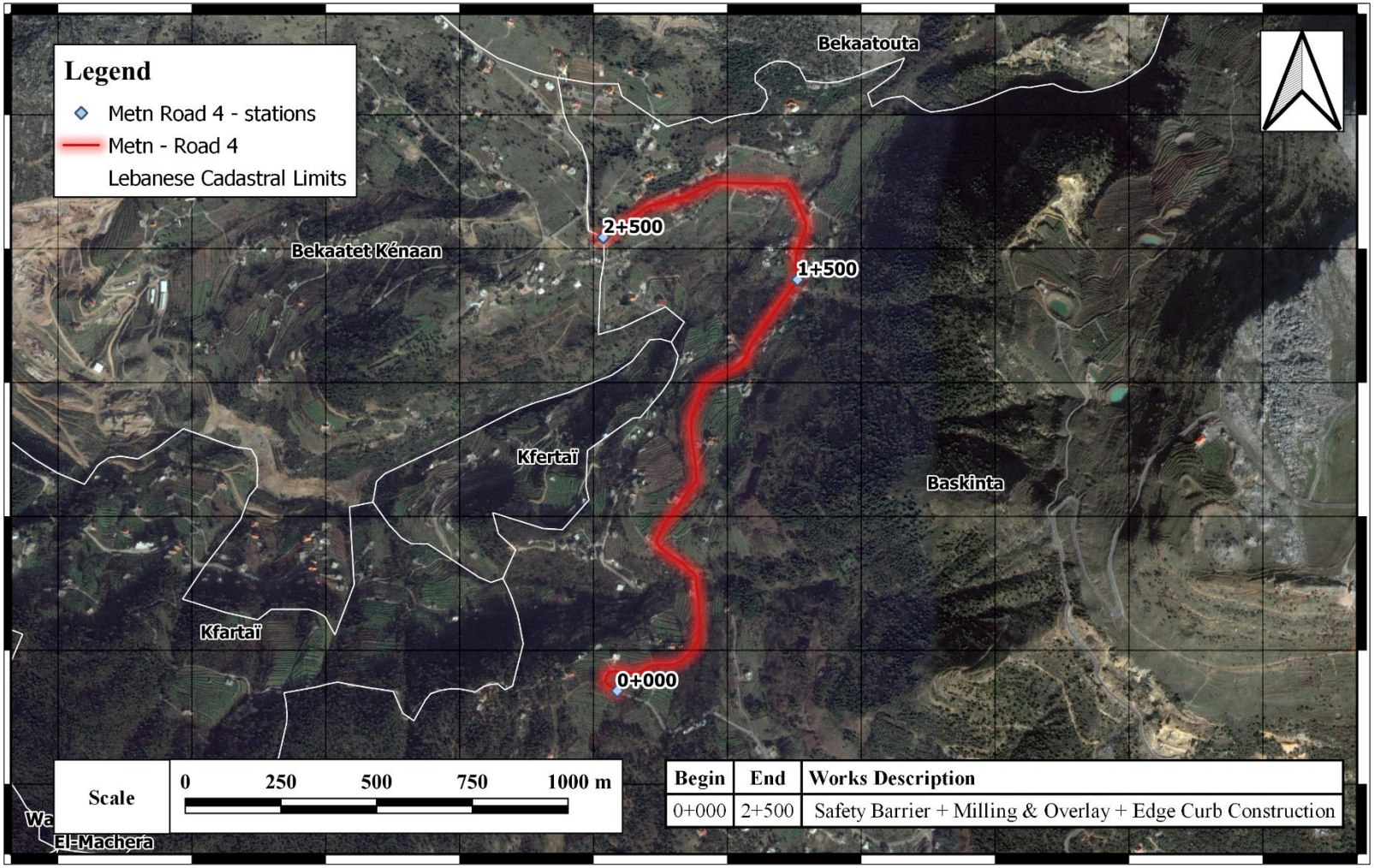
The absence of signing and marking all over the road is well noticed. As for pavement condition, milling and overlay is required. For relevant data regarding this road, refer to Table 3-8 and Figure 3-9.

Table 3-8 Existing road condition survey – Metn R4

Beginning	End	Cadaster Location	Road Classification	Urban / Rural	Existing Road Width (m)	Single / Dual Carriageway	Traveled Way Width (m)	Cross-Sections Assessment	Pavement Assessment	Road Safety Assessment
0+000	2+500	Baskinta	Primary	Rural	5.5-6	Single	5.5-6	Critical width at some locations	Milling & Overlay	Need Safety Barrier and Cut Slope

Source: Dar Al Handasah Nazih Taleb & Partners, 2019

Figure 3-9 Work stations along with road rehabilitation activities along Metn R4 alignment



Source: Geoflint s.a.r.l. & Dar Al Handasah Nazih Taleb & Partners, 2019

3.3 Contractor's Equipment and Materials

The contactor's equipment needed for the rehabilitation activities are presented in Table 3-9. The quantities of raw materials to be used during the rehabilitation phase are presented in Table 3-10).

Table 3-9 Contractor's Equipment to be used

Contractor's Equipment	
Description	No
Excavator	3
Shovel	3
Bob cat	4
Pick-up	4
Truck	6
Water tank	4
Steel roller	3
Conc. transit mixer	3
Asphalt cutter	4
4x4 Vehicles	4
Vehicles	6
Plate compactor	6
Asphalt Paver	1
Jack Hammer	3

Table 3-10 Quantities of main materials to be used during the whole period of the rehabilitation works

Material	**Unit**	**Quantity**
Sub-base and base Course	m^3	15,600
Bituminous Material	m^3	44,800
Reinforced Concrete	m^3	4,710
Clearing and Grubbing	m^2	40,000
Lighting Columns	Number	28
Lighting Brackets	Number	10

3.4 Site Rehabilitation Staffing

It is estimated that rehabilitation works for Metn roads will require a total of 18 months. Moreover, around 142 workers will be involved in rehabilitation activities. These workers must be hired preferably from the surrounding local communities (including Syrian labors that reside in the concerned project areas) (Table 3-11)

Table 3-11 Contractor's Personnel

Contractor's Personnel	
Project Manager	1
Civil Engineer	4
Surveyor	4
Foreman	4
Watchman	4
Skilled labor	20
Labor	60
Steel fixer	8
Carpenter	8

Operator	25
Office boy	4
Total	142

3.5 Site Facilities & Infrastructure

The Project site will not include any facilities on-site including 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 a Project Offices. These offices will be used by the Contractor Engineers, technical skilled workers and Supervising Consultants. The flat will be equipped with toilet, 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 the application of proper mitigation measures.

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. Description of the Environment and Social Context

The environmental and social baseline assessment is a key component in any ESMP study. This assessment will grant an initial assessment of all existing phenomena and conditions in the study area and within the area of influence before the implementation of the project. The aim is to identify key environmental and social issues/impacts that need to be mitigated and monitored during project implementation.

4.1 Physical Environment

4.1.1 Topography

Roads under consideration are Metn R1a, R2a, R3 and R4 located in Metn caza. The variation in elevation of the vertical alignments are shown in Table 4-1 and the elevation contour lines are shown in Annex 1 in Figure A, Figure B, Figure C, Figure D, Figure E, and Figure F.

In summary, Metn roads 1a and 4 are considered rural mountainous situated on relatively high altitudes towards the east with less population density compared to roads 2a and 3 that have higher agglomeration of buildings and located towards the coast.

Table 4-1 Mean sea level elevations of Metn Roads (R1a, R2a, R3 and R4)

Road Name		Altitude approximate range (m)
Metn Road 1 a	Section 1	963 – 1,225
	Section 2	936 – 1,030
Metn Road 2 a		240 – 388
Metn Road 3	Section 1	390 – 594
	Section 2	476-597
Metn Road 4		1,139 – 1,210

4.1.2 Geology

The geology of the studied roads was investigated for outcropping formations, subsurface stratigraphy, structure (faults, folds, seismic, etc.), hydrogeology (groundwater and sea water intrusions) and hydrology (surface water).

Metn R1a section 1

The outcropping lithological formations in and around the study area belong to the Cretaceous and Jurassic geological time periods (Figure G in Annex 1). The road crosses the formations shown in Table 4-2.

Table 4-2 Geological outcrops exposed along Metn R1a section 1 alignment

Geology	Name	Description
C_1	Chouf Sandstone (Grés de Base), Neocomian-Barremian	Varicoloured, cross bedded Sandstone with inter-beds of shale; contains heavy minerals; color depends upon percentage of hematite and presence of volcanics giving purplish color; Sand is sometimes white; contains coal seams and traces of brittle amber. This formation can reach 300 meters in thickness.
J_6	Bikfaya Limestone, Portlandian epoch	Finely crystalline, massive, cliffy Limestone that includes trace to abundant brown chert nodules. This formation is chemically deposited with smooth fresh fracture. The thickness of this unit is ranging from 60 to 65 m and Type section is Bikfaya.
J_7	Salima Limestone, Portlandian epoch	Composed of Chocolate brown Shale and bluish Marl, in many parts it's intercalated with thick oolitic Limestone bed. The marl weathers to a ceramic, ochre color and Crinoids fossil can be recorded in this formation. Thickness varies from zero-few meters to 150 m. Type section is Salima.

Source: Dubertret, (1945)

Metn R1a section 2

The outcropping lithological formations in and around the study area belong to the Cretaceous and Jurassic geological time periods (Figure H in Annex 1). The road crosses the formations shown in Table 4-3.

Table 4-3 Geological outcrops exposed along Metn R1 a section 2 alignment

Geology	Name	Description
C_1	Chouf Sandstone (Grés de Base), Neocomian-Barremian	Varicoloured, cross bedded Sandstone with inter-beds of shale; contains heavy minerals; color depends upon percentage of hematite and presence of volcanics giving purplish color; Sand is sometimes white; contains coal seams and traces of brittle amber. This formation can reach 300 meters in thickness.
J_6	Bikfaya Limestone, Portlandian epoch	Finely crystalline, massive, cliffy Limestone that includes trace to abundant brown chert nodules. This formation is chemically deposited with smooth fresh fracture. The thickness of this unit is ranging from 60 to 65 m and Type section is Bikfaya.
J_7	Salima Limestone, Portlandian epoch	Composed of Chocolate brown Shale and bluish Marl, in many parts it's intercalated with thick oolitic Limestone bed. The marl weathers to a creamish, ochre color and Crinoids fossil can be recorded in this formation. Thickness varies from zero-few meters to 150 m. Type section is Salima.

Source: Dubertret, (1945)

Metn R2a

The outcropping lithological formations in and around the study area belong to the Cretaceous and Jurassic geological time period (Figure I in Annex 1). The road crosses the formations shown in Table 4-4.

Table 4-4 Geological outcrops exposed along Metn R2a alignment

Geology	Name	Description
C_1	Chouf Sandstone (Grés de Base), Neocomian-Barremian	Varicoloured, cross bedded Sandstone with inter-beds of shale; contains heavy minerals; color depends upon percentage of hematite and presence of volcanics giving purplish color; Sand is sometimes white; contains coal seams and traces of brittle amber. This formation can reach 300 meters in thickness.
J_6	Bikfaya Limestone, Portlandian epoch	Finely crystalline, massive, cliffy Limestone that includes trace to abundant brown chert nodules. This formation is chemically deposited with smooth fresh fracture. The thickness of this unit is ranging from 60 to 65 m and Type section is Bikfaya.
J_7	Salima Limestone, Portlandian epoch	Composed of Chocolate brown Shale and bluish Marl, in many parts it's intercalated with thick oolitic Limestone bed. The marl weathers to a creamish, ochre color and Crinoids fossil can be recorded in this formation. Thickness varies from zero-few meters to 150 m. Type section is Salima.

Source: Dubertret, (1945)

Metn R3 section 1

The outcropping lithological formations in and around the study area belong to the Cretaceous and Jurassic geological time period (Figure J in Annex 1). The road crosses the formations shown in Table 4-5.

Table 4-5 Geological outcrops exposed along Metn R3 section 1 alignment

Geology	Name	Description
J_6	Bikfaya Limestone, Portlandian epoch	Finely crystalline, massive, cliffy Limestone that includes trace to abundant brown chert nodules. This formation is chemically deposited with smooth fresh fracture. The thickness of this unit is ranging from 60 to 65 m and Type section is Bikfaya.

Source: Dubertret, (1945)

Metn R3 section 2

The outcropping lithological formations in and around the study area belong to the Cretaceous and Jurassic geological time period (Figure K in Annex 1). The road crosses the formations shown in Table 4-6.

Table 4-6 Geological outcrops exposed along Metn R3 section 2 alignment

Geology	Name	Description
C_1	Chouf Sandstone (Grés de Base), Neocomian-Barremian	Varicoloured, cross bedded Sandstone with inter-beds of shale; contains heavy minerals; color depends upon percentage of hematite and presence of volcanics giving purplish color; Sand is sometimes white; contains coal seams and traces of brittle amber. This formation can reach 300 meters in thickness.

J_6	Bikfaya Limestone, Portlandian epoch	Finely crystalline, massive, cliffy Limestone that includes trace to abundant brown chert nodules. This formation is chemically deposited with smooth fresh fracture. The thickness of this unit is ranging from 60 to 65 m and Type section is Bikfaya.

Source: Dubertret, (1945)

Metn R4

The outcropping lithological formations in and around the study area belong to the Cretaceous and Jurassic geological time period (Figure L in Annex 1). The road crosses the formations shown in Table 4-7.

Table 4-7 Geological outcrops exposed along Metn R4 alignment

Geology	Name	Description
C_1	Chouf Sandstone (Grés de Base), Neocomian-Barremian	Varicoloured, cross bedded Sandstone with inter-beds of shale; contains heavy minerals; color depends upon percentage of hematite and presence of volcanics giving purplish color; Sand is sometimes white; contains coal seams and traces of brittle amber. This formation can reach 300 meters in thickness.
B_{c1}	Volcanics of Chouf Sandstone	Associated with this pre-Chouf Sandstone uplift, the Basaltic volcanic of the Chouf Sandstone (C_1) is located. It is described as reddish clayey beds which appear to be weathered volcanic tuffs.
B_{j6}	Black Basalt	Volcanic formation with about 50 m of thickness, overlapping J_6 (Bikfaya Limestone). This type is an impermeable rock, aquiclude layer that results in seasonal spring discharges.
J_7	Salima Limestone, Portlandian epoch	Composed of Chocolate brown Shale and bluish Marl, in many parts it's intercalated with thick oolitic Limestone bed. The marl weathers to a creamish, ochre color and Crinoids fossil can be recorded in this formation. Thickness varies from zero-few meters to 150 m. Type section is Salima.
J_6	Bikfaya Limestone, Portlandian epoch	Finely crystalline, massive, cliffy Limestone that includes trace to abundant brown chert nodules. This formation is chemically deposited with smooth fresh fracture. The thickness of this unit is ranging from 60 to 65 m and Type section is Bikfaya.

Source: Dubertret, (1945)

4.1.3 Hydrogeology

Geological units can be defined as aquifer or aquiclude in terms of storing and transmitting water, and these types depend on the geological environment in which they occur.

An aquifer can be a subsurface rock or sediment unit that is porous and permeable, high enough that it stores and transmits useful quantities of water. Aquifers are divided into the following categories:

- Confined: overlain by an impermeable rock unit,
- Unconfined: that is not overlain by an -impermeable rock unit, where the water in this aquifer is under atmospheric pressure and is recharged by precipitation that falls on the land surface directly above the aquifer,
- or Semi-confined: partially confined, or overlain, by gravel, sand, silt or soil layers of low permeability through which recharge and discharge can still occur.

Aquiclude is a geological formation which, although porous and capable of absorbing water, does not permit its movement at rates sufficient to furnish an appreciable supply for a well or spring. Alternatively, it could be an impermeable body of rock or stratum of sediment that acts as a barrier to the flow of groundwater.

The study area is characterized by the presence of aquifers within the various formations:

- Aquifers in the area are the Chouf Sandstone (C_1), Bikfaya Limestone (J_6), and Salima Limestone (J_7) which is composed of sand, with very high permeability, and clay, with low permeability are present within these deposits. In relation to permeability and porosity, there are no important fractures or joints within these formations that is why they are classified as a semi-aquifer.

In terms of hydro stratigraphy, Metn roads mostly fall on a karstic limestone formation represented as 1 in Figure M, Figure N, Figure O, Figure P, Figure Q, and Figure R (in Annex 1), and described in Table 4-8, which is the most important karstic system in the study area. The system is characterized by a significant amount of groundwater flowing in channels, faults and fractures. The transmissivity of these formations is generally high and water table is shallow.

Any accidental spillage of wastewater onto open ground can easily infiltrate the karstic limestone and is highly likely to pollute water present in the subsurface. Moreover, it is prohibited to discharge any solid waste or wastewater into the winter channels as this will lead to adverse impacts to the downstream “Wadi Antelias” river. “Wadi Antelias” river is closest to Metn R2a, with an approximate distance of 1.1 km. A similar risk is present in the case of Section 1 of Metn R3 due to its proximity from Naher El Kalb River and Jeita Grotto. The shortest distance between the road and Naher El Kalb (upstream of Jeita Grotto) is 530 m. Also, the shortest distance between this road and Jeita Grotto is 1.1 km.

Table 4-8 Legend of the hydrogeology maps shown in Figure M, Figure N, Figure O, Figure P, Figure Q, and Figure R in Annex 1

Geology Class	Groundwater Sheets	Lithology Facies	Age	Flows of the sources I/sec.	Probable instantaneous flows of the works I/sec.	Transmissivity m^2/sec
1	In karstic formations Wide and rich water table	Massive limestones and dolomitic limestones with interval. Marls Thickness: >1000 m.	JURASSIC Bathonien-Portlandien	<100 100-1000 >1000	>100	$10^{-2} \leq T \leq 1$ Generally high
2		Limestone regularly bedding Thickness: 800 to 1,000 m.	CRETACE Cenomanien-Turonien	< 100 100-1000 >1000	>100	$10^{-2} \leq T \leq 1$ Generally high
10	Local or discontinuous water table	Sandstone Thickness : 150 à 250 m.	CRETACE	<10	<10	$10^{-5} \leq T \leq 10^{-4}$ Poor with weak
16	Areas generally without water table or a very local water table	Alternations of clay-sandy, limestone beds and marl Thickness: 300 to 400 m.	Cretaceous Aptian Albian	<5 (Sources intermittentness)	<5	Weak with very weak
22		Basalts Variable Thickness	Cretaceous inf. Miocene Pliocene QUATERNARY	_	Very weak	Very weak

Road (Metn)	Geology Class					
	1	**2**	**10**	**16**	**22**	
1a-s1	✓		✓			*The roads lie on the following geology classes*
1a-s2	✓					
2a	✓		✓			
3a-s1	✓					
3a-s2	✓					
4	✓		✓		✓	

4.1.4 Climate and Meteorology

The climate and meteorological parameters play a vital role in transport and dispersion of pollutants in the atmosphere. Thus, the collection and analysis of meteorological information, including primarily precipitation, ambient temperature, wind direction and speed, are essential data for adequately assessing environmental impacts. The most significant meteorological parameters that influence the direct environmental impacts at the proposed project are: wind due to its ability to carry dust and odors to nearby communities; and precipitation due to its ability to enhance the infiltration of accidental spills and contaminated rehabilitation wastewater within the area depending on site operation procedures. Meteorological data are obtained either from the closest available stations and whenever not available satellite data are used and referenced in the text.

Precipitation rates

Metn R1a

Precipitation in the summer season between the month of June and September are negligible (~ 10 mm) along the road. The highest precipitation is recorded in January with an average value of 190 mm and the total annual precipitation is approximately 892 mm. Refer to Figure S in Annex 1.

Metn R2a

Precipitation in the summer season between the month of June and September are negligible along Metn R2a. The highest precipitation is recorded in January with an average value of 177 mm and the total annual precipitation is 877 mm. Refer to Figure T in Annex 1.

Metn R3

Precipitation in the summer season between the month of June and September are negligible along Metn R3. The highest precipitation is recorded in January with an average value of 192 mm and the total annual precipitation is 903 mm. Refer to Figure U in Annex 1.

Metn R4

Precipitation in the summer season between the month of June and September are negligible along Metn R4. The highest precipitation is recorded in January with an average value of 192 mm and the total annual precipitation is 950 mm. Refer to Figure V in Annex 1.

Wind records

In general, wind speed and direction vary with time and location depending on season and location. Dominant winds directions on the Lebanese coast are westerly and southern westerly (blowing from west to east and south-west directed to the north-east). Wind speed varies throughout the year and is as low as 2.5 m/s to a high of 4.15 m/s. Refer to Table 4-9.

Table 4-9 Wind direction, average monthly wind speed, and wind probability recorded at Beirut Rafic Hariri station from 6/2005 until 7/2011

Month of year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dominant Wind direction												
Wind probability > = 4 Beaufort (%)	9	13	13	12	8	11	13	16	10	7	6	7
Average Wind speed (m/s)	3.1	3.6	3.6	3.6	3.6	4.15	4.15	4.15	3.6	3.05	2.5	3.05

Source: Tripoli Meteorological Station

Temperature (Land Surface)

- *Metn R1a*

The hottest month in the area is August (29.4 ^{o}C) and coldest month is January (4.6 ^{o}C). Fluctuations in the temperature values are shown in Figure W in Annex 1.

- *Metn R2a*

The hottest month in the area is August (31.1 ^{o}C) and coldest month is January (6.7 ^{o}C). Fluctuations in the temperature values are shown in Figure X in Annex 1.

- *Metn R3*

The hottest month in the area is August (30 ^{o}C) and coldest month is January (5.8 ^{o}C). Fluctuations in the temperature values are shown in Figure Y in Annex 1.

- *Metn R4*

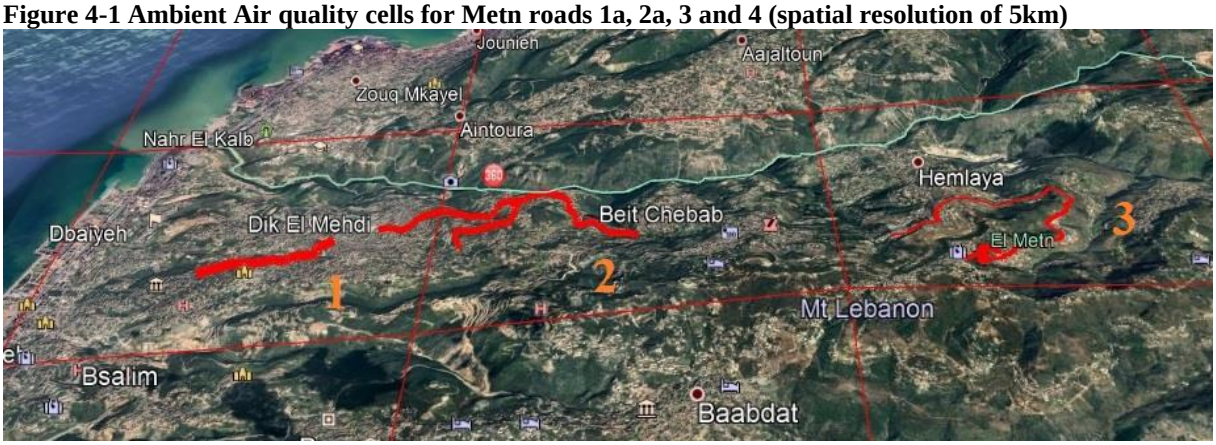
The hottest month in the area is August (28.6 ^{o}C) and coldest month is January (1.6 ^{o}C). Fluctuations in the temperature values are shown in Figure Z in Annex 1.

4.1.5 Air quality and Noise

Air Quality

Air quality is an essential component in assessing social wellbeing and health status of a community. Developing baseline information will help in comparing the impacts of the project relative to the existing conditions. Ambient air quality data was gathered from the UNDP project "Air quality assessment in an East Mediterranean country: the case of Lebanon" which is based at the Ministry of Environment. The UNDP/MoE monitors the criteria pollutants: Particulate Matter (PM), Ozone (O_3), Carbon monoxide (CO), Nitrogen dioxide (NO_2), Sulfur dioxide (SO_2) which are recognized by national and international organizations as good indicators of anthropogenic emissions.

Figure 4-1 Ambient Air quality cells for Metn roads 1a, 2a, 3 and 4 (spatial resolution of 5km)



Source: MoE, 2019

Table 4-10 Ambient air quality in µg/m^3 for Metn roads R1a, R2a, R3 and R4 (roads fall in cells 1, 2, 3) – refer to Figure 4-1

Cell ID	NO_2	O_3	PM_{10}	$PM_{2.5}$	SO_2	CO
1	82.707	40.613	38.992	34.740	52.427	1338.390
2	48.169	63.365	27.471	24.414	30.896	679.104
3	27.881	78.298	21.877	19.315	19.449	456.189
Lebanese Ambient Air Quality standards, Decision 52/1	100	100	80	-	80	10,000
NAAQS, EPA	107.6	147.7	150	35	84.6	11,070
Exposure Duration	1 year	8 hours	24 hours	24 hours	1 year	8 hours

Source: MoE, 2019

As revealed in Table 4-10 that ambient air quality concentrations along the four Metn roads of all chosen criteria pollutants are compliant with the national guidelines (Decision 52/1) and the international USEPA National Ambient Air Quality Standards (NAAQS) standards.

Noise

Noise levels were measured at each of the road sections using a handheld decibel meter. The meter used is of type Nady DSM-1X Specs having an accuracy of ±1.4 dB with a frequency range of 31.5 to 8,000 Hz.

Regarding Metn roads, measurements were taken based on the working stations assigned by Dar Al Handasah Nazih Taleb. The schedule of the acoustic survey was planned based on availability of transportation, availability of the handheld decibel meter, availability of staff, and availability of time.

Metn R1a

Results are reported in Table A (in Annex 1), showing minimum, equivalent continuous A-weighted sound level, maximum, allowable noise level according to Lebanese guidelines, and date and time of acquisition per road section. Measured sound exposure levels varied from as low as 38.2 decibels (dB) to as high as 83.2 (dB), where the equivalent continuous noise level (L_{eq}) varied between 57.9 (dB) and 70 (dB) along the whole road section. The road has an average L_{eq} of 65 (dB).

A study done in 2004 aimed at comparing magnitudes of different sound pressure values (dB) with the noise generated from an ordinary conversation (refer to Table E in Annex 1). In this context, on average, a person maneuvering Metn R1a will experience a sound magnitude of 64 (dB), which is approximately equivalent to the sound pressure generated by an ordinary conversation.

Metn R2a

Similar to the above, measured sound exposure levels varied from as low as 45.3 decibels (dB) to as high as 87.5(dB), where the equivalent continuous noise level (L_{eq}) varied between 72.3 (dB) and 78.6 (dB) along the whole road section. The road has an average L_{eq} of 76 (dB). Refer to Table B (in Annex 1).

Similarly, with reference to Table E (in Annex 1), a person maneuvering Metn R2a will experience a sound magnitude of 76 (dB), which is approximately twice as loud as an ordinary conversation.

Metn R3

Similar to the above, measured sound exposure levels varied from as low as 31.2 decibels (dB) to as high as 91.8(dB), where the equivalent continuous noise level (L_{eq}) varied between 54.2 (dB) and 78.1 (dB) along the whole road section. The road has an average L_{eq} of 66 (dB). Refer to Table C (in Annex 1).

On average, a person maneuvering Metn R3 will experience a sound magnitude of 66 (dB), which is approximately equivalent to the sound pressure generated by an ordinary conversation (refer to Table E in Annex 1).

Metn R4

Similar to the above, measured sound exposure levels varied from as low as 39.6 decibels (dB) to as high as 80.1(dB), where the equivalent continuous noise level (L_{eq}) varied between 59.9 (dB) and 62.3 (dB) along the whole road section. The road has an average L_{eq} of 60 (dB). Refer to Table D (in Annex 1).

Similarly, with reference to Table E (in Annex 1), a person maneuvering Metn R4 will experience a sound magnitude of 60 (dB), which is equivalent to the noise generated by an ordinary conversation.

4.2 Biological Environment and Land use/Land Cover

In the context of this specific ESMP for road rehabilitation in Metn Caza, the direct influence area concerns existing roads. Consequently, a rapid biological assessment has been carried out to draw the ecological profile of the adjacent areas to the concerned road, assess key habitats and flora diversity to identify those species endangered or IUCN-listed that are at added risk from the proposed project. This will serve the management plan and the mitigation measures that will be taken in order to reduce the project's potential impact on the local environment.

The assessment was based on field surveys and generated Land use/Land Cover (LULC) maps for each studied road (refer to Figure AA, Figure BB, Figure CC, Figure DD, Figure EE, and Figure FF in Annex 1).

4.2.1 Field Survey

Dates, Methodology, and Limitations

Given the limited timeframe of this study, a single field visit was set for each road (not necessarily during the best period for field visits due to time limitations). The field investigation did not aim for an exhaustive inventory of the biodiversity of the project area but a general overview of present species (mainly flora) and habitats. This general approach allows the identification of the conservation status of the natural habitats.

Moreover, LULC maps were generated for each road and compiled with site visits observations with respect to adjacent key habitats to the concerned roads.

Walking transects were recognized to obtain an understanding of the vegetation communities in the area and record existing species. Knowing that a single visit is not enough, the study had to consider some species as potentially present. Moreover, it was difficult to perform a complete faunal survey. Thus, information on fauna does not only include the encountered species during the field visit, but also potential species were considered in this assessment (fauna listing was done only for roads that involve rich habitats). The potentiality of presence of a species was based on: (a) the occurrence of the species habitat; (b) observations of the species near the study area; (c) the fact that the study area is in the distribution range of the species; and (d) related scientific papers.

4.2.2 Evaluation Criteria

Various regulatory and scientific criteria allow organizing in a hierarchy the importance of habitats and species observed in a given area. These criteria include the endemism, rarity, the ecological importance (key species, specialized species, etc.); the biological status (migratory species, breeding species, etc.); and the biological susceptibility.

There is no list of protected species in Lebanon. The protected species are therefore considered based on international conventions for which Lebanon is part of and the IUCN Middle East red list.

In this assessment, the ecological value of species was based on their local ecological importance (distribution of species and degree of endemism (Tohmé and Tohmé, 2014) and IUCN classification).

4.2.3 Results

4.2.3.1 Metn R1a

Project settlement

The studied MetnR1a consists of two alignments/sections that have a combined length of 9.80 km.

- Section 1 starts at El-Mhaidce, at an elevation of 962 m, passes through Chouaya and very briefly through Zeghrine, and continues upward until it ends in Choueir, at an elevation of 1,225 m.
- Section 2 starts at Zeghrine (at 1,030 m), descends to an elevation of 936 m while passing through Chouaya and Ain El Teffaha, and re-ascends to end in Chrine (at 982 m).

The road is settled at an altitude ranging between 936 and 1,225 meters which makes the studied area covering the‘EU-Mediterranean and Supra-Mediterranean zones (According to CORINE classification, EU-Mediterranean zone ranges from 500 to 1,000 meters, whereas, Supra-Mediterranean zone ranges from 1,000 to 1,500). The altitudinal range plays an important role in plant composition (Abi Saleh, 1996).

Natural Habitats, Flora, and Fauna

Key Habitats

The main habitats that are concerned by the project fall into four types as per field visit and LULC map provided by the National Center for Scientific Research (2017).

Section 2 of Metn R1a involves less populated areas where rural settlements are intermixed with agricultural lands including terraces and olive groves (mainly in Ain El Teffaha), fragmented woodlots and scrublands (mainly in Chrine). Refer to Figure BB (in Annex 1).

Regarding section 1 of Metn R1a, maquis ecosystems (on rocky terrain) border the road when specifically passing through Chouaya. Maquis ecosystems constitute a dynamic hideout for numerous reptiles, mammals, and birds. The rest of the road is surrounded by residential units, cultivated pine patches (umbrella pine trees), and degraded ecosystems (garrigue vegetation).

Table 4-11 Key Habitats encountered along Metn R1a. Refer to Figure AA and Figure BB (in Annex 1).

Habitats types in LULC Map	Field visit observation (Metn R1a, sections 1 and 2)
Agricultural Areas	• Agriculture terraces

	• Cultivated trees including olive groves
Grasslands	• Scrublands and grasslands used for agriculture and forage (Croplands)
Wooded lands	• Mediterranean oak woodland, dominated by the evergreen oak species *Quercus calliprinos*, with a scattering of deciduous oak *Quercus infectoria* and other tree species. • Open garrigue vegetation, discontinuous bushy associations of the Mediterranean calcareous plateaus. • Riparian habitats.
Artificial areas	• Rural settlements in Chouaya and Ain El Teffaha • Urban areas in Choueir

Figure 4-2 Choueir (station 4+800 in Figure AA in Annex 1)

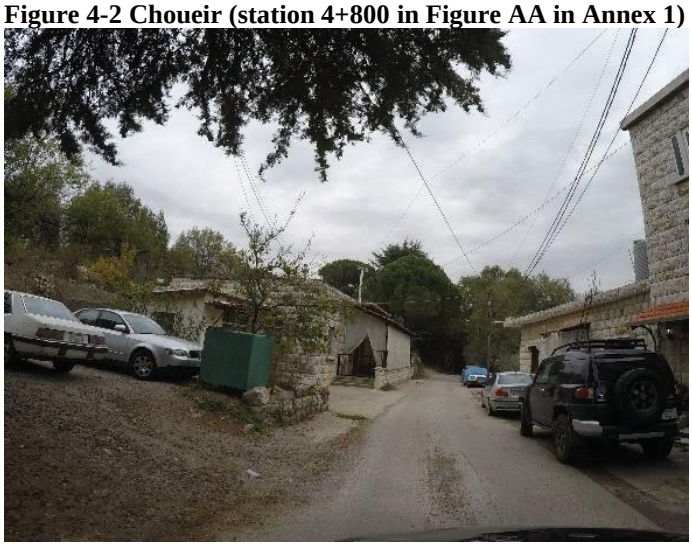
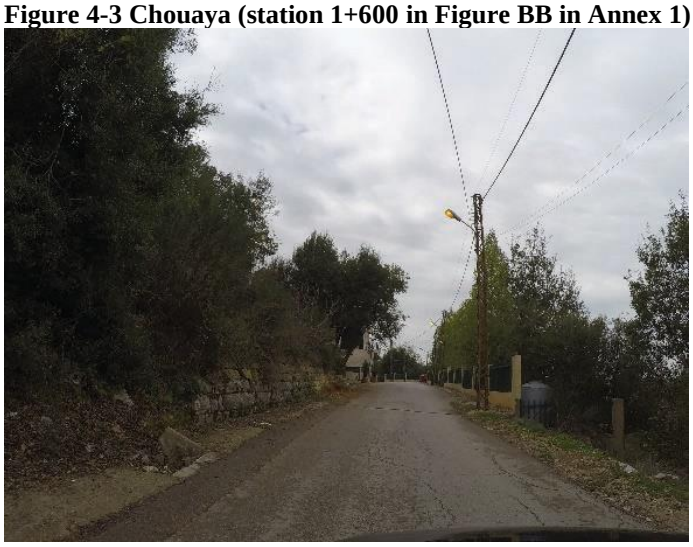


Figure 4-3 Chouaya (station 1+600 in Figure BB in Annex 1) – rural area



Flora and Fauna

In terms of flora, the road is mainly bordered by species of the supramediterranean zone including *Quercus calliprinos* and its degradation stages, *Pisatcia palaestina*, *Juniperus oxycedrus*, and *Quercus infectoria*.

Table 4-12 List of main plant species recorded at the project area

Species	Habitat	Distribution (Tohmé)
Quercus calliprinos	Woodlands and rocky hill slopes	EMR *
Quercus infectoria	Forests, woodlands	EMR
Celtis australis	Roadsides and near streams	Mediterranean
Pinus pinea	Sandstone	Mediterranean
Platanus orientalis	Riparian and lacustrine	Common
Rubus hedycarpus	Wet Soil common	Common
Pistacia terebinthus palaestina	woodlands and rocky hill slopes	EMR

** Eastern Mediterranean Region (EMR)*

Regarding the local fauna, species (mammals) of ecological interest believed potential in the study area namely in wooded lands include the European Hedgehog (*Erinaceus europaeus concolor)*, the European badger (*Meles meles*), and the squirrel (*Sciurus anomalus syriacus*). These species are rare and threatened at the local level.

4.2.3.2 Metn R2a

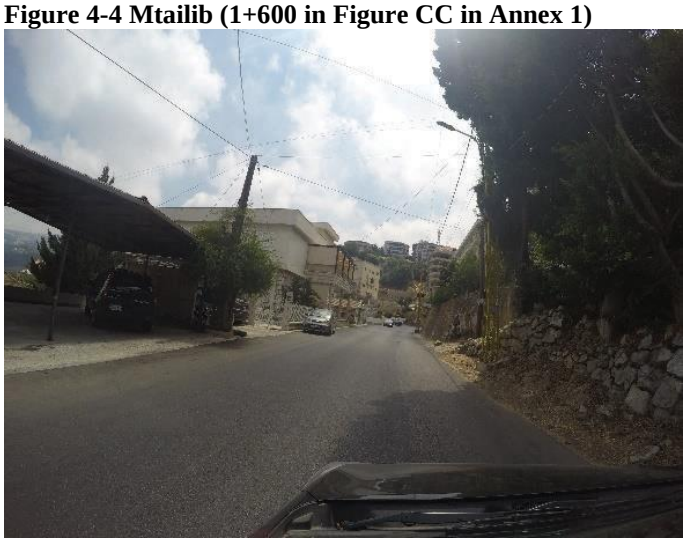
Project settlement

Metn R2a consists of a single alignment with a total length of 2 km. It starts at El-Mtaileb at an elevation of 239 m, passes through Mazraet Beit Chaar, and continues ascending until it ends at the boundary between Dik El Mehdi and Mazraet Yachouh, at an elevation of 388 m. According to CORINE classification, the studied area consists of a 'Thermo-Mediterranean' zone since it is settled between 0 and 500 meters. The altitudinal range plays an important role in plant composition (Abi Saleh, 1996).

Natural Habitats, Flora, and Fauna

Metn R2a passes through residential and commercial areas (artificial areas) as per field visit and the LULC map provided by the National Center for Scientific Research (Refer to Figure CC in Annex 1, 2017). In other words, the studied road involves a path that is already under anthropogenic influences and does not involve any sensitive habitat or rich ecosystem. The road is mainly bordered by human settlements, industries, and lines of cultivated trees, or degraded ecosystems with low vegetation cover. In this context, the area does not provide an important habitat for a large variety of animals. Hence no listing of flora and fauna is provided for this road.

Figure 4-4 Mtailib (1+600 in Figure CC in Annex 1)



4.2.3.3 MetnR3

Study Area

Project settlement

Metn R3 consists of two sections or alignments intersecting at Kornet El Hamra that have a combined length of 7.30 km.

- Section 1 starts at Mazraet Yachouh, at an elevation of 390 m, passes through Kornet el Hamra, El Freike, Chaouié- Knaitré et Mar Gergess Bhurdok, and continues upward until it ends in Beit Chebab, at an elevation of 594 m.
- Section 2 starts at Kornet El Hamra (at 476 m), passes through Hebouss, and continues ascending to end in Ain Aar (at 597 m).

According to CORINE classification, the studied area covers Thermo-Mediterranean and Eu-Mediterranean zones.

Natural Habitats and Associated Flora

The main habitats encountered along Metn R3 fall into two main types (wooded lands and artificial areas) as per field visit (refer to Table 4-13) and LULC map provided by the National Center for Scientific Research (2017). Refer to Figure DD and Figure EE (in Annex 1).

Section 1 of the road that starts at Mazraet Yachouh and passes through Kornet el Hamra, El Freike and Chaouié consists mainly of rural areas (houses surrounding narrow roads, olive groves, and fragmented woodlots). In Beit Chabeb a small segment of the road is surrounded by maquis ecosystem (a small intact green patch). Regarding section 2 of the road, it mainly involves residential areas in Hebouss and Ain Aar. Finally, particular biotopes (i.e. riparian habitats) were encountered as the road is rich in water channels including species such as plane and poplar trees. These habitats are important refuge for amphibians, birds and reptiles.

Table 4-13 Key Habitats encountered along Metn R3 (refer to Figure DD and Figure EE in Annex 1).

Habitats types in LULC Map	Field visit observations (Metn R3 sections 1 and 2)
Wooded lands	• Open woodland with some scrubby vegetation • Mediterranean maquis • Riparian thickets including species such as *Platanus orientalis*, *Salix sp.*, *Celtis australis* intermixed with *Hedera helix*, and shrubby vegetation including *Rubus hedycarpus*
Artificial areas	• Residential area (rural settlements, small shops, and cultivate trees including eucalyptus trees).

Figure 4-5 Kornet el Hamra (rural settlements are intermixed with cultivated trees between stations 1+200 & 2+300 in Figure DD in Annex 1)

4.2.3.4 Metn R4

Study Area

Project settlement

Metn road 4 is located in Baskinta and consists of a single alignment with a total length of 2.30 km. It starts at an elevation of 1,170 m, moving inwards within Baskinta as it descends to 1,139 m and then gradually ascending until it ends at an elevation of 1,210 m. According to CORINE classification, this makes the studied area a 'Supra-Mediterranean' zone since its altitude falls between 1,000 and 1,500 meters). The altitudinal range plays an important role in plant composition.

Natural Habitats and Associated Flora

According to site visits and the LULC map provided by the National Center for Scientific Research, the main habitats encountered along Metn R4 include agricultural areas, wooded lands (open or dense woodland and riparian habitats) and artificial areas. Refer to Table 4-14 and Figure FF in Annex 1).

More precisely, the concerned community is a medium-populated agricultural community where adjacent ecosystems to the road are comprised of agricultural lands (fruit trees, namely apple and peach trees). The alignment is mainly bordered by houses, small shops, and fruit trees. The overall ecosystem is under clear anthropogenic influences with a resulted monotonous vegetation cover (involving resilient species).

Table 4-14 Key Habitats encountered along the Metn R4 (refer to Figure FF in Annex 1).

Habitats types in LULC Map	Field visit observations
Agricultural Areas	• Agricultural lands (namely terraces)
Wooded lands	• Open woodland with some scrubby vegetation • Riparian thickets including species such as *Platanus orientalis, Salix sp., Celtis australis* intermixed with *Hedera helix*, and shrubby vegetation including *Rubus hedycarpus*
Artificial areas	• Rural residential areas and small shops • Overgrazed oak coppices

Figure 4-6 Baskinta (road bordered by agricultural terraces shown in Figure FF in Annex 1)

4.2.4 Summary of Results

In summary, the assessment showed that Metn R2a does not include any rich ecosystems. Metn R2a passes through residential and commercial areas (artificial areas) as per field visit and the LULC map. In other words, the studied road involves a path that is already under anthropogenic influences and does not involve any sensitive habitat. The road is mainly bordered by human settlements, industries, and lines of cultivated trees, or degraded ecosystems with low vegetation cover. In this context, the area does not provide an important habitat for a large variety of animals. Similarly, Metn R4 is mainly bordered by agricultural lands (fruit trees, namely apple and peach trees), houses, and small shops. The overall ecosystem is under clear anthropogenic influences with a resulted monotonous vegetation cover (involving resilient species).

However, some adjacent areas to Metn R1a and Metn R3 consist of maquis ecosystems that are intermixed with agricultural and fragmented lands. Maquis ecosystems constitute a dynamic hideout for numerous reptiles, mammals, and birds. Specifically, section 1 of Metn R1a road is bordered by maquis ecosystems (on rocky terrain) when passing through Chouaya and a small segment of section 1 of Metn R3 in Beit Chabeb is surrounded by maquis ecosystem (intact green patch dominated by oak).

Finally, particular biotopes (i.e. riparian habitats) were encountered namely along Metn R3 and Metn R4, as they are rich in water channels. Riparian habitats are important refuge for amphibians, birds and reptiles and need special attention.

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4.3 Socio-Economic Condition

This section describes the social and economic conditions of Metn Caza where Metn R1a, R2 a, R3 and R4 will be rehabilitated.

4.3.1 Relevant Caza Background

Demographic Profile

The district of Metn is one out of the 26 districts of Lebanon, occupying 263 km^2 of surface area. According to the latest national report (MoPH, 2016), Metn caza has a total population of 483,352 (excluding Syrians displaced), accounting for 11.26 % of the total national population. According to UNDP (2008), the overall headcount poverty within Metn is 11%, compared to Lebanon's average of 27%. However, from 2013 until 2016, Metn showed a growth rate of 44 %, raising the population to 750,000, due to the heavy influx of Syrian displaced. Approximately 54,578 Syrian refugees are registered in Metn (UNHCR, 2017). Syrian refugees are generally spread out through different areas of the community. On the other hand, there is an unofficial Palestinian refugee camp in Metn, which is specifically located in Dbaye.

The enormous influx of Syrian workforce with willingness to accept lower wages has created a competition with skilled and unskilled Lebanese labor and cause a drop in the daily wage.

Infrastructure and Healthcare Sector

Due to the enormous increase in the overall population of El Metn in the past few years and a decrease in the average precipitation level over the past 30 years, the area continues to suffer from scarcity in water supply and inadequate water quality and sanitation services. Regarding infrastructure, the Italian Agency for Development Cooperation launched the funding of a water supply and wastewater treatment program in 2009. The project is composed of a complete water supply system and a wastewater treatment system with a treatment plant. The current Waste Water Treatment Plant (WWTP) is Khenchara WWTP (2500 m^3) (serving the villages of Baskinta, Bteghrine, Dhour Choueir, Choueir, Ayroun, Daouar, Khenchara, Jouar, Bolonia, Mrouj Marjaba, and Ain Al Sendyan).

The roads in El Metn are narrow, damaged and lack proper safety measures, hence increasing the risk of accidents (especially in Baskinta village). Such deteriorating roads also hinder the easy access to the rural peripheries by limiting the mobility of the general population. Moreover, the absence of sufficient rainwater collection canals leads to often blocked roads during severe weather, mainly during the winter.

Regarding health care facilities, Metn caza consists of different facilities ranging from public and private hospitals, First Aid Stations (Lebanese Red Cross) and private clinics. The main healthcare centers in Metn are: Serhal hospital, Middle East Institute of Health, Saideh hospital, Eye and Ear Hospital International, Centre Hospitalier Beit Chabab, Bhannes, Dahr al Bachek Governement Hospital, BelleVue Medical Center, St. Joseph Hospital, Al-Arz Hospital, Haroun Hospital, Hopital Psychiatrique De La Croix, Hopital AbouJaoude, Dr. Nader Saab Hospital, Bitar Hospital, St. Jean Hospital, Al Jabal Hospital or Jabal Lebnan Hospital. In

addition to hospitals, Red Cross Stations are distributed in different locations in Metn which are able to cover the entire caza: Antelias, Bolonia, Cornet Chehwan, Beit Mery and Jal El Dib.

Educational Sector

Several public and private schools are established in the project area such as Rosary college (7 m away of Metn R3), Dhour Choueir Public Secondary School (129 m away from Metn R1a), and College des Soeurs des Saints Coeurs (8 m away from Metn R1a).

4.3.2 Road Sensitive Receptors

Sensitive receptors were collected during the field visits and previous surveys for similar projects. The data was analyzed using ArcGIS. Categories considered as sensitive receptors during road rehabilitation are schools, churches, hospitals, mosques, closest residential buildings, and other archeological features (refer to Figure GG, Figure HH, Figure II, Figure JJ, Figure KK, and Figure LL in Annex 1).

The main sensitive receptors encountered along the Metn roads are presented as follows:

- Metn R1a section 1 (refer to Figure GG in Annex 1):
  - ✓ Residential areas at station 0+000 (rural settlements)
  - ✓ Residential agglomerations in addition to nearby schools and places of worship from station 4+800 to station 5+400 (urban settlements)
  - ✓ Dispersed residential buildings in addition to schools and places of worship from station 1+500 to 4+800 (rural settlements)
  - ✓ The highly affected school and church along Metn R1 section 1 are College des Soeurs des Saints Coeurs – Dhour Choueir and Dhour Choueir Church respectively.

- Metn R1a section 2 (refer to Figure HH in Annex 1):
  - ✓ Dispersed residential areas bordering the road, in specific, from station 0+000 to 2+100 (rural settlements)
  - ✓ Agricultural lands in Ain el Teffaha

- Metn R2a (refer to Figure II in Annex 1):
  - ✓ Residential units along the whole road (urban settlements)
  - ✓ Schools and places of worship (such as St. Joseph Church and Les Petits Rigolos) located along or nearby the road specifically between station 0+000 and station 1+600

- Metn R3 section 1 (refer to Figure JJ in Annex 1):
  - ✓ Residential agglomerations (urban settlements), specifically from station 0+000 to almost station 3+700
  - ✓ Schools and places of worship bordering the road such as Rosary College, Sacre Coeur Church, Saint Joseph and Saint Doumit Church

- Metn R3 section 2 (refer to Figure KK in Annex 1):
  - ✓ Residential units from 0+000 to 0+900 (urban settlements) and dispersed residential areas from 0+900 to 2+075 (rural settlements)
  - ✓ School and place of worship along the end of the road such as Saint Elie Church and IC school

- Metn R4 (refer to Figure LL in Annex 1):

  - ✓ Few residential units surrounding the road (rural settlements)
  - ✓ Places of worship such as Saint Michael Monastery
  - ✓ Agricultural lands (namely agricultural terraces)

Table 4-15 summarizes the nearby schools and places of worship surrounding the studied roads along with their respective distances.

Table 4-15 Relevant sensitive receptors encountered along and near Metn Roads

Sensitive Receptors	Distance (m)
Metn R1a	
Collège des Soeurs des Saints Coeurs – Dhour Choueir	8
Dhour Choueir Church	10
Eglise Evangelique	118
Dhour Choueir Public Secondary School	129
Metn R2a	
Les Petits Rigolos (day care)	10
St. Joseph Church	97
Metn R3	
Rosary College	7
Sacre Coeur Church	8
Saint Elie Church	12
Saint Joseph and Saint Doumit Church	15
IC school	20
Metn R4	
Saint Michael Monastery	21

Source: Geoflint s.a.r.l. survey results, 2019

4.3.3 Traffic Survey

For the purpose of road rehabilitation; which requires pavement analysis and design, a traffic survey was conducted by Dar Al Handasah Nazih Taleb & Partners. The survey focused on the gathering of baseline data for the existing road conditions, and the Average Daily Traffic (ADT) was the main parameter collected. In addition, the types of vehicles maneuvering the two roads were also examined.

The data collection program consists of automatic classified counts with wide range of traffic count conditions and road characteristics. All long road segments (more than 10 km) required more than one count station one at the beginning and at the end as well an intermediate location where this road link intersect with a higher rank road (example: Secondary intersecting with Primary) while for short road segments one classified count is carried out at the middle of the road link, which is defined as follow:

- For Primary roads, a link is defined as the road section between two consecutive intersections with primary or secondary roads.
- For secondary roads, a link is defined as the road section between two consecutive intersections with primary, secondary or tertiary roads.

The distribution of the Automatic Traffic Count (ATC) Stations throughout Metn caza is shown in Figure MM (in Annex 1).

Metn R1a

Two ATC stations were installed along Metn road 1a in order to determine level of traffic. The ADT counts showed a minimum of 1,244, a maximum of 4,206, and an average of 2,602 vehicles per day (refer to Table F in Annex 1). Moreover, the type and classification of vehicles were determined, where it was revealed that a passenger car was the main vehicle type (94.2 %) maneuvering the road, followed by a four-tire truck (3.6 %) (Refer to Table G in Annex 1).

Metn R2a

One ATC station was installed along Metn road 2a in order to determine level of traffic. The ADT counts showed a minimum of 17,620, a maximum of 18,327, and an average of 17,974 vehicles per day (refer to Table H in Annex 1). Moreover, the type and classification of vehicles were determined, where it was revealed that a passenger car was the main vehicle type (83.5 %) maneuvering the road, followed by a motorcycle (9 %) (Refer to Table I in Annex 1).

Metn R3

Three ATC stations were installed along Metn road 3 in order to determine level of traffic. The ADT counts showed a minimum of 656, a maximum of 4,003, and an average of 2,199 vehicles per day (refer to Table J in Annex 1). Moreover, the type and classification of vehicles were determined, where it was revealed that a passenger car was the main vehicle type (94.2 %) maneuvering the road, followed by a motorcycle (3.2 %) (Refer to Table K in Annex 1).

Metn R4

One ATC station was installed along Metn road 4 in order to determine level of traffic. The ADT counts showed a minimum of 658, a maximum of 670, and an average of 664 vehicles per day (refer to Table L in Annex 1). Moreover, the type and classification of vehicles were determined, where the following distribution was revealed: passenger cars (88.7 %), motorcycles (5.7 %), and four-tire trucks (3.5 %) (Refer to Table M in Annex 1 for complete classification).

Summary of Results:

The ADT values were determined in order obtain an idea about the level of traffic in each of the four Metn roads. Clearly, given that Metn 2a road is a primary road (closest to the coast and urbanized areas), it witnessed the highest traffic volume (maximum of 18,327 vehicles per day). On the other hand, Metn road 4, which is also a primary road but situated in a rural area having the highest altitude among all roads, witnessed the least traffic volume (average of 664 vehicles per day). The remaining two roads (Metn R1a and R3) witnessed similar to very close traffic counts, with averages of 2,602 and 2,199 respectively.

Finally, it was shown that passenger cars were the main mode of transportation used, followed by motorcycles and four-tire trucks.

5. Potential Environmental and Social Impacts

The expected social and environmental impacts were assessed during both the rehabilitation and operation phases of the project. Regarding the operation phase, this assessment entails the "**Defects Liability Period'** during which the Contractor is responsible for maintenance activities.

Regarding the social assessment, potential beneficiaries of the project and the adversely affected groups, including Lebanese and Syrians involved in the project and/or living in the surrounding communities of Metn R1a, R2a, R3 and R4 were considered in this assessment. Moreover, concerning refugee camps, during the site visits to Metn R1a, R2a, R3 and R4, refugee camps of vulnerable groups such as Syrians were not observed. As such, impacts on socio economic conditions of vulnerable groups were assessed as part of the impacts on the surrounding residential areas, as in this case displaced Syrians are not living in specific camps, and thus are considered as part of the local communities of Metn. Moreover, it is important to mention that rehabilitation and maintenance works in Metn R1a, R2a, R3 and R4 will not require land acquisition, therefore, vulnerable groups along the roads to be rehabilitated in Metn Caza will not be relocated.

5.1 Assessment Methodology

The assessment followed the Lebanese MoE grading methodology stated in Decree 260/1, dated 2015. The impact grading methodology is explained in this section.

This approach was adopted in order to address the several sources of impacts from the project's rehabilitation and operational phases. The stages of the evaluation process are the following:

1. Identification of project-related activities (sources) and environmental aspects.
2. Identification of potential impacts to the environment (physical, biological, human, cultural).
3. Evaluation and assessment of the related unmitigated impact significance.

Impacts are first classified as shown the table below:

Table 5-1 Classification of impacts

Matrix	Classification	Criteria
N (Nature)	**P** (Positive)	• The proposed activity offers benefits for the overall project
	N (Negative)	• Impacts having minimal to major negative influence
	D (Direct)	• Impact arising directly from the project activities
	I (Indirect)	• Impacts arising from activities not directly related to the project development
M (Magnitude)	**L** (Low)	• High potential to mitigate negative impacts on the physical, biological or human environment to the level of insignificant effects. • Disturbance of degraded areas with little conservation value. Minor changes in species occurrence or variety.

Matrix	Classification	Criteria
		• Simple mitigation measures may be needed to minimize impacts
	M (Moderate)	• Medium range (beyond site boundary but restricted to local area). • Medium-term (reversible over time, duration of operational phase). • Potential to mitigate negative impacts on physical, biological or human environment. However, the implementation of mitigation measures may still not prevent some negative effects. • Destruction/Disturbance of areas with potential conservation value. Complete changes in species occurrence or variety. • Mitigation measures will help minimize impacts
	H (High)	• Disturbance to areas of high conservation value. Destruction of rare or endangered species. • Mitigation is required. • Largely irreversible impacts on the physical, biological or human environment. • Has a massive impact on the surrounding livelihood. • Potentially irreparable damage to a site of social and/or cultural importance
E (Extent)	**L** (Local)	• Limited to the project area • Locally occurring impact within the locality of the proposed project
	G (Global)	• Extend beyond the local area • National impact affecting resources on a national scale
T (Timing)	**S** (Short-term)	• Activities and their related impacts are characterized by a short duration of effect
	M (Medium-term)	• Activities and their related impacts are characterized by a medium duration of effect
	L (Long-term)	• Activities and their related impacts are characterized by a long duration of effect
D (Duration)	**C** (Construction)	• Impacts arise during the construction phase of the proposed project
	O (Operation)	• Impacts arise during the operational phase of the project
R (Reversibility)	**R** (Reversible)	• Impacts may be reversible, or able to be rehabilitated upon the decommissioning of the proposed project
	I (Irreversible)	• Impacts may not be reversible, or able to be rehabilitated upon the decommissioning of the proposed project
L (Likelihood of occurrence)	**L** (Low)	• The classified impact is unlikely to occur under normal operating conditions
	M (Medium)	• The classified impact may possibly occur
	H (High)	• The classified impact is unlikely to occur under normal operating conditions

Matrix	Classification	Criteria
S (Significance)	**L** (Low)	• Results in no substantial adverse change to existing environmental conditions
	M (Medium)	• Substantial adverse change to existing environmental conditions • Can be mitigated to less-than-significant levels by implementation of proposed potentially feasible mitigation measures or by the selection of an environmentally superior project alternative
	H (High)	• Substantial adverse change to existing environmental conditions • Cannot be fully mitigated by implementation of all feasible mitigation measures

The environmental significance matrix adopted is based on the well-known "weighted scoring" or "weighing and scoring" method used as a tool in various decision analysis applications. In this method, the following steps takes place:

1. Attributes relevant to the project are chosen
2. Weights or numerical values are assigned to each attribute depending on its importance (values should be based on objective data or expert opinion to exclude subjectivity during the process).
3. Scores are allocated to each option to reflect its status with respect to each attribute

The final result is a single weighted score for each option, which is used to quantify its overall performance/significance. As such, the adopted matrix is designed to allow subjective conclusions to be numerically recorded or quantified, therefore providing at the same time an impact evaluation and quantitative record to revert to in the future:

Table 5-2 Significance Impact Matrix

	Magnitude x Extent x Duration								
Likelihood x Frequency	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	2	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**
	3	**6**	**9**	**12**	**15**	**18**	**21**	**24**	**27**
	4	**8**	**12**	**16**	**20**	**24**	**28**	**32**	**36**
	5	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**
	6	**12**	**18**	**24**	**30**	**36**	**42**	**48**	**54**

***Yellow**: Negligible / **Green**: Low significance / **Blue**: Medium significance / **Red**: High significance*

5.2 Positive Impacts during Rehabilitation

5.2.1 Positive Social Impacts

Positive socio-economic impacts, during rehabilitation, is creating direct and indirect short-term jobs for Lebanese and Syrians living in the community around the selected roads. In turn, local economic development and livelihood opportunities will be enhanced. Direct job opportunities at the selected road rehabilitation sites will be offered to poor communities and vulnerable groups (low skilled Lebanese and Syrians) in order to enhance their socio-economic conditions. The roads rehabilitation project will also create indirect jobs for low skilled

Lebanese and Syrians in supporting industries and services (such as production of construction materials at local shops and factories, transportation of materials, maintenance of equipment).

Moreover, the road rehabilitation project will also enhance the local economic development of the surrounding community in the following three cases:

- Knowing that the Contractor will not perform vehicle and equipment repair onsite, preferably maintenance activities will be done in repair shops surrounding the Metn R1a, R2a, R3 and R4.
- The Contractor will rent a fenced land in the surrounding area of Metn R1a, R2a, R3 and R4 to be used for parking purposes.
- The Contractor might rent an apartment for the low skilled workers (in case hiring of low skilled workers from the surrounding community is not possible) form the nearby community.

Further, Lebanese and Syrian workers' skills and experience in road rehabilitation and maintenance will be strengthened, as a result of the learning and training programs of the job onsite.

5.3 Potential Negative Impacts during Rehabilitation

5.3.1 Potential Negative Environmental Impacts

Negative impacts that may derive from the project rehabilitation phase are namely adverse impacts on the local environment. This section elaborates the potential impacts on each environmental component.

5.3.1.1. Impacts on Water Quality

The roads in Metn Caza mostly fall on a karstic limestone formation. The system is characterized by a significant amount of groundwater flowing in channels, faults and fractures. The transmissivity of these formations is generally high and water table is shallow.

Any accidental spillage of wastewater (from the portacabin toilet), chemicals, or toxic substances onto open ground can easily infiltrate the karstic limestone and is highly likely to pollute water present in the subsurface. Moreover, any dumping of solid waste or discharge of wastewater into the streams and winter channels will lead to adverse impacts to the downstream "Wadi Antelias" river.

Generally, all the roads in Metn Caza are in close proximity to streams, except for Metn R 2a. Thus, direct pollution of the surrounding streams is anticipated, if proper management practices are not adopted.

The major impacts on groundwater and surface water during the rehabilitation works can be associated with the following activities:

- During installation of concrete barriers, on-site concrete pouring may leach and get deposited in nearby streams.
- During paving of road, any accidental deposition of toxic asphalt substances into nearby streams can cause pollution of surface water and underground aquifers since most of the road alignments fall on a karst limestone aquifers (refer to Figure M, Figure N,Figure O, Figure P, Figure Q, and Figure R in Annex 1).
- During installation of road markings, spillage of chemical paint substances can also pollute open channel watercourses.
- Excavations, drilling, and milling produce substantial amounts of dust and scattered pavement materials. Dust can enter water courses when it is mixed and directed by rain or it can be deposited naturally. This can cause cloudiness and increased water turbidity.
- The portacabin toilet is a source of wastewater generation. Improper management of the generated waste will pollute nearby surface water bodies, streams and underground aquifers since most of the road alignment falls on a karst limestone aquifers. This means that transmissivity is high in the project area, thus, proper management practices should be implemented to avoid contamination of surface and groundwater resources.
- Contaminated stormwater runoff along with sediment transport from the rehabilitation site into the surrounding streams is possible. Storm water runoff or a direct point source discharge can transport pollutants, deposits and residues as well as eroded materials from the site into the receiving environment. Storm water may carry with it the following:

    - Spilled fuels
    - Slurry from pavement milling, drillings, and excavations for drainage ditches
    - Suspended particles, such as sand, slits, bentonite, cements
    - Solid waste, such as plastic, paper, bottles, wood

All of the aforementioned discharges can significantly impact water quality in the area. Proper management modalities would be crucial in order to reduce and prevent contamination of water resources surrounding the roads to be rehabilitated in Metn Caza.

Accordingly, the impacts on water quality are assessed as: direct, moderate, local, short-term, irreversible, of high likelihood of occurrence and of medium significance.

5.3.1.2.Impacts on Soil Quality

Excavation

Excavation of soil to install new drainage ditches will result in disturbance of soil structure and thus may cause an increase in soil erosion and release of sediments. This will permanently change the structure of the soil and surface geology.

Mismanagement of Solid Waste and Wastewater

Rehabilitation activities, specifically pavement reconstruction will result in the generation of solid and hazardous wastes; mainly rehabilitation waste such as old asphalt layers, crushed sub base aggregates, etc.…Improper management of the waste generated from the rehabilitation

works, direct disposal of the domestic-like solid waste (mainly plastic, paper, bottles…), and the direct discharge of domestic-like wastewater (from the portable toilet) generated by the engineers and workers onsite will significantly impact soil quality.

Accidental Leakages

Accidental spills of bituminous materials with construction runoff and storm water might result in soil quality deterioration.

Accordingly, the impacts on soil quality are assessed as: direct, moderate, local, short-term, irreversible, of high likelihood of occurrence and of medium significance.

5.3.1.3.Impacts on Air Quality

Exhaust emissions

Impacts on air quality during the rehabilitation works include exhaust emissions of CO, CO_2, NOx, and SO_2 due to increased traffic flow, combustion of diesel for the movement of vehicles/machinery. Constructions vehicles involved in pavement works include but are not limited to:

- Excavators (emission factors presented in Table 5-3)
- Vehicles transporting workers to/from site (i.e. buses, mini-vans, cars).
- Delivery vehicles (i.e. aggregate delivery trucks, and light delivery vehicles)

Combustion and vehicle exhaust gases constitute a complex mixture of organic and inorganic substances such as: PM10, NO_2, SO_2 Toluene, Xylenes, and Ozone. These combustion sources are likely to be extremely difficult to quantify due to the unpredicted operational needs throughout the rehabilitation process.

Table 5-3 Emission factors for construction equipment (Ahn, Pan, et.al, 2010)

Equipment	HC (g/hr)	CO (g/hr)	NO_x (g/hr)	PM (g/hr)	CO_2 (g/hr)
Bulldozer	130.09	270.01	806.53	5.56	55.13
Dumper	100.53	272.45	962.29	8.78	83.44
Excavator	56.78	128.26	385.64	2.94	28.84
Grader	75.52	200.45	655.43	5.86	56.48
All equipment	18.34	63.00	105.96	0.367	6.72

Dust emissions

Dust is an almost inevitable consequence of roadwork. Gravel and crushed gravel and hard rock aggregates always contain a proportion of fines, and if the material is dry, a fairly heavy dust cloud can be raised when it is mobilized.

The following activities associated with the rehabilitation phase are anticipated to lead to the generation of dust:

- Excavation and leveling works

- Movement of raw materials transporting vehicles on unpaved surfaces
- Unloading of raw materials
- Open storage of raw materials
- Disturbances to material stockpiles by local winds and material handling, which is of great significance depending on the road location.
- Wind blow during transportation of materials by vehicles and specifically when transporting on unpaved roads.

Dust emissions from each of the sources described above will be largely dictated by the wind conditions in the area. Emission of large quantities of fugitive dust may adversely impact air quality, construction workers and surrounding communities.

Nearby receptors such as churches, schools and residential buildings (shown in Figure GG, Figure HH, Figure II, Figure JJ, Figure KK, and Figure LL in Annex 1) to be disturbed by the generated fugitive emissions are presented in section 4.3.2. For instance, the assessment showed that towards the end segment of the Metn R1a section 1 (mainly from station 4+800 to station 5+400), Metn R2a, Metn R3 section 1 and first segment (0+000 to 0+900) of Metn R3 section 2 are mostly urbanized. In other words, they are surrounded by numerous sensitive receptors such as churches and schools, located at a distance of less than 10 m from the roads (refer to Table 4-15). Further, the agricultural lands in Ain el Teffaha (Metn R1a section 2) and Baskinta (Metn R4) will be adversely affected by the generated dust emissions.

Odor emission

Odors from asphalt fumes can cause unpleasant smells to the surrounding. Sensitive receptors such as churches and schools near the roads at a distance of less than 10 m (Table 4-15) can be highly affected.

Accordingly, the impacts on air quality can be assessed as: direct, high, local, medium-term, irreversible, of high likelihood of occurrence and of high significance.

5.3.1.4.Impacts on Acoustic Environment

A significant increase in noise is expected during pavement reconstruction along the road sections. Rehabilitation activities may create a problem of noise and vibration generated by construction equipment, truck traffic, and other similar sources. Noise will be mainly generated while mobilizing equipment for the transportation, excavation of land, and raw material transportation.

The road rehabilitation noise and vibration levels highly depend on the type of the equipment/heavy machinery, magnitude and duration of the rehabilitation activities. The main sources of noise are heavy machinery such as, excavators, bob cat, steel roller, pick- up, dump trucks, etc.… Noise generating activities, such as pavement milling and drilling, can cause unpleasant noise levels and disrupt teaching activities at nearby schools. The potential impact depends on the magnitude and duration of rehabilitation-related activities. Works such as road markings, signing, etc.…, do not generate high noise levels and do not disturb the surrounding environment.

Nearby receptors such as churches, schools and residential buildings to be disturbed by the generated noise are presented in section 4.3.2. For instance, the assessment showed that last segment of the Metn R1a section 1 (mainly from station 4+800 to station 5+400), Metn R2a, Metn R3 section 1 and first segment (0+000 to 0+900) of Metn R3 section 2 are mostly urbanized. Additionally, they are surrounded by numerous sensitive receptors such as churches and schools, located at a distance of less than 10 m from the roads (refer to Table 4-15).

Therefore, high noise levels should be minimized to avoid nuisance of the surrounding residents and minimize the health effects of vibration and high noise levels on the construction workers.

Accordingly, the impacts on the acoustic environment are assessed as: direct, moderate, local, short-term, reversible, of high likelihood of occurrence and of moderate significance.

5.3.1.5.Impacts on Visual Intrusion

Visual impacts relate to changes in available views of the landscape, and the effect of those changes on the surrounding environment. Visual intrusion during road rehabilitation works is unlikely to be significant. The road already exists and no major excavation works will be taking place to block a natural scenery view. Impacts on visual intrusion are of very low significance.

Accordingly, the impacts on visual intrusion are assessed as: direct, low, local, short-term, reversible, of low likelihood of occurrence and of negligible significance

5.3.1.6.Impacts on Biodiversity

Given that the project aims to upgrade existing roads by improving drainage, slopes, embankments, traffic signs, shoulders, and other structures; strengthening pavements; and completing resurfacing (i.e. no widening of roads will take place), expected impacts on natural habitats are potential spillages of wastes, dust raised, and increase in noise, light, and traffic movement during rehabilitation work.

In particular, direct effects on wildlife include the generation of emissions and disturbances such as noise, dust, and pollutants in the soil and vegetation (Rajvanshi *et al.* 2001). In fact, it was 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 influences animal behavior, altering activity patterns, and causing stress, loss of reproductive success, and physiological disturbance. Normally, some animals may vacate the area, while, others may get used to the noise (responses may vary among species). Further, wastewater discharge and illegal dumping of solid waste into the roadside shrublands and riparian habitats can severely affect the local fauna and flora and eventually lead to population destruction. In addition, given that lighting poles will be rehabilitated when needed, additional lighting might affect local fauna in sensitive habitats.

Finally, during rehabilitation, there is an increase in traffic movement; this can induce increased roadkill (i.e. mortality due to vehicular collisions). Animals that are attracted to roads or that need to cross them are more vulnerable.

However, given that the concerned roads generally involve paths that are already under anthropogenic influences, the potential impacts of the project on the local biodiversity are expected to be limited to disturbance of local fauna only when roads are surrounded by maquis ecosystems (short segments in Metn R3 and Metn R1a (section 1), potential illegal dumping and discharge of wastes into streams (involves all Metn roads) and dust accumulation on nearby vegetation and agricultural lands (mainly Metn R4).

Accordingly, the impacts on biodiversity are assessed as: direct, moderate, local, short-term, irreversible, of medium likelihood of occurrence and of medium significance

5.3.1.7.Impacts on Existing Infrastructure

The road rehabilitation works might have adverse impacts on the existing infrastructure including underground cables, sewage network, and water network existing under the road pavement. Random digging and milling of deteriorated road pavement, without previous investigation of possible existence of underground appliances, may interfere with any existing infrastructure; that is possibly serving nearby surrounding residential and agricultural areas. Damage of existing infrastructure, for instance wastewater infrastructure or water networks, can cause several undesirable impacts such as cutting off water supply for irrigation, generation of bad smells, and attraction of water borne diseases and vectors due contaminated water accumulation.

Accordingly, impacts on existing infrastructure are assessed as direct, moderate, local, short-term, reversible, of medium likelihood of occurrence, and of low significance

5.3.1.8.Impacts on Resources Consumption

Freshwater Demand

During the rehabilitation phase, water will be supplied from the Water Establishment of Mount Lebanon by tankers, if needed. Freshwater will be mainly used for dust suppression of the temporary stockpiles onsite.

Worker camps will not be installed since the Contractor will employ low skilled Syrians and Lebanese from the surrounding communities of Metn R1a, R2a, R3 and R4. As a result, the unskilled workers will get their food and water supply from their homes. In addition, the nearby office will provide water for the Contractor’s engineers, technical/skilled labor, and the supervising consultants. Consequently, water resources will not be required for domestic purposes.

Water consumption varies and it cannot be estimated as it highly depends on the rehabilitation activities, working days per year and other factors. Rehabilitation activities will consume moderate volumes of water, it will only be for a relatively short finite period.

Energy Demand

During the rehabilitation phase, required works will require the use of several heavy equipment/machinery that highly consume energy in the form of fossil fuel, leading to the depletion of fossil fuel resources. However, the rehabilitation phase will be of short-term.

Raw Materials Demand

During the rehabilitation phase, required works will necessitate the use of raw materials (refer to Table 3-10), leading to depletion of natural resources.

Accordingly, the impacts on resource consumption are assessed as: direct, moderate, local, short-term, irreversible, of high likelihood of occurrence and of medium significance.

5.3.1.9.Impacts on Public and Workers Health and Safety

a) Occupational Health and Safety

Occupational hazards during the rehabilitation works are associated with working in all weather conditions, handling heavy machinery and other sophisticated rehabilitation equipment and long hours of work. In addition, continuous exposure to environmental emissions resulting from the rehabilitation activities can induce health problems. Moreover, a badly planned site can increase the risk of accidents and injuries from falls of materials and collisions between workers and machinery or equipment. Finally, prevention and protective measures should be introduced according to priorities. The potential types of occupational hazards that might occur during the rehabilitation works of the roads include the following:

Physical hazards

Physical hazards are potential accidents or injuries or illnesses that occur due to repetitive exposure to mechanical action or work activity (IFC, 2007). Forms of physical hazards are but not limited to the following:

Slips, Trips and Falls: Slips, trips and falls have been identified as being the most hazardous feature of survey sites. Occasionally, as a survey progresses, increasing numbers of people crossing these areas results in gradually worsening conditions.

Unplanned Trenching: Vibration may be caused from heavy equipment or from street traffic. Moving heavy equipment may include bulldozers, backhoes, loaders, and/or dump trucks. Equipment and materials may collapse trench walls if operated or stored too close to the trench edge. Water and temperature changes can pose a serious threat to excavations and trenches. Sources of water on job sites include surface water, the level of the water table, moisture content, rain, and cities with existing utilities in the right-of-way.

Environment Hazard: those types of hazards are due to environmental factors like the weather, sun and similar factors and they may lead to the following:

- Hypothermia and Hyperthermia due to sun exposure or sudden temperature change
- Hypotension and Hypertension due to lack of nutrients and medical history

- Dehydration lost due to lack of fluids and excess loss of body water through urine, tears, stool and sweat. An individual can sweat an average of 1.1 liters / hour when exposed to sun.
- Fire caused by accident or ignited by outsiders that will lead to external and internal burns.
- Bites and stings from the wilderness and most common are bees and snakes.

Noise: Extended exposure to excessive noise levels can cause noise-induced hearing loss specifically noise levels above 85 (dB) can cause hearing loss.

Vibrations: Earthwork activities and material loading / unloading activities generate levels of vibrations. Exposure to high level of vibrations for a significant duration will affect workers' health such as carpal tunnel syndrome and permanent damage to the nerves. Whole-body vibration can occur from operating large mobile equipment such as drillers, air hammers, pile drivers, tractors, graders, excavators and many more. Hand-arm vibration can result from using hand-held equipment such as drills, hammers and disc grinders. Hand-arm vibration may cause carpal tunnel syndrome, a disease that affects the fingers and hands.

Vehicle Hazards

Vehicles transporting personnel and equipment to the study area are subject to vehicle hazards (transport impacts, road accidents, vehicle crashes). Vehicle crashes can be divided into the following types:

- Frontal and rear impact
- Rotational impact
- Rollover

Chemical Hazards

Chemical hazards occur due to exposure to toxic, corrosive, sensitizing or oxidative substances. During rehabilitation activities, employees are mainly at risk of being exposed to asphalt fumes from pavement works among other solvents. Exposure to asphalt fumes is linked to acute effects such as headache, fatigue, reduced appetite, breathing problems, and skin irritation (Norseth et al, 1991).

Ergonomic Hazard

Ergonomic factors, such as repetitive motion, overexertion, and manual handling lead to occupational injuries such as strains, low back pain, fatigue and others. According to Sang et al (2007), there has been, for years, an increase in rates of work-related musculoskeletal disorders in highway construction specifically and the construction industry in general. Common causes are manual material handling and awkward postures, especially when lifting.

b) Public Health and Safety

Most of the potential impacts on public health and safety comprise of those described in the previous sections. For instance, the impacts on water quality and availability, air quality soil quality, etc… all have consequences on human health. Nonetheless, some potential impacts, which were not yet discussed, are addressed in this section. First, during the rehabilitation activities, risk of road traffic accidents might increase in between vehicles, pedestrians and vehicles, specifically in highly populated areas surrounded by residential buildings and schools. Second, the proximity of the roads to communities and the open access to rehabilitation sites consist of a potential risk to the public, namely the risk of injuries as a consequence of falls or contact with heavy equipment. This might occur in case of unauthorized or accidental entry of residents into areas where the rehabilitation activities are taking place. This risk, however, is commonly encountered in cases of road rehabilitation projects and will be addressed through a standard set of best practices. This includes the usage of proper signage and barriers, in addition to flagmen and temporary traffic signs when necessary (refer to section 6.1.8).

Accordingly, impacts on health and safety are assessed as: negative, moderate, local, short-term, irreversible, of high likelihood of occurrence and of medium significance

5.3.2 Potential Negative Social Impacts during Rehabilitation

Generally, during the rehabilitation and maintenance activities, adverse impacts on socio-economic conditions are associated with nuisance, traffic disturbance, labor influx and increase in GBV risks associated with SEA and SH, inappropriate labor conditions and obstruction of temporary access routes to sensitive receptors and others. Therefore, the potential impacts on socio-economic conditions of laborers onsite and the residents of the surrounding communities of Metn R1a, R2a, R3 and R4 are presented below.

The adverse impacts of the project on socio-economic conditions will be temporary in nature, however, implementing appropriate measures to mitigate these impacts is the core responsibility of the Contractor.

5.3.2.1. Impacts on Socio-Economic Conditions of Surrounding Communities

(1) Traffic Disturbance and Nuisance

During the rehabilitation works of the Metn R1a, R2a, R3 and R4, potential socioeconomic impacts include, nuisance and traffic disturbance from the rehabilitation activities onsite. The most significant sources of noise and traffic are heavy machinery and the movement of transport vehicles into and from the rehabilitation site, leading to increase in commuting time and inconvenience to roads users.

(2) Labor Influx and Labor Induced SEA

Potential labor influx will increase the risk of labor induced SEA towards women in the surrounding communities. SEA is defined as “any actual or attempted abuse of a position of vulnerability, differential power, or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another”. Sexual abuse is further defined as “the actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions” (World Bank, 2018). In this context,

project beneficiaries or members of project-affected communities may experience SEA (World Bank, 2018).

Knowing that the project is expected to employ low skilled Syrians and Lebanese already living in the community around the selected roads for rehabilitation, large labor influx of outsiders into the communities might not occur. However, since the roads to be rehabilitated (such as Metn R1a section 1, Metn R2a and Metn R3 section 1) are in close proximity to residences, schools and other sensitive receptors, the potential risk for SEA is increased. It is important to note that if the Contractor doesn't recruit low skilled labor from the nearby communities, the risk of SEA towards women in the community will be high.

(3) Obstruction of Access Routes to Sensitive Receptors

Impacts on sensitive receptors include, temporary obstruction of access routes to residential units, schools, places of worship and hospitals (refer to Figure GG, Figure HH, Figure II, Figure JJ, Figure KK, and Figure LL in Annex 1), as presented in section 4.3.2. In specific the assessment showed that the most urbanized roads to be affected by temporary obstruction of sensitive receptors are the final segment of the Metn R1a section 1 (mainly from station 4+800 to station 5+400), Metn R2a, Metn R3 section 1 and first segment (0+000 to 0+900) of Metn R3 section 2. In other words, these roads will be highly affected since they are surrounded by numerous sensitive receptors such as churches and schools, located at a distance of less than 10 m from the roads (refer to Table 4-15).

5.3.2.2.Impacts on Socio-Economic Conditions of Labor

(1) Labor Induced SH

The employment of both men and women in REP project might increase the risk of SH towards female employees at the workplace. SH is defined as "Unwelcome sexual advances, requests for sexual favors, and other unwanted verbal or physical conduct of a sexual nature occurring between personnel/staff working on the project" (World Bank, 2018).

(2) Child Labor

The immense needs of vulnerable communities may result in underage workers making themselves available for work. This could result in the employment of child laborers. Employment of underage labors is a violation of the Lebanese Law No. 0 dated 1946. Given the type of planned rehabilitation works, children can get injured in the workplace. In this context, employers are subject to the youth employment provisions under Law No. 0.

(3) Inadequate Labor Conditions

The project can result in poor labor conditions in the case of the violation of labor law. The project beneficiaries, Lebanese and Syrian communities, might not have work permissions or contractual protections with contractors and their wages are to be set by the market. While Contractors should follow local labor laws, in Lebanon, monitoring of whether local labor laws are followed is not always performed. Therefore, large and vulnerable population of beneficiaries may be at risk of working for wages that are less than those recognized by the law

and may be forced into accords that are not consistent with the law (e.g. work schedules or rest periods).

(4) Social tensions and conflict over job-sharing and dissatisfaction with allocation of project-generated jobs.

The project is expected provide job opportunities for both Syrians and low-skilled Lebanese in host communities. Syrians already tend to work in low-paid work, often decreasing the rate of salaries in the formal labor market and inducing conflicts within local communities. Moreover, potential perceptions that project employment ratios favor Syrian communities might further worsen the social tensions between the two groups.

(5) Risk of under-participation or underemployment or discrimination of women

The risk of under-participation or underemployment or discrimination of women in the context of REP project will be high, if the Contractor doesn't set specific percentage of women employment to benefit from the project. Moreover, women's engagement in construction works is not common and also not encouraged, according to Lebanon's social and cultural norms.

5.4 Potential Positive Impacts during Operation

5.4.1 Potential Positive Environmental Impacts

The potential positive environmental impacts of the project are associated with enhanced road conditions.

First, improved drainage helps in decreasing contaminated storm water run-off and consequently helps limit the impact on the streams surrounding Metn R1a, R3 and R4. Further, slope stabilization activities will result in a positive impact as it decreases the chances of soil erosion. Improved drainage decreases likelihood of run-off water to reach and contaminate nearby soil. As a result, the project is expected to have a positive impact on soil quality during operation. Finally, the proposed rehabilitation works will result in less congestion and delays. Moreover, it is predicted that the project will increase the average speed per vehicle and reduce travel time which would typically improve the overall air quality through potential reduction in CO_2 emissions.

5.4.2 Potential Positive Social Impacts

The social benefits of the rehabilitation work, during operation, include transport connectivity and easier access to rural, peri-urban and urban areas. Additionally, the rehabilitated roads will result in potential reduction in traffic congestion, reduced travel time and transport cost. The improvement in the safety conditions of the roads (due to improved drainage and lighting, additional safety barriers, and slope protection measures) will lead to potential reduction in road accidents, during the operation of the Metn R1a, R2a, R3 and R4. In turn, this will result in economic savings from the reduced cost of road crash injuries and fatalities. Moreover, employment opportunities will be offered for a short period of time, knowing that the Contractor will be responsible for the routine maintenance of the roads, during the one year of Defects Liability Period (post rehabilitation phase).

5.5 Potential Negative Impacts during Operation

The negative impacts assessment, during the operation phase, mainly focuses on the maintenance activities that might be required during the Defects Liability Period (one-year period). However, it is important to mention that the Contractor might not perform any maintenance activities, if not necessary.

5.5.1 Potential Negative Environmental Impacts

5.5.1.1. Impacts on Water and Soil Quality

Potential impacts on water quality should be considered due to the particularity of the project area, knowing that Metn R1a, R3 and R4 are surrounded by streams and most of the roads fall on karstic limestone formation that generally has high transmissivity. Spills of chemicals and pollutants during maintenance activities can affect soil and water quality, if such activities are not managed properly.

Accordingly, impacts on water and soil quality are assessed as: direct, moderate, long-term, local, and irreversible, of medium likelihood of occurrence and of medium significance

5.5.1.2. Impacts on Air Quality and Odor Emission

During the operation phase of the project, impacts on air quality are associated with maintenance activities and movement of vehicles. This includes dust and exhaust emissions. The extent of the impact will depend on type and duration of required maintenance activities.

Moreover, the main expected vehicle emissions are (World Bank, 1997):

- Nitrogen oxides (NOx) which is a by-product of fuel combustion in combustion chambers, under conditions of extreme heat and pressure,
- Hydrocarbons (HC) which are produced due to the incomplete combustion of fuel and its evaporation. The emissions of hydrocarbons are strongly correlated with the type of fuel used. The most notorious HC produced are benzene and ethylene.
- Carbon monoxide (CO) which is the result of incomplete combustion in engines
- Sulfur dioxides (SOx) emissions which are directly linked to the sulfur content of the fuel.

Accordingly, impacts on air quality are assessed as: direct, moderate, short-term, local, and irreversible, of medium likelihood of occurrence and of medium significance

5.5.1.3. Impacts on Acoustic Environment

The operational phase is expected to be associated with increased noise levels during maintenance activities. Noise is mainly associated with four main sources: a) vehicles noise, b) friction between vehicles and the road surface, c) driver behavior, and d) maintenance activities (Table 5-4) (World Bank, 1997).

Table 5-4 Sources of acoustic pollution during road operation

Noise Source	Impacts
Vehicle noise	Transportation vehicles generally produce noise from the engine, transmission, suspension, braking, and stop-and go traffic conditions. The noise levels are expected to increase with the poor maintenance of vehicles accessing the road.
Road noise	Contact between tires and pavement significantly contributes to overall traffic noise. The level depends on the type and condition of tires and pavement. The frictional noise increases with higher speed and during sudden braking.
Driver behavior	Vehicles' horns, loud music, shouting, sudden braking or accelerating contributes to traffic noise.
Road maintenance	Periodically, road maintenance is generally required. Such activities will utilize heavy machinery which will contribute to noise pollution.

The exposure to increased noise levels can affect the wellbeing of local residents, both physiologically and psychologically. Noise exposure is considered a source of annoyance which might result in increased stress levels and health impacts. It can cause auditory fatigue, temporary and permanent lessening of hearing ability and sleep disorders (World Bank, 1997).

Accordingly, impacts on acoustic environment are assessed as: direct, moderate, short-term, local, and reversible, of high likelihood of occurrence and of medium significance

5.5.1.4.Impacts on Biodiversity

During the operation phase of the project, in general, the impacts on biodiversity are expected to be very limited as no additional roads will be built. On the contrary, rehabilitation of existing roads will probably improve the conditions of adjacent lands and plant communities (the impacts of vehicle-generated dust from unpaved roads will be reduced).

The main expected impacts during operation on the local ecosystem include (1) the potential sedimentation of heavy metals due to surface runoff (Batool et al, 2012) if drainage systems were not fixed; (2) the potential spills during maintenance activities, and (3) the increase in light pollution levels, when roads are equipped with additional light (the project will involve the rehabilitation of lighting poles on Metn R1a, Metn R3, Metn R2a and the provision of additional lighting brackets on Metn R1a).

However, light pollution can be reduced if the contractor used green lights when new lights deemed necessarily. Moreover, given that the concerned roads generally involve paths that are already under anthropogenic influences, potential impacts are expected to be of low significance. Only limited segments of ecological significance can witness further disturbance from the project. These segments are surrounded by maquis ecosystems (short segments in Metn R3 and Metn R1a (section 1).

Accordingly, impacts on biodiversity are assessed as: direct, moderate, local, long-term, irreversible, of high likelihood of occurrence, and of medium significance

5.5.1.5.Impacts on Energy Consumption

Energy consumption is expected to be high during the operation phase of the project due to additional lightings. Moreover, maintenance works will require the use of several heavy equipment/machinery that highly consume energy in the form of fossil fuel, leading to the depletion of fossil fuel resources.

Accordingly, impacts on energy consumption were assessed as: direct, low, short-term, local, and reversible, of moderate likelihood of occurrence and of medium significance.

5.5.1.6.Impacts on Public and Workers Health and Safety

During the operation phase of the project, occupational health hazards can be attributed to maintenance-related accidents. Proper supervision and the implementation of adequate safety measures will limit the occurrence of accidents from maintenance activities. Any maintenance works and their potential impacts are expected to be similar in nature to those of this project's rehabilitation phase (disturbance of traffic and road accidents).

Accordingly, impacts on health and safety are assessed as: direct, moderate, local, short-term, reversible, of medium likelihood of occurrence and of medium significance

5.6 Summary of Potential Environmental Impacts

Rehabilitation phase

During the rehabilitation phase of the project, the impact on air quality is expected to be of high significance.

Table 5-5 Summary of potential negative environmental impacts during rehabilitation

Environmental Receptor	Impact															Significance
Sources	Accidental leakages of concrete pouring, toxic asphalt substances , chemical paints	Excavations , milling and drillings	Contaminated storm water runoff	Domestic-like solid waste (plastic, paper, bottles and others)	Waste such as old asphalt layers, crushed sub base aggregates	Vehicles transporting workers	Delivery vehicles	Unloading and open storage of raw materials	Odors from asphalt fumes	Mobilization and use of are heavy machinery	Changes in available views of the landscape	Exposure to environmental emissions	Road traffic accidents	Handling heavy machinery	Physical, chemical, biological and ergonomic hazards	
Water Quality	x	x	x	x												
Soil Quality	x	x	x	x	x											
Air Quality		x				x	x	x	x							
Acoustic Environment		x				x	x			x						
Biodiversity	x	x	x	x	x						x					
Visual Amenity											x					
Existing Infrastructure		x														
Resources Consumption										x						
Health and Safety												x	x	x	x	

Operation phase

Summary of negative environmental impacts during the operation phase are presented in Table 5-6.

Table 5-6 Summary of potential negative environmental impacts during operation

Environmental Receptor	Impact						Significance
	Accidental spills of chemicals and pollutants	Dust and exhaust emissions	Use of vehicles heavy equipment and machinery	Accidents from Handling of heavy machinery	Disturbance of traffic and road accidents	Light and noise pollution	
Water and Soil Quality	x						
Air Quality		x	x				
Acoustic Environment			x				
Biodiversity	x	x				x	
Resources Consumption			x				
Health and Safety				x	x		

Significance	
High	
Medium	
Low	
Negligible	

During the operation phase of the project, the main environmental positive impacts are presented in Table 5-7.

Table 5-7 Summary of positive environmental impacts during operation

Environmental Component	Positive Impacts
Water quality	Decreased contaminated stormwater runoff due to the improved drainage
Soil quality	Decreased chances of soil erosion due to slope stabilization
Air quality	Improvement in the overall air quality through potential reduction in CO_2 emissions, as a result of increased the average speed per vehicle and reduced travel time

5.7 Summary of Potential Social Impacts

Rehabilitation Phase

Summary of expected positive and negative social impacts of the project during its rehabilitation are presented in Table 5-8

Table 5-8 Summary of potential positive and negative social impacts during rehabilitation

Potential Positive Social Impacts
• Creating direct and indirect short-term jobs for Lebanese and Syrians living in the surrounding community • Enhancing economic development and livelihood opportunities • Strengthening Lebanese and Syrian workers' skills and experience in road rehabilitation and maintenance
Potential Negative Social Impacts
• Labor influx (in case the contractor doesn't recruit labor from the surrounding community) and potential risk of labor induced SH towards female workers and SEA towards women in the surrounding community (due to the close proximity of residents and schools to the roads to be rehabilitated). • Potential risk of child labor • Poor labor conditions • Dissatisfaction with job allocation • Risk of under-participation or underemployment of women • Nuisance and traffic disturbance • Temporary obstruction of access routes to sensitive receptors

Operation Phase

Summary of expected positive social impacts of the project during its operation are presented in and Table 5-9.

Table 5-9 Summary of potential positive social impacts during operation

Potential Positive Social Impacts
• Enhanced transport connectivity • Potential reduction in traffic congestion, reduced travel time and transport cost • Potential reduction in road accidents • Economic savings from the reduced cost of road crash injuries and fatalities • Short-term employment opportunities for routine maintenance (during the first year of operation)

6. Mitigation of Environmental and Social Impacts

6.1 Mitigation Measures during Rehabilitation

As part of the ESMP, mitigation refers to the set of measures taken to eliminate, reduce, or remedy potential undesirable effects resulting from the rehabilitation of the proposed project.

Generally, mitigation measures are to be considered in all the developmental stages of the project. Mitigation is a description of the measures visualized in order to avoid, reduce and where practicable remedy significant adverse impacts. Moreover, it includes decisions about the modification of proposed development avoid, reduce or remedy the adverse environmental impacts that are identified.

6.1.1 Water and Soil Quality

Impacts on water and soil quality were assessed as: direct, high, local, short-term, irreversible, of high likelihood of occurrence and of medium significance. Thus, the proposed mitigation measures include:

Control of Soil Manipulation Activities

- 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
- Placement of geotextile silt traps as appropriate, especially in areas close to water bodies (when Metn R1a, R3 and R4 are in close proximity to nearby streams).

Control of Accidental Spills

- All refueling and maintenance operations shall take place off-site, vehicles should be fueled up before arriving to the road section
- A spill response plan shall be in place and all workers should be trained on its implementation.

Management of Solid Waste and Wastewater

- Good site practices including the effective disposal of all wastes generated on-site should be adopted.
- The generated waste onsite should be properly segregated at source into recyclables and organic waste in appropriately labelled waste bins. Sorting at source of domestic and general waste should be implemented.
- Sufficient waste disposal points must be provided and regular collection for disposal must take place near the road.
- Adequate bins for collection and storage of waste materials should be provided.
- Prevent the overfilling of the waste containers.
- Wastewater shall not be discharged onto the open ground or into any water body. In case the portacabin toilet is not close enough to the existing network to be linked

directly to it, the portacabin toilet will be linked to a polyethylene storage tank. If so, the following should be done:

- A specialized contractor will be selected to periodically collect (pump out) the wastewater from the polyethylene tank.
- The supervising consultant should inspect it regularly to check for any leakages and to ensure that the generated wastewater is properly collected before it's full.

- Domestic-like waste shall be removed daily from the site.
- Excavated soil should be stored and transported offsite to a nearest licensed dumpsite due to possible heavy metal contamination.
- Any excavated unsuitable material should be removed from site within 24 hours. Reuse of contaminated soil material is prohibited and random disposal of this material in open abandoned areas is never allowed.

Control of Stormwater Runoff

In case of temporary storage of excavated materials, accidental contamination or spills of the removed soil should be avoided to limit contamination of storm water runoff and in turn the surrounding streams.

Any stockpiled construction material should be covered with an impermeable layer to avoid contamination of stormwater runoff.

6.1.2 Air Quality

Impacts on air quality were assessed as: direct, high, local, medium-term, irreversible, of high likelihood of occurrence and of high significance. Thus, the proposed mitigation measures include:

Control of Exhaust Emissions

- Ensuring maintenance of all rehabilitation equipment regularly, at least once a month.
- Machinery and equipment should be equipped with air pollution control equipment that should be monitored regularly to ensure its effective operation.
- Avoiding idling time of machinery.
- Ensuring regular maintenance of vehicles.

Control of Dust Emissions

- Using dust-suppression methods to reduce emission of particulate matter into the surroundings.
- Prohibit dust-generating activities during excessively windy periods.
- Prohibit burning of generated waste material.
- Covering raw materials stockpiles with plastic impermeable layers, when raw materials are not in use.
- Avoid excessive vehicular movement on unpaved roads.

- Vehicle maximum speed limit in work zones should be decreased to 25 km/hr.
- Trucks hauling raw materials into the rehabilitation site should be covered properly with tarpaulins.
- All trucks and vehicles exiting the rehabilitation site should be dust-free.
- Stockpiles of fine material such as topsoil material, aggregates etc. shall be protected from wind.
- In case of asphalt milling, spray water on exposed surfaces during dry periods especially near schools, hospitals, rural communities, agricultural areas, etc.…
- Maintaining stockpiles at minimum heights
- Contractors shall regularly inspect stockpiles, exposed work areas and rehabilitation work practices.
- Spills or leakages are effectively recorded and reported to the adequate management entity, along with immediate clean-up.
- Daily cleaning of streets and pathways in vicinity of rehabilitation site that are affected by soil and dust

Control of Odor Emissions

- Transport trucks, specifically trucks transporting asphalt, are to be tightly covered at all hauling times to reduce as much as possible release of unpleasant odors.

6.1.3 Acoustic Environment

Impacts on acoustic environment were assessed as: direct, moderate, local, short-term, reversible, of high likelihood of occurrence and of medium significance. Thus, the proposed mitigation measures include:

During the road bypass rehabilitation works, excessive noise emissions can be reduced by adopting the following measures:

- Applying an appropriate schedule such as from 8 am to 4 pm to avoid any works that may cause noise and vibration during nighttime. Additionally, nighttime activities should be done using noise reducing means or low-noise technologies.
- Using vehicles and equipment that meet national standards for noise and vibration.
- Regular maintenance of the machinery, equipment and vehicle should be carried out to prevent excessive noise.
- Publishing and registering allowed working time of rehabilitation machines with local authorities and ensuring strict compliance with set times.
- Restricting the use of noisy machines and/or adopting noise-reducing means (silencers) for rehabilitation machines, especially near sensitive areas.

6.1.4 Biodiversity

Impacts on biodiversity were assessed as: direct, moderate, local, medium-term, irreversible, of medium likelihood of occurrence and of medium significance. Thus, the proposed mitigation measures are:
Induced negative impacts of road projects on biodiversity can be minimized by taking special

care when passing through rich or critical natural ecosystems (maquis, wooded lands, rivers...etc.).

- A waste management plan must be adopted to avoid contaminating the soil and water and hence affecting the local biota;
- Workers should be instructed to protect flora and fauna when feasible as well as their habitats;
- Washing of vehicles and machinery should be done offsite and away from particular biotopes (wooded lands and riparian ecosystems);
- Solid waste, rehabilitation debris should not be dumped into the natural habitat;
- Restricting the use of noisy machines and/or adopting noise-reducing means (silencers) for rehabilitation machines, especially near sensitive areas (maquis ecosystems and riparian habitats);
- Water spraying must be done frequently in order to avoid dust accumulation on adjacent vegetation (namely for Metn R4 that involves numerous agricultural lands).
- Green lights are recommended (when additional lighting is deemed necessary during the rehabilitation phase) for the road segments that are bordered by maquis ecosystems (namely Metn R1a and Metn R3);
- Road cross-section must be fixed during the rehabilitation phase to reduce the impact on biodiversity, for example, by flattening side slopes. This makes crossing easier for animals that find roads a physical barrier (WB). Also, providing longer sight lines for drivers is recommended as it can reduce collisions with animals by allowing more reaction time.

6.1.5 Existing Infrastructure

The impacts on the existing infrastructure were assessed as direct, moderate, local, short-term, reversible, of medium likelihood of occurrence, and of low significance. Following are the mitigation measures:

Prepare procedures for rapid notification to the concerned Municipality or public entity and assistance with re-instatement, in the event of any disruption of public utilities.
Splitting works into the road segments will be done to ensure quick progression through roads while causing minimal disruption to traffic.

6.1.6 Visual Amenity

The impacts on visual intrusion were assessed as of negligible significance. Thus, the proposed mitigation measures are:

- Covering of temporary stockpiled excavations on the side of the road
- Ensuring that the light source is the minimum intensity for the required purpose;
- Ensuring that lights are turned off by timer or manually when they are not needed;
- Ensuring that fittings are chosen that direct light accurately to where it is needed;
- Ensuring that the type of light chosen is the least likely to cause light pollution;

6.1.7 Resource Consumption

Impacts on resource consumption were assessed as: direct, high, moderate, short-term, irreversible, of high likelihood of occurrence and of medium significance. Thus, the proposed mitigation measures include:

Energy Demand Control

- Ensuring that equipment that are not in use are turned off.
- Conducting regular maintenance and efficient operation of machinery.
- Vehicles should not be allowed to remain idle for long periods.
- Recording monthly fuel consumption.

Raw Material Demand Control

In the context of the project, the Contractor must acquire the required raw materials from a licensed quarry.

6.1.8 Health and Safety

6.1.8.1.Occupational Health and Safety (OHS)

Impacts on health and safety were assessed as: negative, moderate, local, short-term, irreversible, of high likelihood of occurrence and of medium significance.

According to IFC (2007), preventive and protective measures should be introduced according to the following order of priority:

- Elimination through eradicating the activity or source of risk from the work process, such as by substituting a hazardous chemical by a safer chemical.
- Control through adopting engineering controls at the source of impact, such as by acoustic insulation.
- Minimization through designing safe work systems and administrative or institutional control measures, such as by job rotation or training safe work procedures.
- Limitation through providing, using, and maintaining appropriate PPE in conjunction with training, such as by using masks and gloves.

Specific measures according to IFC (2007) to limit impacts due to the open nature of rehabilitation sites and their proximity to the community include:

- Measures to prevent unauthorized access to dangerous areas should be in place
- Openings should be sealed by gates or removable chains
- Fall prevention and protection measures should be implemented, such as the installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area
- Signage should be in accordance with international standards and be well known to, and easily understood by workers, visitors and the general public as appropriate
- Marking all energized electrical devices and lines with warning signs

- Establishing rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures, and control of traffic patterns or direction

Training of Personnel

Training is an essential component of safety and health management since workers who perform tasks without adequate training can cause themselves or others serious injuries or even death. Therefore, the following trainings should be implemented (Muiruri & Mulinge, 2014):

- Ensure that all workers are given proper site-specific instructions on occupational health and safety prior to commencing work.
- The Occupational Health and Safety training should consist of hazard awareness and control measures.
- The training should ensure proper usage of personal protective equipment (PPE).
- The trainees should acquire knowledge of emergency procedures and preventive actions.
- There should also be job-specific health and safety training.
- Additional training should be provided if risks change.
- Refresher training should be provided periodically, if skills are not frequently used.

Noise Emissions

According to IFC (2007), the following should be implemented:

- Employees should not be exposed to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection.
- Another way of protection can be achieved through limiting the duration of noise exposure. For instance, for every 3 dB (A) increase in sound levels, the allowed exposure period should be reduced by 50 percent.
- Periodic medical hearing checks should be performed on employees who are exposed to high noise levels.

Health and Safety Signs

Examples of signs that must be present at the rehabilitation site include but are not limited to the following (DOLIDAR, 2017):

- Wear safety helmets and reflective jackets
- Permit to work areas
- Falling Hazard, Use safety belt
- Watch for moving equipment
- Wear safety footwear
- Wear hearing protection
- Wear eye protection
- First aid
- Danger of electricity

- No smoking
- Work in progress
- Stop and go

First Aid and Injuries

The availability of first aid kits and the adoption of the following recommendations is essential in order to respond quickly and efficiently to any accident or injury:

- At least one laborer per each group of workers onsite should be appointed to respond to emergency cases, on condition that adequate first aid training is provided.
- One employee for every 25 employees on site should be trained in first aid. The assigned personnel should be provided with appropriate identification, including a red hard hat with a white "red cross" symbol and an identification badge (CDR, 2007).
- All workers onsite should know where the first aid facilities are located and how to adequately use first aid kits.
- A full list of nearby hospitals, medical centers and emergency contact numbers should be provided to workers onsite.
- All injuries or accidents at the rehabilitation site should be reported immediately and the contractor should maintain and keep a record of accidents or illnesses.
- Designing machines to eliminate trap hazards and ensuring that extremities are kept out of harm's way under normal operating conditions.
- Turning off or disconnecting machinery with exposed moving parts.
- Marking all energized electrical devices and lines with warning signs.
- Checking all electrical cords, cables and hand power tools for frayed and exposed cords and following manufacture recommendations for maximum permitted operational voltage.
- Protecting power cords and extensions from physical damages like traffic and environmental factors like getting wet from rain.
- Use mechanical assists to eliminate or reduce exertions required to lift heavy material, hold tools and work objects.

Personal Protective Equipment (PPE)

Proper use of PPEs is essential to limit the occurrence of occupational hazards. Accordingly, the following should be implemented (DOLIDAR, 2017):

- An adequate supply of suitable personnel protective equipment (PPE) such as hard hats, safety boots, reflective jackets, and others should be maintained.
- The PPEs (specifically hard hat and reflective jacket) provided to managers and safety officers should have a different color than the PPEs of the rehabilitation workers onsite.
- Ensure that workers wear PPEs all the time during working hours.
- Workers must be trained on the proper and effective use of personal protective equipment.
- Workers should be aware of the potential risks that they might encounter, in case of not wearing their PPEs.

- Where there is a risk of injury from falling objects, safety helmets must be provided, and worn by the workers.
- Adequate eye protection should be provided and worn whenever there is a possibility of eye injuries.
- When working in an area or with machines that have high noise levels, hearing protection must be worn.
- Gloves must be provided to the workers and the type of the gloves must be appropriate to the type of work being executed.
- Respiratory protection appropriate to a given working activity should be provided to the workers who are exposed to respiratory hazards.

The following PPE should be used when handling and working with asphalt (NIOSH, 2003):

- Wearing thermally insulated gloves to keep asphalt from burning or irritating the skin.
- Wearing long-sleeve shirts and long pants without cuffs and keeping the sleeves rolled down and close to the collar.
- Wearing Steel-toed safety shoes.
- Wearing a face shield, not just safety glasses.

The following mitigation measures should be adopted by labor when handling and working with asphalt (NIOSH, 2003):

- Never stick your head in an asphalt tank or mixing container.
- Never lean over a kettle. Stay upwind from asphalt if possible.
- Enclosing mixing and stirring operations.
- Stop what you're doing if you notice symptoms. Ask your foreman for advice.
- Keep asphalt off your skin and out of your eyes.
- If you do get asphalt in your eyes, flush with water for 15 minutes.
- Eating, drinking and smoking are prohibited during any asphalt activity.

6.1.8.2.Public Health and Safety (PHS)

Site Layout and Planning

- Designing carefully the rehabilitation site in order to avoid or reduce accidents due to trips, slips, and collisions (General layouts are set in Annex 2).
- Providing roads within the zones being rehabilitated with speed limits signs of 25 km/hr to decrease risks of collisions and accidents.
- Restricting access to the zones of unfinished works and providing guards to control entrances and exits.
- No work activities are to be conducted without the presence of barriers, temporary traffic lights, and flagmen if necessary, which are required to warn the public of the existing rehabilitation site and its activities.

Traffic Diversion

Exact locations and distances of detours are to be set by the site engineer. These points are set according to work progress, location and traffic. Moreover, illustrated detour signage should be displayed around the site as necessary. In addition, the approximate location of signs is shown on the drawings (Annex 2). Exact locations are to be determined on site upon engineer's approval.

- The contractor has to ensure access diversions for traffic at each stage of work and to provide all necessary requirements to facilitate the continuity of traffic circulation.
- Prior to any works, the contractor shall submit to the engineer a detailed method statement showing and describing the following:
    - The division of the works into phases and sections
    - The various traffic diversions related to each phase of the works.
    - The temporary diversion of the different services and utilities (avoid continuous disturbance).
- Adequate warning signs and security of the site, namely through barriers, should be provided during non-working hours.
- Where the pavement crosses service entrances (houses or shops) which are higher or lower than the pavement edge level, the contractor has to construct concrete steps as directed by the engineer on site. Steps are constructed wherever the difference in elevation between the entrance and pavement levels are more than 250 mm.
- In case where the pavement edge limit crosses a parking or a pedestrian footpath, a depressed sidewalk curb shall be applied as shown on drawings (Annex 2) and directed by the engineer.

Noise Emissions

- Noise levels should be maintained within the national permissible limits (presented in Table 2-4) and limited to working hours as allowed by obtained permits.
- Transportation of construction material during regular working hours should be minimized, when possible.

6.2 Mitigation Measures during Operation

6.2.1 Water and Soil Quality

The impacts of the project on water and soil quality were assessed as: direct, moderate, long-term, local, and irreversible, of medium likelihood of occurrence and of moderate significance. Therefore, the proposed mitigation measures include the following:

- All refueling and maintenance operations shall take place off-site, vehicles should be fueled up before arriving to the road section
- A spill response plan shall be in place and all workers should be trained on its implementation.
- Provision of adequate bins for collection and storage of waste material including litterbins and waste skips
- Preventing the overfilling of the waste containers placed on the road

6.2.2 Air Quality

The impacts on the air quality were assessed as: direct, moderate, short-term, local, and irreversible, of medium likelihood of occurrence and of medium significance. Therefore, the proposed mitigation measures include the following:

- Ensuring maintenance of all construction equipment regularly, at least once a month.
- Machinery and equipment should be equipped with air pollution control equipment that should be monitored regularly to ensure its effective operation.
- Avoiding idling time of machinery.
- Using dust-suppression methods to reduce emission of particulate matter into the surroundings.
- Prohibit dust-generating activities during excessively windy periods.
- Vehicle maximum speed limit in work zones should be decreased to 25 km/hr.

6.2.3 Acoustic Environment

The impacts on the acoustic environment were assessed as: direct, moderate, short-term, local, and reversible, of high likelihood of occurrence and of medium significance. Therefore, the main proposed mitigation measure includes applying an appropriate schedule for maintenance activities, for instance, from 8 am to 4 pm in order to avoid any works that may cause noise and vibration during nighttime. In addition, nighttime activities should be done using noise reducing means or low-noise technologies.

6.2.4 Biodiversity

Impacts were assessed as direct, moderate, local, long-term, irreversible, of high likelihood of occurrence, and of medium significance.

During the operation of the project, maintenance activities must be conducted properly in order to avoid spillages and natural habitats contamination. Moreover, given that light pollution will increase as lighting poles will be fixed, however, if green lights are to be used, the local fauna will be less disturbed. Finally, road cross-section must be fixed during the rehabilitation phase to reduce the impact on biodiversity when roads are operational, for example, by flattening side slopes. This makes crossing easier for animals that find roads a physical barrier (WB). Also, providing longer sight lines for drivers is recommended as it can reduce collisions with animals by allowing more reaction time.

6.2.5 Energy Consumption

The impacts on energy consumption were assessed as: direct, low, short-term, local, and reversible, of moderate likelihood of occurrence and of medium significance. Therefore, in order to reduce energy consumption, the following should be applied:

- Equipment should be turned off when not in use.
- Vehicles should not be allowed to remain idle for long periods.

- Recording monthly fuel consumption.

6.2.6 Public and Workers Health and Safety

The impacts on health and safety are assessed as: direct, low, local, short-term, reversible, of medium likelihood of occurrence and of medium significance. Thus, in order to reduce the impacts on health and safety, the following mitigation measures should be applied:

- Ensure that during maintenance all employees utilize appropriate personal protective equipment (e.g. hard hats, steel toe boots, respirators) and are well trained on occupational health and safety.
- Ensure public safety by informing local citizens of the maintenance activities to be performed through the use of media, public announcements, and signage.

6.3 Social Mitigation Measures during Rehabilitation

6.3.1.1.Mitigation Measures on Socio-Economic Conditions of Surrounding Communities

(1) Traffic Disturbance and Nuisance

In order to reduce the impact of traffic disturbance and nuisance on the surrounding communities, the following measures should be implemented:

- Adequate warning, signing, delineation and channeling at least 500 m down and up-gradient from the rehabilitation site must be provided by the project proponents.
- Movement of delivery vehicles outside the site should be restricted to off-peak traffic hours.
- Speed limitation signs should be installed at the access points.
- Full road closures won't be done as all closures will be of partial nature; detours will comprise of merely temporary diversions. In this context, the contractor has to prepare rehabilitation methods and program of work taking into consideration safety and non-stop traffic along the road (refer to Annex 2)
- Commencement of works should not be allowed prior to placing all the required temporary signs, traffic lights, flagmen, etc… wherever and whenever required. Typical signs used are those that indicate the presence of a diversion ahead, the end of diversion, in addition to signs indicating there are works ahead, among others.
- The contractor has to ensure access diversions for traffic at each stage of work and to provide all necessary requirements to facilitate the continuity of traffic circulation.

(2) Labor Influx and Labor Induced SEA

Knowing that some of the roads (such as Metn R1a section 1, Metn R2a and Metn R3 section 1 are in close proximity to sensitive receptors such as residents and schools, it is important to ensure that labor uphold acceptable behavioral manners when interacting with local communities. Therefore, in order to avoid the risk of SEA incidents towards female inhabitants of the surrounding communities, the following measures are highly recommended:

- Providing workers with the necessary training and awareness raising session on issues regarding SEA, prior to signing the CoC (refer Annex 3).
- Obliging employees to attend an induction training course prior to commencing work on site to ensure they are familiar with the company's commitments to address GBV, in specific, SEA and the project's CoC.
- Repeating training and awareness raising on a regular basis as new staff commence work on the project.
- Informing laborers regarding national laws that prosecute perpetrators of SEA
- Providing CoC in a language understood by the workers who will sign the CoC.
- Ensuring requirements in CoCs are clearly understood by those signing it.
- Ensuring that the sanctions embodied in the CoC are be clearly explained.
- Ensuring that workers at the rehabilitation site sign the Code of Conduct (CoC) (refer to Annex 3) that targets GBV risks, specifically SEA induced by labor influx, and penalizes the perpetrators of SEA.
- Verifying that GRM (refer to 8.2.1) is adequately implemented to record complaints from the surrounding communities, to find adequate resolutions and implement corrective actions.

(3) Obstruction of Access Routes to Sensitive Receptors

In order to minimize the temporary obstruction of access routes to residential units, schools, places of worship and hospitals, the contractor should ensure adequate and timely communication with the concerned municipalities and dissemination of project-related work schedule with the surrounding community. In other words, the nearby communities will be informed of the exact timing of activities prior to the commencement of works. Additionally, GRM should be clearly communicated and adequately disseminated.

Further the rehabilitation works should not be performed during peak traffic hours (e.g. works can take place when students are already at school). It is preferable to perform some of the works that are not noisy at night to ensure that access to surrounding schools and residential areas is not hindered. Also, during rehabilitation of long roads, the contractor should work on one small segment at a time, to avoid disturbance of the surrounding sensitive receptors for a long period of time.

6.3.1.2.Mitigation Measures on Socio-Economic Conditions of Labor

(1) Labor Induced SH

Although women participation in rehabilitation works is expected to be low, adequate measures should be addressed to avoid the risk for labor induced SH.

Therefore, laborers should be provided with training sessions and awareness campaigns on SH to ensure that they are aware of issues related to women, social norms and the importance of maintaining and respecting gender equality.

The CoC should be enforced to project laborers (in a language understood by all workers). Additionally, the Contractor should ensure that CoC requirements and sanctions to be applied,

if breached, are well understood by signatories, prior to signing the CoC. Further, it is important to ensure that a proper GRM is established to address any kind of violations to the signed CoC.

(2) Child labor

The project should closely monitor the risk of child labor and should have measures in contracts to ensure that those below the working age are not hired and ensure that labor law of Lebanon is followed. In this context, a labor registry and age verification must be maintained during the whole rehabilitation phase. Also, penalty provisions should be available for hiring child labor.

Additionally, during the employment procedure, the contractor or subcontractor should abide by the Lebanese Law No.0 dated 1946.

(3) Inadequate Labor Conditions

Safety and protection of workers should be ensured within the contracts provided by the contractor and continuous monitoring is required to maintain adequate labor conditions. Further, in order to counter inadequate working circumstances that would make both Syrian and low-skilled Lebanese worker at higher risk of exploitation, appropriate rules and regulations should be implemented in order to ensure the protection of laborers.

Contractors should be forced to abide by the specified Lebanese law determining the minimum wage and minimum working age for children, as per the law, and to comply with, working conditions and hours (as specified in the legal section). Further, the Contractor must comply with Decision 29/1 dated 2018 which restricts significant number of jobs to Lebanese only and allows Syrians to occupy jobs that are not restricted to Lebanese.

(4) Social tensions and conflict over job-sharing and dissatisfaction with allocation of project-generated jobs.

Clear criteria for job selection and allocation should be adopted accounting for the ratio of Syrian and Lebanese community workers in Metn Caza and types of positions available. Moreover, it is important to avoid competition between Syrian workforce willing to accept lower wages and skilled Lebanese labor. Hence, the Contractor should ensure a fair allocation of job opportunities, and most importantly non-discrimination and fair treatment (such as equal wages/benefits and working conditions) should be ensured among workers. In this context, clear communication with all affected workers and a robust GRM are essential to mitigate the potential risk of social tensions or dissatisfaction among Syrian and Lebanese workers.

(5) Under-participation or underemployment or discrimination of women

The following measures should be adopted to ensure women employment by the Contractor:

- Setting minimum percentage of women at the employment phase.
- The project should ensure that gender equality is attained when it comes to recruitment, salary levels and others

- Promoting the employment of females in appropriate jobs such as managerial or administrative positions and giving the opportunity to women to decide the suitable operations that they can perform
- Encouraging women through awareness campaigns on the importance of employment in such project in order to enhance their livelihoods.

6.4 Social Mitigation Measures during Operation

Rehabilitation works under RAP will lead to positive social impacts due to improvement in road conditions such as lighting. This will increase visibility which will contribute to safer environment for women and reduce the probability of SEA.However, some measures are necessary to ensure that positive impacts are maximized. These measures include the following:

- Ensure that workers during the maintenance phase are trained and well understood prior to signing the CoC that targets GBV risks (mainly SEA and SH) and penalizes the perpetrators of GBV.
- Ensure that GRM mechanism is functional to receive any public concerns throughout this phase and to address the received complaints within the set timeframes (specified in section 8.2).

7. Environmental and Social Management and Monitoring Plan

Environmental and social management and monitoring are essential to ensure that the identified impacts are maintained within the allowable levels, unanticipated impacts are mitigated at an early stage, and the expected project benefits are realized. Thus, the main aim is to assist in the systematic and prompt recognition of problems, encouraging effective preventive and mitigation measures and ultimately achieving the goal of good environmental and social performance. A sound understanding of environmental priorities and policies, properly managing the project, acknowledging the regulatory requirements and keeping updated operational information are fundamental to ensure the effective and satisfactory environmental performance.

7.1 Institutional Setup and Capacity Building

The project works will be executed on the main road network which is under the jurisdiction of the MoPWT. In Lebanon, donor-funded road works projects are implemented by CDR upon the request of the Council of Ministers (CoM). Therefore, in the context of REP project, CDR (Road and Transport Department) will execute the project on behalf of the Government/MoPWT.

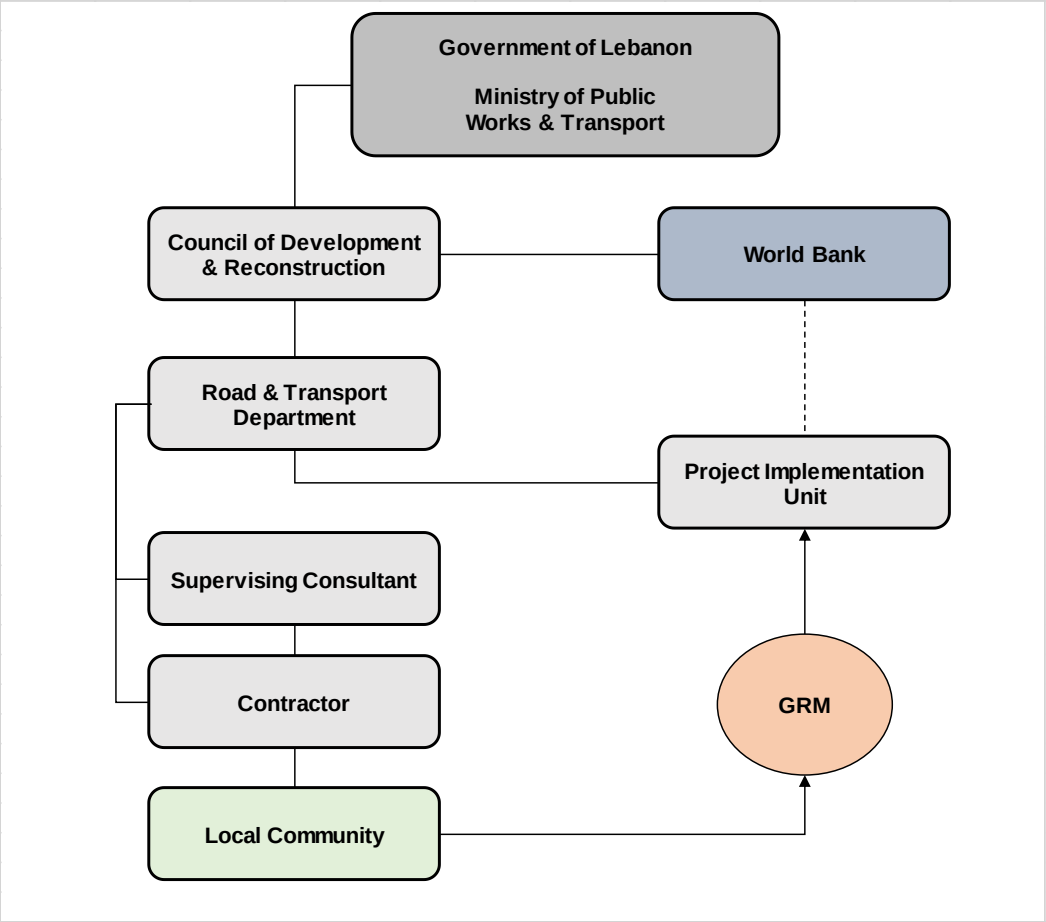
In order to achieve proper environmental management and monitoring, a clear, functional institutional structure was defined (refer to Figure 7-1). During the rehabilitation phase, the contractor would be the primary actor; ensuring compliance of works with the different items specified in the environmental and social management plan. Accordingly, the contractor will be supervised by several entities appointed by CDR. CDR will be responsible for constant monitoring of the rehabilitation works through weekly reports (sent by the contractor) and site visits, ensuring and enforcing mitigation measures.

More specifically, the CDR will develop a Project Implementation Unit (PIU) dedicated to the project, which includes social and environmental specialists to monitor and evaluate the project. Moreover, it will engage a supervising consultant to directly monitor the contractor. In this context, planning, implementation and supervision of environmental safeguards will thus take place at different stages (a) PIU, (b) Supervising Consultant, and (c) Contractor.

PIU will be responsible for providing the overall plan direction, technical support, appraisal and validation of environmental and social management plans, and monitoring of environmental compliance and progress reporting to the World Bank. The responsibility of implementation and management of environmental/social safeguards by the PIU will be coupled with the assignment of supervising consultant (focal point(s) for environmental and social safeguards) who will be in charge of ensuring sound application of the ESMP. Finally, implementation of the ESMPs will mainly be the contractors' duty and consequently the contractor will have to appoint qualified environmental, health and safety consultant and a social development consultant in order to ensure compliance with the ESMPs during the rehabilitation phase of the project.

The main concerned municipalities will be involved in managing and communicating citizens' potential complaints to the CDR (PIU).

Figure 7-1 Institutional setup



7.1.1 Training

Despite the institutions' previous experiences in implementing similar projects, institutional capacity development would be beneficial to ensure proper implementation and supervision of the suggested mitigation measures and monitoring program. For instance, human resources can be improved through training and regular follow-up.

In order to ensure safeguard procedure, instruments and monitoring needs of the REP are well understood by the contractor staff, CDR (i.e. the supervising consultant) will provide trainings. Trainings will aim to familiarize the contractor's staff on the following guidelines and instruments:

World Bank's safeguard policies;
National environmental regulations (the main social and environmental legal texts listed in the legal section of this ESMP);
Safeguards planning, management and monitoring requirements of the REP as specified in the ESMP;
GRM

7.2 Mitigation Plans

7.2.1 Environmental and Social Mitigation Plans

Table 7-1 Environmental Management Plan in Rehabilitation Phase

Source of Impact	Project Activities	Proposed Mitigation Measures	Responsibility	Cost Estimation (USD)
Emission				
Air Emissions/Odors	Generation of dusts, exhaust gases, and odors from pavement reconstruction and others activities	• Ensuring maintenance of all construction equipment regularly, at least once a month. • Machinery and equipment should be equipped with air pollution control equipment that should be monitored regularly to ensure its effective operation. • Avoiding idling time of machinery. • Ensuring regular maintenance of vehicles.	Project contractors / consultant	Included in the rehabilitation Cost
Acoustic Environment	Construction equipment noise and vibrations, earth manipulating activities from pavement milling and drainage excavations	• Applying an appropriate schedule for maintenance activities, for instance, from 8 am to 4 pm in order to avoid any works that may cause noise and vibration during nighttime. • Nighttime activities should be done using noise reducing means or low-noise technologies. • Using vehicles and equipment that meet national standards for noise and vibration. • Regular maintenance of the machinery, equipment and vehicle should be carried out to prevent excessive noise. • Publishing and registering allowed working time of construction machines with local authorities and ensuring strict compliance with set times. • Restricting the use of noisy machines and/or adopting noise-reducing means (silencers) for construction machines, especially near sensitive areas.	Project contractors / consultant	Included in the rehabilitation Cost
Solid Waste and Wastewater Generation	Generation of rehabilitation wastes and domestic-like wastes and wastewater	• Good site practices including the effective disposal of all wastes generated on-site should be adopted. • The generated waste onsite should be properly segregated at source into recyclables and organic waste in appropriately labelled waste bins. Sorting at source of domestic and general waste should be implemented. • Sufficient waste disposal points must be provided and regular collection for disposal must take place near the road.	Project contractors / consultant	Included in the rehabilitation Cost

		• Adequate bins for collection and storage of waste materials should be provided. • Prevent the overfilling of the waste containers. • Domestic-like waste shall be removed daily from the site and should be collected by either the concerned municipality or the waste collection company (either RAMCO or City Blue) • Excavated soil should be stored and transported offsite to a nearest licensed dumpsite due to possible heavy metal contamination. • Any excavated unsuitable material should be removed from site within 24 hours. Reuse of contaminated soil material is prohibited and random disposal of this material in open abandoned areas is never allowed. • In case of linking the portacabin toilet to a polyethylene storage tank, the following should be done: o A specialized contractor should be selected to periodically collect the wastewater from the polyethylene tank. o The supervising consultant should inspect it regularly to check for any leakages and to ensure that the generated wastewater is properly collected before it's full.		
Accidental Releases	Accidental spills of construction material, and storm water runoff	Control of Accidental Spills • All refueling and maintenance operations shall take place off-site, vehicles should be fueled up before arriving to the road section • A spill response plan shall be in place and all workers should be trained on its implementation. Control of Stormwater Runoff • In case of temporary storage of excavated materials, accidental contamination or spills of the removed soil should be avoided to limit contamination of storm water runoff and in turn the surrounding streams. • Any stockpiled construction material should be covered with an impermeable layer to avoid contamination of stormwater runoff.	Project contractors / consultant	Included in the rehabilitation Cost

Soil Manipulation	Soil erosion and sedimentation from drainage or sidewalks excavations	• 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 • Placement of geotextile silt traps as appropriate, especially in areas close to water bodies (i.e. Metn R1a, R3 and R4).	Project contractors / consultant	Included in the rehabilitation Cost
Existing Infrastructure	Interference of pavement drilling and milling with infrastructure	• Prepare procedures for rapid notification to the concerned Municipality or public entity and assistance with re-instatement, in the event of any disruption of public utilities. • Splitting works into the road segments will be done to ensure quick progression through road while causing minimal disruption to traffic.	Project contractors / consultant	Included in the rehabilitation Cost
Resources Consumption	Increase energy demand	• Ensuring that equipment that are not in use are turned off. • Conducting regular maintenance and efficient operation of machinery. • Vehicles should not be allowed to remain idle for long periods. • Recording monthly fuel consumption.	Project contractors / consultant	Included in the rehabilitation Cost
Biological Resources	Changes in natural habitat and biodiversity	• A waste management plan must be adopted to avoid contaminating the soil and water and hence affecting the local biota; • Workers should be instructed to protect flora and fauna when feasible as well as their habitats; • Washing of vehicles and machinery should be done offsite and away from particular biotopes (wooded lands and riparian ecosystems); • Solid waste, rehabilitation debris should not be dumped into the natural habitat; • Restricting the use of noisy machines and/or adopting noise-reducing means (silencers) for construction machines, especially near sensitive areas (maquis ecosystems and riparian habitats); • Water spraying must be done frequently in order to avoid dust accumulation on adjacent vegetation (namely for Metn R4 that involves numerous agricultural lands). • Green lights are recommended (when additional lighting is deemed necessary during the rehabilitation phase) for the road segments that are bordered by maquis ecosystems	Project contractors / consultant	Included in the rehabilitation Cost

		(namely Metn R1a and Metn R3); • Road cross-section must be fixed during the rehabilitation phase to reduce the impact on biodiversity, for example, by flattening side slopes. This makes crossing easier for animals that find roads a physical barrier (WB). Also, providing longer sight lines for drivers is recommended as it can reduce collisions with animals by allowing more reaction time.		
Visual intrusion	Day time and night time rehabilitation works	• Covering of temporary stockpiled excavations on the side of the road • Ensuring that the light source is the minimum intensity for the required purpose; • Ensuring that lights are turned off by timer or manually when they are not needed; • Ensuring that fittings are chosen that direct light accurately to where it is needed; • Ensuring that the type of light chosen is the least likely to cause light pollution;	Project contractors / consultant	Included in the rehabilitation Cost
Social Risks	• Labor influx and Labor-induced SH and SEA • Workers tension (Syrian/Lebanese ratio) • Child labor • Inadequate labor conditions • Traffic disturbance • Obstruction of Access Routes to Sensitive Receptors	**Socio-Economic Conditions of Surrounding Communities** <u>Traffic Disturbance and Nuisance</u> • Adequate warning, signing, delineation and channeling at least 500 m down and up-gradient from the rehabilitation site must be provided by the project proponents. • Movement of delivery vehicles outside the site should be restricted to off-peak traffic hours. • Speed limitation signs should be installed at the access points. • Full road closures won't be done as all closures will be of partial nature; detours will comprise of merely temporary diversions. In this context, the contractor has to prepare rehabilitation methods and program of work taking into consideration safety and non-stop traffic along the road (refer to Annex 2) • Commencement of works should not be allowed prior to placing all the required temporary signs, traffic lights, flagmen, etc… wherever and whenever required. Typical signs used are those that indicate the presence of a diversion ahead, the end of	Project contractors / consultant	Included in the rehabilitation Cost

		diversion, in addition to signs indicating there are works ahead, among others. • The contractor has to ensure access diversions for traffic at each stage of work and to provide all necessary requirements to facilitate the continuity of traffic circulation. <u>Labor Influx and Labor Induced SEA</u> • Providing workers with the necessary training and awareness raising session on issues regarding SEA, prior to signing the CoC (refer to Annex 3). • Obliging employees to attend an induction training course prior to commencing work on site to ensure they are familiar with the company's commitments to address GBV, in specific, SEA and the project's CoC. • Repeating training and awareness raising on a regular basis as new staff commence work on the project. • Informing laborers regarding national laws that prosecute perpetrators of SEA • Providing CoC in a language understood by the workers who will sign the CoC. • Ensuring requirements in CoCs are clearly understood by those signing it. • Ensuring that sanctions embodied in the CoC are be clearly explained. • Ensuring that workers at the rehabilitation site sign the Code of Conduct (CoC) (refer to Annex 3) that targets GBV risks, specifically SEA induced by labor influx, and penalizes the perpetrators of SEA. • Verifying that GRM is adequately implemented to record complaints from the surrounding communities, to find adequate resolutions and implement corrective actions. <u>Obstruction of Access Routes to Sensitive Receptors</u> • In order to minimize the temporary obstruction of access routes to residential units, schools, places of worship and hospitals, the		

		contractor should ensure adequate and timely communication with the concerned municipalities and dissemination of project-related work schedule with the surrounding community. • Nearby communities should be informed of the exact timing of activities prior to the commencement of works. • The rehabilitation works should not be performed during peak traffic hours (e.g. works can take place when students are already at school). • It is preferable to perform some of the works that are not noisy at night to ensure that access to surrounding schools and residential areas is not hindered. • During rehabilitation of long roads, the contractor should work on one small segment at a time, to avoid disturbance of the surrounding sensitive receptors for a long period of time. **Socio-Economic Conditions of Labor** <u>Labor Induced SH</u> • Laborers should be provided with training sessions and awareness campaigns on SH • CoC should be enforced to project laborers (in a language understood by all workers). • The Contractor should ensure that CoC requirements and sanctions to be applied, if breached, are well understood by signatories, prior to signing the CoC. • The Contractor should ensure that a proper GRM is established to address any kind of violations to the signed CoC. <u>Child Labor</u> • The project should closely monitor the risk of child labor and should have measures in contracts to ensure that those below the working age are not hired and ensure that labor law of Lebanon is followed. • Labor registry and age verification must be maintained during		

		the whole rehabilitation phase. • Penalty provisions should be available for hiring child labor. • During the employment procedure, the contractor or subcontractor should abide by the Lebanese Law No.0 dated 1946. <u>Inadequate Labor Conditions</u> • Safety and protection of workers should be ensured within the contracts provided by the contractor • Continuous monitoring is required to maintain adequate labor conditions. • Appropriate rules and regulations should be implemented in order to ensure the protection of laborers. • Contractors should be forced to abide by the specified Lebanese law determining the minimum wage and minimum working age for children. • Contractor must comply with Decision 29/1 dated 2018 which restricts significant number of jobs to Lebanese only and allows Syrians to occupy jobs that are not restricted to Lebanese. <u>Social tensions and conflict over job-sharing and dissatisfaction with allocation of project-generated jobs.</u> • Clear criteria for job selection and allocation should be adopted accounting for the ratio of Syrian and Lebanese community workers in Metn Caza and types of positions available. • It is important to avoid competition between Syrian workforce willing to accept lower wages and skilled Lebanese labor. • The Contractor should ensure a fair allocation of job opportunities, and most importantly non-discrimination and fair treatment should be ensured among workers. (such as equal contractual wages/benefits and working conditions) should be also ensured among workers. • Clear communication with all affected workers and a robust GRM are essential to mitigate the potential risk of social		

		tensions or dissatisfaction among Syrian and Lebanese workers. <u>Under-participation or underemployment or discrimination of women</u> • Setting minimum percentage of women at the employment phase. • The project should ensure that gender equality is attained when it comes to recruitment, salary levels and others • Promoting the employment of females in appropriate jobs such as managerial or administrative positions and giving the opportunity to women to decide the suitable operations that they can perform • Encouraging women through awareness campaigns on the importance of employment in such project in order to enhance their livelihoods.		
Occupational Health and Safety Hazards	Rehabilitation activities	Specific measures according to IFC (2007) to limit impacts due to the open nature of rehabilitation sites and their proximity to the community include: • Measures to prevent unauthorized access to dangerous areas should be in place • Openings should be sealed by gates or removable chains • Fall prevention and protection measures should be implemented, such as the installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area • Signage should be in accordance with international standards and be well known to, and easily understood by workers, visitors and the general public as appropriate • Marking all energized electrical devices and lines with warning signs • Establishing rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures, and control of traffic patterns or direction *Training of Personnel*	Project contractors / consultant	Included in the rehabilitation Cost

		The following trainings should be implemented (Muiruri & Mulinge, 2014): • Ensure that all workers are given proper site-specific instructions on occupational health and safety prior to commencing work. • The Occupational Health and Safety training should consist of hazard awareness and control measures. • The training should ensure proper usage of personal protective equipment (PPE). • The trainees should acquire knowledge of emergency procedures and preventive actions. • Refresher training should be provided periodically, if skills are not frequently used. *Noise Emissions* According to IFC (2007), the following should be implemented: • Employees should not be exposed to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection. • Another way of protection can be achieved through limiting the duration of noise exposure. For instance, for every 3 dB (A) increase in sound levels, the allowed exposure period should be reduced by 50 percent. • Periodic medical hearing checks should be performed on employees who are exposed to high noise levels. *Health and Safety Signs* Examples of signs that must be present at the rehabilitation site include but are not limited to the following (DOLIDAR, 2017): • Wear safety helmets and reflective jackets • Permit to work areas • Falling Hazard, Use safety belt		

		• Watch for moving equipment • Wear safety footwear • Wear hearing protection • Wear eye protection • First aid • Danger of electricity • No smoking • Work in progress • Stop and go *First Aid and Injuries* The availability of first aid kits and the adoption of the following recommendations is essential in order to respond quickly and efficiently to any accident or injury: • At least one laborer per each group of workers onsite should be appointed to respond to emergency cases, on condition that adequate first aid training is provided. • One employee for every 25 employees on site should be trained in first aid. The assigned personnel should be provided with appropriate identification, including a red hard hat with a white "red cross" symbol and an identification badge (CDR, 2007). • All workers onsite should know where the first aid facilities are located and how to adequately use first aid kits. • A full list of nearby hospitals, medical centers and emergency contact numbers should be provided to workers onsite. • All injuries or accidents at the rehabilitation site should be reported immediately and the contractor should maintain and keep a record of accidents or illnesses. • Turning off or disconnecting machinery with exposed moving parts. • Marking all energized electrical devices and lines with warning signs. • Checking all electrical cords, cables and hand power tools for frayed and exposed cords and following manufacture recommendations for maximum permitted operational voltage.		

		• Use mechanical assists to eliminate or reduce exertions required to lift heavy material, hold tools and work objects. *Personal Protective Equipment (PPE)* Proper use of PPEs is essential to limit the occurrence of occupational hazards. Accordingly, the following should be implemented (DOLIDAR, 2017): • An adequate supply of suitable personnel protective equipment (PPE) such as hard hats, safety boots, reflective jackets, and others should be maintained. • The PPEs (specifically hard hat and reflective jacket) provided to managers and safety officers should have a different color than the PPEs of the rehabilitation workers onsite. • Ensure that workers wear PPEs all the time during working hours. The following PPE should be used when handling and working with asphalt (NIOSH, 2003): • Wearing thermally-insulated gloves to keep asphalt from burning or irritating the skin. • Wearing long-sleeve shirts and long pants without cuffs and keeping the sleeves rolled down and close to the collar. • Wearing Steel-toed safety shoes. • Wearing a face shield, not just safety glasses. The following mitigation measures should be adopted by labor when handling and working with asphalt (NIOSH, 2003): • Never stick your head in an asphalt tank or mixing container. • Never lean over a kettle. Stay upwind from asphalt if possible. • Enclosing mixing and stirring operations. • Stop what you're doing if you notice symptoms. Ask your foreman for advice. • Keep asphalt off your skin and out of your eyes.		

		• If you do get asphalt in your eyes, flush with water for 15 minutes. • Eating, drinking and smoking are prohibited during any asphalt activity.		
Public Health and Safety	Rehabilitation activities	**Site Layout and Planning** • Designing carefully the rehabilitation site in order to avoid or reduce accidents due to trips, slips, and collisions • Providing roads within the zones being rehabilitated with speed limits signs of 25 km/hr to decrease risks of collisions and accidents. • Restricting access to the zones of unfinished works and providing guards to control entrances and exits. • No work activities are to be conducted without the presence of barriers, temporary traffic lights, and flagmen if necessary, which are required to warn the public of the existing rehabilitation site and its activities **Traffic Diversion** • Exact locations and distances of detours are to be set by the site engineer. These points are set according to work progress, location and traffic. Moreover, illustrated detour signage should be displayed around the site as necessary. In addition, the approximate location of signs is shown on the drawings (Annex 2). Exact locations are to be determined on site upon engineer's approval. • The contractor has to ensure access diversions for traffic at each stage of work and to provide all necessary requirements to facilitate the continuity of traffic circulation. • Prior to any works, the contractor shall submit to the engineer a detailed method statement showing and describing the following: o The division of the works into phases and sections	Project contractors / consultant	Included in the rehabilitation Cost

		○ The various traffic diversions related to each phase of the works. ○ The temporary diversion of the different services and utilities (avoid continuous disturbance). • Adequate warning signs and security of the site, namely through barriers, should be provided during non-working hours. • Where the pavement crosses service entrance (houses or shops) which are higher or lower than the pavement edge level, the contractor has to construct concrete steps as directed by the engineer on site. Steps are constructed wherever the difference in elevation between the entrance and pavement levels are more than 250 mm. • In case where the pavement edge limit crosses a parking or a pedestrian footpath, depressed sidewalk curb shall be applied as shown on drawings (Annex 2) and directed by the engineer. **Noise Emissions** • Noise levels should be maintained within the national permissible limits (presented in Table 2-4) and limited to working hours as allowed by obtained permits. • Transportation of construction material during regular working hours should be minimized, when possible.		

Table 7-2 Environmental Management Plan in Operation Phase

Source of Impact	Project Activities	Mitigation Measures	Responsibility	Cost Estimation (USD)
Emission				

Air Emissions	Dust and exhaust emissions	• Ensuring maintenance of equipment used in road maintenance activities (e.g. shovel, steel roller, excavator…) regularly, at least once a month. • Machinery and equipment should be equipped with air pollution control equipment that should be monitored regularly to ensure its effective operation. • Avoiding idling time of machinery. • Using dust-suppression methods to reduce emission of particulate matter into the surroundings. • Prohibit dust-generating activities during excessively windy periods. • Vehicle maximum speed limit in work zones should be decreased to 25 km/hr.	Project contractors / consultant	Included in the rehabilitation Cost
Acoustic pollution	Vehicle and equipment noise from maintenance activity	• Applying an appropriate schedule for maintenance activities, for instance, from 8 am to 4 pm in order to avoid any works that may cause noise and vibration during nighttime. • Nighttime activities should be done using noise reducing means or low-noise technologies.	• Contractor during the first year • Municipalities and MoPWT after the one-year period	Secured by responsible party
Solid waste and Wastewater Generation	Accidental spills and Generated domestic solid waste and wastewater during maintenance	• All refueling and maintenance operations shall take place off-site, vehicles should be fueled up before arriving to the road section • A spill response plan shall be in place and all workers should be trained on its implementation. • Provision of adequate bins for collection and storage of waste material including litterbins and waste skips • Preventing the overfilling of the waste containers placed on the road • Proper disposal of any generated wastewater during maintenance activities	• Contractor during the first year • Municipalities and MoPWT after the one-year period	Secured by responsible party
Depletion of Resources				
Biological Resources	Light and noise pollution – negative effect on	• When conducting maintenance activities, a waste management plan must be set to avoid contaminating the nearby streams and affecting	• Contractor during the first year	Secured by responsible party

	biodiversity (fauna and flora)	the local biodiversity. Moreover, restricting the use of noisy machines, especially near sensitive areas (maquis ecosystems). • Install silencers to the maintenance machines • Light pollution will increase as lighting poles will be fixed, however, if green lights are to be used, the local fauna will be less disturbed. • Road cross-section must be fixed during the rehabilitation phase to reduce the impact on biodiversity when roads are operational, for example, by flattening side slopes. This makes crossing easier for animals that find roads a physical barrier (WB). Also, providing longer sight lines for drivers is recommended as it can reduce collisions with animals by allowing more reaction time.	Municipalities and MoPWT after the one-year period	
Resources Consumption	Energy Consumption	• Equipment should be turned off when not in use. • Vehicles should not be allowed to remain idle for long periods. • Recording monthly fuel consumption.	• Contractor during the first year • Municipalities and MoPWT after the one-year period	Included in the Construction Cost
Other Impacts				
Health and Safety Hazards	Maintenance related accidents	• Ensure that during maintenance all employees utilize appropriate personal protective equipment (e.g. hard hats, steel toe boots, respirators) and are well trained on occupational health and safety. • Ensure public safety by informing local citizens of the maintenance activities to be performed provided through the use of media, public announcements, and signage • Signage should be in accordance with international standards and be well known to, and easily understood by workers, visitors and the general public as appropriate • Marking all energized electrical devices and lines with warning signs • Establishing rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures, and control of traffic patterns or direction • Ensure that all workers are given proper site-specific instructions on occupational health and safety prior to commencing work. • The Occupational Health and Safety training should consist of hazard awareness and control measures.	• Contractor during the first year • Municipalities and MoPWT after the one-year period	Secured by responsible party

		• The training should ensure proper usage of personal protective equipment (PPE).		
Social	GBV risks and public complaints	• Ensure that workers during the maintenance phase sign the CoC that targets GBV risks and penalizes the perpetrators of GBV. • Ensure that GRM mechanism is functional to receive any public concerns throughout this phase and to address the received complaints within the set timeframe (specified in section 8.2)	• Contractor during the first year • Municipalities and MoPWT after the one-year period	Secured by responsible party

7.3 Monitoring Plan

Environmental and social monitoring is one of the most important parts of an efficient and coherent operation of a project. All environmental and social requirements and restrictions from authorities, project owners and local communities are interlinked and form the primary reference for monitoring and evaluation. In other words, monitoring aims to ensure that all project activities undertaken are environmentally and socially sound, while considering the mitigation measures discussed in the previous section.

It does so by defining a clear set of measurable indicators in an attempt to properly evaluate the project's performance from both an environmental and a social aspect. These indicators, also known as Key Performance Indicators (KPIs), can then be used to assess the project's implementation in a timely manner. Consequently, they assist in the early detection of any deviations from the project's goals. It is important to note that the assessment of all proposed measures is vital to ensure their proper implementation and the optimal operation of the project.

This allows the involved parties to take any corrective measures and limit any unsatisfactory performance if such a case arises. It also allows them to accurately communicate the performance of the project with regulators, the public, or other stakeholders.

Monitoring involves the observation, review, and assessment of onsite activities (including parameters) to ensure adherence to regulatory standards and the suggestions made to lessen negative impacts.

7.3.1 Monitoring Plan Implementation

Contractors shall employ qualified environmental and health officers/inspectors responsible for monitoring project activities. Their aim is to ensure that the proposed activities, including the suggested mitigation measures, are properly implemented during the rehabilitation phase. The relevant ministries would also be expected to follow up, if deemed necessary, on the proper implementation and abidance by the relevant laws and regulations.

Monitoring during the operational phase is mainly the responsibility of CDR and any concerned local authorities, namely the relevant municipalities. The KPIs for this project are listed in Table 7-3.

Table 7-3 Key performance indicators for the monitoring plan

Parameter	Standard/Indicator	Phase
Air quality	Lebanese Stack Emission Standards Lebanese Exhaust Emissions Standards for Vehicles	Rehabilitation and post rehabilitation phase
Occupational health and safety	Number of accidents and working days lost Health and Safety Guidelines Compliance with Lebanese Labor Law	
Public safety	Number of accidents involving public safety	
Noise levels	Lebanese Noise Emission Limits for Outdoor Areas	
Soil and water quality	Compliance with Lebanese Standards for the Discharge of wastewater to sewage network/ surface water	

Others	Labor age, labor wage, percentage of women in labor, work injuries, code of conduct trainings, number of grievances (internal and/or external)	

The monitoring requirements associated with the management strategies which should be implemented during rehabilitation and operation are outlined in Table 7-4 and Table 7-5.

Table 7-4 Environmental Monitoring Plan in Rehabilitation Phase

Impact	Parameters to Monitor	Frequency	Monitoring Location	Monitoring Method	Standard/Guidelines National/International	Monitoring Responsibility	Institutional Follow-up	Approximate Cost (USD/year)
Emissions								
Air Emissions/GHG/Dust	PM2.5-10, SO_x, NOx, O_3, CO, Total Suspended Particles (TSP)	Testing once during the project life and weekly inspection	• Construction vehicles exhaust • Around rehabilitation site for dust	• Single point sampling (at one quarter the diameter across the stack/source) • Visual opacity measurement (smoke inspection)	Particulate Matter ($PM_{<10}$) 80 µg/m^3 Sulfur dioxide (SO_2) 120 µg/m^3 Nitrogen dioxide (NO_2) 150 µg/m^3	Supervising Consultant	CDR (PIU)	104,000 (2000 per test)
Noise	Noise Levels (Lmin, Lmax, and Leq)	Monthly during noisy operation	Around the rehabilitation site, especially near loud machinery and major rehabilitation activities	One sample per location (near sensitive receptors)	Refer to Table 2-7	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
WW Generation	pH, Temperature: max, BOD, COD, Sulfate, Fecal Coliform, Total Coliform, Suspended solids, Oil and grease	Before commencement of work and bi-annually	Sediment trap at downstream assigned for contaminated stormwater runoff	Two samples at effluent of chosen sediment trap	pH: 6-9 Temperature: max 30 °C BOD: 25 mg/L COD: 125 mg/L Sulfate: 1 mg/L Fecal Coliform: 0 CFU/100ml Total Coliform: 0CFU/100ml at 37^0C Suspended solids: 60 mg/L Oil and grease: 50 mg/L	Supervising Consultant	CDR (PIU)	600

Impact	Parameters to Monitor	Frequency	Monitoring Location	Monitoring Method	Standard/Guidelines National/International	Monitoring Responsibility	Institutional Follow-up	Approximate Cost (USD/year)
	Domestic-like wastewater	Daily	Polyethylene storage tank (in case portacabin toilet is not linked to WW network)	Visual inspection	• Prohibit leaks from tank • Prohibit overfilling of tank	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
Accidental Releases	Number of spills/leaks (of lubricants, oil, fuel, or other chemicals)	Weekly	Around the rehabilitation site, especially near equipment, material, and storage tanks	Visual inspection	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
Depletion of Resources								
Energy Resources	Fuel consumption rates	Monthly	At fuel storage tanks area	Respective to fuel consumed	N.A	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
Biological Resources	Ecological audit for particular biotopes	Weekly	Riparian habitats near water channels and streams	Samples and photos per location and GPS point	N.A	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
Socio-Economic								
GBV	• Code of conduct trainings • Signed forms • Dates of training	Bi-annually	At training locations	Respective to the amounts of trainings conducted	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
	• GBV-related internal grievances	Monthly	At each rehabilitation zone	• Received complaints and GRM records	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
OHS	• Total number of work injuries • OHS-related internal grievances	Continuously	At each rehabilitation zone	Visual inspection Employee records	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost

Impact	Parameters to Monitor	Frequency	Monitoring Location	Monitoring Method	Standard/Guidelines National/International	Monitoring Responsibility	Institutional Follow-up	Approximate Cost (USD/year)
	• OHS-related trainings							
	• Visual field inspections • Verbal complaints by workers • Ensure use of PPE	Continuously	Around rehabilitation site and used roads	Continuous visual inspection	N.A	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
Social Tensions and Conflicts over Job-Sharing	• Number of related grievances • Percentage of workers (based on gender, nationality)	Monthly	• Around the rehabilitation sites • Employee records	Received complaints and records	N.A.	Supervising Consultant	CDR (PIU)	-
Obstructing Access to Amenities	Type, location, and duration of amenity to which access was obstructed	Daily	At rehabilitation sites	Visual inspection	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
Working conditions	Labor's wages	Monthly	Laborers' contracts	Workers complaints records Labor law verification	N.A.	Supervising Consultant	CDR (PIU)	-
Child labor	Labor's age	Monthly	Laborers' records/ files	Labor registry and age verification Labor law verification	N.A.	Supervising Consultant	CDR (PIU)	-
Underemployment of Women	Percentage of female employees in workforce	Bi-annually	Laborers' records/ files	Labor registry	N.A.	Supervising Consultant	CDR (PIU	-

Impact	Parameters to Monitor	Frequency	Monitoring Location	Monitoring Method	Standard/Guidelines National/International	Monitoring Responsibility	Institutional Follow-up	Approximate Cost (USD/year)
Other Grievances	• Internal and external grievance reports	Weekly or upon grievance occurrence	At each rehabilitation zone	Complaints records	N.A.	Supervising Consultant	CDR (PIU	Included in rehabilitation Cost
Other Impacts								
Visual intrusion	Dust pollution (opacity)	Daily	At dust generating activities	Several photographs per location + opacity measurement	N.A	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
Damage to existing infrastructure	Type, size, and number of damaged infrastructure entities	Daily	Around the rehabilitation site.	Visual inspection	N.A.	Supervising Consultant	CDR (PIU)	-

Table 7-5 Environmental Monitoring Plan in Operation Phase

Impacts	Parameters to Monitor	Frequency	Monitoring Location	Monitoring Method	Standard/Guidelines National/International	Monitoring Responsibility	Approximate Cost (USD/year)
Emissions							
Noise	Noise Levels (Lmin, Lmax, and Leq)	Bi-annually or upon complaints	Along the two concerned roads near sensitive receptors and complainers	One sample per location	Refer to Table 2-7	Supervising Consultant	Included in rehabilitation Cost
WW Generation	Leakages, spillages, improper discharges, etc.	Annually	Upon maintenance routine, at wastewater piping system	Visual Inspection	N.A.	Supervising Consultant	Included in rehabilitation Cost
Other Impacts							
Social Satisfaction	External complaints or grievances	Bi-annually or upon complaints	Along the two concerned roads	Received complaints and records	N.A.	Supervising Consultant	Included in rehabilitation Cost
Road Safety	Accidents: number, dates, frequency, and causes	Annually	Along the two concerned roads	Visual inspection (of accident logs containing the mentioned data)	N.A.	Supervising Consultant	Included in rehabilitation Cost

7.3.2 Documentation and Reporting

Monitoring yields lots of data regarding project performance. As a result, proper documentation is necessary for two reasons: first to prepare and send performance reports to the concerned parties and second to analyze the acquired data and implement changes when necessary.
In this context, monitoring reports will take place as described below.

Contractor's Health and Safety officers submit compliance reports to the Environmental Supervision Consultants on a monthly basis.

The Environmental Supervision Consultants review and approve contractor reports and submit them to PIU on a monthly basis.

PIU submits environmental/social progress as part of their quarterly project progress reports to the WB on a quarterly basis.
In case of severe incidents (e.g. fatality on site) immediate reporting within 24 hours to CDR and within 48 hours to the WB must be done.

7.3.3 Guidelines for Health and Safety Plan during Rehabilitation

An effective Occupational Health and Safety Plan, in line with World Bank guidelines, for rehabilitation be submitted by the Contractor and approved by the appointed supervising Consultant prior commencement of works. The plan should should include at least the following components:

- Proper signage in and around the sites (local language to be understood by all);
- Fire response and spill response measures;
- Proper storage and signage of materials including Material Safety Data Sheets;
- Safety measures according to type of equipment;
- Train workers on lifting and material handling techniques;
- Plan work site layout to reduce the need for manual transfer of heavy objects,
- Personal safety equipment;
- Medical services which includes first aid kits;
- Mobile sanitary facilities;
- Safe drinking water in accordance with regulations.

In addition, the plan should also incorporate all of the previously mentioned measures stated in section 6.1.8 which address in great detail OHS and PHS measures. All rehabilitation staff should be trained on the Health & Safety Plan and the specific safety measures related to their own activities.

8. Consultation, Disclosure and GRM

8.1 Public Consultation

Project-affected groups, mainly municipalities and local NGOs were consulted on the project's environmental and social aspects.

Two public participation meetings were arranged for Metn Caza. The first public participation meeting was held at the Municipality of Choueir on Thursday December 12, 2019 dealing with Metn R1a and Metn R4, whereas the second meeting was held at the Mar Elias Church Theatre in Antelias on Monday December 16, 2019 dealing with Metn R2a and Metn R3. During the meetings, attendees were informed about the project objectives, the identified natural, economic, and social resources of importance in the area, the project's possible environmental and social risks, and the planned mitigation measures.

Invitations were sent by the consultant on behalf of CDR to concerned municipalities and NGOs through official letters, emails and direct phone calls. The invitation letter is attached in Annex 4. Invitations were sent to the concerned parties at least one week before the meeting date.

During the public participation, project details and design, impacts and mitigation measures were presented in a 35-minute presentation (see more details in Annex 4), which has followed by an open discussion with the attendees. In particular, the consultant informed the attendees about the project objectives, the identified natural, economic, and social resources of importance in the area, the project's possible environmental and social risks, the project GRM mechanism and the planned mitigation measures.

The main attendees of the meeting were namely the heads of concerned municipalities, women, citizens and relevant NGOs (including Fifty-fifty, Women in Front, and The Rural Woman Association) (refer to the lists of attendees in Annex 4). The number of attendees reaches 24 for both meetings of which 7 were women.

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 List of Contacted Local NGOs

Organization	Phone Number	Activities
Fifty-fifty	04-412897	All three NGOs aim at empowering women and increasing their participation in political and public life. They also create public awareness, and lobby to reform gender laws, all for the common purpose of instating gender equality in Lebanon.
Women in Front	04-521096	
The Rural Lady Association	04-984955	
Amel Association	01-317293	Since its creation, in 1979, Amel has opened field hospitals, maternities, development and medical centers in addition to cooperatives in several areas, regardless of their political or religious affiliations. As part of its support to refugees program, it provides humanitarian aid to refugee communities, irrelevant of nationality. across the entire country.
Frontiers' Rights (Rouwad Houkouk)	01-383556	Ruwad was founded in 2014 after long years of advocacy work launched by its activists in 1999. The association defends the fundamental rights of marginalized groups in Lebanon, focusing on three areas: statelessness, right to asylum, and right to personal freedom, safety and non-refoulement (non-forced return to home country).

b) 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 Metn Caza, the total number of registered Syrian is 54,578 individuals (UNHCR, 2017). They were contacted through the International NGOs to seek their feedback about the Project. Accordinlgy, this ESMP did not receive any concern about the Project.

Table 8-2: 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 Mr. French 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 (GRM)

The project will include a project-wide GRM that will register and address grievances and complaints from individuals and households who are affected by the project. Anonymous grievances will be addressed in both GRMs for communities and workers. The maximum anticipated time needed to close a GRM case is 45 days.

8.2.1 GRM for Surrounding Communities

The primary purpose of the GRM will be to provide clear and accountable means for project beneficiaries and affected persons to raise concerns of possible tensions and feelings of exclusion and complaints and seek solutions when they believe they have been harmed by the project. As such, the GRM will allow citizens to directly voice concerns or grievances to the implementing agency and ensure that these concerns are responded to and addressed in a timely manner.

The key objectives of the GRM are:

- Record, categorize and prioritize the grievances;
- Resolve the grievances via consultation with all stakeholders (and notify those stakeholders of the resolutions)
- Relay any unresolved cases to the relevant authority.

The GRM will be accessible to all relevant stakeholders who can use this mechanism to send their suggestions, concerns and complaints related to the project. 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 Metn 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 (see Figure 8-1):

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 (rstephan@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 Metn 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 Social Specialist of the PIU for the project. The issue shall be resolved within a maximum of two weeks.

Level 3: If the person is not satisfied with the decision of the Social Specialist of PIU, he or she can bring the complaint to the attention of the PIU Director's Office. 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 act ion being taken, and when a result may be expected.

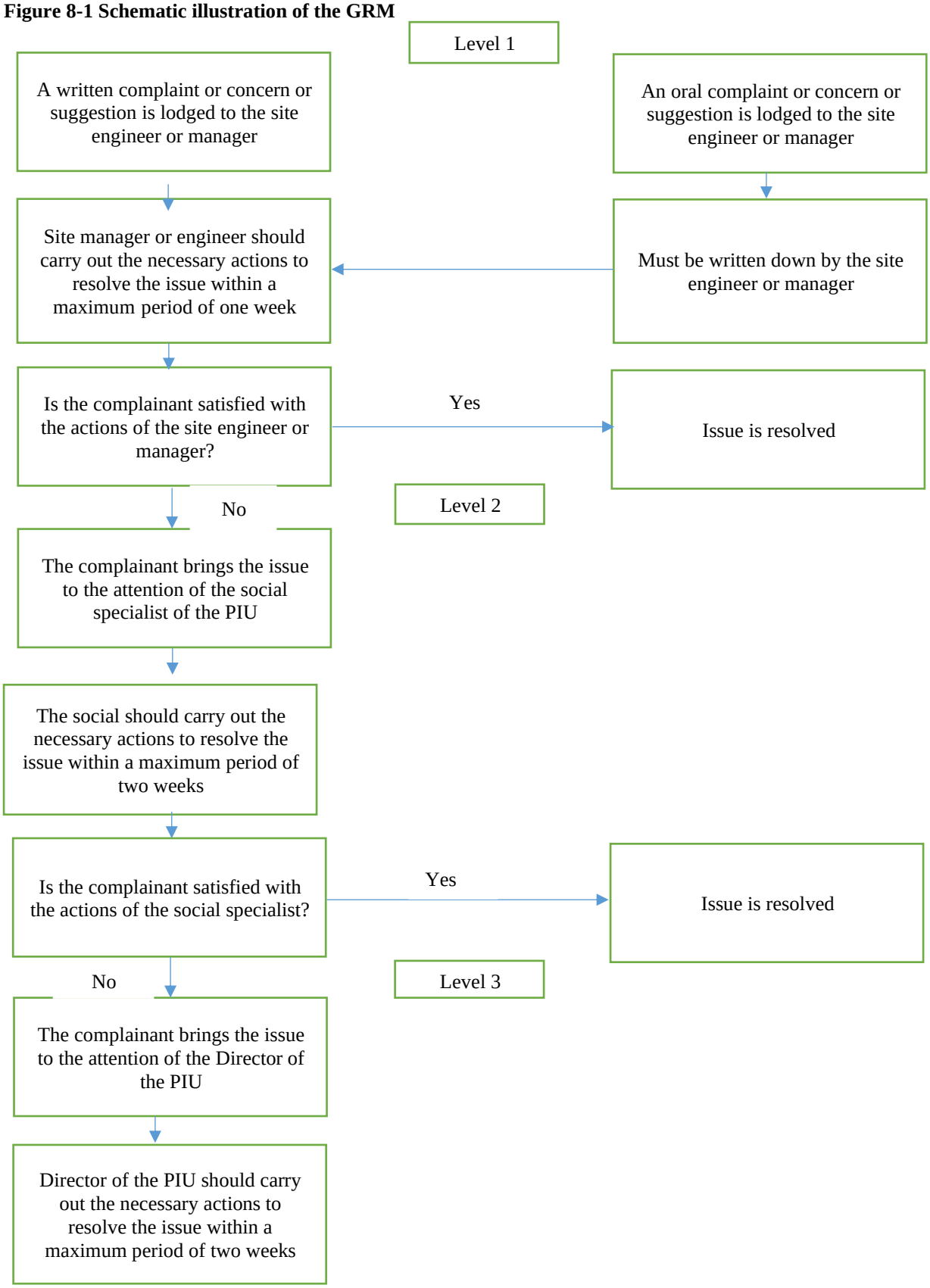
Moreover, reporting of the complaints to the PIU should be done regularly. The designated person at each level should report to the PIU on the number and subject of new complaints received, and the status of the already existing complaints, if any. The report should also inform the PIU of complaints 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 5) 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 Schematic illustration of the GRM



8.2.2 GRM for Workers

Similar to the GRM for surrounding communities, a GRM for internal employees is necessary, namely the labors onsite. 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 PIU Director and should be resolved within one week. It also follows the Complaints Register form (refer to Annex 5).

9. Conclusion

The ESMP identified and assessed the potential environmental and social impacts of REP and consulted relevant stakeholders when preparing the management plan.

In specific, this ESMP report addresses four selected roads for rehabilitation in Metn caza (R1a, R2a, R3, and R4) with a total length of 21.4 km. The rehabilitation activities include: pavement works, improvement and installation of road surface drainage, construction of retaining walls and installation of safety barriers, marking and signing, and installation and maintenance of lighting poles. Works will involve around 142 workers and extend for a total of 18 months.

Road rehabilitation activities are expected to incur environmental impacts that are similar among all Metn Caza roads. Common environmental impacts inlcude fugitive dust emissions, increase in noise, contaminaton of water quality, disruption to traffic movement, potential damages to existing utilities, and disturbance of local biodiversity. Once roads are rehabilitated, the project is expected to improve drainage systems (less runoff water), road safety conditions, reduce traffic accidents and traffic congestion, and ultimately enhance livelihood opportunities. On the other hand, the main expected environmental impacts on water and soil could result from maintenance activities if not managed properly during the "**Defects Liability Period'** during which the Contractor is responsible for maintenance activities.

In this context the contractor must implement proper waste and safety plans and all the environmental mitigation measures provided in this ESMP.

A proper management plan was provided for specific concerns regarding the roads in Metn. The plan includes measures to control exhaust emissions, dust and odor emissions, and soil manipulation activities during the rehabilitation phase. Moreover, proper measures and guidelines on the control of accidental spills of construction materials were provided to prevent soil contamination were provided. Regarding biodiversity, although the concerned roads are mainly under anthropogenic influences, contractors must be careful during the rehabilitation work so that the direct impacts (direct destruction) on ecosystems and associated fauna would be minimal. Waste management plan must be adopted to avoid soil and water contamination that could have irreversible impacts on biodiversity. In other words, rehabilitation debris should not be dumped into the natural habitat (e.g. streams and water channels encountered in Metn Caza along the studied roads).

The potential social risks of the project include labor influx, potential risk of labor induced SH towards female workers and SEA towards women in the surrounding community, potential risk of child labor and poor labor conditions; unfair job allocation; underemployment of women; traffic disturbance; and provisional obstruction of access routes to sensitive receptors which is expected to be high specifically for Metn R2a (residential and commercial areas), Metn R1a (section 1, involving schools), and Metn R3 (highly populated and surrounded by schools). In this context, the ESMP provided measures to mitigate these risks through periodic monitoring of labor conditions, specific required clauses within contracts that aim to protect workers, and the CoC for GBV issues. In addition, a robust GRM must be clearly communicated to all project-affected persons before and during project implementation.

Moreover, a monitoring plan was set along with defined responsibilities for the operationalization of the ESMP. In other words, the ESMP generated key project environmental and social indicators to monitor project implementation success. It is designed to guarantee effectiveness in the measurement of major project outcomes and outputs based on measurable indicators.

Lastly, a Construction Environmental and Social Management Plan must be prepared once the contractors are appointed. This CESMP must account as well for the recommendations and guidelines provided within this ESMP to ensure protection of the surrounding environment and the society.

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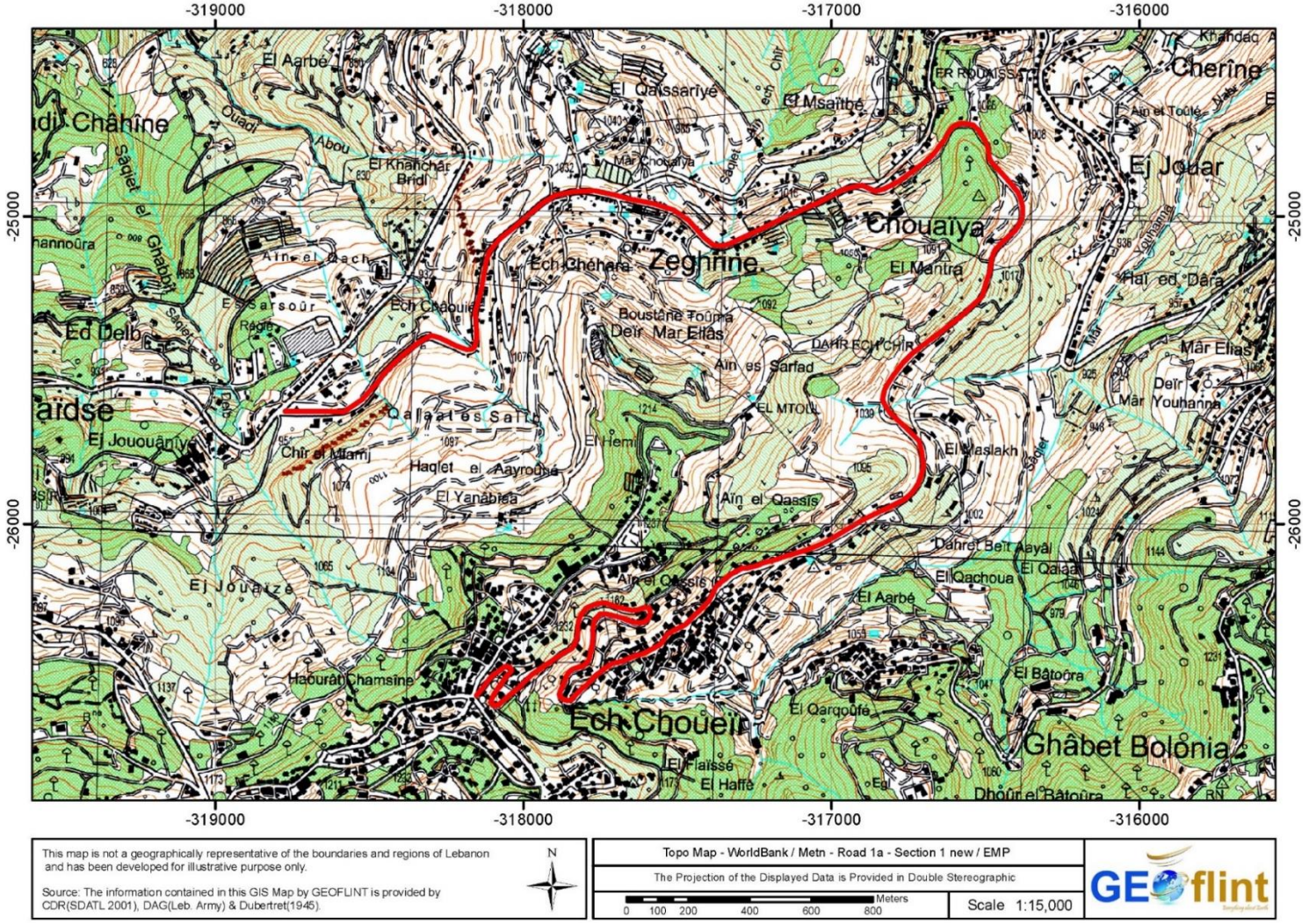
Annex

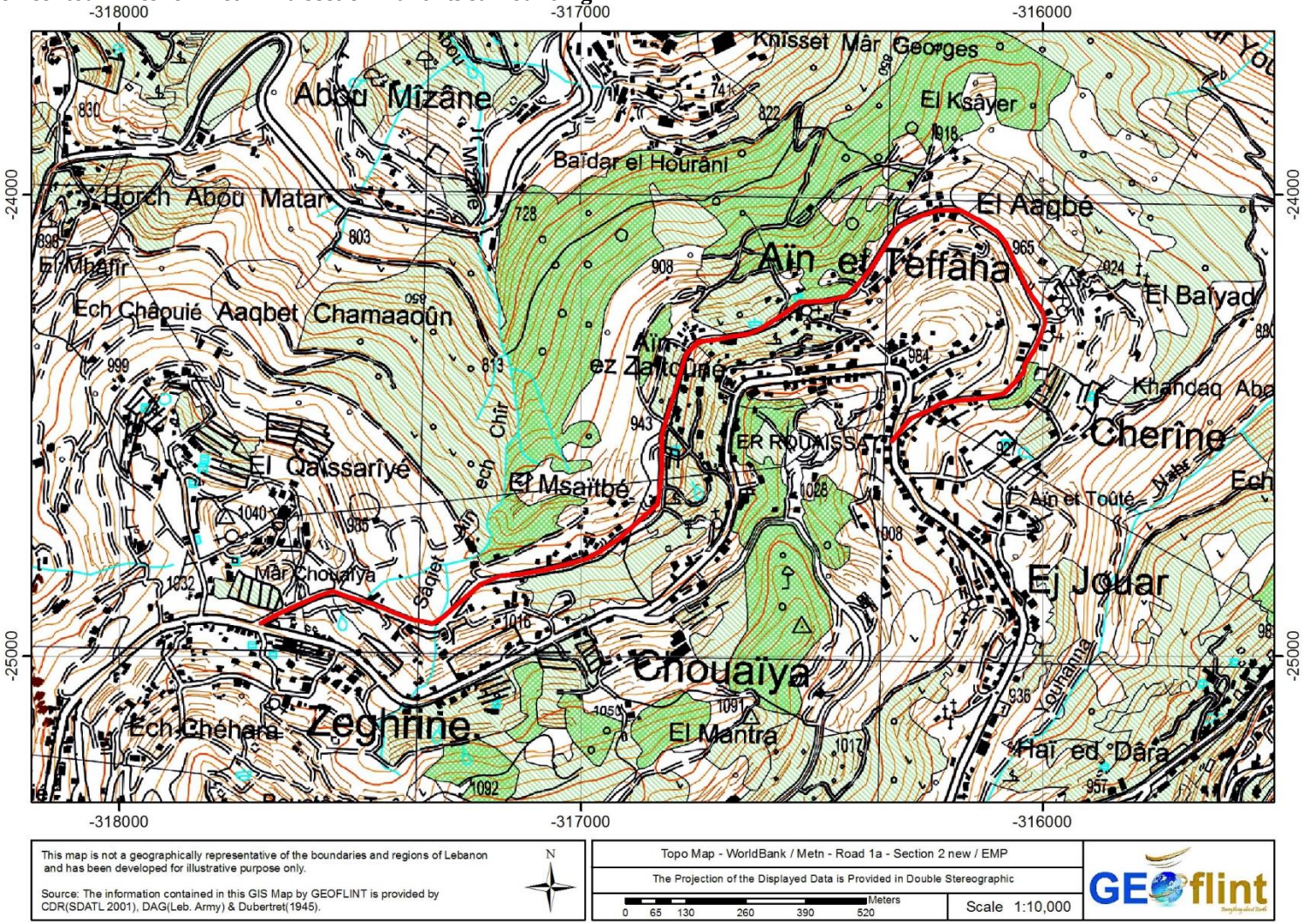
Annex 1: Figures and Tables Related to Chapter 4

Figure A Elevation contour lines for Metn R1a section 1 and its surrounding



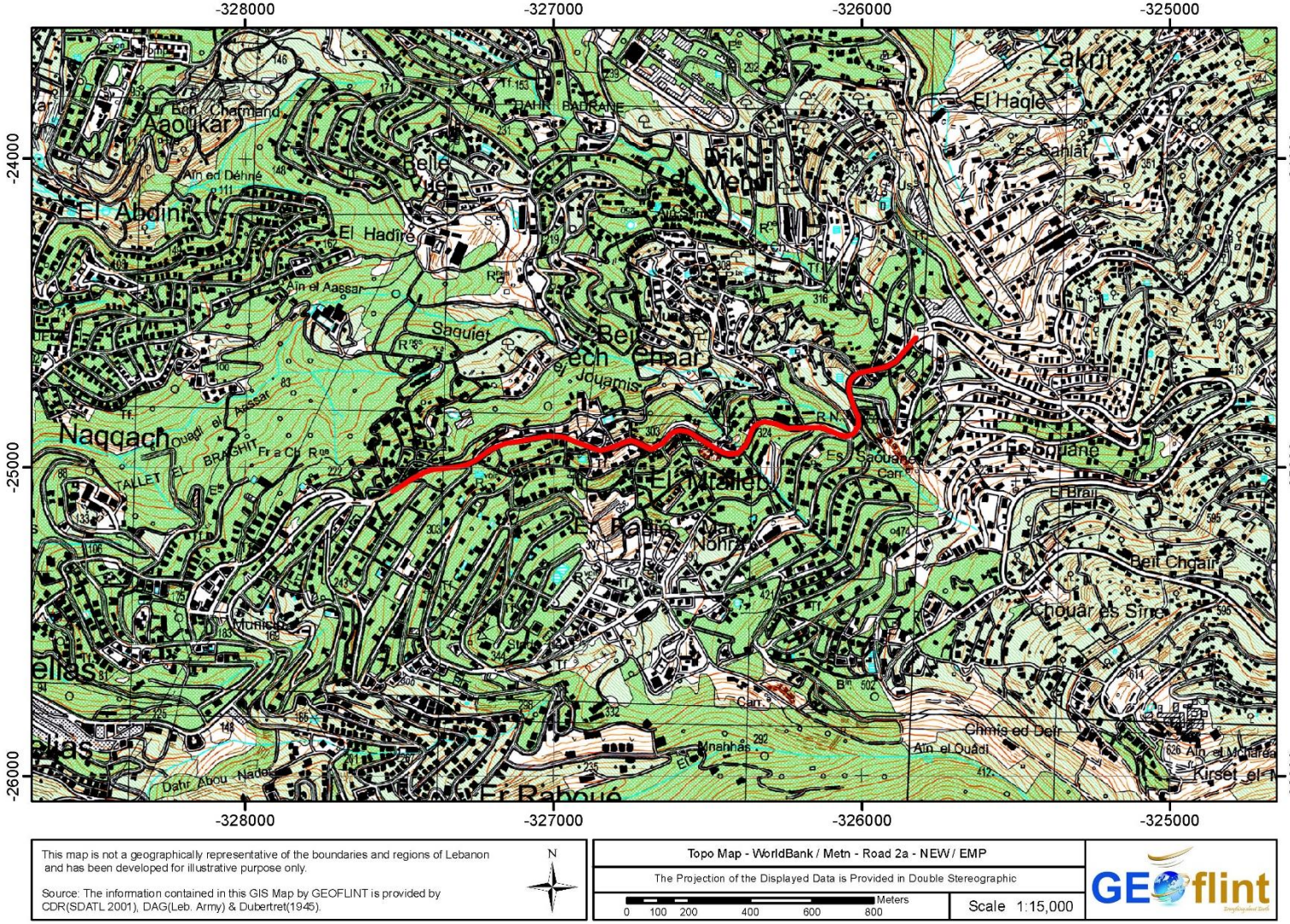
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure B Elevation contour lines for Metn R1a section 2 and its surrounding



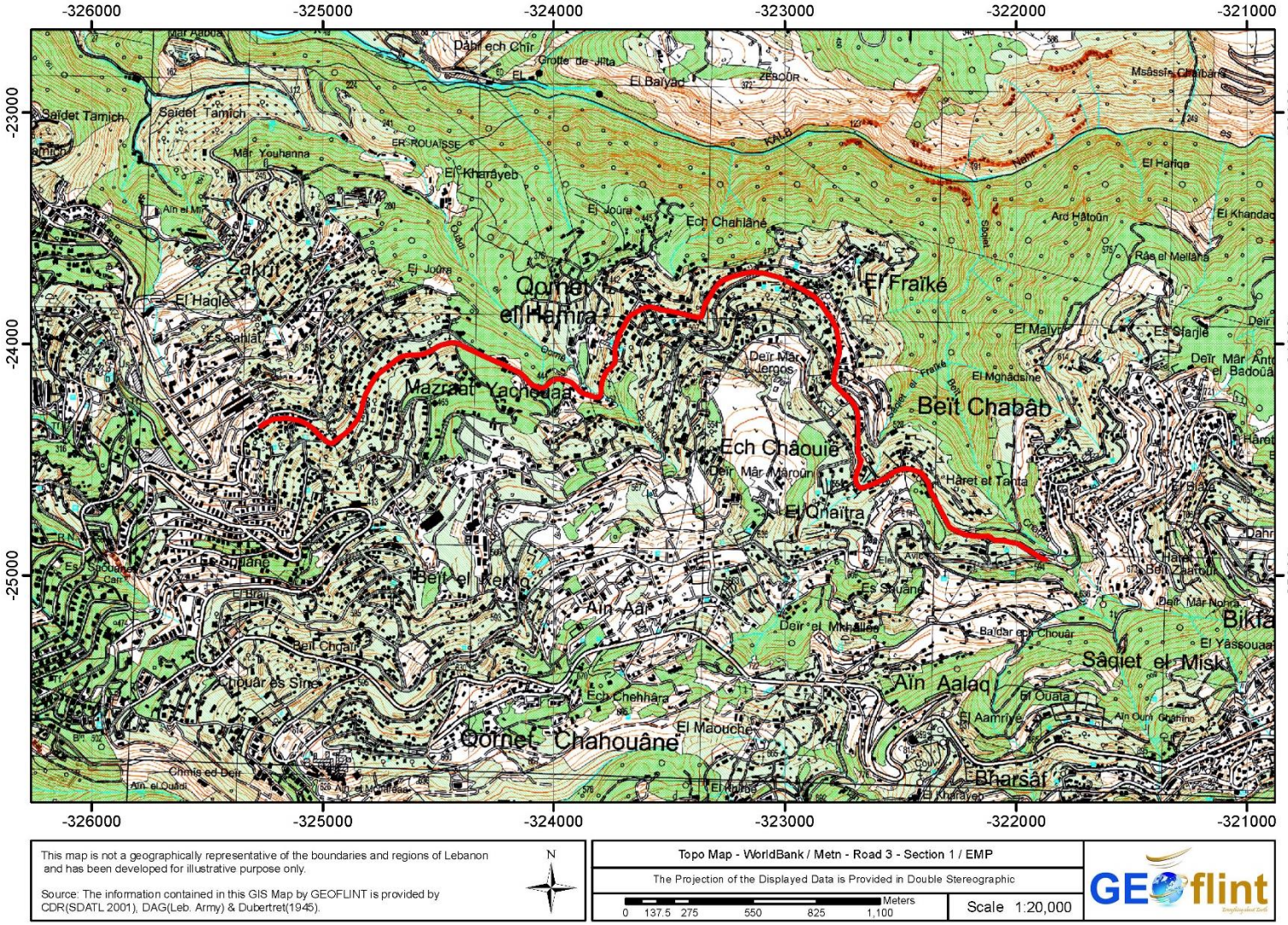
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure C Elevation contour lines for Metn R2a and its surrounding



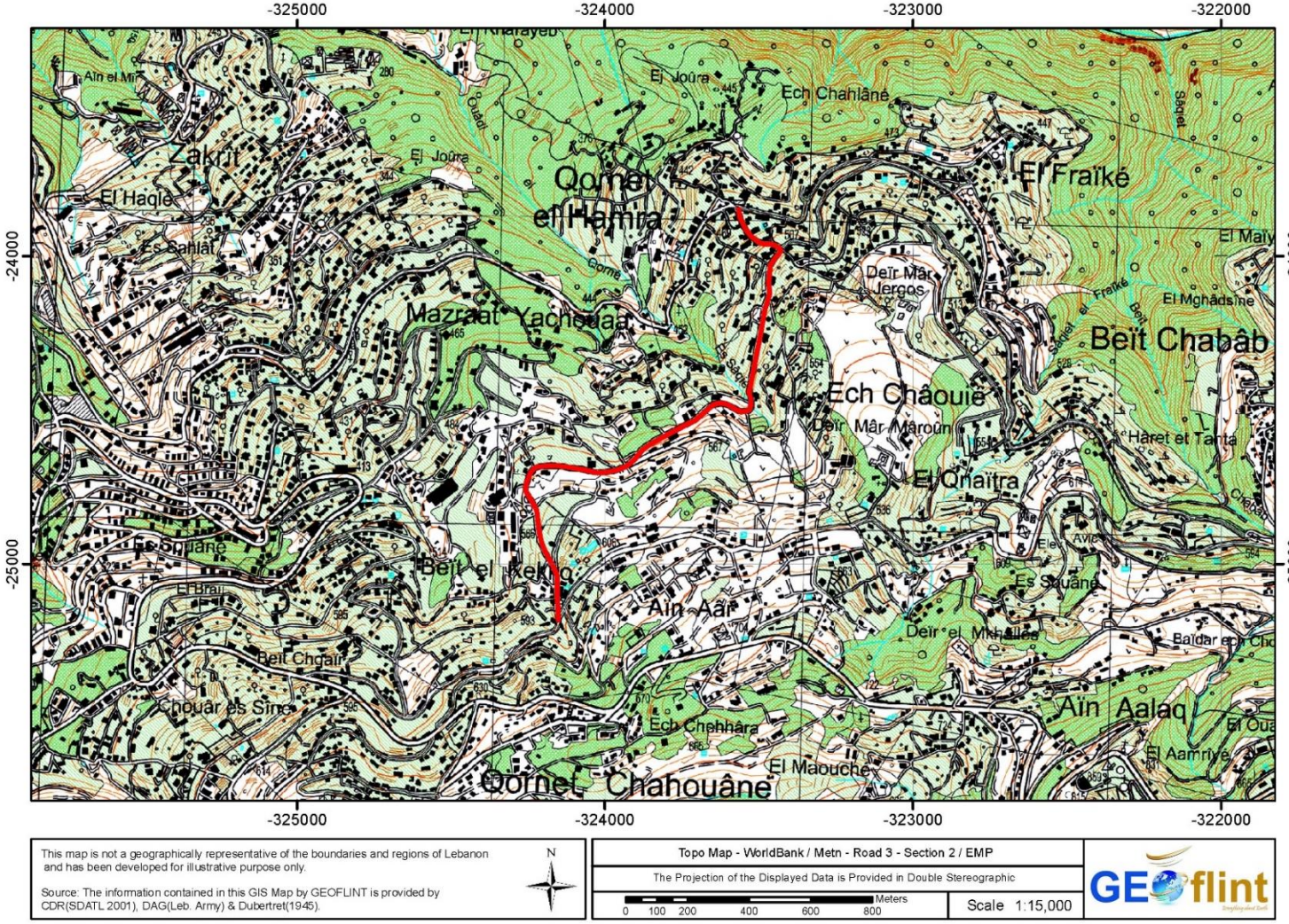
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure D Elevation contour lines for Metn R3 section 1 and its surrounding



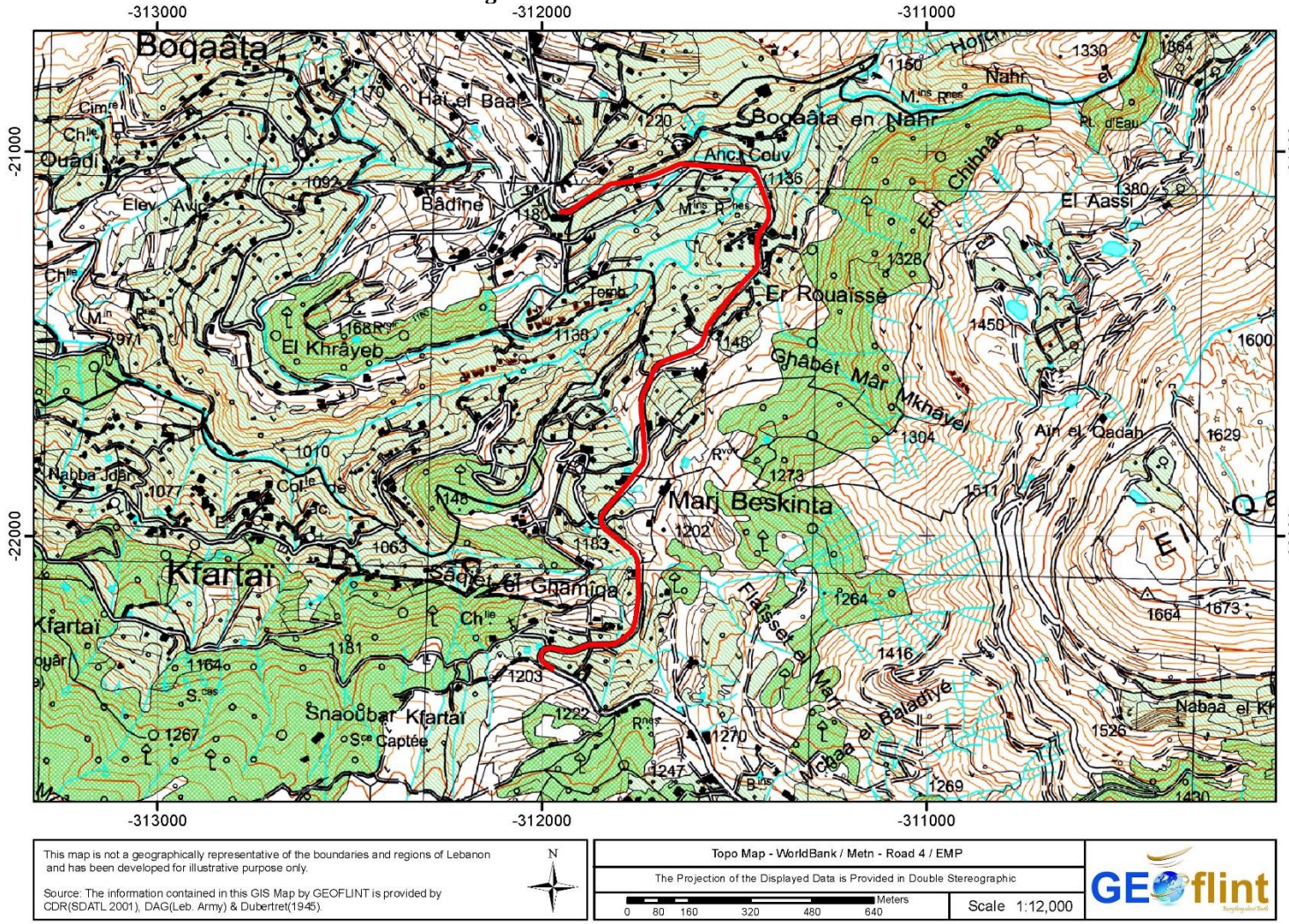
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure E Elevation contour lines for Metn R3 section 2 and its surrounding



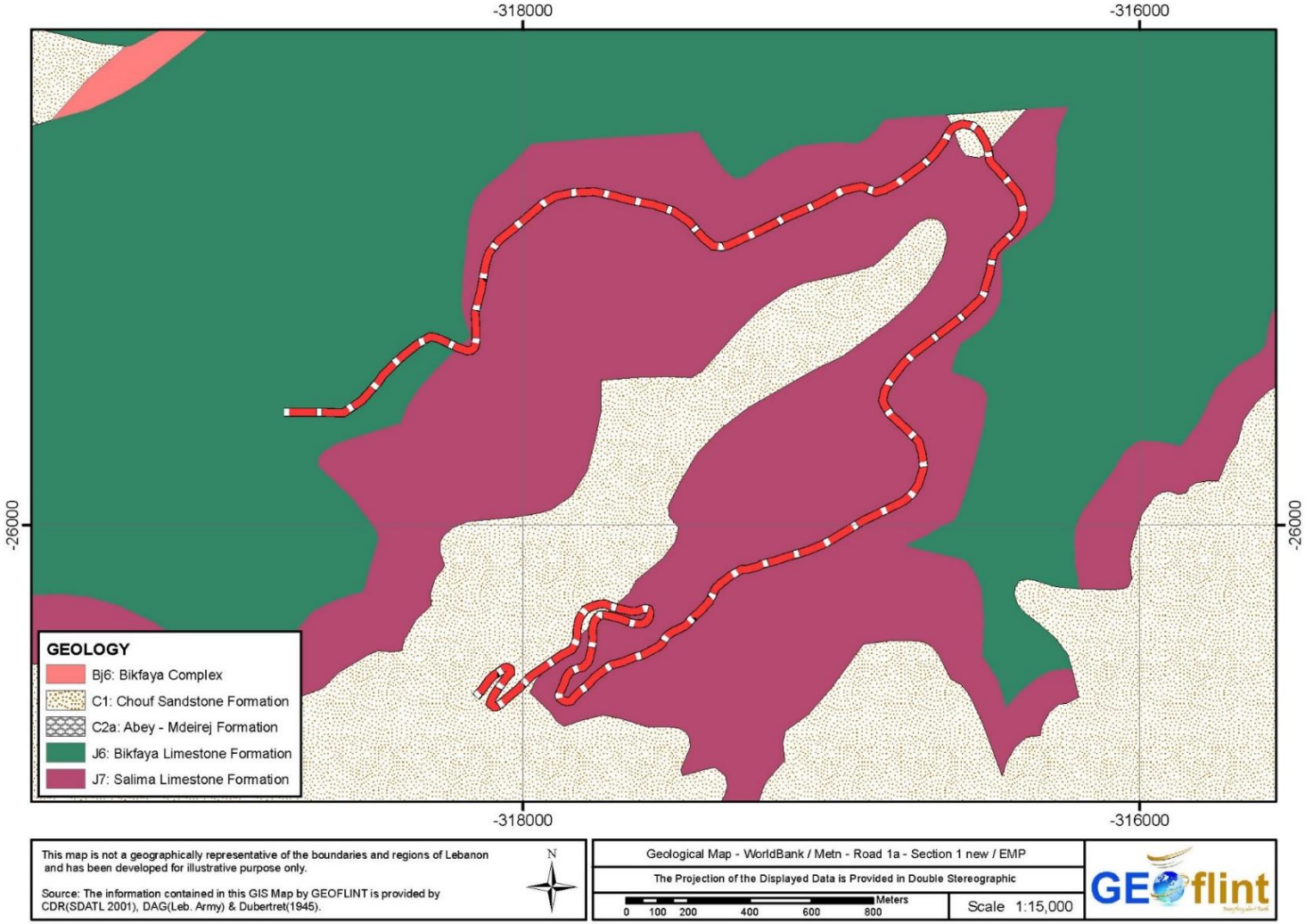
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure F Elevation contour lines for Metn R4 and its surrounding



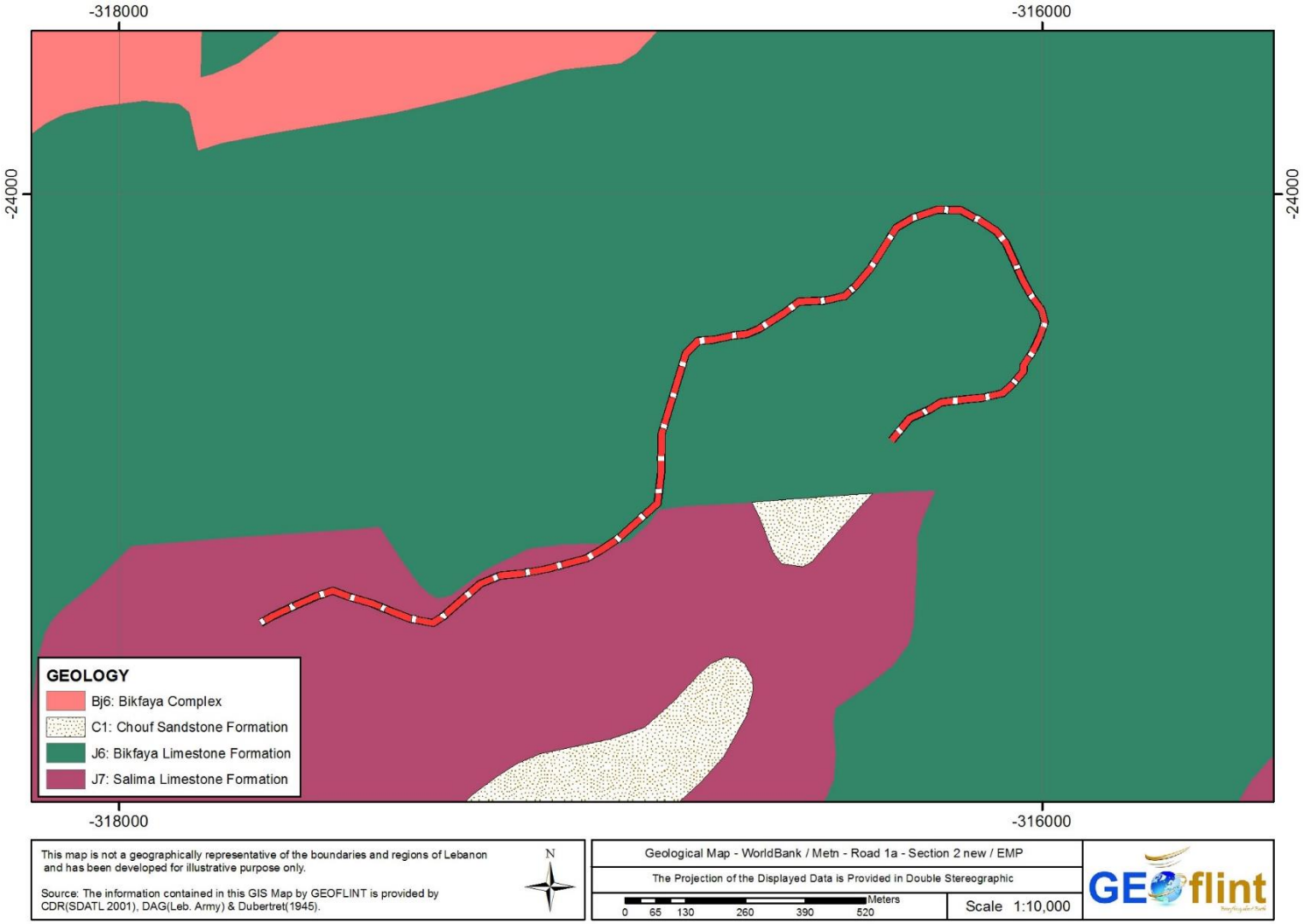
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure G General Geological map of Metn R1a section 1 and its surrounding (surface outcrops)



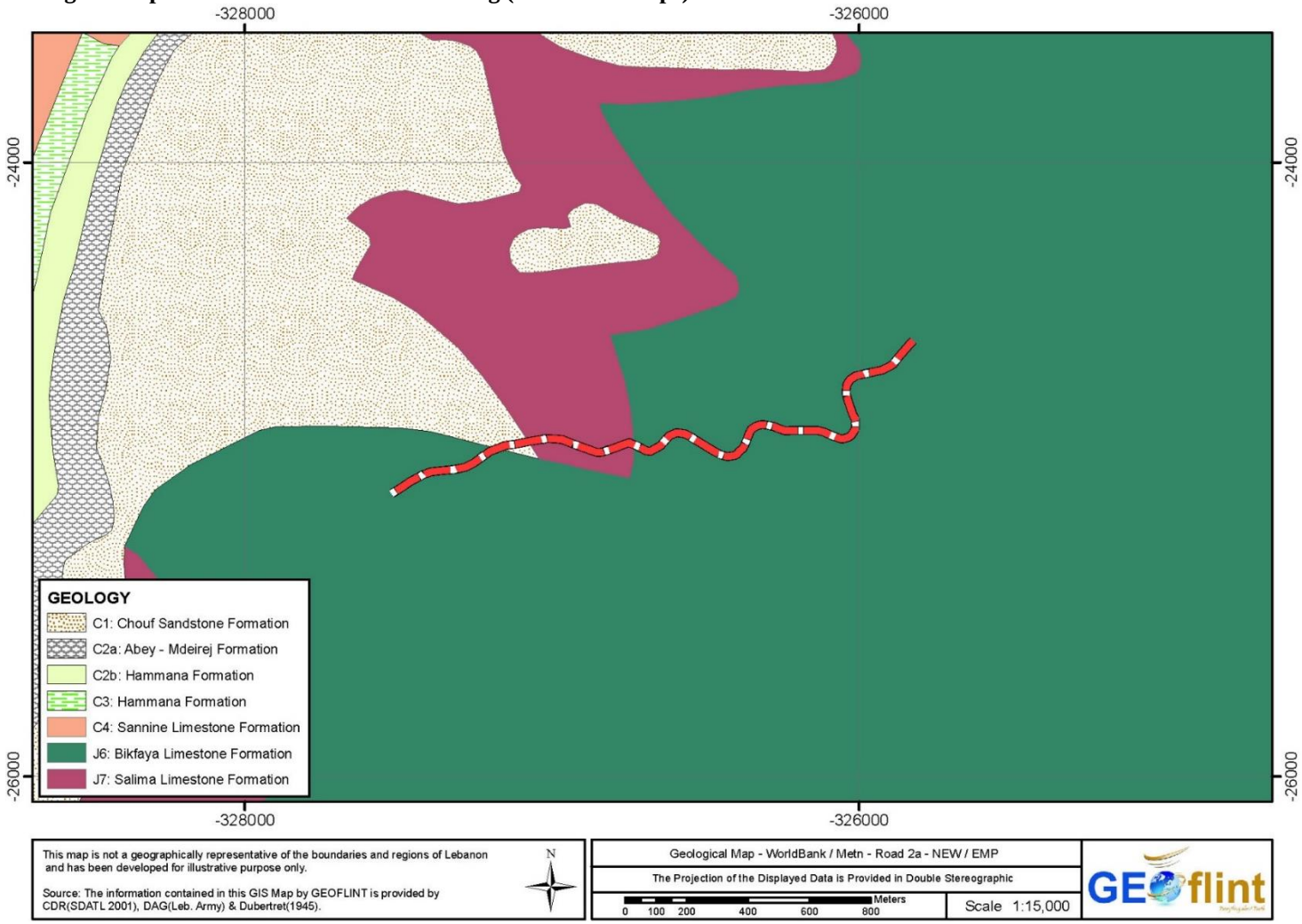
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure H General Geological map of Metn R1a section 2 and its surrounding (surface outcrops)



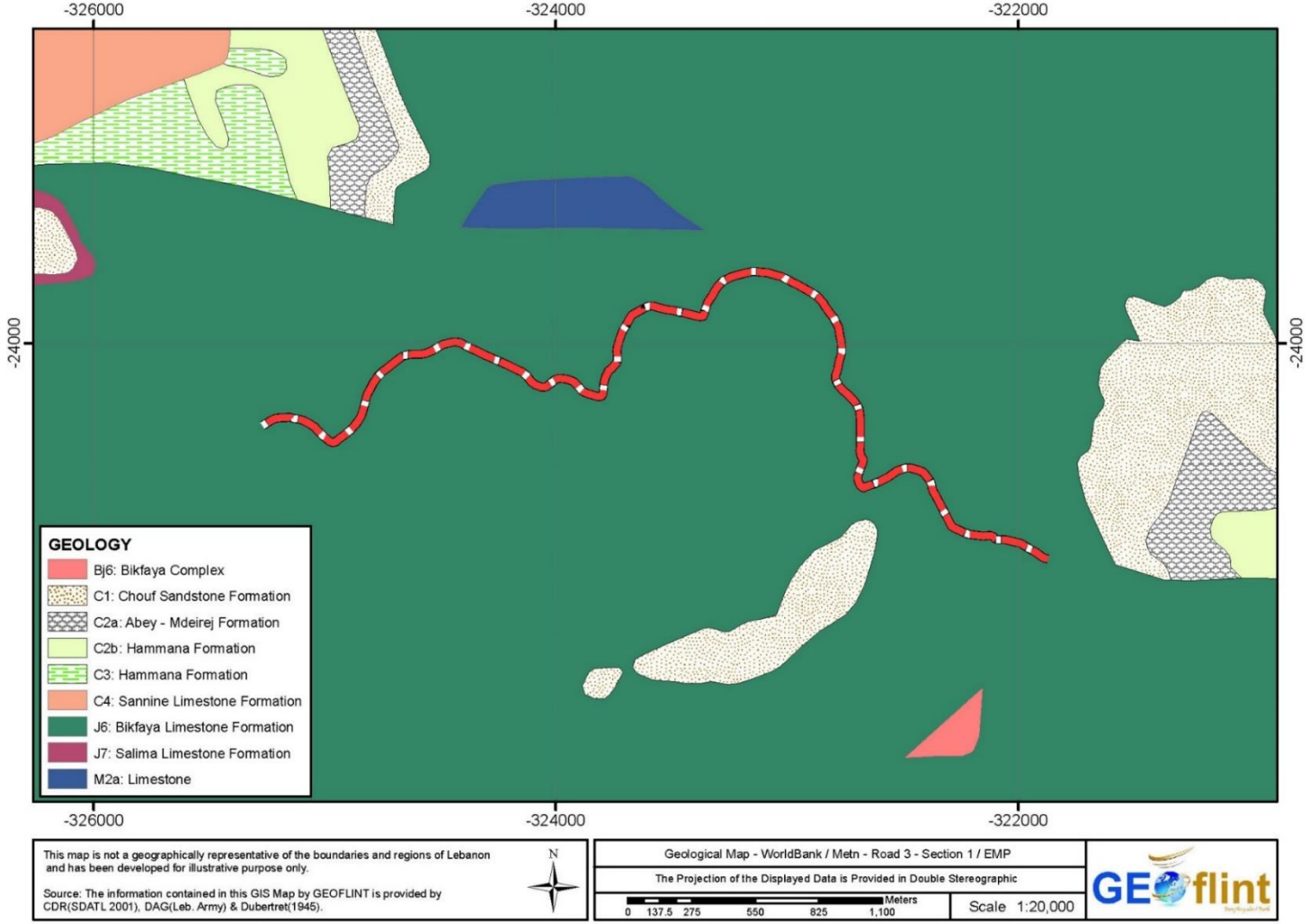
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure I General Geological map of Metn R2a and its surrounding (surface outcrops)



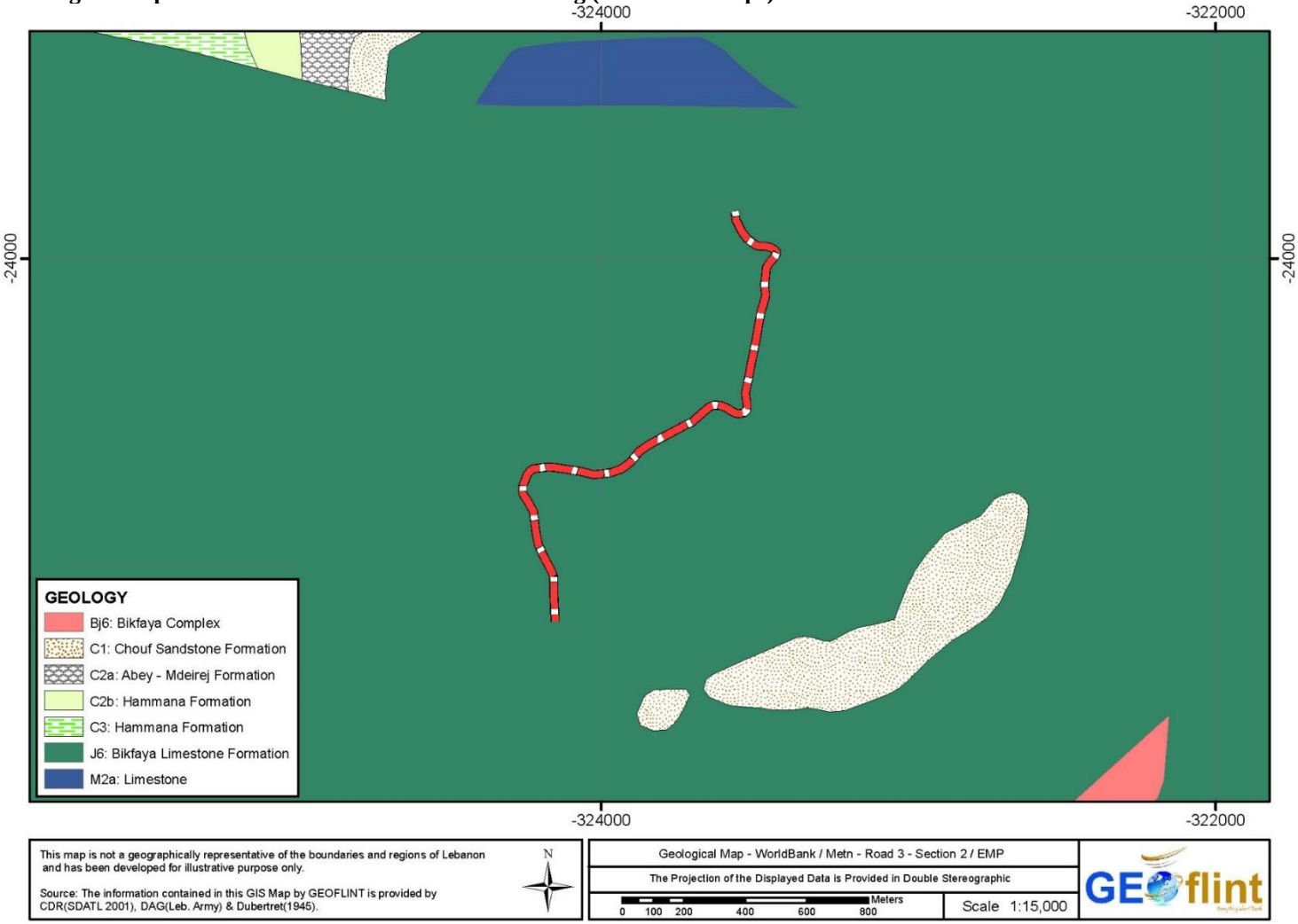
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure J General Geological map of Metn R3 section 1 and its surrounding (surface outcrops)



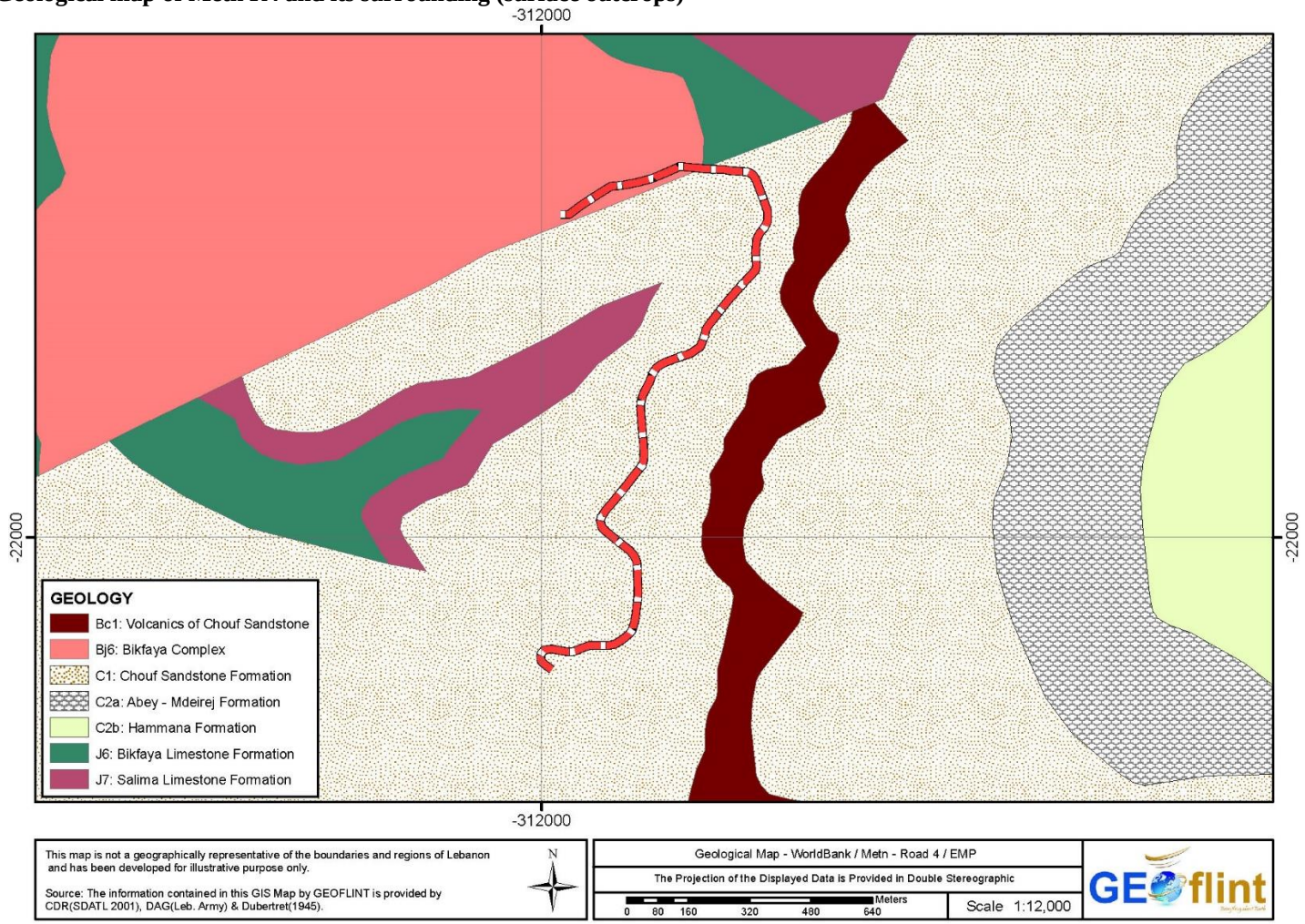
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure K General Geological map of Metn R3 section 2 and its surrounding (surface outcrops)



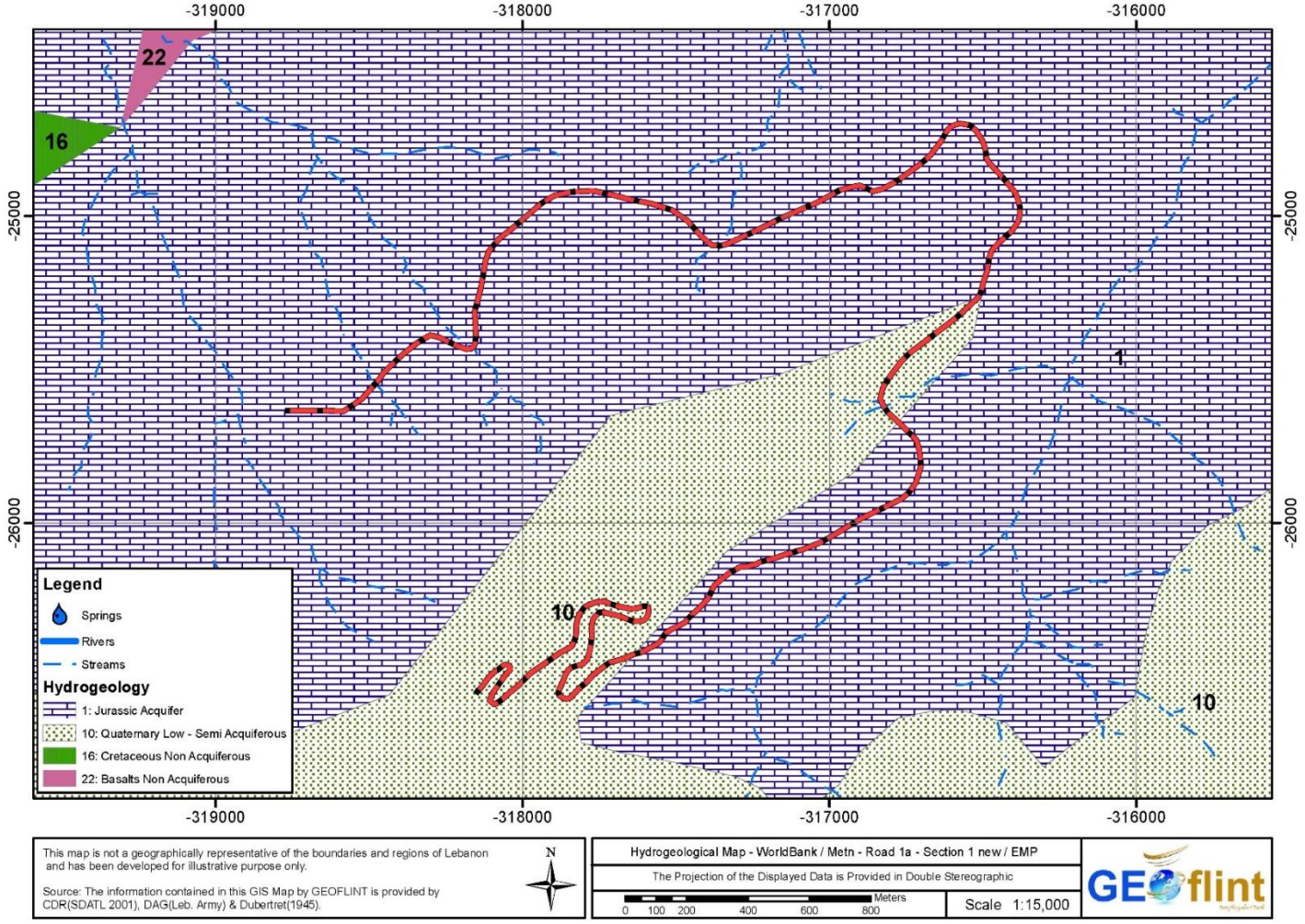
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure L General Geological map of Metn R4 and its surrounding (surface outcrops)



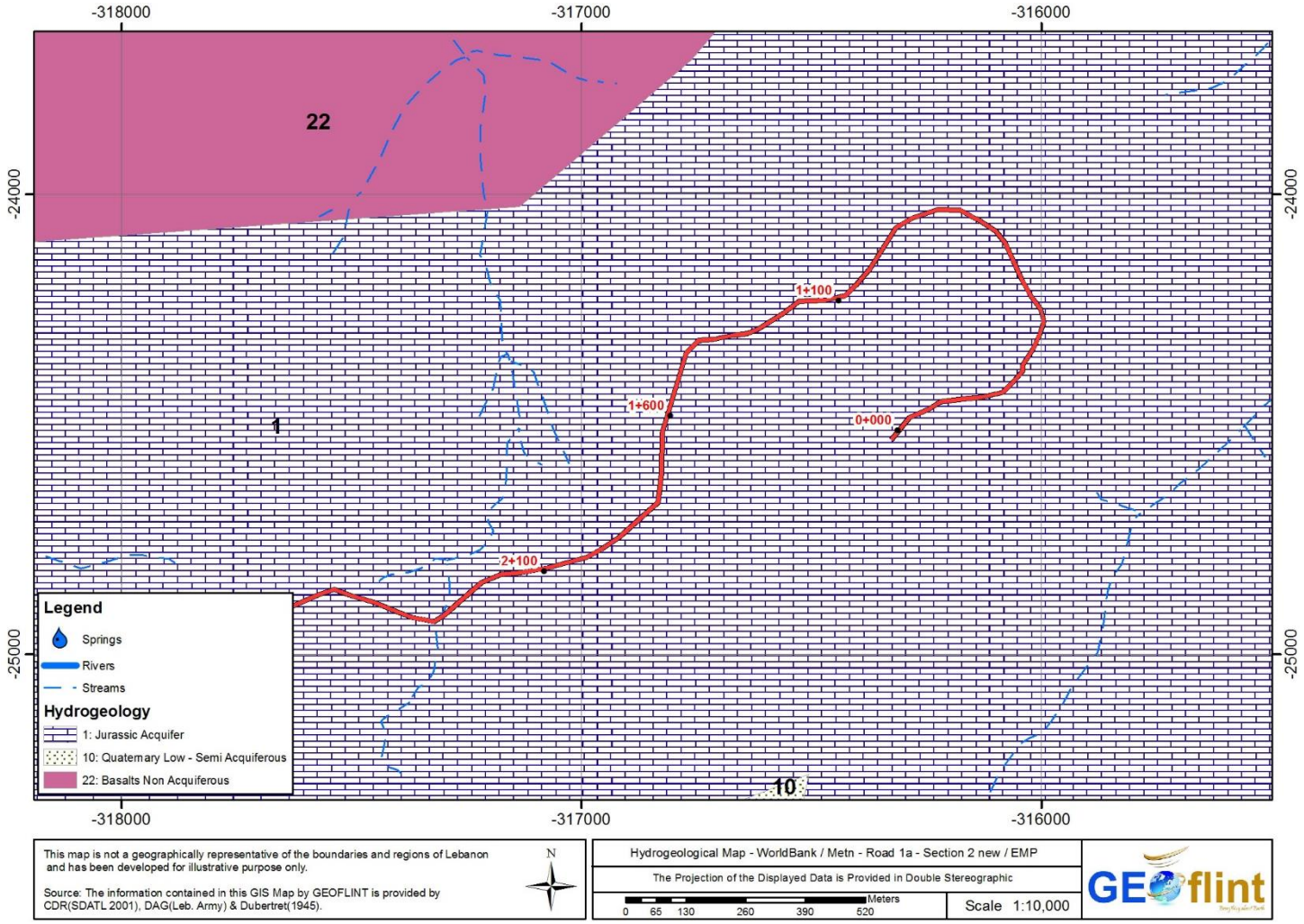
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure M Hydrogeological map of Metn R1a section 1 and its surrounding (map showing water potential of the subsurface). Refer to Table 4 8 for description of hydrogeology classes.



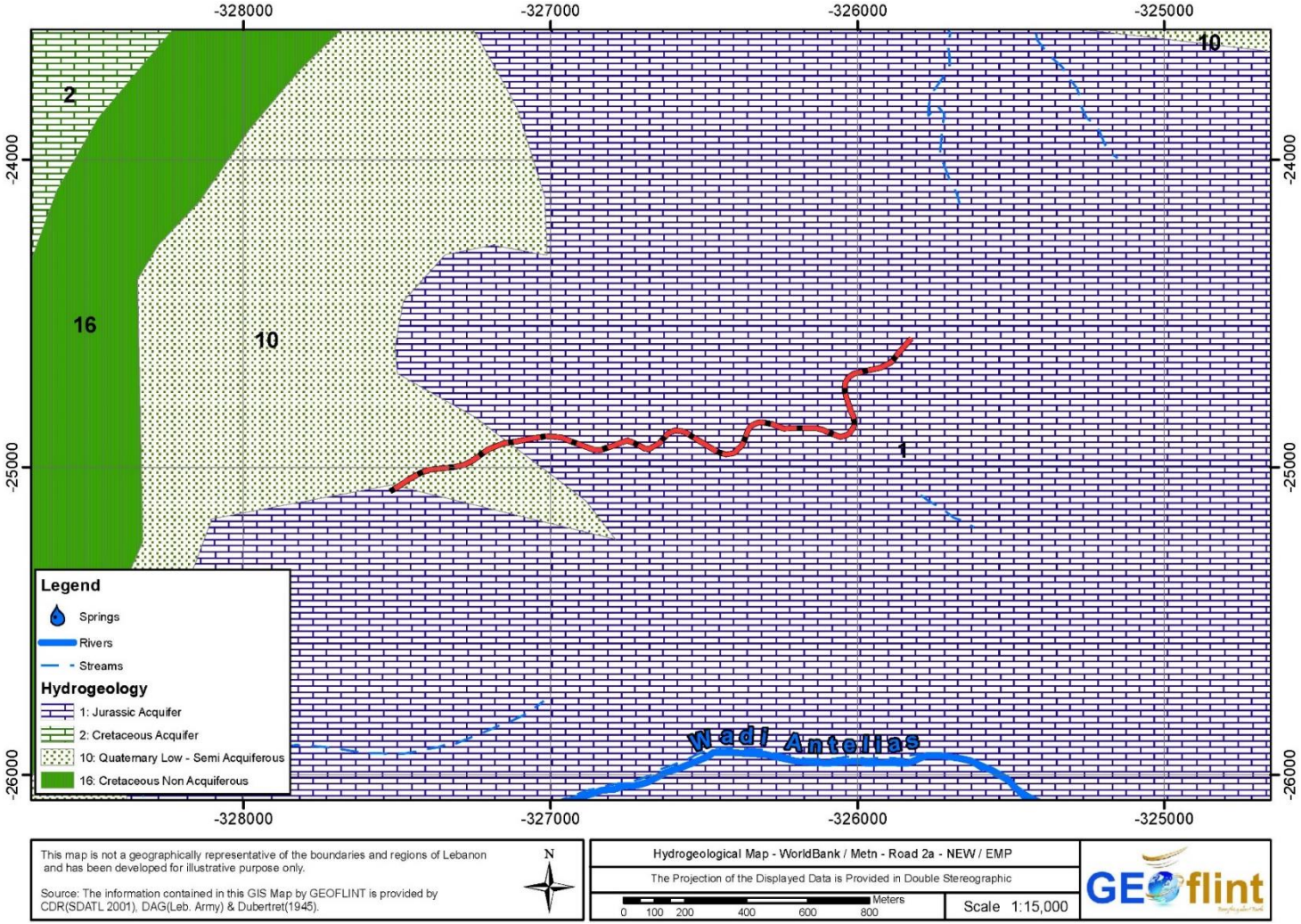
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure N Hydrogeological map of Metn R1a section 2 and its surrounding (map showing water potential of the subsurface). Refer to Table 4 8 for description of hydrogeology classes.



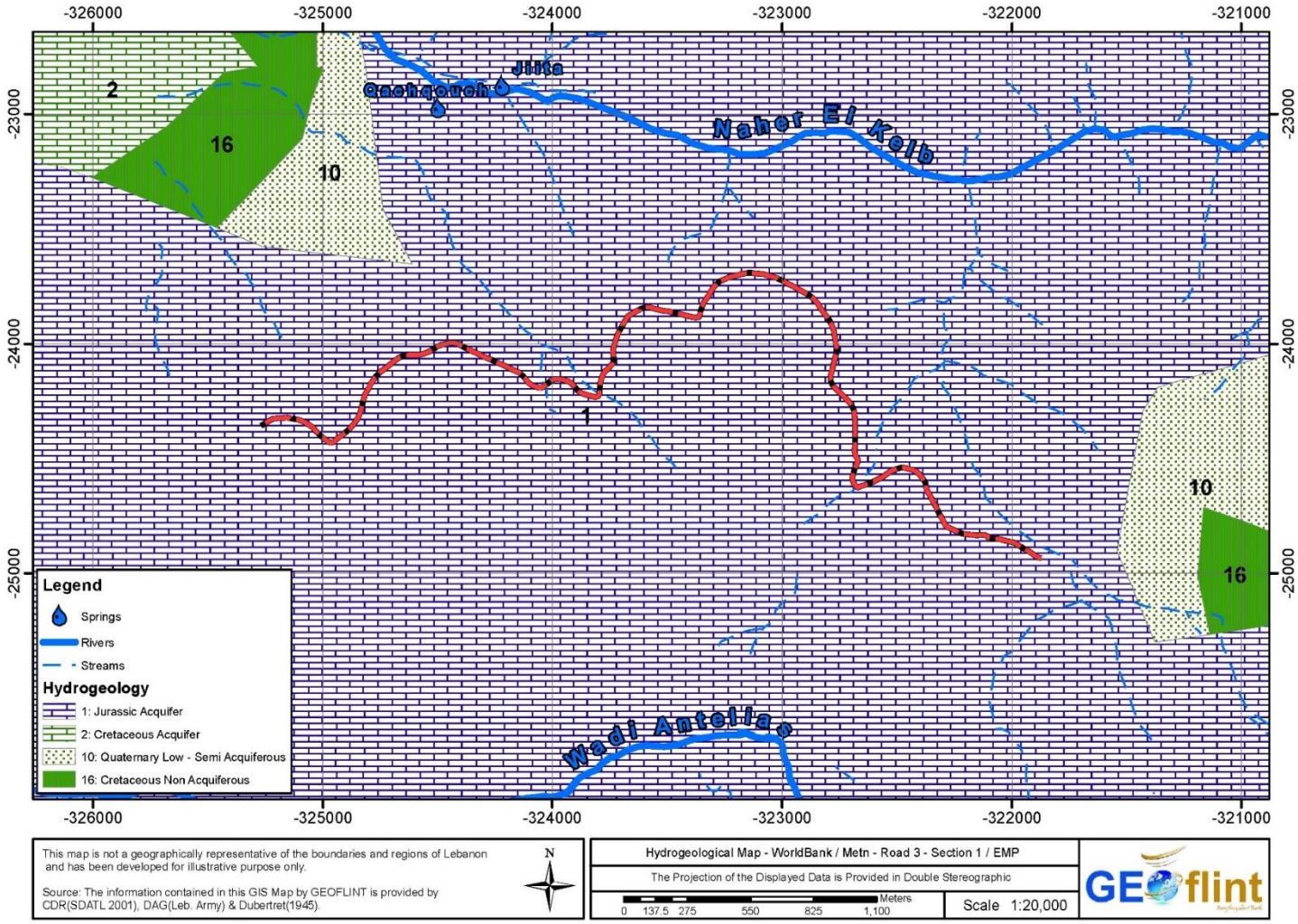
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure O Hydrogeological map of Metn R2 a and its surrounding (map showing water potential of the subsurface). Refer to Table 4 8 for description of hydrogeology classes.



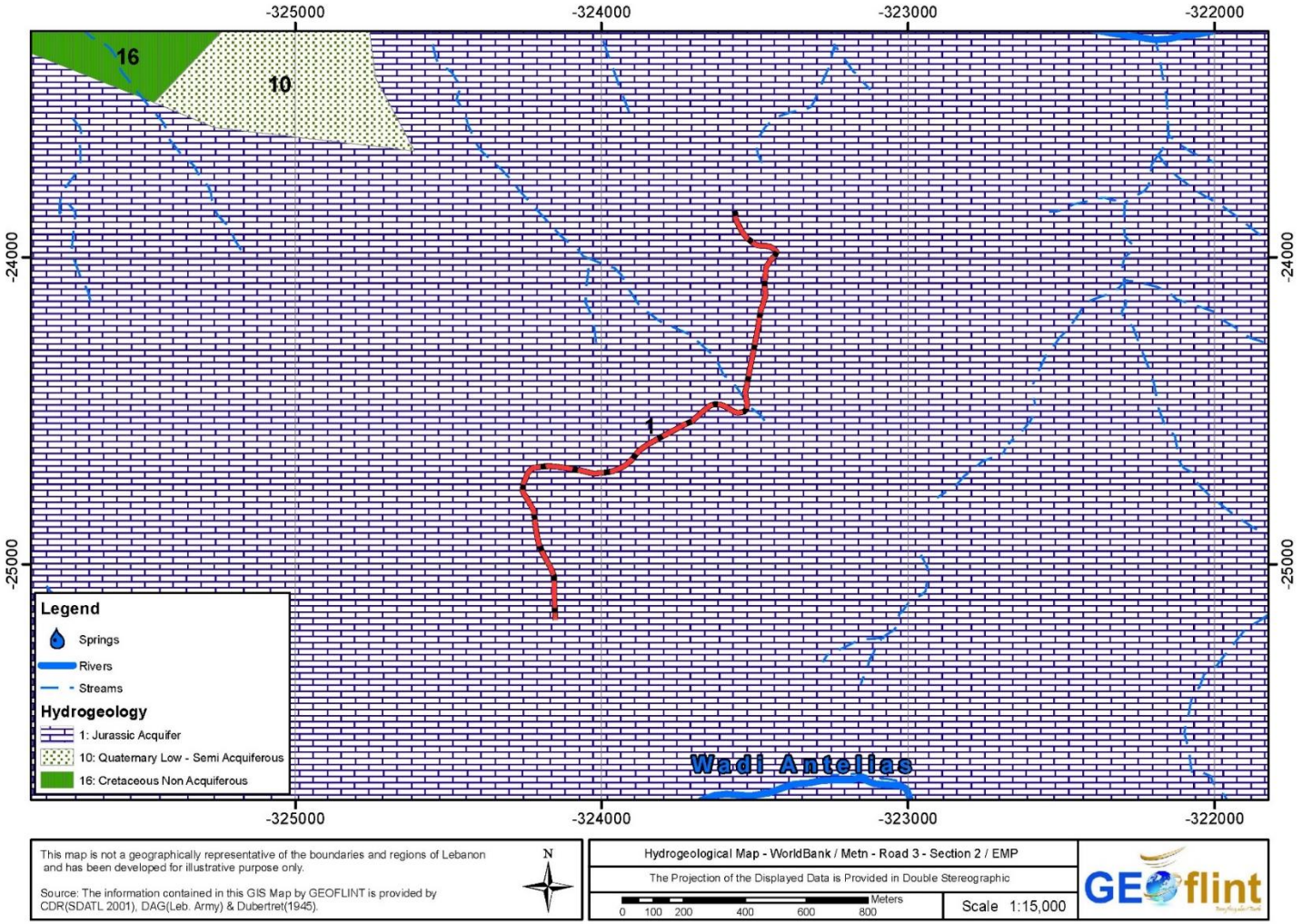
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure P Hydrogeological map of Metn R3 section 1 and its surrounding (map showing water potential of the subsurface). Refer to Table 4 8 for description of hydrogeology classes.



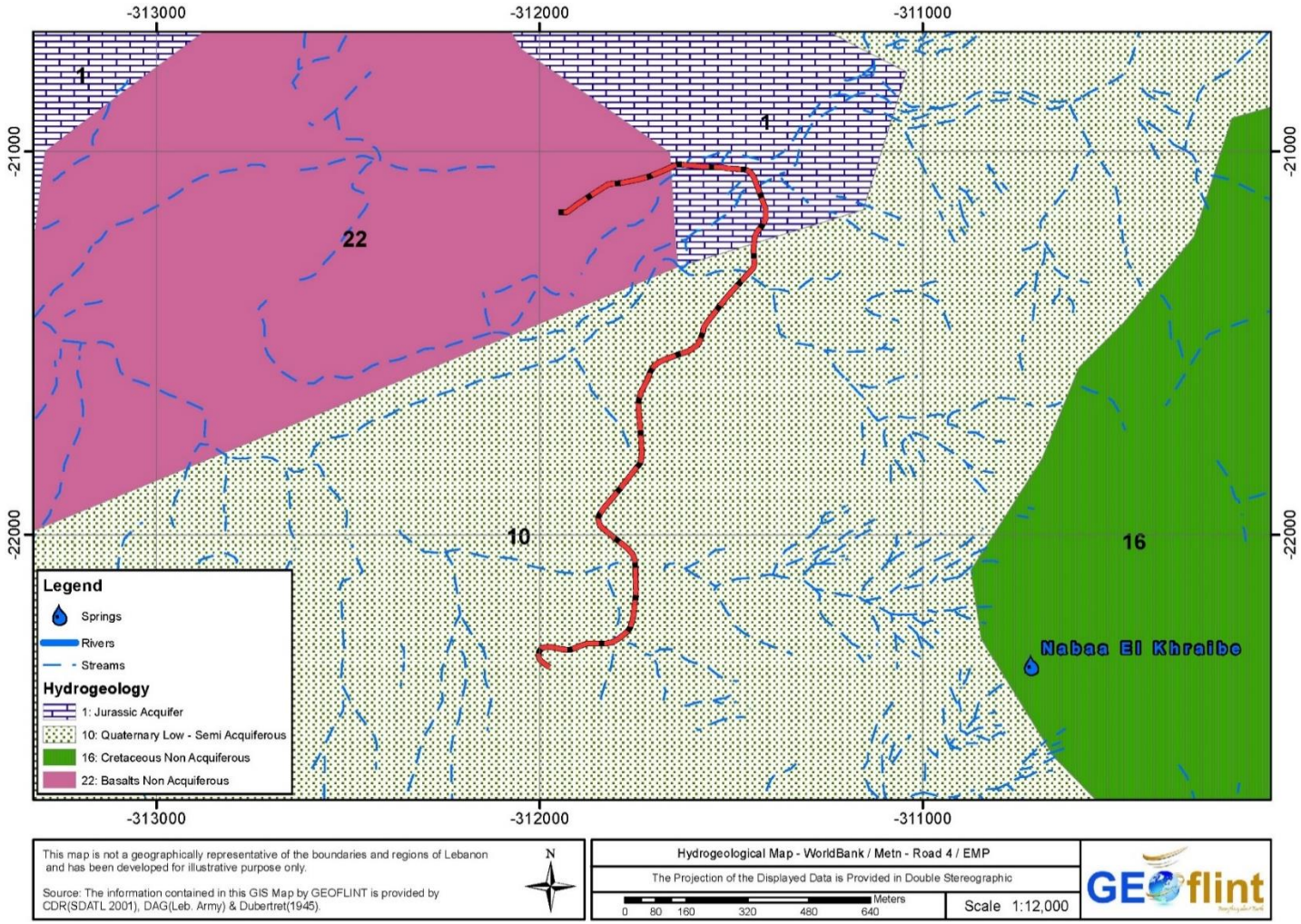
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure Q Hydrogeological map of Metn R3 section 2 and its surrounding (map showing water potential of the subsurface). Refer to Table 4 8 for description of hydrogeology classes.



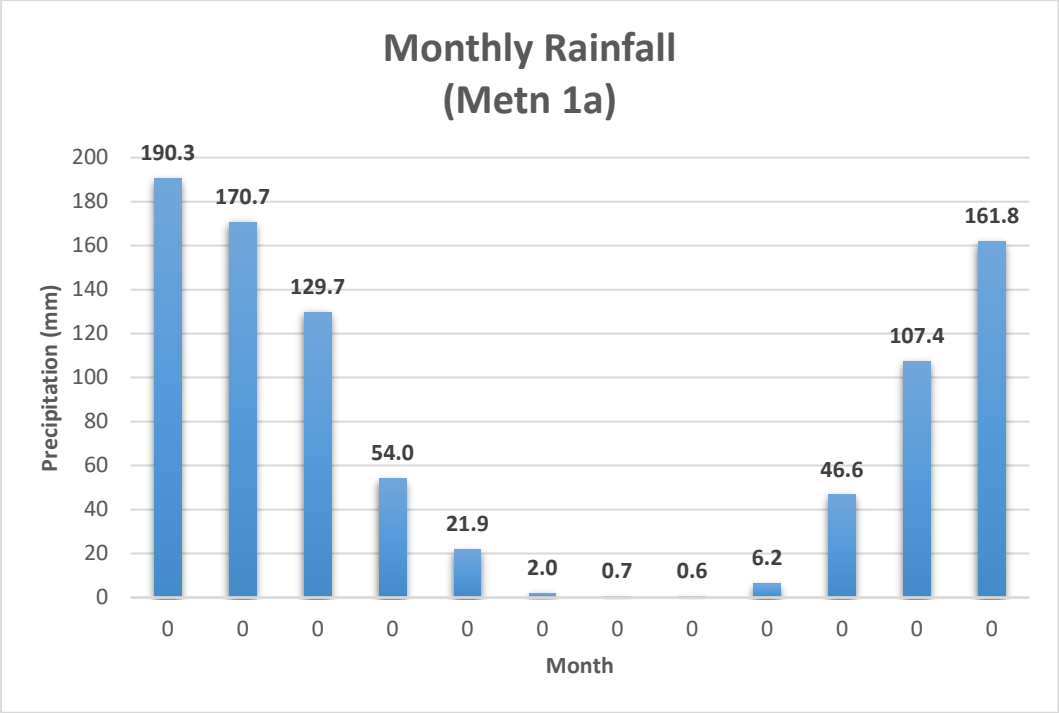
Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure R Hydrogeological map of Metn R4 and its surrounding (map showing water potential of the subsurface). Refer to Table 4 8 for description of hydrogeology classes.



Source: CDR, DAG, & Dubertret; processed by Geoflint

Figure S Precipitations values along Metn R1a alignment (period extending between 1996-2018) CHIRPS satellite 4.5 km spatial resolution



Source: CHIRPS satellite

Figure T Precipitations values for Metn R2a (1996-2018) CHIRPS satellite 4.5km spatial resolution

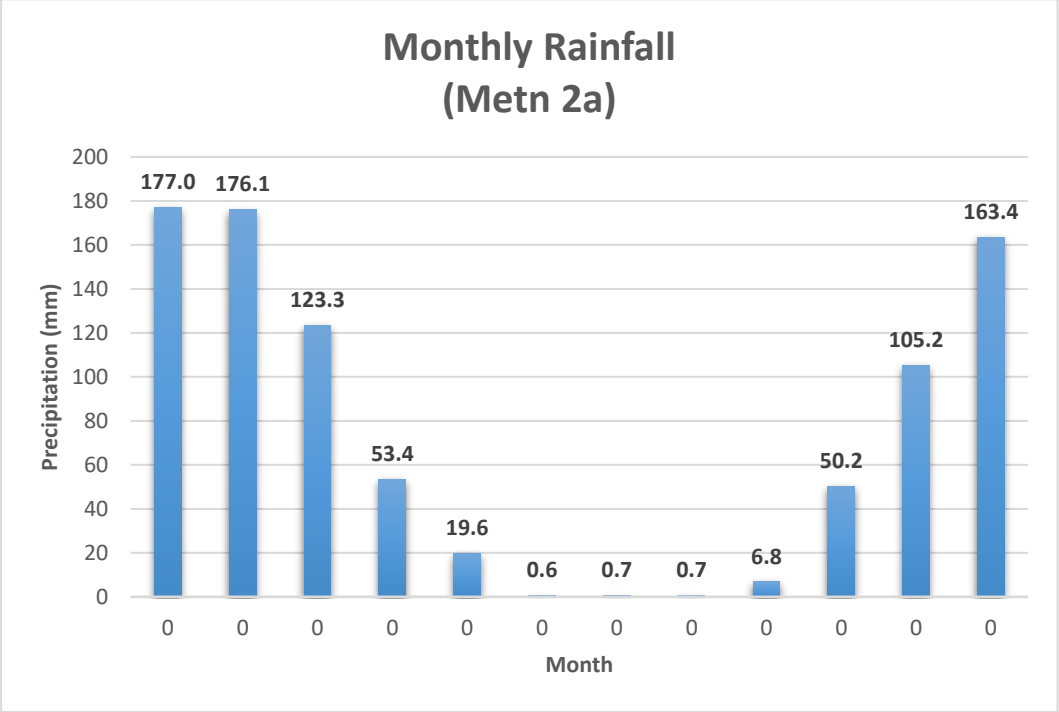
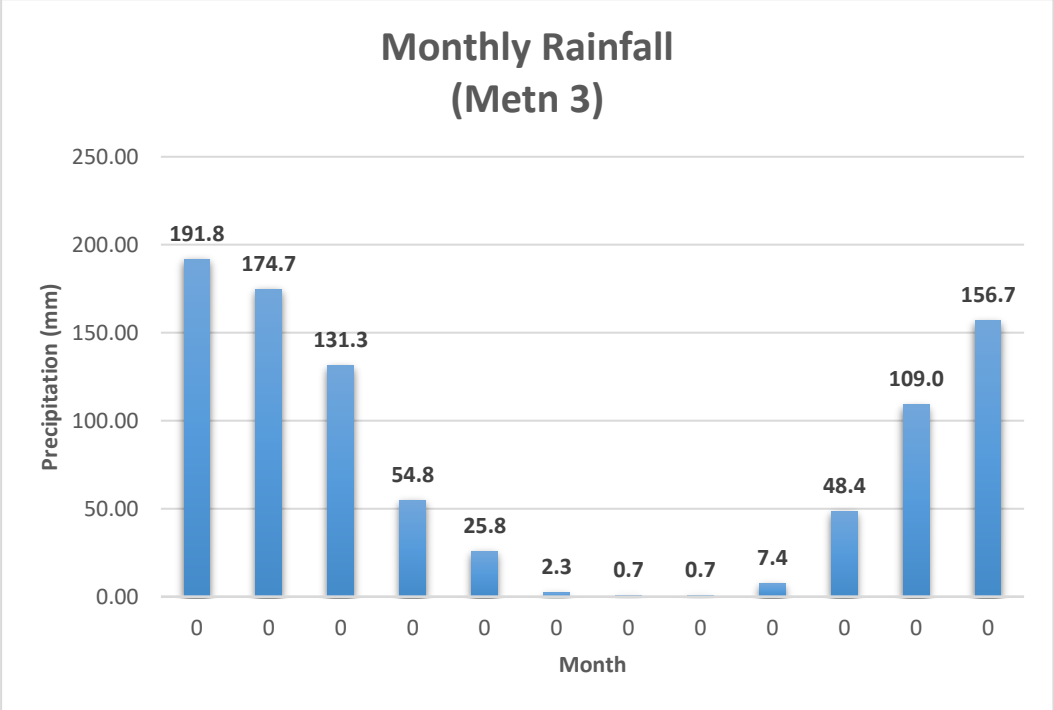
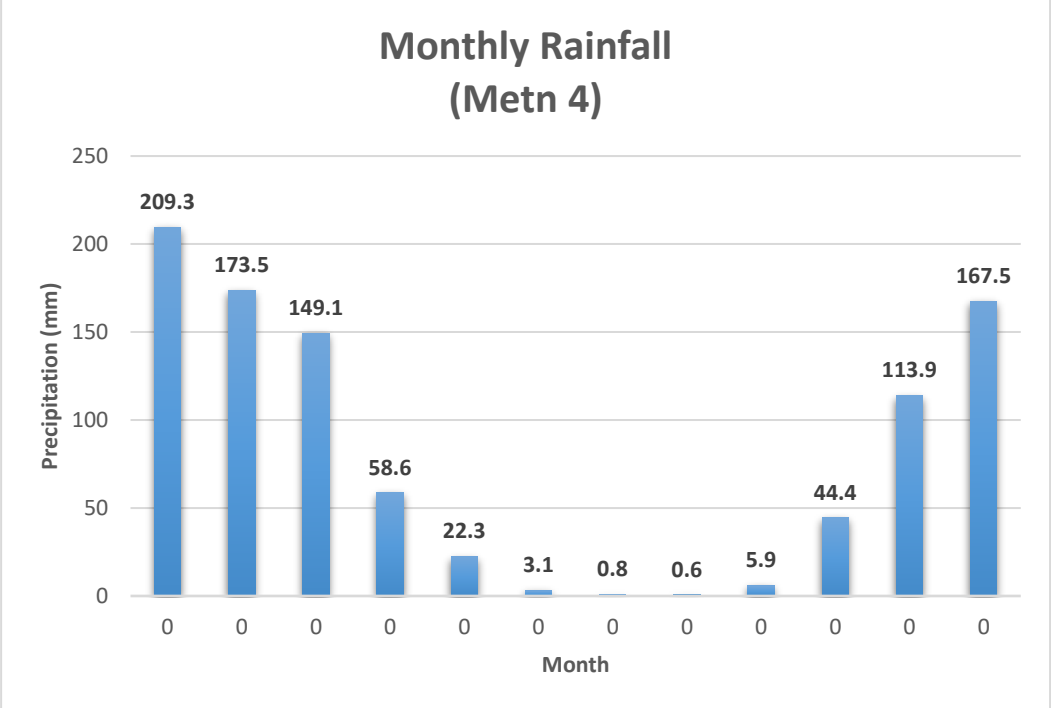


Figure U Precipitations values for Metn R3 (1996-2018) CHIRPS satellite 4.5km spatial resolution



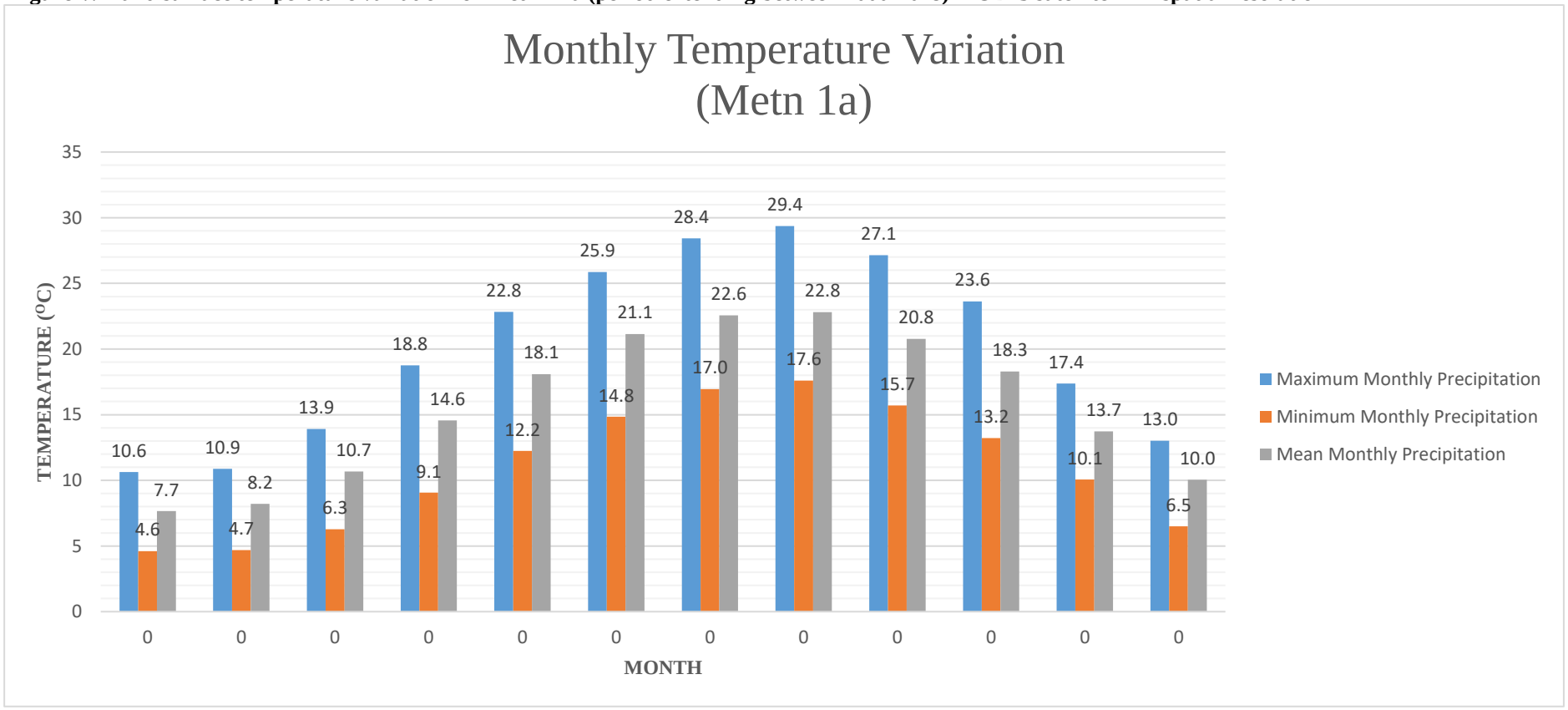
Source: CHIRPS satellite

Figure V Precipitations values for Metn R4 (1996-2018) CHIRPS satellite 4.5km spatial resolution



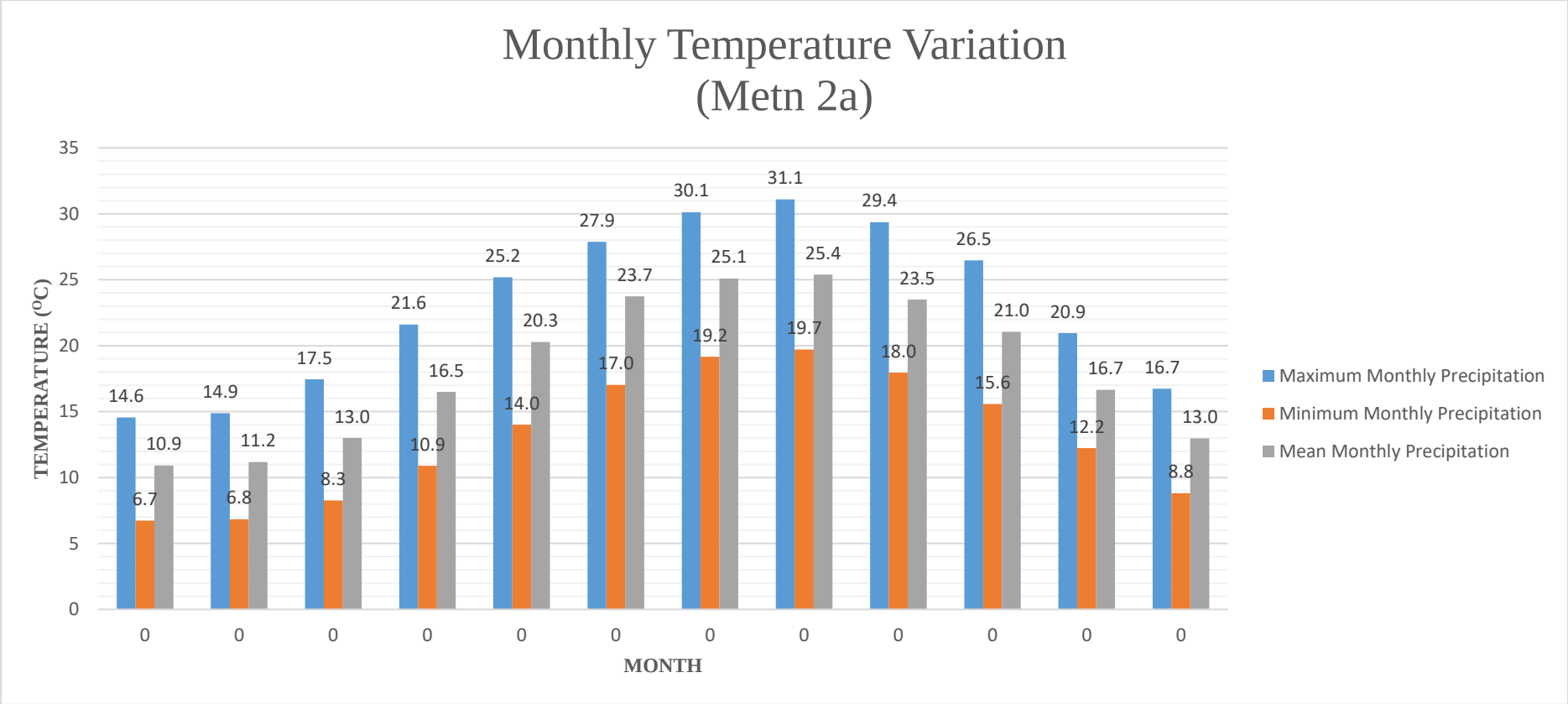
Source: CHIRPS satellite

Figure W Land surface temperature variation for Metn R1a (period extending between 2000-2018) MODIS satellite 1km spatial resolution



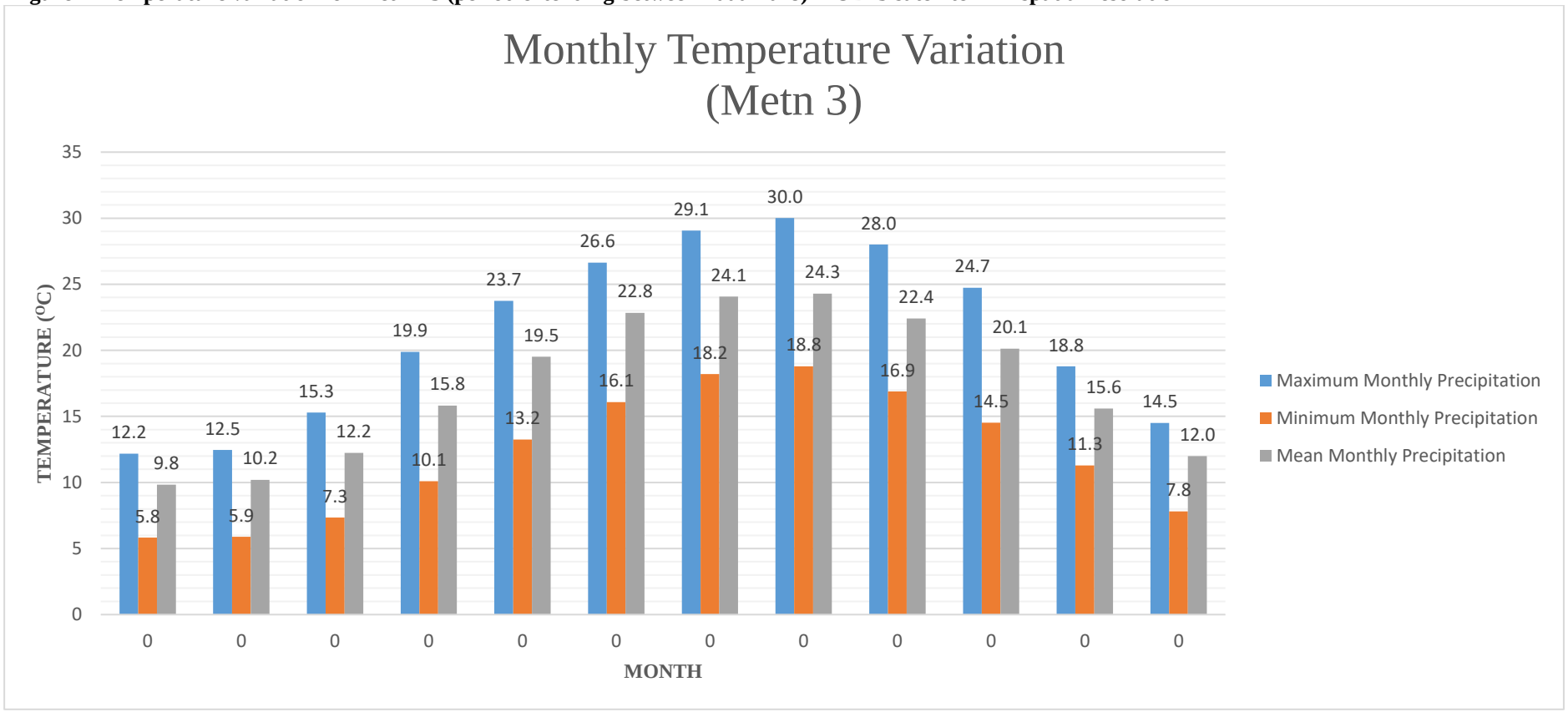
Source: MODIS satellite

Figure X Temperature variation for Metn R2a (period extending between 2000-2018) MODIS satellite 1km spatial resolution



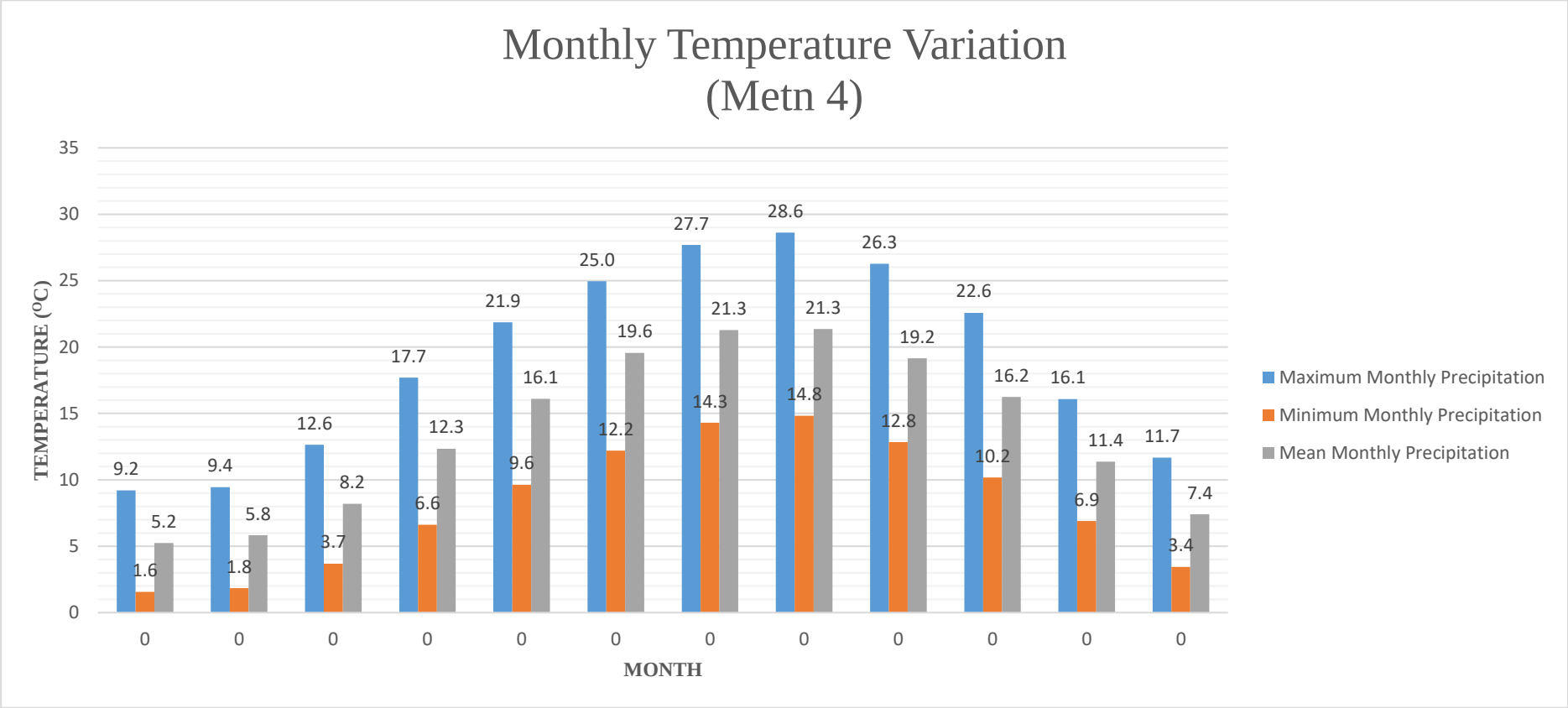
Source: MODIS satellite

Figure Y Temperature variation for Metn R3 (period extending between 2000-2018) MODIS satellite 1km spatial resolution



Source: MODIS satellite

Figure Z Temperature variation for Metn R4 (period extending between 2000-2018) MODIS satellite 1km spatial resolution



Source: MODIS satellite

Table A Metn R1a existing acoustic conditions (location of stations shown in Figure AA and Figure BB in Annex 1)

	Section	Time	Station	Min (dB)	Leq (avg) (dB)	Max (dB)	Allowable Noise Level
December 2, 2019	Section 1	12:10	0+000	51.6	64.9	74.1	Refer to Table 2-6
		12:23	1+500	38.6	57.9	66.1	
		12:34	4+800	46.3	67.2	81.2	
		12:51	5+400	38.2	61	63.2	
		13:15	7+156	51.2	70	82.3	
	Section 2	14:10	0+000	51.1	63.2	73.4	
		14:25	1+100	46.1	65.2	85.2	
		14:37	1+600	53.2	68.3	81.3	
		14:56	2+100	46.3	68.2	83.2	
		15:11	2+790	39.2	63	58.2	

Source: Geoflint acoustic survey, 2019

Table B Metn R2a existing acoustic conditions (location of stations shown in Figure CC in Annex 1)

	Time	Station	Min (dB)	Leq (avg) (dB)	Max (dB)	Allowable Noise Level
December 5, 2019	12:10	0+000	61.9	78.6	87.5	Refer to **Table 2-6**
	12:36	1+600	47.2	72.3	86.3	
	12:51	2+133	45.3	76.3	84.2	

Source: Geoflint acoustic survey, 2019

Table C Metn R3 existing acoustic conditions (location of stations shown in Figure DD and Figure EE in Annex 1)

	Section	Time	Station	Min (dB)	Leq (avg) (dB)	Max (dB)	Allowable Noise Level
December 10, 2019	Section 1	12:01	0+000	39.2	64	71.3	Refer to Table 2-6
		12:13	1+200	33.2	56.2	68	
		12:21	2+300	46.1	67.6	81.5	
		12:39	2+900	38.9	63.1	68.2	
		13:05	3+700	56.9	67.6	91.2	
		13:26	5+100	51.5	64.4	73.6	
	Section 2	14:10	0+000	31.2	54.2	66	
		14:25	0+200	51.9	64.8	73.9	
		14:37	0+900	61.2	78.1	88.2	
		14:56	1+700	45.9	66.6	91.8	
		15:11	2+075	45.8	76.9	82.8	

Source: Geoflint acoustic survey, 2019

Table D Metn R4 existing acoustic conditions (location of stations shown in Figure FF in Annex 1).

	Time	Station	Min (dB)	Leq (avg) (dB)	Max (dB)	Allowable Noise Level
December 11, 2019	12:01	0+000	52.3	62.3	75.6	Refer to **Table 2-6**
	12:10	1+500	43.5	61.5	80.1	
	12:21	2+500	39.6	59.9	71.1	

Source: Geoflint acoustic survey, 2019

Table E Comparing decibel measurements to an ordinary conversation

Sound Environment	Sound Pressure Level (dB)	Approximate loudness with regard to ordinary conversation
Threshold of hearing	0	Don't hear anything
Broadcast studio interior or resulting leaves	10	1/32nd as loud as conversation
Quiet house interior or rural night-time	20	1/16th as loud
Quiet office interior or watch ticking	30	1/8th as loud
Quiet rural area and small theatre	40	1/4th as loud
Quiet suburban area of dishwasher in next room	50	½ as loud
Office interior or ordinary conversation	60	Ordinary conversation
Vacuum cleaner at 10 ft	70	Twice as loud
Passing car at 10ft or garbage disposal at 3ft	80	4 times as loud
Passing bus or truck at 10ft or food blender at 3ft	90	8 times as loud
Passing subway train at 10ft	100	16 times as loud
Nigh club with band playing	110	32 times as loud
Threshold of pain	120	64 times as loud as conversation

Source: Trace R&D Center University of Wisconsin-Madison, 2004

Figure AA LULC map with work stations shown in red along Metn R1a alignment (section 1)

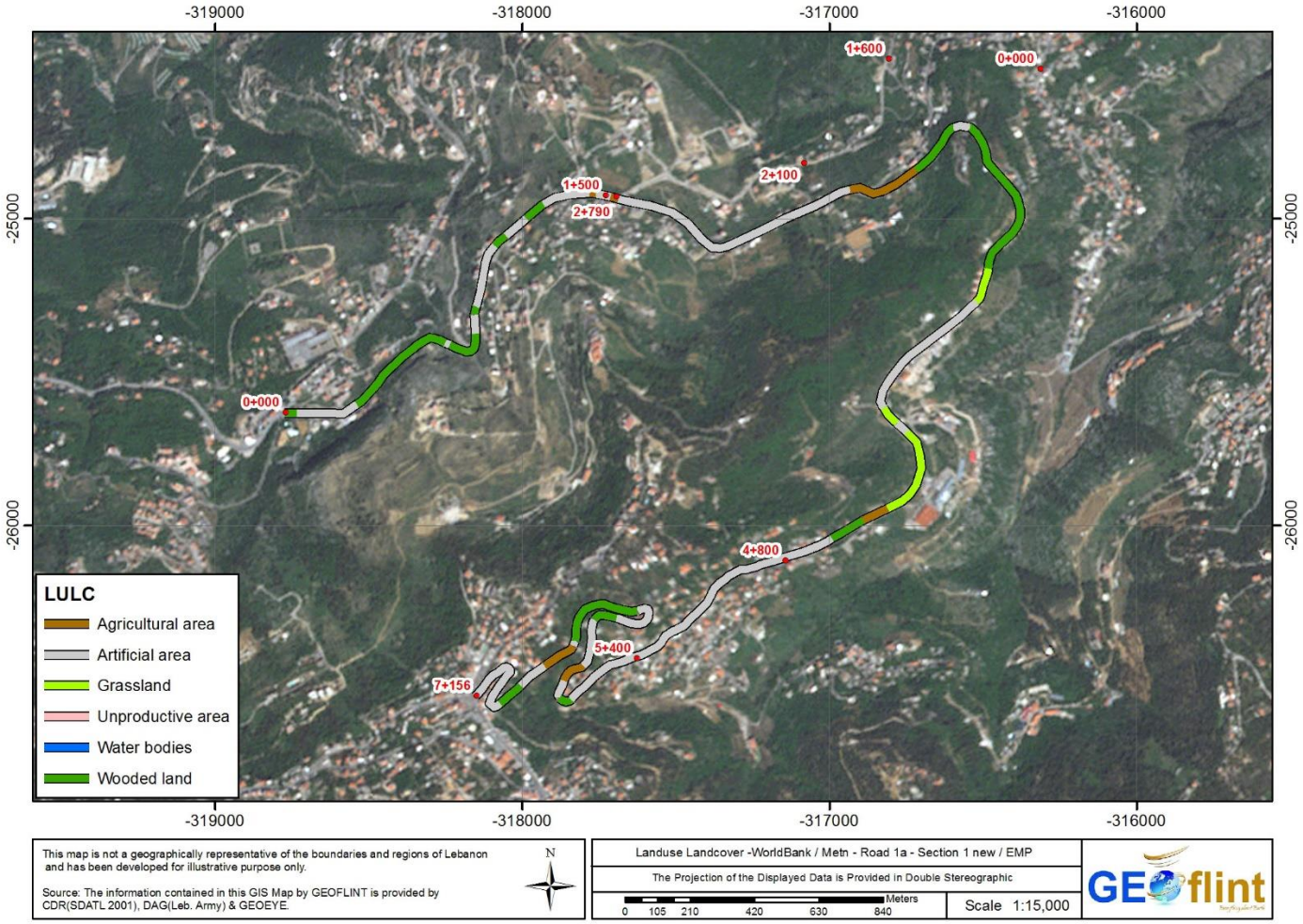


Figure BB LULC map with work stations shown in red along Metn R1a alignment (section 2)

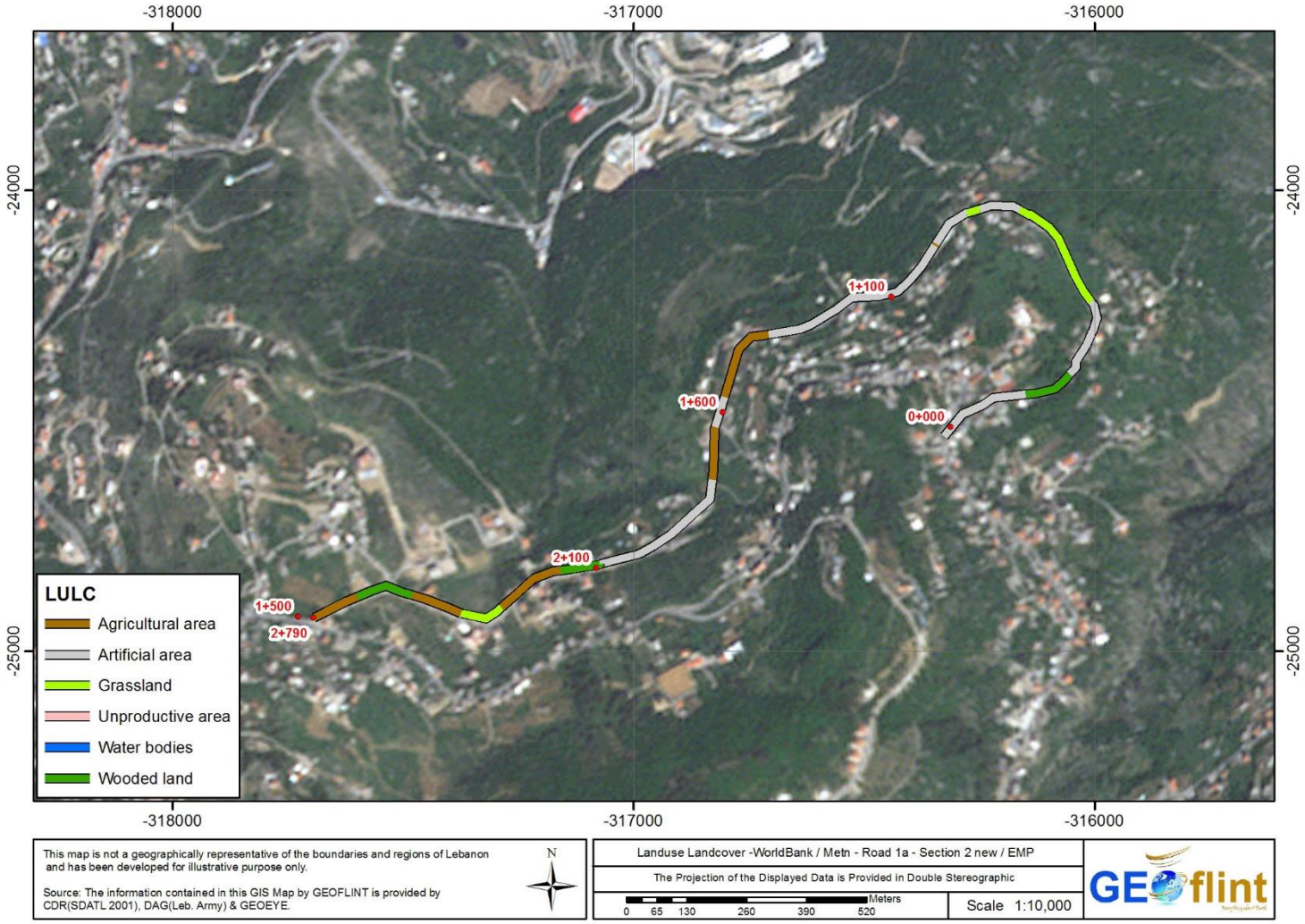


Figure CC LULC map with work stations shown in red along Metn R2a alignment

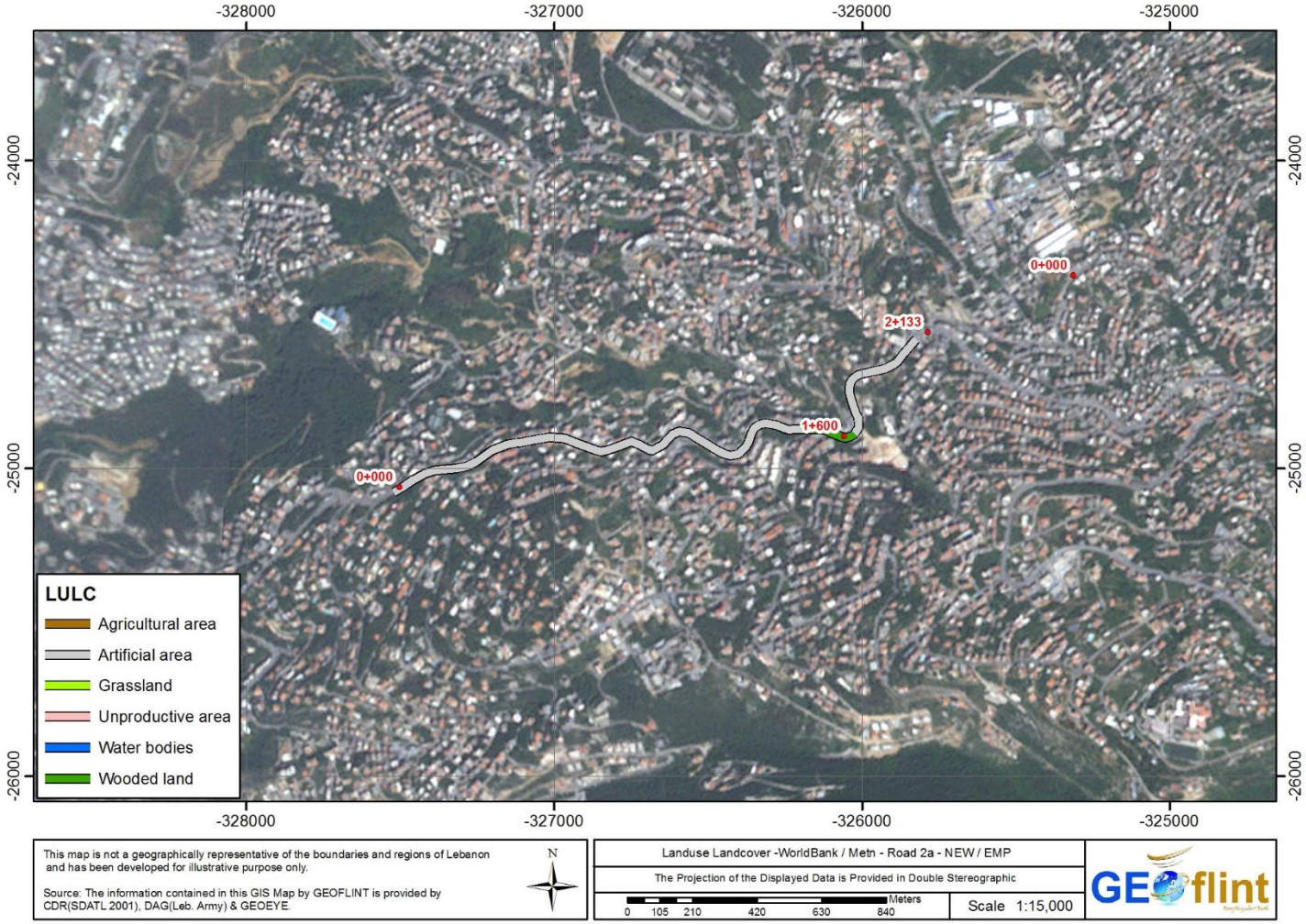


Figure DD LULC map with work stations shown in red along Metn R3 alignment (section1)

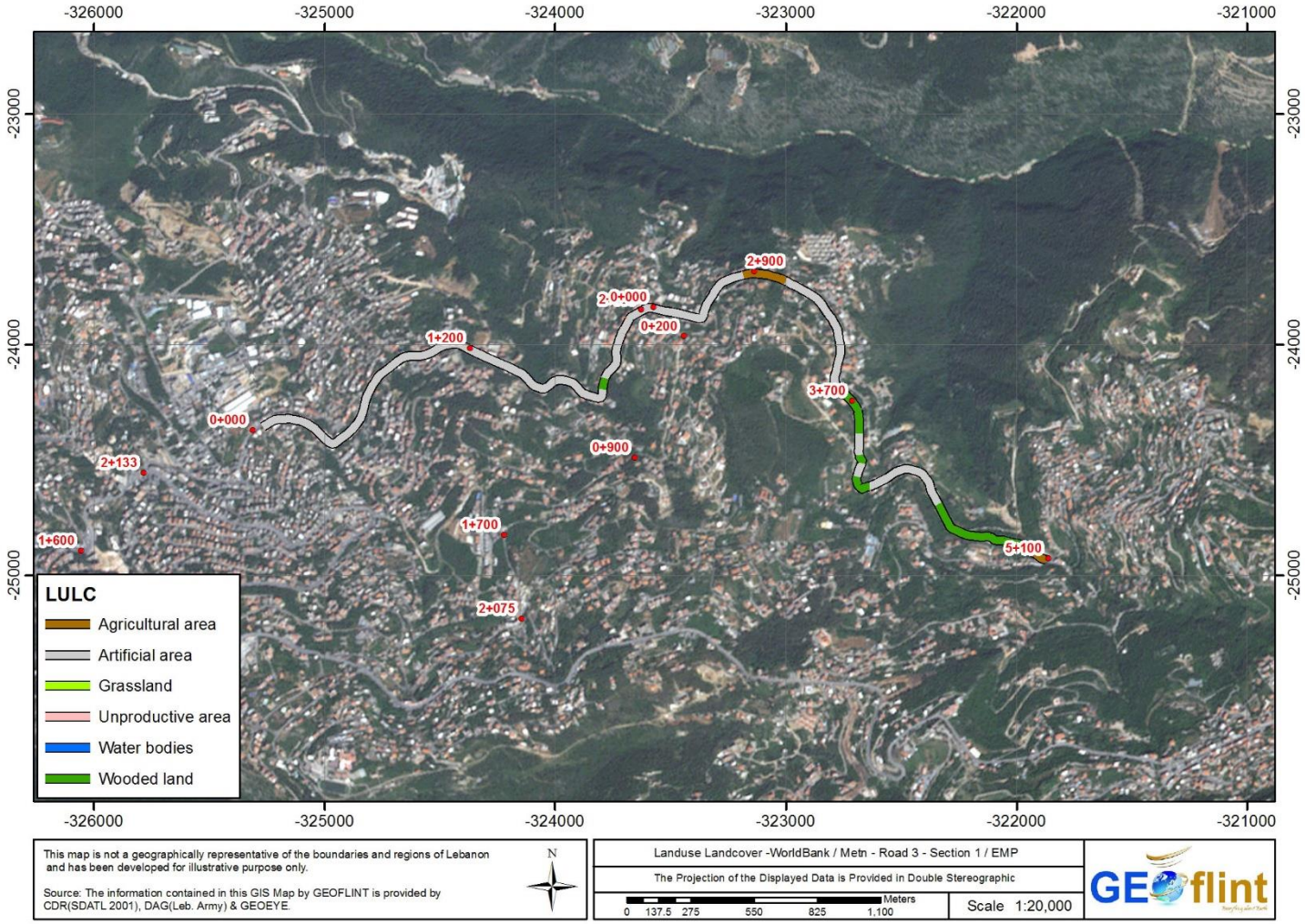


Figure EE LULC map with work stations shown in red along Metn R3 alignment (section2)

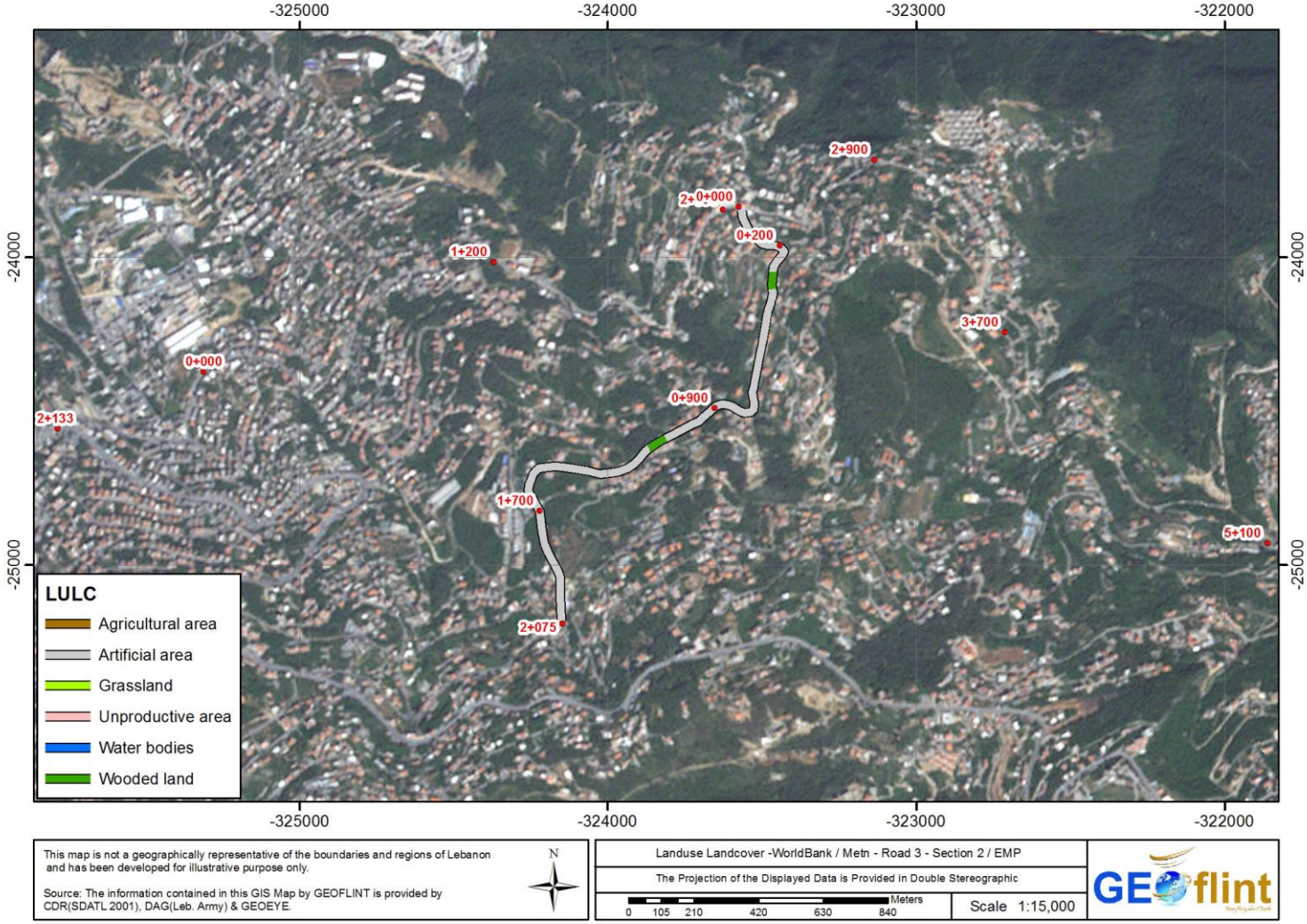


Figure FF LULC map with work stations shown in red along Metn R4 alignment

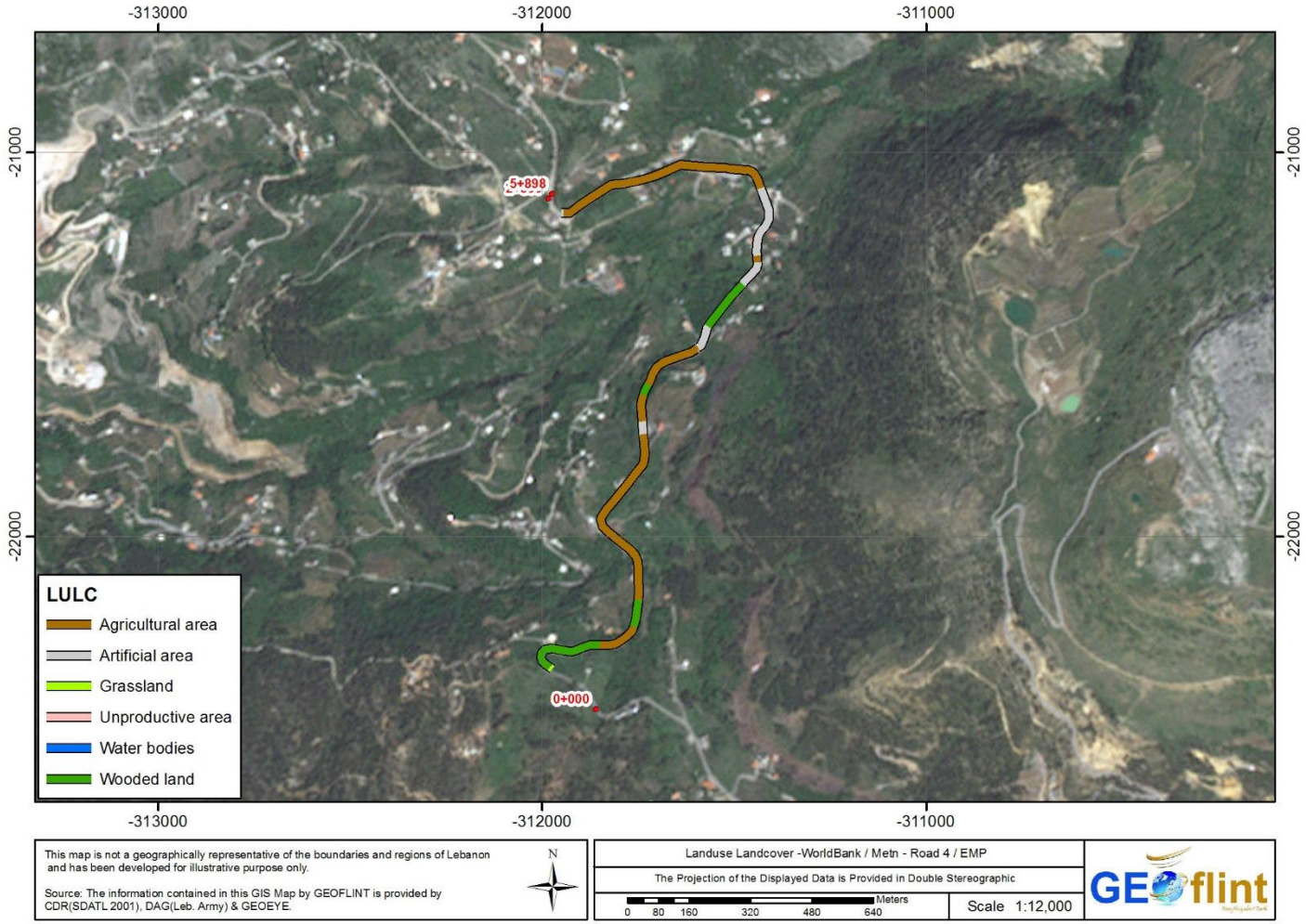
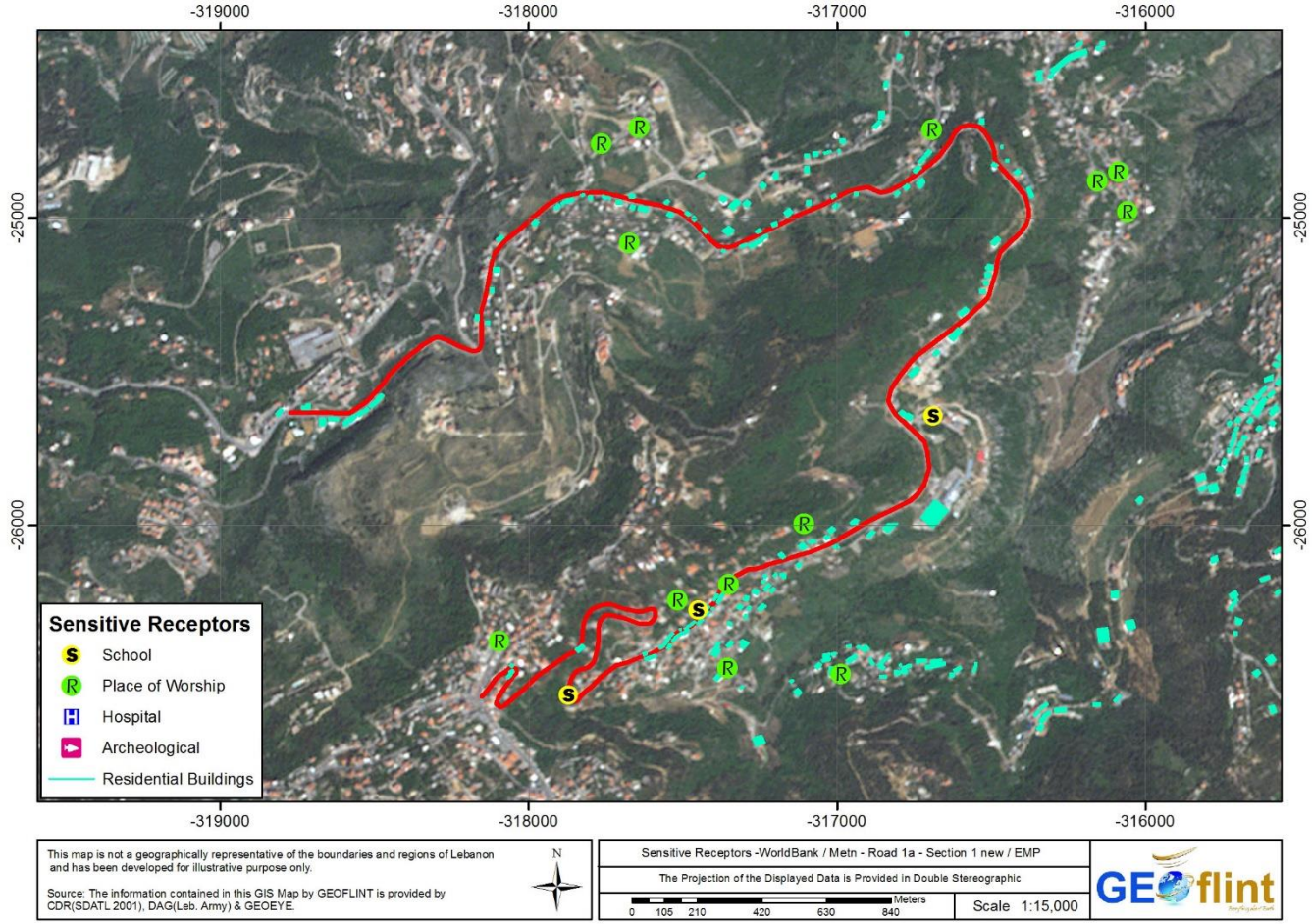
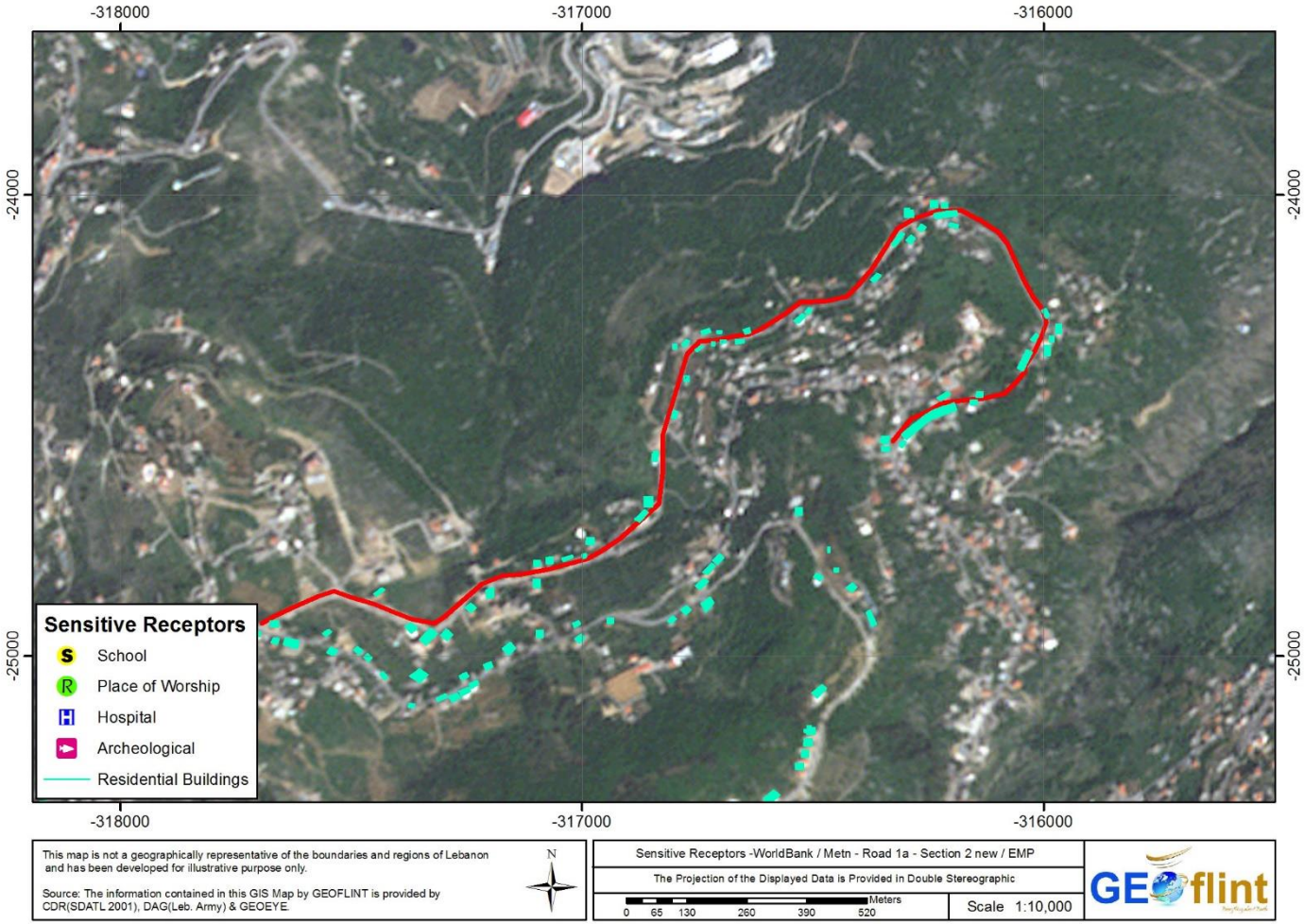


Figure GG Closest sensitive receptors along Metn R1a (section 1)



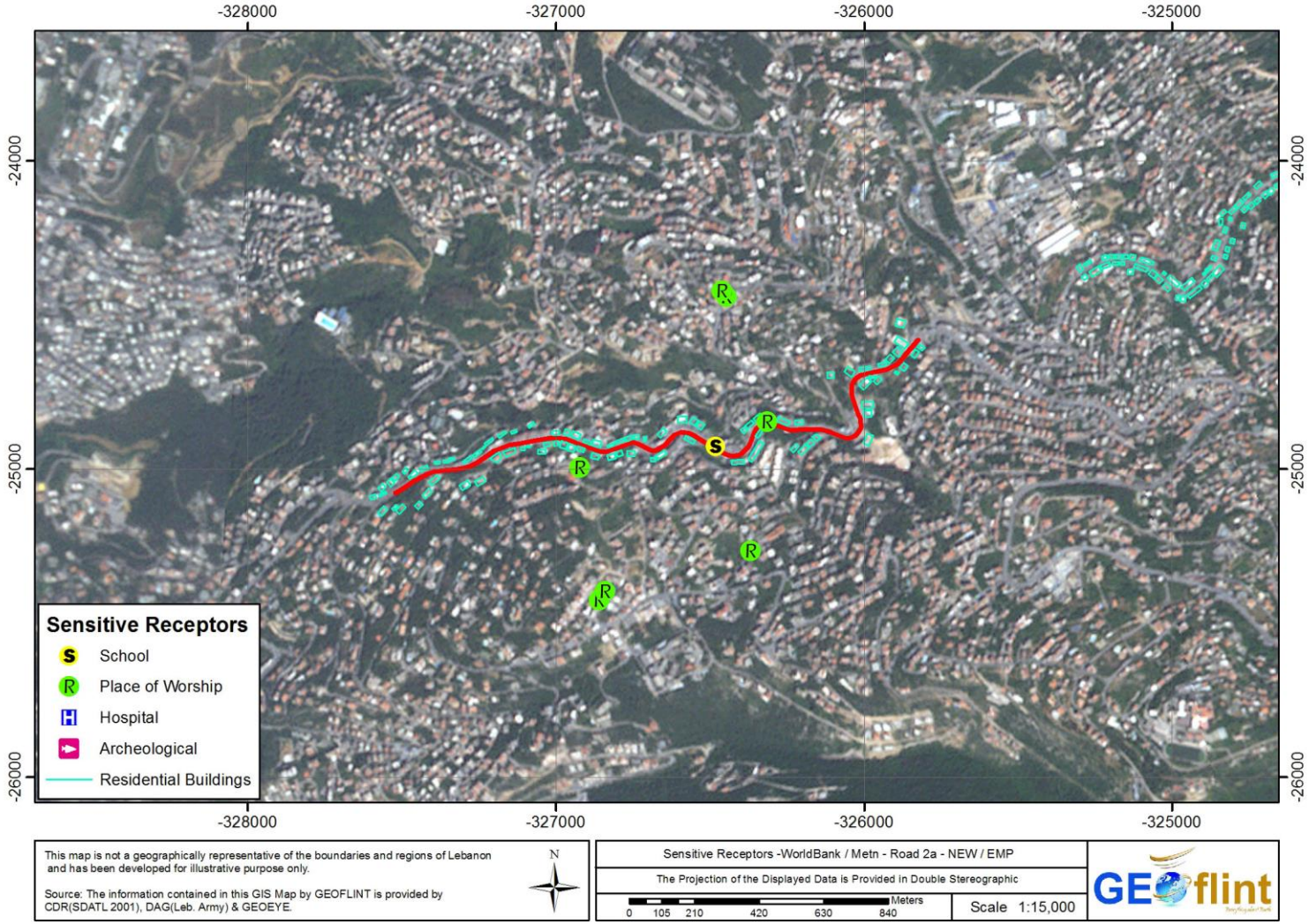
Source: Geoflint s.a.r.l. & Dar Al Handasah Nazih Taleb & Partners, 2019

Figure HH Closest sensitive receptors along Metn R1a (section 2)



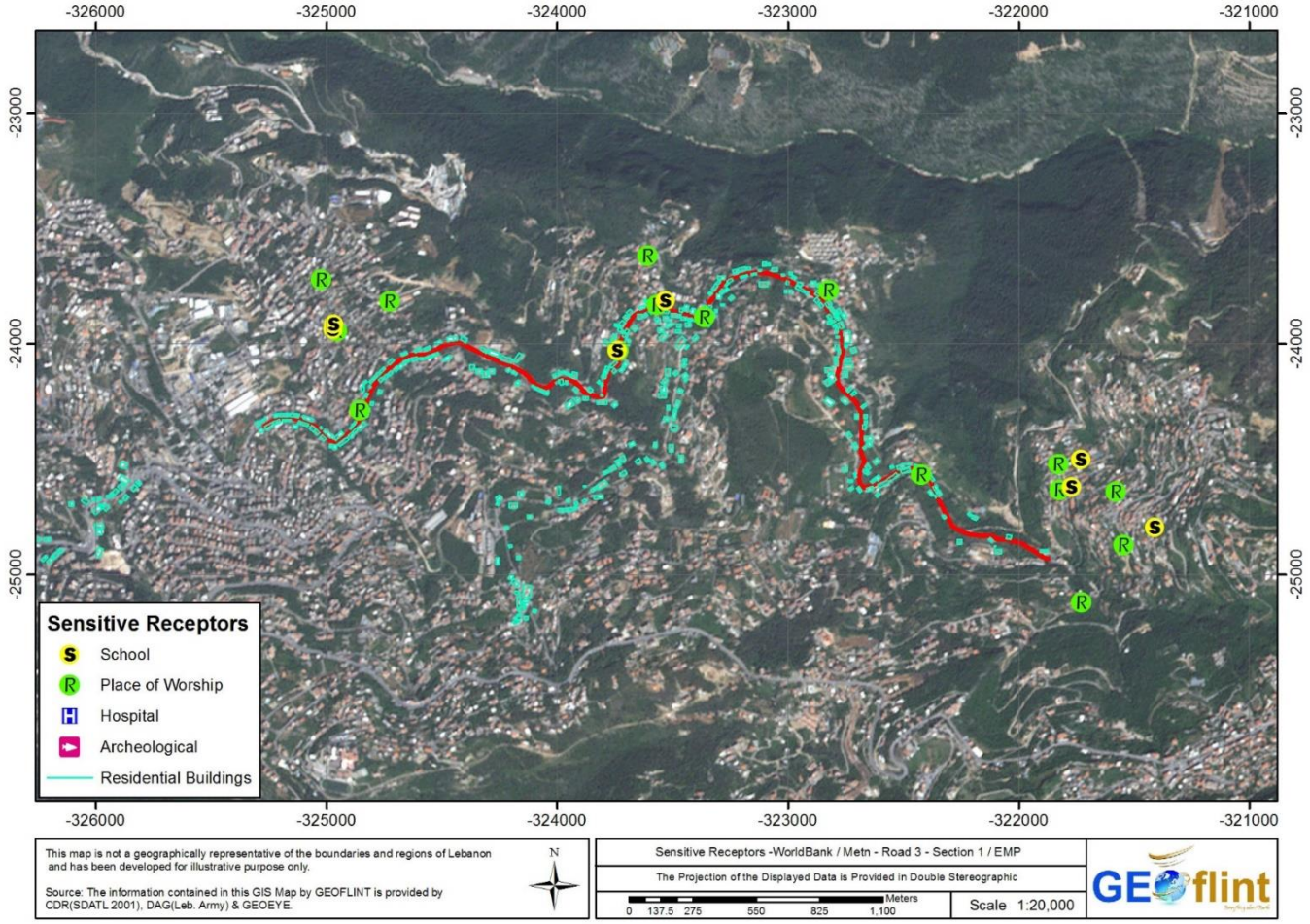
Source: Geoflint s.a.r.l. & Dar Al Handasah Nazih Taleb & Partners, 2019

Figure II Closest sensitive receptors along Metn R2a



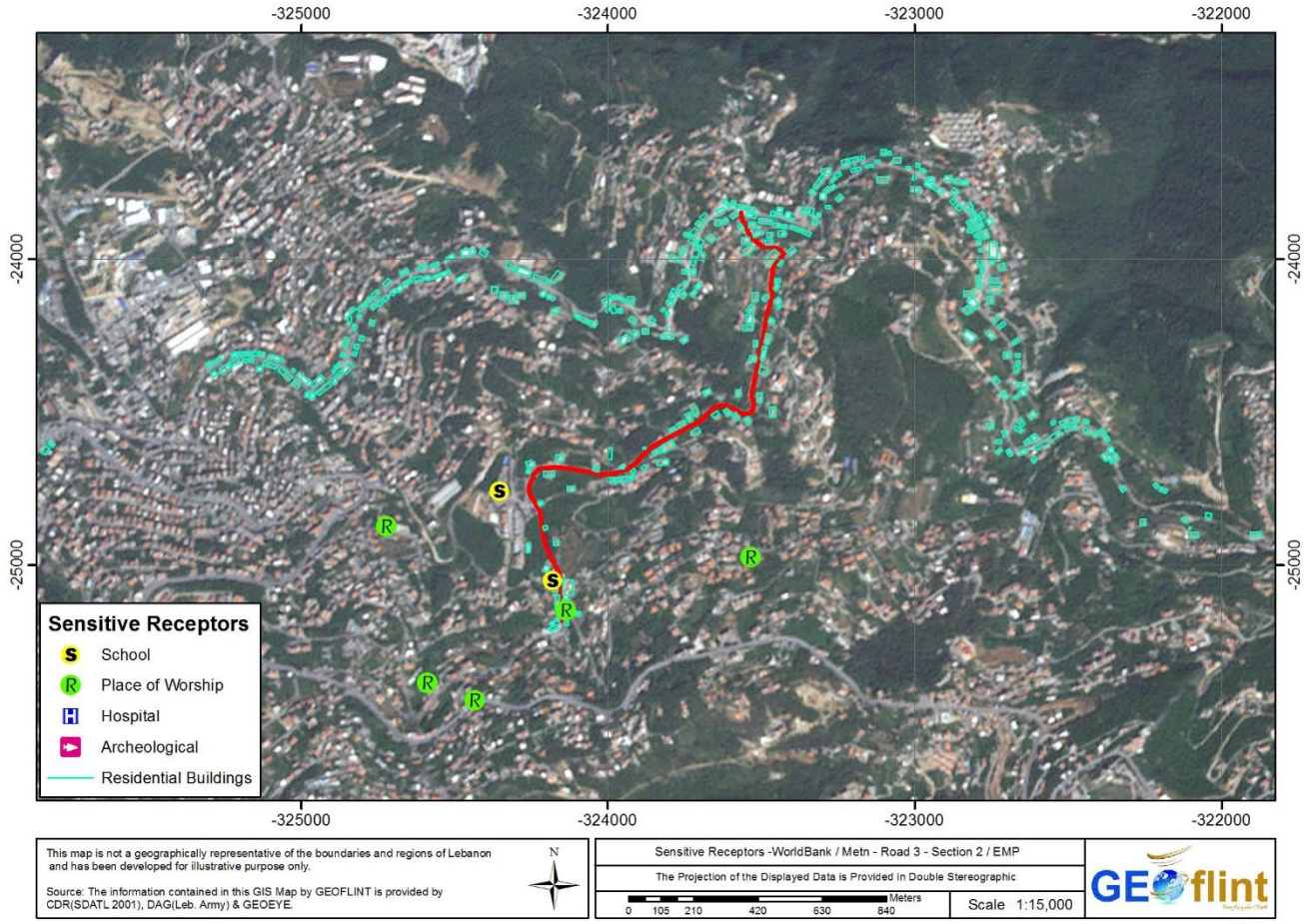
Source: Geoflint s.a.r.l. & Dar Al Handasah Nazih Taleb & Partners, 2019

Figure JJ Closest sensitive receptors along Metn R3 (section 1)



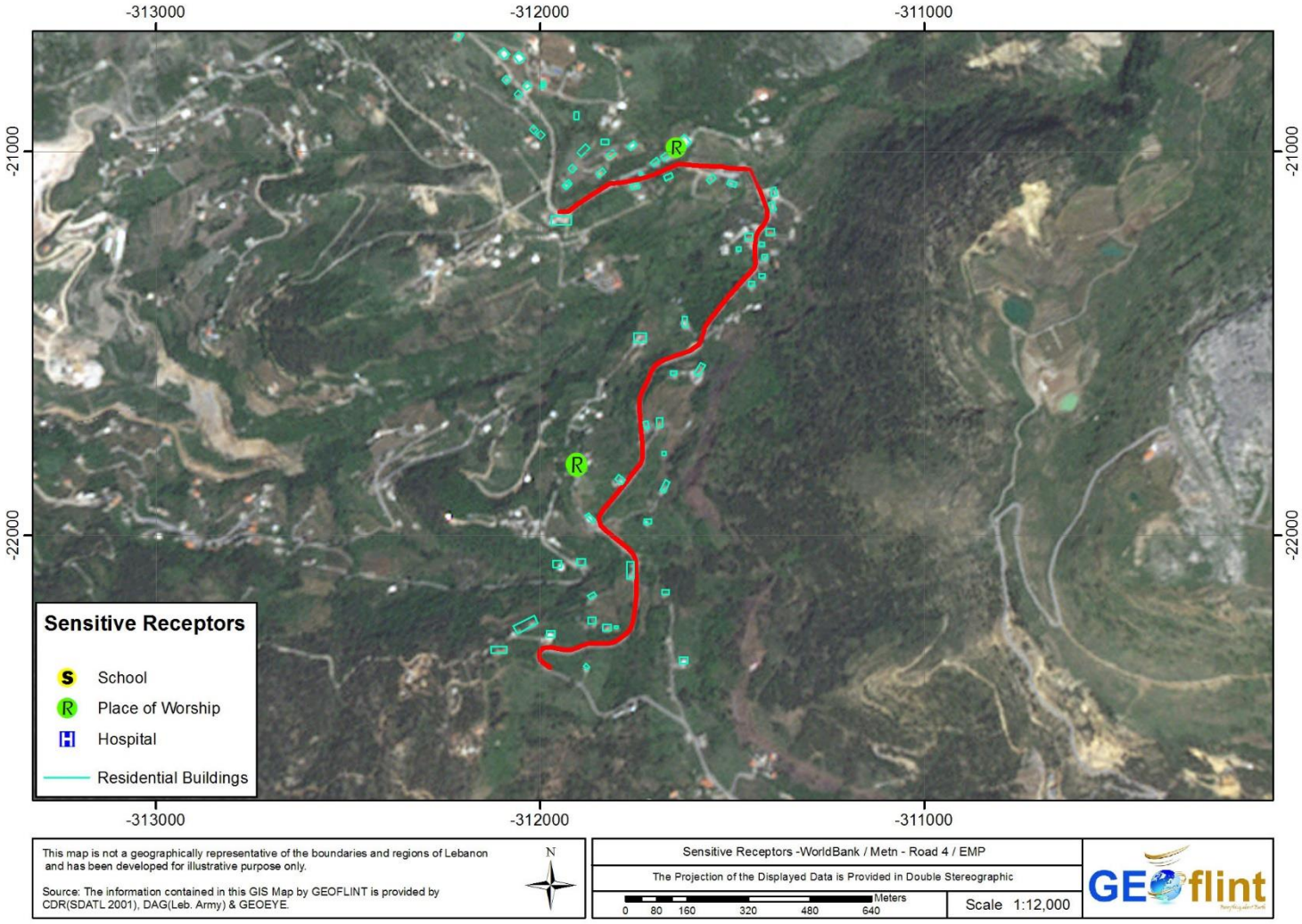
Source: Geoflint s.a.r.l. & Dar Al Handasah Nazih Taleb & Partners, 2019

Figure KK Closest sensitive receptors along Metn R3 (section 2)



Source: Geoflint s.a.r.l. & Dar Al Handasah Nazih Taleb & Partners, 2019

Figure LL Closest sensitive receptors along Metn R4



Source: Geoflint s.a.r.l. & Dar Al Handasah Nazih Taleb & Partners, 2019

Figure MM Distribution of ATC Stations throughout Metn Caza

Source: Dar Al Handasah Nazih Taleb & Partners, 2019

Metn road 1a (R1a)

Table F ADT values for Metn R1a

Caza	Road	Station	Direction	ADT (veh/day)
Metn	Road 1a	M1a-1	Eastbound	1,244
			Westbound	1,252
		M1a-2	Eastbound	3,707
			Westbound	4,206

Table G Type of vehicles passing Metn R1a

	Vehicle Class	Type	Percentage (%)
Metn road 1a	Class 1	Motorcycles	0.9
	Class 2	Passenger Cars	94.2
	Class 3	4-tire trucks	3.6
	Class 4	Buses	0
	Class 5	2-axle (6 tire trucks)	0.7
	Class 6	3-axle trucks	0.3
	Class 7	4+ axle trucks	0.3
	Class 8	3-4 axle single-trailer combinations	0.1
	Class 9	5-axle single-trailer combinations	0
	Class 10	6+ axle single-trailer combinations	0
	Class 11	5- axle multi-trailer combinations	0.1
	Class 12	6- axle multi-trailer combinations	0
	Class 13	7+ axle multi-trailer combinations	0

Metn road 2a (R2a)

Table H ADT values for Metn R2a

Caza	Road	Station	Direction	ADT (veh/day)
Metn	Road 2a	M2a-1	Eastbound	18,327
			Westbound	17,620

Table I Type of vehicles passing Metn R2a

	Vehicle Class	Type	Percentage (%)
Metn road 2a	Class 1	Motorcycles	9
	Class 2	Passenger Cars	83.5
	Class 3	4-tire trucks	1.6
	Class 4	Buses	0.1
	Class 5	2-axle (6 tire trucks)	1
	Class 6	3-axle trucks	1.3
	Class 7	4+ axle trucks	1.1
	Class 8	3-4 axle single-trailer combinations	0.6
	Class 9	5-axle single-trailer combinations	0.5

	Class 10	6+ axle single-trailer combinations	0.2
	Class 11	5- axle multi-trailer combinations	0.2
	Class 12	6- axle multi-trailer combinations	0.5
	Class 13	7+ axle multi-trailer combinations	0.4

Metn Road 3(R3)

Table J ADT values for Metn R3

Caza	Road	Station	Direction	ADT (veh/day)
Metn	Road 3	M3-1	Eastbound	3,671
			Westbound	4,003
		M3-2	Eastbound	2,004
			Westbound	2,139
		M3-3	Northbound	656
			Southbound	719

Table K Type of vehicles passing Metn R3

	Vehicle Class	Type	Percentage (%)
Metn road 3	Class 1	Motorcycles	3.2
	Class 2	Passenger Cars	94.2
	Class 3	4-tire trucks	1.2
	Class 4	Buses	0
	Class 5	2-axle (6 tire trucks)	0.9
	Class 6	3-axle trucks	0.2
	Class 7	4+ axle trucks	0.1
	Class 8	3-4 axle single-trailer combinations	0.1
	Class 9	5-axle single-trailer combinations	0
	Class 10	6+ axle single-trailer combinations	0
	Class 11	5- axle multi-trailer combinations	0
	Class 12	6- axle multi-trailer combinations	0
	Class 13	7+ axle multi-trailer combinations	0
	Others	-	1.3

Metn Road 4(R4)

Table L ADT values for Metn R4

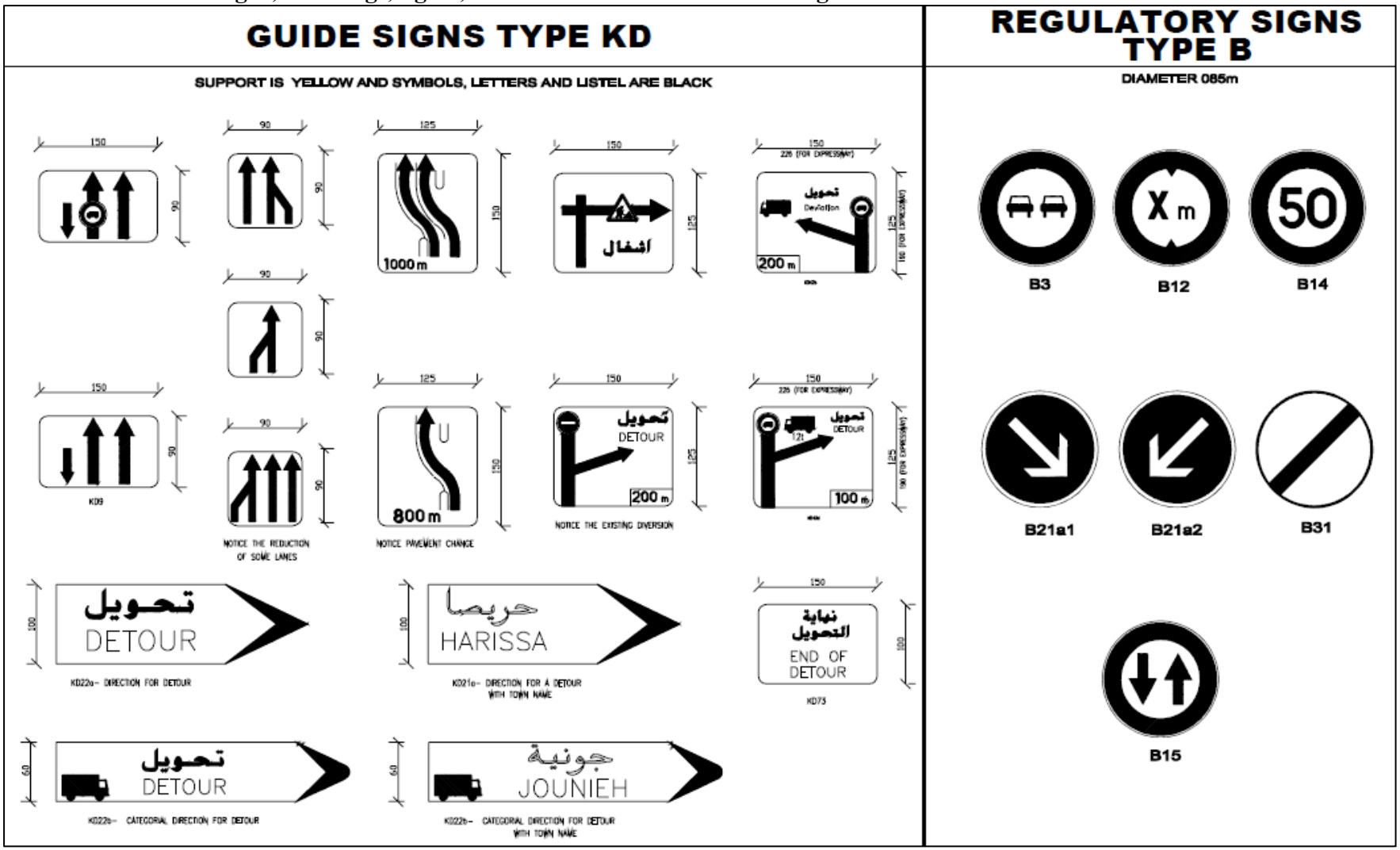
Caza	Road	Station	Direction	ADT (veh/day)
Metn	Road 4	M4-1	Eastbound	670
			Westbound	658

Table M Type of vehicles passing Metn R4

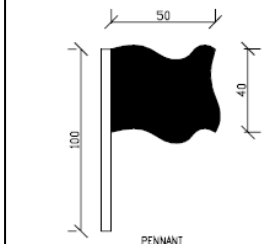
	Vehicle Class	Type	Percentage (%)
Metn road 4	Class 1	Motorcycles	5.7
	Class 2	Passenger Cars	88.7

	Class 3	4-tire trucks	3.5
	Class 4	Buses	0
	Class 5	2-axle (6 tire trucks)	1.6
	Class 6	3-axle trucks	0.3
	Class 7	4+ axle trucks	0.3
	Class 8	3-4 axle single-trailer combinations	0
	Class 9	5-axle single-trailer combinations	0
	Class 10	6+ axle single-trailer combinations	0
	Class 11	5- axle multi-trailer combinations	0
	Class 12	6- axle multi-trailer combinations	0
	Class 13	7+ axle multi-trailer combinations	0
	Others	-	0.6

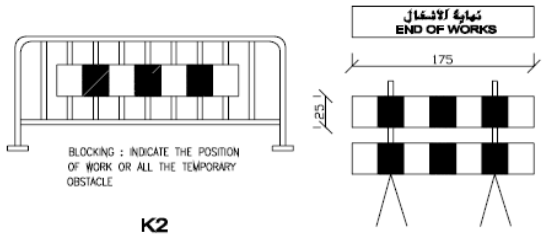
Annex 2: Road signs, markings, lights, and barricades to be used during rehabilitation works



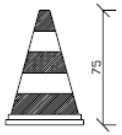
SIGNS TYPE K



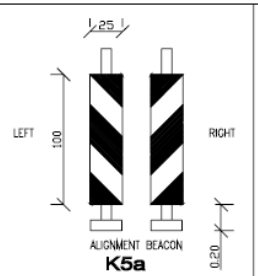
K1



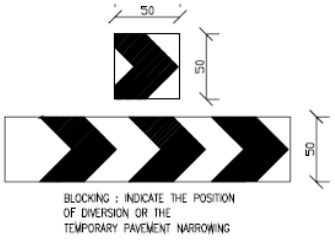
K2



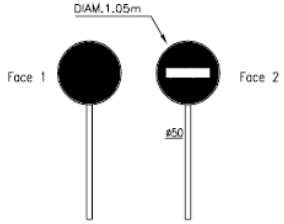
K5a



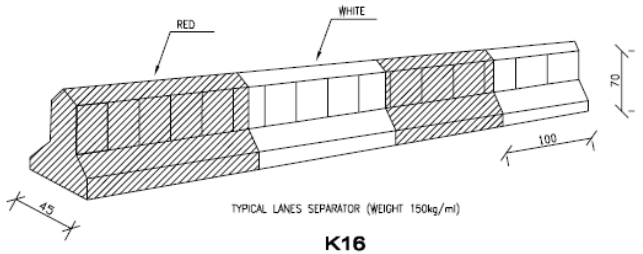
K5a



K8



K10a



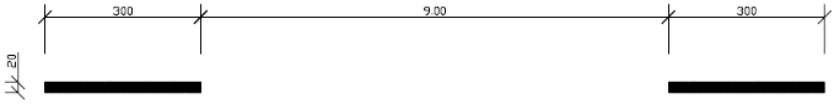
K16

TEMPORARY MARKING

THESE LINES ARE YELLOW AND REFLECTORISING.
THEY CAN BE ERASED OR REMOVED WITHOUT ANY RESIDUAL TRACE.

FOR CONTINUOUS EDGE LINE AND FOR SEPARATING THE TRAFFIC IN OPPOSITE DIRECTIONS

MR2 TEMPORARY

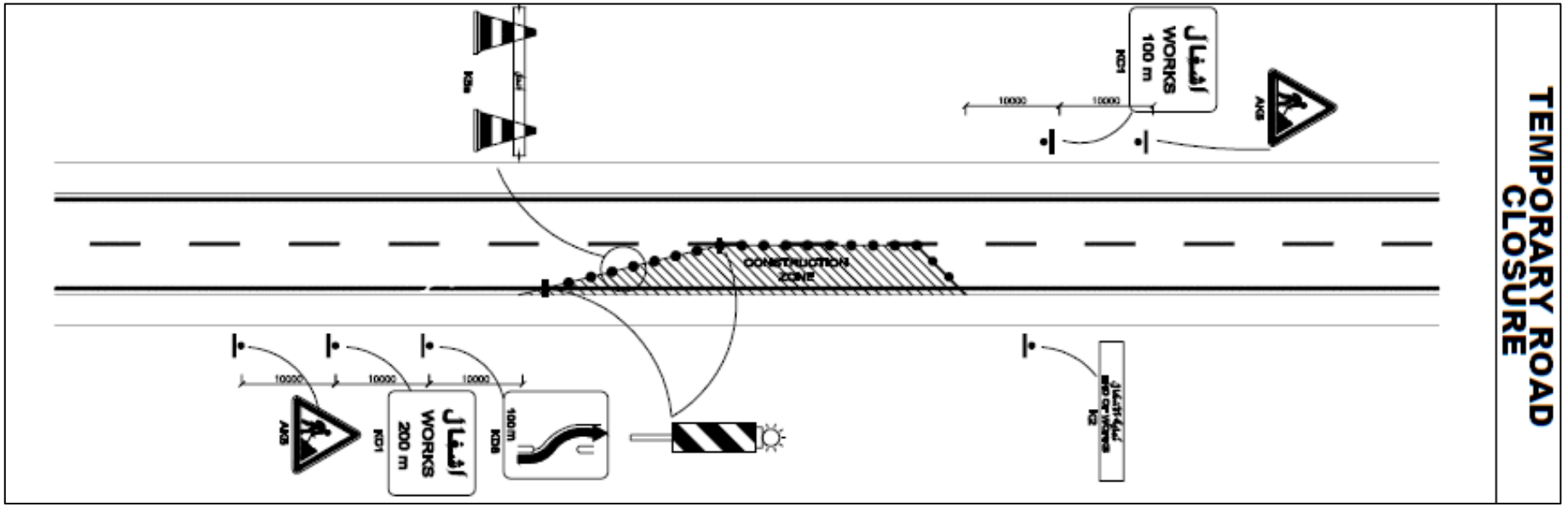


FOR SEPARATING THE TRAFFIC IN THE SAME DIRECTION

TYPE T1

FOR SEPARATING THE TRAFFIC IN THE SAME DIRECTION

TYPE T3


TEMPORARY ROAD CLOSURE
CONSTRUCTION ZONE
WORKS 100 m
WORKS 200 m
10000
10000
10000
10000

WARNING SIGNS TYPE AK

SIDE 0.70 m


AK2


AK3


AK4


AK5

AK3+KM1


AK14


AK17

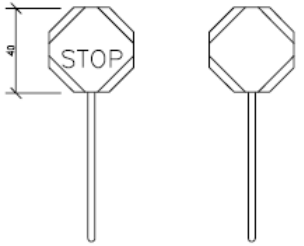

AK22

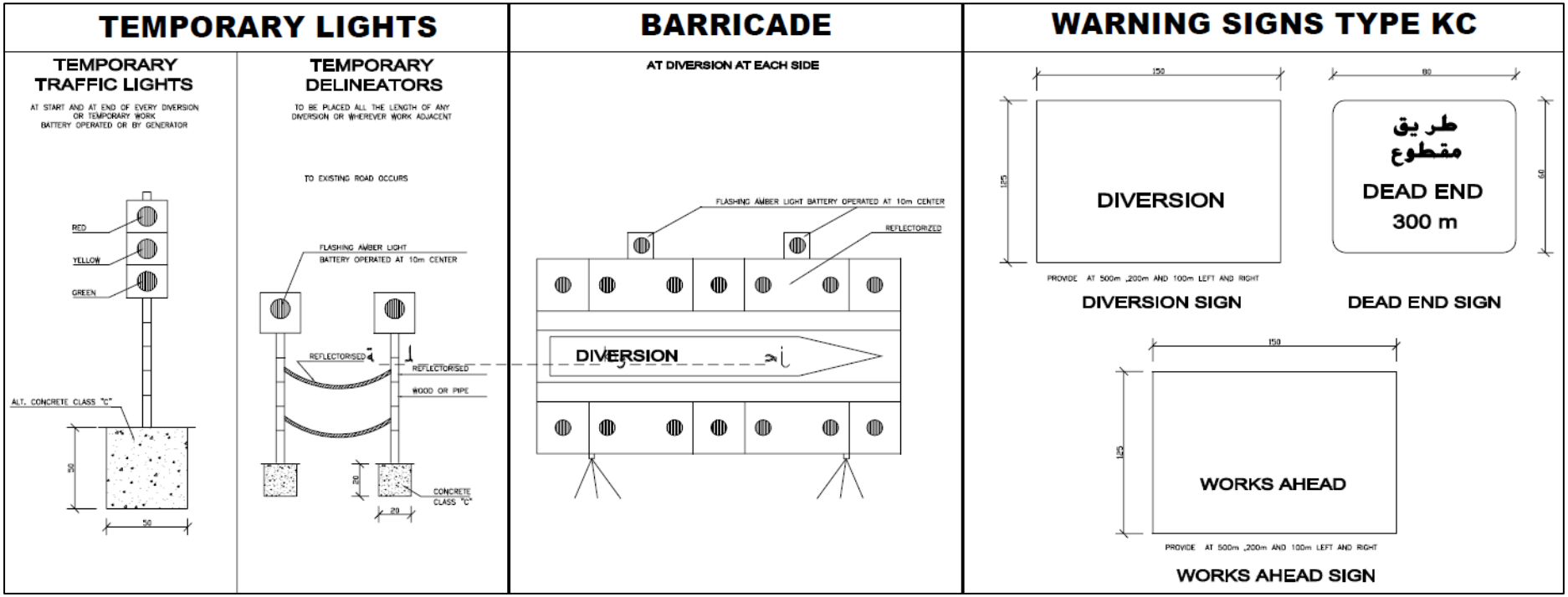
AK14+KM9+KM2
EXAMPLE

AK5+KM9

BY FLAGMEN

STANDARD SIGNS PADDLE




TEMPORARY LIGHTS
TEMPORARY TRAFFIC LIGHTS
AT START AND AT END OF EVERY DIVERSION OR TEMPORARY WORK
BATTERY OPERATED OR BY GENERATOR
RED
YELLOW
GREEN
ALT. CONCRETE CLASS "C"
50
50
TEMPORARY DELINEATORS
TO BE PLACED ALL THE LENGTH OF ANY DIVERSION OR WHEREVER WORK ADJACENT
TO EXISTING ROAD OCCURS
FLASHING AMBER LIGHT
BATTERY OPERATED AT 10m CENTER
REFLECTORISED
REFLECTORISED
WOOD OR PIPE
CONCRETE CLASS "C"
20
20
BARRICADE
AT DIVERSION AT EACH SIDE
FLASHING AMBER LIGHT BATTERY OPERATED AT 10m CENTER
REFLECTORIZED
DIVERSION
WARNING SIGNS TYPE KC
150
125
DIVERSION
PROVIDE AT 500m ,200m AND 100m LEFT AND RIGHT
DIVERSION SIGN
80
طريق
مقطوع
DEAD END
300 m
60
DEAD END SIGN
150
125
WORKS AHEAD
PROVIDE AT 500m ,200m AND 100m LEFT AND RIGHT
WORKS AHEAD SIGN

Annex 3: Code of Conduct

Table N Contractor Code of Conduct Form

Contractor Code of Conduct:

1. All employees, associates, and representatives commit to treating women, children (under the age of 18), and men with respect, regardless of race; color; language; religion; political or other opinion; national, ethnic or social origin; sexual orientation or gender identity; disability; birth or other status.
2. GBV constitutes acts of gross misconduct and is therefore grounds for sanction, which may include penalties and/or termination of employment. All forms of GBV are unacceptable, regardless of whether they take place on the worksite, the worksite surroundings, or off-site. In addition to the potential sanctions listed above, legal prosecution will be pursued, if appropriate, for any employees, associates, and representatives alleged to have committed GBV.
3. Demeaning, threatening, harassing, abusive, or sexually provocative language and behavior are prohibited among all company employees, associates, and representatives.
4. Sexual favors, making promises or favorable treatment dependent on sexual acts are prohibited.
5. Unless there is the full consent by all parties involved, sexual interactions between the company's employees (at any level) and members of the surrounding communities are prohibited. This includes relationships involving the withholding or promise of any kind of reward.
6. All employees, including volunteers and sub-contractors are expected to report suspected or actual GBV by a fellow worker, whether in the same company or not. Reports must be made in accordance with GBV allegation procedures.
7. All employees are required to attend an induction training course prior to commencing work on site to ensure they are familiar with the GBV Code of Conduct.
8. All employees must attend a mandatory training course once a month for the duration of the contract starting from the first induction training prior to commencement of work to reinforce the understanding of the institutional GBV Code of Conduct.
9. All employees will be required to sign an individual code of conduct confirming their agreement to support GBV activities.

I do hereby acknowledge that I have read the foregoing GBV Code of Conduct, and on behalf of the company agree to comply with the standards contained therein. I understand my role and responsibilities to prevent and respond to GBV. I understand that any action inconsistent with this Code of Conduct or failure to act mandated by this Code of Conduct may result in disciplinary action.

Company Name:
Signed by:
Title:
Date:

Table O Individual Code of Conduct Form

Individual Code of Conduct

- This individual Code of Conduct should be signed by all employees, from senior managers through the operational staff, and should also be required from any contractors working with the company.
- I, acknowledge that preventing gender-based violence (GBV) is important, and that preventing it is my responsibility. At [Company], GBV activities constitute acts of gross misconduct and are therefore grounds for sanctions, penalties or potential termination of employment. All forms of GBV are unacceptable, be it on the worksite, the worksite surroundings, or in the community. Prosecution of those who commit GBV may be pursued if appropriate.
- I agree that while working on the [Project], I will:
- Consent to a police background check.
- Treat women, children (persons under the age of 18), and men with respect regardless of race; color; language; religion; political or other opinion; national, ethnic or social origin; sexual orientation or gender identity; disability; birth or other status.
- Not use language or behavior towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
- Not request or engage in sexual favors—for instance, making promises or favorable treatment dependent on sexual acts.
- Understand that unless there is the full consent by all parties involved, sexual interactions between the company's employees (at any level) and members of the surrounding communities are prohibited. This includes relationships involving the withholding or promise of monetary or non-monetary reward.
- Attend and actively partake in training courses related to HIV/AIDS and GBV as requested by my employer.
- Report through the GRM or to my manager any suspected or actual GBV by a fellow worker, whether in my company or not, or any breaches of this Code of Conduct.

Sanctions

[Company] has established a GRM for receiving, reviewing, and addressing allegations of GBV. If an employee has breached the Code of Conduct, the employer will take disciplinary action which could include:

- Informal warning
- Formal warning
- Additional training
- Loss of up to one week's salary
- Suspension of employment (without payment of salary), for a minimum period of one month up to a maximum of six months
- Termination of employment

In addition to the above, if warranted, [Company] will report the employee to the police as per local legal regulations.

I understand that it is my responsibility to use common sense and avoid actions or behaviors that could be construed as GBV or breach this Code of Conduct. I do hereby acknowledge that I have read the foregoing Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to GBV. I understand that any action inconsistent with this Code of Conduct or failure to act mandated by this Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Individual Name:
Signed by:
Title:
Date:

Annex 4: Public Consultation Notes, Presentation, Invitation Letters, and Attendance Sheets

Notes:

Choueir Meeting

During the meeting of Choueir, technical concerns where revealed during the meeting including whether the scope of work encompasses installing new drainage systems when needed and fixing retaining walls that are in bad conditions. Moreover, attendees asked about the duration of works for Metn R1a and Metn R4 and about the start date of the project. In this context, the consultant explained that, when needed, proper drainage systems will be installed and existing retaining walls will be improved. Finally, the schedule for both roads was provided and the consultant mentioned that the implementation of the project is expected to start in spring 2020.

A side meeting with the female attendees was held to further understand their concerns. Women were mainly worried about the access to schools along Metn R1a during the rehabilitation phase of the project. In other words, they were worried regarding obstruction of access routes to schools. In this context, the consultant explained that the ESMP provided guidelines in this respect. The contractor will communicate with the concerned municipalities and disseminate the project work schedule prior to the commencement of works. Further, the rehabilitation works should not be performed during peak traffic hours (e.g. works can take place when students are already at school). It is also suggested to perform works that are not noisy at night to ensure that access to surrounding schools is not hindered. Finally, potential complaints from work activities can be sent to CDR in the context of the project GRM mechanism.

Antelias Meeting

During the second meeting held at Antelias, attendees were mainly worried as the project will not involve widening of roads. According to them, the selected roads namely Metn R2a and Metn R3 have several sections with critical width, thus, they doubt that adding safety features can solve the safety problems witnessed in the area. However, for others, including the Mayor of Freike, basic pavement works would be crucial to increase the safety conditions within their towns. In this context, the Consultant and CDR representative explained that the survey showed that road width at some sections is very narrow and varies between 5.5 and 6 meters. However, widening of these sections requires land expropriation, which is not within the scope of REP.

The common concerns of attendees in the two arranged meetings for Metn caza include:

(1) The concerned municipalities were firstly interested regarding their main role in this project and in monitoring any potential law violations by the contractor during the rehabilitation phase. The heads of municipalities mentioned that during previous projects, they faced problems with contractors dumping rehabilitation wastes near the rehabilitation site (e.g. near streams). They were worried to witness similar behavior during the REP project. In particular, they asked about the procedure of sending their complaints in case the contractor did not abide by the ESMP guidelines. In this context, the consultant and the representative of CDR explained that as head of municipalities

their main role is to inform people about the project and at a later stage, they have a major role in assisting CDR in monitoring the contractor during project implementation. Any violation observed must be reported to CDR. Moreover, the representative of CDR explained to the concerned parties that:

- The project will include a GRM that will register and address grievances and complaints from individuals and households who are affected by the project. Any complaints must be reported to CDR.
- Project monitoring and verification will be undertaken by CDR, the implementing agency, to ensure the project is being implemented in line with the proposed objectives (a supervisory consultant will be monitoring the contractor during the rehabilitation phase ensuring he is abiding by the ESMP). Moreover, it was explained that if the contractor did not comply with the set social and environmental guidelines, they will face penalties.
- Progress reports will be prepared by CDR to the Bank for review. Moreover, the World Bank will ensure continuous implementation support.
- World Bank specialists who are based in Beirut will have regular interaction with CDR. This will allow the Bank to perform continuous monitoring of works.

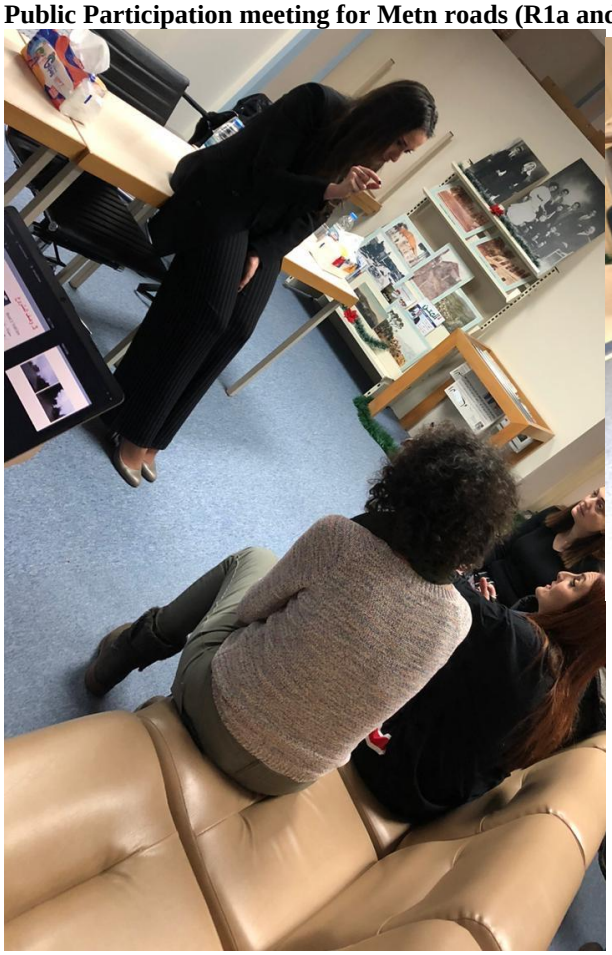
(2) The second main concern during both meetings was the coordination with relevant authorities, especially with respect to public works (i.e. wastewater and water infrastructure, etc.). The head of municipalities were worried whether there would be coordination among ministries and infrastructural institutions before the project implementation to avoid re-excavations of roads and further disturbances and pressures. In this context, the public was informed that CDR will ensure that a full coordination among municipalities and authorities prior to project execution.

(3) Third, local authorities present at both meetings were not satisfied about the selection of roads within the scope of REP. According to them, there are roads that are in greater need for rehabilitation. They asked about the selection process as they were not consulted at the beginning of the project. In this context, the consultant explained that the Government prioritized roads in Metn based on municipalities' official requests beside several technical criteria.

Photos:

Public Participation meeting for Metn roads (R1a and R4) (building of the Choueir Municipality)

Public Participation meeting for Metn roads (R1a and R4) – Side meeting with women



Public participation meeting for Metn roads R2a and R3 (Mar Elias Church Theatre, Antelias)

THE WORLD BANK

مشروع الطرق والعمالة في لبنان

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

REPUBLIC OF LEBANON
Ministry of Public Works & Transport
Directorate General of Land & Maritime Transport

خطة الإدارة البيئية والاجتماعية

قضاء المتن

جلسة مشاركة العامة

GEOflint

DAR AL HANDASAH NAZIH TALEB & PARTNERS
دار الهندسة نزيه طالب وشركاه

نقاط حوار الجلسة

- المقدمة
- أهداف اللقاء
- الجهات المعنية بالمشروع
- وصف المشروع
- ماذا يتضمن المشروع خلال مرحلة التنفيذ؟
- الأثار البيئية والاجتماعية الإيجابية للمشروع
- الأثار البيئية والاجتماعية السلبية المحتملة للمشروع
- خطة الإدارة البيئية والإجتماعية
- أسئلة ومناقشة عامة

مقدمة

- تتمتع شبكة الطرق في لبنان بنطاق وتغطية كافيين بشكل عام
- لكن نسبة كبيرة من تلك الطرق في حالة سيئة وهو الأمر الذي يؤدي إلى إعاقة التنمية المحلية والاقتصادية، خاصة في المناطق الريفية التي تعتبر فيها حالة شبكة الطرق أدنى مستوىً من حالة الطرقات على المستوى الوطني ككل

مقدمة

- يخطّط مجلس الانماء والاعمار لتنفيذ مشروع الطرق والعمالة في لبنان عبر تمويل من البنك الدولي
- يشمل المشروع أعمال تأهيل عدة طرق في بلدات من كافة الأقضية اللبنانية
- أعمال المشروع محصورة بالطرق المصنفة
- يهدف هذا المشروع إلى تحسين كفاءة قطاع الطرق من خلال تحديد أولويات أعمال الطرق وتحسين تقنيات إدارة شبكة الطرق والسلامة العامة

1. أهداف اللقاء

- تحقيق الشفافية عبر إعلام الرأي العام بالمشروع لإبداء ملاحظاتهم وذلك وفقاً لسياسة ضمانات البنك الدولي (سياسة تشغيلية رقم 4.01)
- عرض لأهم الاثار البيئية والاجتماعية والتدابير التخفيفية المرتبطة بتنفيذ المشروع
- مناقشة خطة الإدارة البيئية والإجتماعية للمشروع التي تهدف لحماية الصحة البشرية، السلامة العامة والموارد البيئية

2. الجهات المعنية بالمشروع

الجهة	الصفة
البنك الدولي	ممول المشروع
مجلس الانماء والاعمار	إدارة وتنفيذ
دار الهندسة نزيه طالب وشركاه	استشاري هندسي
جيوفلنت ش.م.م .	استشاري بيئي

3. وصف المشروع

Road 1a: 9.60 km

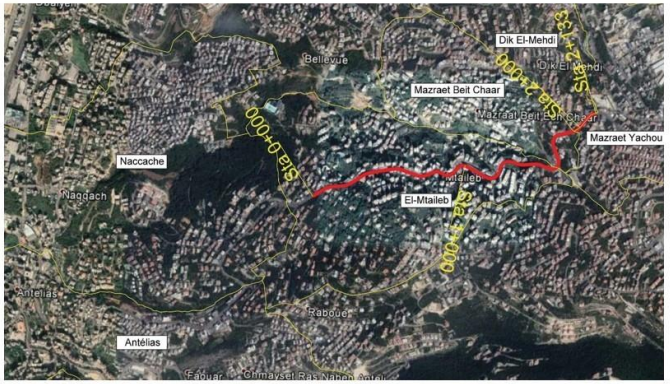
محيدثة – شويا - زغرين - ضهور الشوير

زغرين – شويا - عين التفاحة - شرين

3. وصف المشروع

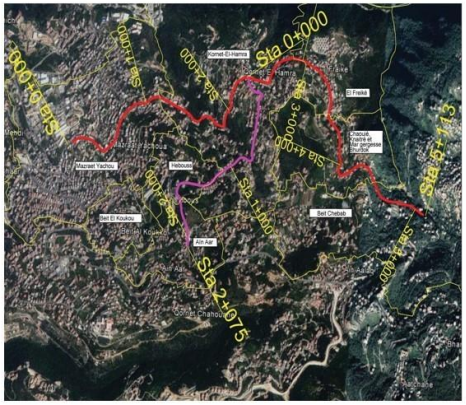
Road 2a: 2 km

المطيلب - بيت الشعّار - مزرعة يشوع - ديك المحدي



3. وصف المشروع

Road 3: 7.3km



مزرعة يشوع - قرنة الحمرا - فريكة – شاوية - بيت شباب

قرنة الحمرا – حبوس - عين عار

3. وصف المشروع

Road 4: 2.30 km

بسكنتا

4. ماذا يتضمن المشروع خلال مرحلة التنفيذ؟

الأنشطة خلال مرحلة التنفيذ:

- استبدال أو تأهيل طبقات الإسفلت بحسب نتائج اختبار من أجل إعادة تأهيل
- إعادة تأهيل شبكة تجميع مياه الأمطار عند الحاجة
- وضع إشارات السير وتخطيط الطرقات
- بناء جدران دعم وحاجز السلامة عند الحاجة

5. الآثار البيئية والاجتماعية الإيجابية للمشروع

مشاريع الطرق:

- تقلل أو تمنع الغبار، وتحسن التصريف، وتقلل العقبات المرورية
- تضمن سلامة الطرق وخاصة القريبة على المدارس والمحلات
- تحد من الحوادث المرورية
- تشجع الناس على الحفاظ على نظافة وأمانة أحيائهم
- ترفع قيمة الأراضي وتزيد الخيارات للأنشطة التجارية على طول الطريق

6. الآثار البيئية والاجتماعية السلبية المحتملة للمشروع خلال مرحلة التنفيذ

الآثار المحتملة على البيئة	التدابير التخفيفية
تلوث الهواء	• إستخدام آلات ذات انبعاثات منخفضة • توجيه مصادر الإنبعاثات بعيداً عن المساكن المحيطة • رش الطرق بإنتظام بالمياه لمكافحة الغبار • تغطية مركبات نقل المواد الأولية والمخلفات من وإلى موقع المشروع • تحديد سرعة الشاحنات والمركبات
تلوث المياه	• استخدام حواجز لمنع وصول الترسبات الرملية الى قنوات المياه • تغطية مواد البناء لتجنب غسلها إلى المسطحات المائية • تطبيق ممارسات ترشيد المياه من قبل عمّال البناء
تلوث التربة	• التأكد من صيانة المركبات والمعدات ومن عدم وجود أي تسرب للوقود • توفير أطقم في الموقع لمعالجة أي انسكاب عرضي على الفور • تعيين مسؤولين عن الممارسات الجيدة في الموقع بما في ذلك العلاج السريع لأي انسكاب عرضي
المخلفات الصلبة	• تدريب الموظفين على إدارة النفايات • إزالة المخلفات الصلبة من الموقع خلال 24 ساعة، والتخلص منها في مكبات قانونية محددة.

6. الآثار البيئية والاجتماعية السلبية المحتملة للمشروع خلال مرحلة التنفيذ

الآثار المحتملة على المجتمع	التدابير التخفيفية
تعطيل حركة السير	• التخطيط والتشغيل السليمين للتحويلات المرورية • إعادة تأهيل الطريق بشكل تدريجي • وضع علامات سير وأنظمة إضاءة في الأماكن الحساسة لضمان سلامة النقل
خطر على الصحة والسلامة المهنية والعامة	• تطوير خطة للتأكد من إلتزام المقاولين بالمبادئ التوجيهية للصحة والسلامة المهنية • توفير المعدات المناسبة للحماية الشخصية • توفير التدريب على الصحة والسلامة المهنية للعمال • تتوفير إرشادات السلامة فيما يخص الأضواء والشرائط البرتقالية والبيضاء...
تأثر الحركة التجارية للمؤسسات والمحال القائمة على جانبي الطريق	• تسريع العمل من خلال الوضع والالتزام بأهداف ومقاييس واضحة لتقييم الأداء ومتابعة سير العمل • إعادة تأهيل الطريق بشكل تدريجي
الضوضاء	• حصر الأعمال في ساعة محددة ومصرح عنها سابقاً • صيانة دورية للمعدات وتجنب تعطلها • الحد من إستخدام الأجهزة والمعدات التي تسبب الضوضاء خصوصاً بالقرب من المنشآت الحساسة (المدارس وأماكن الصلاة)

6. الآثار البيئية والاجتماعية السلبية المحتملة للمشروع خلال مرحلة التشغيل

الآثار المحتملة على البيئة	التدابير التخفيفية
اضطراب الأنظمة الايكولوجية (زيادة مستويات التلوث الضوئي)	• استخدام مصادر الإضاءة الصديقة للطيور بدلاً من الأضواء الصناعية للطرق العامة
زيادة الجريان السطحي (Increased runoff) وتسريب محتمل للمعادن الثقيلة	• إعادة تأهيل شبكة تجميع مياه الأمطار عند الحاجة
زيادة حوادث السير	• وضع إشارات المرور و تعيين الحد الاقصى لسرعة المركبات

7. خطة الإدارة البيئية والإجتماعية

هدف الخطة الادارة البيئية: مراقبة المشروع والتأكّد من مطابقته مع جميع المعايير البيئية.

بعد دراسة الاثار المحتملة للمشروع ،تقوم الدراسة باقتراح اساليب تخفيفية لهذه الاثار وسبل لمراقبتها.

خطة الادارة البيئية تتضمن:

- مراقبة نوعية المياه
- مراقبة نوعية التربة
- مراقبة نوعية الهواء
- مراقبة نوعية التنوع البيولوجي
- مراقبة الصحة والسلامة العامة
- خطة طوارئ في حال حدوث اي حادث مفاجئ.

أسئلة ومناقشة عامة

يمكنكم إبداء رأيكم عبر التواصل

مع شركة جيوفلنت ش.م.م.
هاتف: 05 954 662 /3/4
فاكس: 05 954 662 Ext. 108
بريد الكتروني: m.ballouk@geoflint.com

أو عبر التواصل مع وحدة مشروع الطرق والعمالة في مجلس الانماء والاعمار
هاتف: 01 980096 Ext. 317
بريد الكتروني: rstephan@cdr.gov.lb

شكـــــراً لحضوركم ومشاركتكم

Public Consultation Invitation Letters

Geoflint s.a.r.l.
Cell. : 00961-3-219 059
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Fax: Ext. 108
GF floor – center Mar Roukoz- Hazmeih
P.O.Box: 45 - 165
BEIRUT – LEBANON
website: www.geoflint.com

جيوفلنت ش.م.م.
خليوي: ٠٥٩ ٢١٩ ٠٠٩٦١
هاتف: ٤/٣/٩٦٢ ٩٥٤ ٠٠٩٦١
فاكس: مقسم ١٠٨
الطابق الأرضي – مارو كز سنتر - الحازمية
صندوق بريد: ٤٥ – ١٦٥
بيروت – لبنان
شهادة تسجيل شركة رقم: ٢٣٩٢٢٦٤

الموضوع: دعوة لحضور إجتماع مشاركة عامة حول مشروع "الطرق والعمالة"

تحية طيبة وبعد،

بما أن مجلس الإنماء والإعمار يقوم بتمويل من البنك الدولي بتنفيذ مشروع "الطرق والعمالة" لتأهيل طرقات في جميع المحافظات اللبنانية، بإستثناء محافظة بيروت؛

ولما كانت تكلفت شركة دار الهندسة نزيه طالب وشركاه من قبل مجلس الإنماء والإعمار للقيام بالدراسات الهندسية والبيئية المتعلقة بالمشروع والتي بدورها كلّفت شركة جيوفلنت ش.م.م. للإستشارات البيئية بإعداد خطة ادارة بيئية وإجتماعية للمشروع المذكور؛

وحيث أنه برزت الضرورة لعقد اجتماعات تشاورية مع الجهات المعنية والعامة بشؤون البيئة والأمور الإجتماعية ذات الصلة بمشاريع الطرق والإستماع إلى آرائهم المتعلقة بالمشروع؛

وبما أن قضاء المتن يتضمن ٤ طرقات من مجموع الطرقات الملحوظة للتأهيل في هذا المشروع؛

لذلك،

ندعوكم لحضور إجتماع مشاركة للعامة في تمام الساعة الرابعة بعد الظهرمن يوم الخميس الواقع في ١٢ كانون الاول في مبنى بلدية ضهور الشوير؛ ونتمنى على المواطنين الكرام، إبداء الملاحظات الخطيّة، في حال وجودها، حول المشروع المذكور، وإرسالها إلى شركة جيوفلنت ش.م.م. بواسطة الفاكس على الرقم التالي: ٠٥/٩٥٤٦٦٢.

مدير شركة جيوفلنت ش.م.م.
خليل زين

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BEIRUT – LEBANON
website: www.geoflint.com

جيوفلنت ش.م.م.
خليوي: ٠٠٩٦١-٣-٢١٩ ٠٥٩
هاتف: ٠٠٩٦١-٥-٩٥٤ ٦٦٢/٣/٤
فاكس: مقسم ١٠٨
الطابق الأرضي – ماروكل سنتر - الحازمية
صندوق بريد: ٤٥ – ١٦٥
بيروت – لبنان
شهاد تسجيل شركة رقم: ٢٣٩٢٢٦٤

الموضوع: دعوة لحضور إجتماع مشاركة عامة حول مشروع "الطرق والعمالة"

تحية طيبة وبعد،

بما أن مجلس الإنماء والإعمار يقوم بتمويل من البنك الدولي بتنفيذ مشروع "الطرق والعمالة" لتأهيل طرقات في جميع المحافظات اللبنانية، بإستثناء محافظة بيروت؛

ولما كانت تكلفت شركة دار الهندسة نزيه طالب وشركاه من قبل مجلس الإنماء والإعمار للقيام بالدراسات الهندسية والبيئية المتعلقة بالمشروع والتي بدورها كلّفت شركة جيوفلنت ش.م.م. للإستشارات البيئية بإعداد خطة ادارة بيئية وإجتماعية للمشروع المذكور؛

وحيث أنه برزت الضرورة لعقد اجتماعات تشاورية مع الجهات المعنية والعامة بشؤون البيئة والأمور الإجتماعية ذات الصلة بمشاريع الطرق والإستماع إلى آرائهم المتعلقة بالمشروع؛

وبما أن قضاء المتن يتضمن ٤ طرقات من مجموع الطرقات الملحوظة للتأهيل في هذا المشروع؛

لذلك،

ندعوكم لحضور إجتماع مشاركة للعامة عند الساعة الخامسة بعد الظهر من يوم الإثنين الواقع في ١٦ كانون الاول في صالة كنيسة مار الياس - انطلياس؛ ونتمنى على المواطنين الكرام، إبداء الملاحظات الخطيّة، في حال وجودها، حول المشروع المذكور، وإرسالها إلى شركة جيوفلنت ش.م.م. بواسطة الفاكس على الرقم التالي: ٠٥/٩٥٤٦٦٢.

مدير شركة جيوفلنت ش.م.م.
خليل زين

GEOflint

December 12, 2019

Roads and Employment Project (REP)

Public Participation – Metn District (Shweir)
قائمة حضور

الاسم	المنصب	البريد الإلكتروني	رقم الهاتف
جورج علم	رئيس بلدية		٠٢/٢٢٧١٢٢
[illegible]	[illegible]		٠٢/٤٥٧٧٧٩
[illegible]	[illegible]		٨١/٦٩٢٠١٧
[illegible]	[illegible]		71 398999
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[illegible]	[illegible]		04/392049
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GEOflint

16/12/2019

Road and Employment Project

Public Participation- Metn Caza (Antelias)
قائمة حضور

رقم الهاتف	البريد الإلكتروني	المنصب	الاسم
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03/556601	[illegible]philippe@gmail.com	[illegible]	[illegible]
	٧٠١٤٠٦٤٠	انطلياس محل	[illegible]
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03/558592		[illegible]	[illegible]
03/553933		مواطن انطلياس	[illegible]
03/919609	[illegible]@gmail.com	[illegible]	[illegible]
03/212789	Beitchabab.municipality@gmail.com	رئيس بلدية بيت شباب [illegible]	الياس [illegible]

Annex 5: Complaint 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