ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF CONSTRUCTION AND OPERATION OF SYRIA CEMENT PLANT AND CAPTIVE POWER PLANT, AND ASSOCIATED QUARRYING ACTIVITIES SYRIA

NON-TECHNICAL SUMMARY

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1. INTRODUCTION

The Syrian Cement Company (SCC), a Joint Stock Company formed between MAS Group of Syria and Lafarge Group of France. The project proponent, Lafarge Group, proposes to establish a Portland Cement Plant with its associated quarries and a coal fired captive power plant in the district of Aleppo, Syria. The proposed SCC plant will have an expected daily production capacity of clinker and cement of 7,500 and 9,090 tons, respectively. The annual Portland cement production capacity is estimated to be 3 million tons per year. The proposed plant capacity is primarily based on market demand and the availability of raw materials. Future plans to increase the production capacity through the introduction of a second production line of 7,500 t/day capacity will take place as part of the project phase 2 extension plans.

2. PROJECT DESCRIPTION

2.1. LOCATION AND SURROUNDING LAND USE

The total surface area of the project is around 14.6 km^2. The cement plant is located on a plot of 130 hectares (1.3 km^2) approximately 160 Km to the north-east of Aleppo city, 135 Km north-west of the Raqqah city and approximately 30 Km south of the Syrian-Turkish borderline (Figure 1). The site was selected due to its close proximity to a limestone deposit (675 ha) which is situated on the boundary of proposed cement plant and the basalt deposit (675 ha) 15 km to the north of the plant site. The quarry sites total the remaining 13.3 km^2 and are state-owned. The quarry sites will be leased from the Syrian Government.

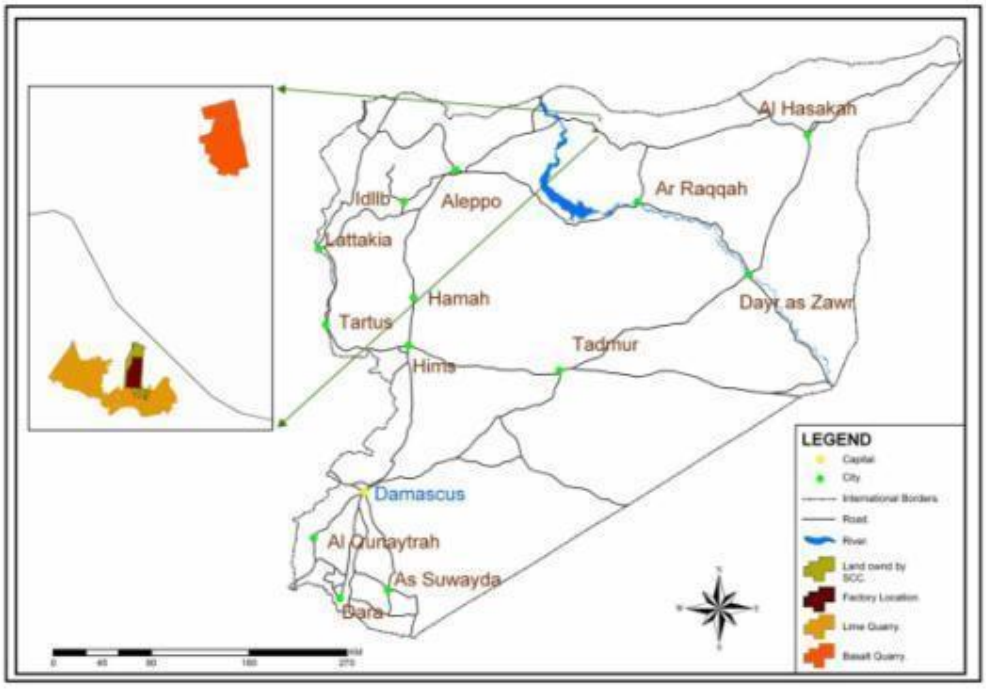

Figure 2-1: Location of the project site

The limestone quarry has an anticipated lifespan of 115 years if it serves a single line at the proposed cement plant. The basalt deposit will be further explored once the land has been acquired.

The area surrounding the site is dominated by agricultural production (wheat, barley and livestock) with more than 30 villages or clusters of homesteads interspersed. Other quarry activities can be found to the

west of the project site and a Turkish cement factory has recently been established about 30 km to the North –east.

2.2. CONSTRUCTION ACTIVITIES

It is expected that it will take approximately 24 months from the commencement of the project to the time of full production. It is anticipated that the plant will be operational by mid-2010. Construction activities will comprise the following:

- **Equipment manufacturing**: Equipment will be manufactured elsewhere and transported to the site for assembly. It is likely that the equipment will be transported using the existing Aleppo-Al Hessakah Highway.
- **Site preparation:** The site will be leveled utilising excavators, trucks, bulldozers, graders and compactors. Due to the flat terrain, it is unlikely that additional material will be imported to the site. Excess material will be temporarily stockpiled on site and used as raw material (replacing basalt) in the production process.
- **Civil works:** Foundations will be excavated and reinforced concrete pads will be laid where required by process units or buildings. Buildings will be constructed from either blockwork or reinforced concrete.
- **Finishing:** As the main structures are erected mechanical and electrical assembly teams will install the required systems.

During construction water consumption will be approximately 600m^3/day. Water will be sourced from existing shallow wells adjacent to the plant site. Electricity will be provided by 24 diesel generators. The diesel required for the generators will be stored on-site in two tanks which have a secondary containment (bund) to prevent spread of spill and potential contamination.

A variety of solid wastes will be generated during the construction phase, including:

- Inert construction material (including excess soil, rubble etc.) will be used as fill;
- Other construction wastes are segregated and dealt with in four categories:
  - **Hazardous waste** (such as used oil and oil filters) are handed over to an approved contractor for recycling oil;
  - **Metal and wood scrap** is sold directly for off-site recycling;
  - **Domestic waste** is picked up by the Municipality and transported to the local Sareen landfill site 20 km from the plant site.

During peak construction, approximately 1,800 workers will be employed on site. The majority of these workers will be sourced from the local population and the rest housed in 3 construction camps able to accommodate a total of 760 workers, located next to the project site. The construction camp includes the following amenities and services:

- **Water and sewage:** Water will be sourced from a shallow well next to the site while sewage will be directed into a lined septic tank.
- **Electricity:** Electrical power is provided to the site by diesel generators which are supported with an appropriately bunded diesel tank.
- **Waste collection and disposal:** Waste is temporarily stored in a waste facility on site before collection and disposal at the Sareen landfill site 20 km from the plant site.

2.3. OPERATIONS/CEMENT MANUFACTURING PROCESS

The cement manufacturing process comprises seven critical stages, as follows:

1. Quarrying;
2. Crushing and pre-homogenisation of limestone and additives
3. Milling, homogenisation and storage of raw materials
4. Preheating and clinkerisation
5. Clinker cooling and storage
6. Clinker grinding
7. Cement storage, packing and distribution
8. Thermal Captive Power Plant

A variety of raw materials are required in the cement manufacturing process. The imported materials will be transported to site on tucks. The details of this process are provided in Table 2-1.

Table 2-1: Volumes of outsourced materials and distance from plant (per year)

RAW MATERIAL	ANNUAL QUANTITY (TONS)	SOURCE OF SUPPLY	DISTANCE FROM PLANT	NO OF TRUCK LOADS (50 TON TRUCKS)
Limestone	3,750,000	Koujak and Kharab Eshik Mountains	2 km	75,000
Basalt	768,240	Kortek Village-Gelabeya Area	15 km	15,364
Pozzolana	700,000	Manakhir Quarry	125 km	14,000
Sand	250,000	Karyateen – Homs Governorate	475 km	5,000
Gypsum	150,000	Gureen Quarry – Raqqah Governorate	170 km	3,000

The total number of monthly truck trips (at 3,113, excluding limestone) is significant, and the local highway will need to be upgraded at the exit point to the plant site to accommodate such loads, in addition the link road between the plant site and the basalt quarry will need to be upgraded and re-routed to bypass villages.

Electrical and water requirements of the plant will be met as follows:

- **Electricity:** In November 2007 the Syrian authorities cancelled their approval for supplying electrical power for all cement plants in the country hence the 45mW of power required to operate the project will be secured through an onsite thermal (coal-fired) captive power plant. The plant will consist of two 30MW generating units.
- **Water:** The total water requirement for the cement plant, power plant and the associated housing works is 7,000m^3/day, which will be met through water pumped from 5 shallow wells and 2 deep wells on the property. The water will be treated at an onsite water treatment plant, before being distributed.

The site will contain an on-site laboratory, fire fighting systems and workshops.

2.4. DECOMMISSIONING AND REHABILITATION

At the end of the project life, the plant and machinery is will be removed from the site and where possible re-deployed into new projects. Post-mining rehabilitation will be guided by the post-mining land-use stipulated by the local authorities. A mine rehabilitation plan will be developed according to these requirements.

3. SOCIAL AND ENVIRONMENTAL BASELINE CONDITIONS

3.1. LAND USE AND SOCIO-ECONOMIC SETTING

The study area's topography is a flat terrain lying at an elevation ranging between 420m - 500m a.s.l, and bounded in the south by mountainous hills. The southern area has small valleys or Oueds formed along ephemeral streams, flowing downstream in a northerly direction.

Thirty villages are scattered throughout the study area, and all share similar socio-economic characteristic. The study area comprises of mainly agricultural lands occupying a total area of 28, 272 ha, divided into 1,837 ha of irrigated lands and 26, 367 ha dry lands; with 69 ha of forest. Almost 60% of the agricultural lands are privately owned. Sixty percent of the population own on average 25ha and 40% own on average 2 ha. The total population in the study area is approximately 5,397 inhabitants, with an average of 7 members per household. A total of 769 houses are recorded with the majority (62%) constructed of mud. Five schools are found in the study area, two of which provide secondary level education. One health-care centre operates in the Jalabieh village requiring people to seek health services in other villages such as Ain Arab (north). An archaeological survey in the region of West Jazira, found that the closest mound to the study area lies in the village of Jalabieh located 5 km to the north of the cement plant location.

3.2. BIOPHYSICAL ENVIRONMENT

3.2.1. Climate

The average monthly temperatures range between a low of 0˚C to a high of 39˚C. The prevailing wind directions in winter are easterly, westerly and northerly. The mean annual precipitation is approximately 280 mm/year. Periods with high amounts of rainfall span form November to February, dry periods on the other hand extend from July to September. The average humidity in the study area is 77% during the winter period and 41% in dry periods. Maximum absolute humidity values may reach 100%, while the lowest humidity ever recorded in dry periods was 2%.

3.2.2. Air Quality

Limited air quality monitoring has been undertaken at four (4) locations (Tolak, Kharab Ishk, Damerjek Sharky and Kojak Met). Air pollutants monitored included CO, NO_2, SO_2 and PM_{10}. The ambient air quality reading for all pollutant types revealed that the ambient levels within the study area are very low (<0.5 ppm for CO_2, <0.001 ppm for SO_2, <0.02 ppm for NO_2 and <9.3 µg/m^3 for PM_{10}) and well within the permissible Syrian Ambient Air Quality Standards of 8.6 ppm, 0.1 ppm, 0.132 ppm and 100 µg/m^3 respectively.

3.2.3. Noise

Baseline ambient noise level monitoring survey was conducted at the same locations of the air monitoring locations. The readings revealed that the noise level within the study area were on average <40dB(A) and fall well within the national Syrian ambient noise level standards for rural areas.

3.2.4. Water

No permanent surface water resources exist within the study area. However, several small ephemeral streams exist flowing within small valleys/Oueds following a rain event. Three (3) aquifers are currently exploited in the study area. These are the Neogene, the Paleogene and the Cretaceous aquifers. A survey of the existing wells in the area revealed the presence of about 49 wells mostly tapping the Neogene and Paleogene aquifers. The depths of the wells vary between 65 and 190 m below ground (BG). Most of wells drilled in the Paleogene to the east of the plant site are dry. Water level contour maps for each of the tapped aquifers shows that ground water flow direction in the Paleogene and Neogene aquifers is in an east to west direction. The recharge area for the Paleogene aquifer consists of the Paleogene exposures located to the west and northwest to the site location. For all parameters and samples analyzed, results revealed contaminant levels are well below the Intervention Value of the Dutch groundwater standards.

3.2.5. Ecology

The vegetative cover in the study area consists mainly of semi-shrubs and herbs covering 35-45% of the wild patches. The study area has witnessed an accelerated change in natural vegetation to agricultural lands mainly induced by increased human pressure (agriculture, urbanization, etc). No protected areas were identified in the study area based on published documents or during the reconnaissance field survey. In general, the fauna in the study area belongs to the Mediterranean zoogeographic sub-region. Domestic animals are commonly found but some wild mammals have thrived despite the pressures of agricultural ecosystems. Apart from domestic birds such as chicken and turkey, wild species like rock dove, crested lark, and house sparrow were observed. The study area has low levels of biodiversity with a few amphibians and reptiles. Arthropod species such as dermipteras are inhabitants of the study area. These species serve as a source of food for other animals especially birds, reptiles, and amphibians.

3.2.6. Cultural Heritage and Archaeology

The closest mound to the Study Area lies in the village of Jalabieh located 5 km to the north of the cement plant location.

4. PUBLIC CONSULTATION

A public consultation process was undertaken in accordance with Syrian EIA Act, Annex 4 for "*Public Participation – Mechanisms and Procedures*", which called for a Public Hearing during the scoping phase of the project so as to introduce relevant stakeholders to the proposed project, its scope of work and inform the public about the anticipated impacts and the planned mitigation measures to be adopted for each impact (a copy of the presentation to stakeholders is attached).

The main concerns and views voiced during the public hearing (5 March 2009) were:

- Alteration of existing land use (i.e. shift from agricultural to industrial). This includes sharing of existing groundwater used for agricultural irrigation leading to resource depletion;
- Public health and safety risks induced from disease outbreaks, noise and vibration, industrial atmospheric emissions, fugitive dust emissions and waste management;
- Control measures to safeguard against pollution of agricultural resources;
- Proposed source of electricity and water ;
- Potential employment opportunities.

Following the public meeting all suggestions, comments and concerns from the different parties were documented, evaluated and addressed by the SCC representatives and EIA team.

5. DESCRIPTION OF ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS

Table 5-2 and Table 5-3 highlight the key impacts associated with the project. The type, nature (positive, negative, direct, indirect), magnitude, timing (during design, operation), duration (short term/temporary, long term/permanent) and significance of impacts is assessed. The evaluation approach implemented in this study is a Receptor-Specific Analysis approach addressing the various sources of impacts from the project's different implementation phases including mobilization, site preparation, commissioning, drilling/quarrying operations, and site restoration. The impact significance was determined using the following basic assessment criteria (and discussed in more detail in the following section:

Table 5-1: Impact Assessment Management Matrix

		LIKELIHOOD RATING		
		A	B	C
CONSEQUENCE RATING	1	1A	1B	1C
	2	2A	2B	2C
	3	3A	3B	3C
	4	4A	4B	4C
	5	5A	5B	5C
	6	6	6	6

KEY			
Consequences		Likelihood	Acceptability
1 - Negligible	4 - Significant	A - Low	Negligible with minor mitigation
2 - Minor	5 - Catastrophic	B - Medium	Minimize Impacts
3 - Moderate	6 - Beneficial	C - High	Unacceptable

Table 5-2: Comparison between Environmental Impact Severity Matrix – a) No Mitigation Measures Applied, b) Measures in Place

ACTIVITY / SOURCE OF THE IMPACT	UNMITIGATED IMPACTS – RECEPTOR								MITIGATED IMPACTS – RECEPTOR							
	AIR QUALITY	LAND USE AND VISUAL IMPACT	WATER RESOURCES	BIODIVERSITY	NOISE & VIBRATIONS	INFRASTRUCTURE AND TRAFFIC	ARCHAEOLOGICAL	SOCIO-ECONOMIC & PUBLIC HEALTH	AIR QUALITY	LAND AND VISUAL	WATER RESOURCES	BIODIVERSITY	NOISE & VIBRATIONS	INFRASTRUCTURE AND TRAFFIC	ARCHAEOLOGICAL	SOCIO-ECONOMIC & PUBLIC HEALTH
CONSTRUCTION PHASE																
Plant Site	2C	3C	2B	3B	2C	4C	1A	4C	1C	2A	2B	1C	2A	3B	1A	3B
Roads	2C	3C	1A	1C	2C	4C	1A	4C	1C	2A	-	1C	2A	3B	1A	3B
OPERATIONS PHASE																
Plant Site																
Crushing and Pre-homogenisation	3C	4C	1A	3B	3C	1A	1A	2B	2A	2A	1A	2A	2A	1A	1A	B
Milling, Homogenisations & Storage of Raw Materials	3B	4C	1A	3B	3C	1A	1A	2B	2A	2A	1A	2A	2A	1A	1A	B
Pre-heating, Kilning and Heating	4C	3C	1A	3B	3C	1A	1A	4C	2A	2A	1A	2A	2A	1A	1A	1B
Cooling, Grinding, Storage and Packing	3B	4C	3C	3B	3C	1A	1A	2B	2A	2A	2B	2A	2A	1A	1A	B
Transport of Raw Materials and Final Product	2C	4C	2B	3B	3C	5C	1A	3B	2A	2A	1A	2A	2A	2B	1A	1B
Captive Power Plant	4C	3C	4C	3B	3C	1A	1A	B	2A	2A	2B	2A	2A	1A	1A	B
Office & Accommodation Facilities	1A	2C	2B	3B	1A	1A	1A	B	1A	2A	1A	2A	1A	1A	1A	B
Limestone Quarry																
Drilling and Blasting	4C	4C	1A	2C	4C	1A	1A	2B	2B	2B	1A	1A	2B	2B	1A	1B
Transport	3B	3B	1A	1A	3B	1A	1A	2B	1B	1B	1A	1A	1A	1A	1A	1B
Basalt Quarry																
Drilling and Blasting	4C	4C	1A	2C	4C	1A	1A	2B	2B	2A	1A	1A	2B	2B	1A	1B
Transport	3B	3B	1A	1A	3B	5C	2B	5C	1B	1B	1A	1A	2B	2B	1A	1B

Consequence	Likelihood	Acceptability
1. Negligible 2. Minor 3. Moderate 4. Significant 5. Catastrophic 6. Beneficial	A. Low B. Medium C. High	Negligible with minor mitigations Minimize impacts Significant / major mitigation Beneficial

Table 5-3*: Summary of impacts and mitigation measures for key receptors

Receptor	Impacts		Mitigation Measures		Final Rating	
	Construction	Operations	Construction	Operations	C	O
Air quality	• Health impacts associated with increased levels of pollutants; • Emissions of air pollutants, including - airborne particulates (dust) - fugitive emissions - exhaust and combustion emissions	• Health impacts associated with increased levels of pollutants; • Dust generation and nuisance/health impacts on the local community. • Emissions of Greenhouse Gasses (GHG's)causing global climate impacts • Diseases associated with high levels of air pollutants • Dust on agricultural lands	• Well maintained and operated equipments, using appropriate fuel mixtures, e.g. diesel fuel with low sulphur content (5% sulphur content) • Using environmentally friendly equipment with higher fuel efficiency or equipped with air pollution control devices to minimize exhaust emissions. • Avoiding equipment and vehicles left running unnecessarily; • Watering-down dusty work areas. • Efficient scheduling of deliveries to reduce traffic load • Maintaining stockpiles at minimum heights and forming long-term stockpiles into the optimum shape (i.e. stabilization) to reduce wind erosion. • Maintaining handling areas in a dust free state as far as practicable. • Establishing and enforcing appropriate speed limits over all unpaved surfaces. • Travelling on existing and paved tracks wherever possible. • Avoiding open burning of solid waste through segregation and recycling, and through disposal according to a solid waste management plan	• Install low emission burners • Product development with new clinker (BCAF) and enhanced (Portland) clinker reactivity & with concrete formulation (admixtures, granular optimization • Concentrate on interface between the cement plant flue gases & treatment plant (gas conditioning, scrubbing, liquefaction) • Using alternative materials and biomass • Energy consumption (reduce Specific Heat Consumption) • Reduce the Consumption of Power. • Upgrade its factories and improve its activities and operations on a continuous basis by using alternative power sources. • Dust control measure - wetting of roads, dust screens and equipment which generates low dust emissions • Efficient scheduling of deliveries to reduce traffic load • Maintaining stockpiles at minimum heights and forming long-term stockpiles into the optimum shape (i.e. stabilization) to reduce wind erosion. • Establishing and enforcing appropriate speed limits over all unpaved surfaces. • Travelling on existing and paved tracks wherever possible. • Avoiding open burning of solid waste through segregation and recycling, and through disposal according to a solid waste management plan • Well maintained and operated equipment, using appropriate fuel mixtures, e.g. diesel fuel with low sulphur content (5% sulphur content)	1C	2B

Water Resource	• Stress on already heavily utilised local groundwater resources • Groundwater pollution • Accidental chemical or oil spill from the project's operations	• Stress on already heavily utilised local groundwater resources • Groundwater pollution • Accidental chemical or oil spill from the project's operations (e.g. refuelling operations).	• Lined Septic tanks as part of the Waste Management Plan • Ensure that no sanitary or waste water is discharged onto the land • Using biological, mechanical or thermal control measures • Identify high risk spill areas- e.g. generators and fuel tanks – and have impervious surfaces and capture facilities in place • Clean up spills if any with an absorbent material such as cat litter. Chemicals spilled near wells can move directly and rapidly into groundwater. Chemicals spilled near ditches or streams can move rapidly into surface water. • Selecting properly the location of mixing areas; Mixing and loading of pesticides should be done on an impervious pad whenever areas show limestone, marl or conglomerates formations • If chemical pesticides are applied, concentrates need to be carefully measured before they are placed into the spray tank. • Casing should not present open spaces and should be tested for leaks prior to casing installation • Ensuring that the sealing grouting is properly installed, coupled with a continuous monitoring for cracks, or potential deterioration, • Using of chemically inert expandable material for grouting and drilling, to avoid physical deterioration upon contact with water All equipments shall be cleaned and decontaminated prior to passing through the aquiferous formations; • Ensure an appropriate storage of equipment, • Unfinished borehole should be temporary sealed with special caps • Use of water-based fluids including non-toxic chemicals;	• Development of a detailed monitoring plan to monitor the groundwater levels, and selected water quality parameters such as conductivity, and temperature • Domestic wastewater will be channelled through the waste treatment plant • Storm water runoff and wash water will be channelled to evaporation ponds before being used to irrigate and control dust • Reducing water consumption and increasing recycling operations in all production units. This will include, but not exclusively, collection of washing and cooling water, supervising water consumption and reusing treated wastewater (once wastewater treatment plant is operational) as part of its water saving measures • Exploitation of the limestone aquifer, to reduce the stress of the shallow aquifer. Installation of two production wells tapping the Cretaceous limestone aquifer. Routine inspection and maintenance of equipment to ensure that risk of leak/spill is minimized; • Promotion of good housekeeping during operation and maintenance; • Ensuring a supply of suitable absorbent materials is available at re-fuelling points for use in dealing with minor spills. If a leak or spill occurs during loading or offloading operations, the operations will be stopped and the spill will be contained, cleaned up and collected. • Spills from generators, chemicals or disposed waste onsite shall be reported readily in order to seek immediate remedial; • Drip trays will be installed underneath equipment such as diesel generators to contain leakage. The drip trays will be maintained and kept drained of rainwater;	2B	2B

Receptor	Impacts		Mitigation Measures		Final Rating	
	Construction	Operations	Construction	Operations	C	O
Biodiversity	• Loss of terrestrial habitat • Damage to vegetation • Land contamination	• Disturbance of normal breeding, migration etc patterns	• Routine checking of trenches (if any) and escape routes to minimize, if not prevent, entrapment of fauna; • Washing down of vehicles in place and prior to commencing work; • Preservation of excavated top-soil for future site restoration procedures particularly in highly disturbed areas; • Limiting vehicular transport to defined roads as to prevent unnecessary injury, habitat destruction and complying with safe driving procedures; • Reporting of any violation relating to hunting and trading activities; • Implementing good housekeeping practices on the field and implementing SCC's proposed Solid Waste Management plan in order to eliminate any source of hazard to the native fauna	• Limiting access to quarry sites and plant area via erection of concrete barriers and/or fencing so as to prevent accidental falls of fauna (and potentially herders, children, pedestrians). • Define refuge areas (for nesting, resting, feeding and breeding) – no-go for people, vehicles etc • Limiting vehicular transport to defined roads as to prevent unnecessary injury, habitat destruction and complying with safe driving procedures; • Reporting of any violation relating to hunting and trading activities; • Implementing good housekeeping practices on the field and implementing SCC's proposed Solid Waste Management plan in order to eliminate any source of hazard to the native fauna • Routine checking of trenches (if any) and escape routes to minimize, if not prevent, entrapment of fauna; • Washing down of vehicles in place and prior to commencing work	1C	1B
Land Use and Visual Impact	• Conflict with current land use for off-site facilities • Landscape changes	• Landscape changes	• Physical barriers such as walls and netting • Limiting the construction site (waste, roads etc) to the 130 ha will ensure that the area effected is limited to the plant site (130 ha) and does not spill over onto adjoining lands.	• Good design and effective landscaping • Plant green zones near impact receptors • Variation of colour on the plant structures • Containing the quarry operations to the quarry sites this will ensure that the area affected is limited to the quarry and does not spill over onto adjoining grazing lands. • Quarries need to be fenced to ensure that local herders and their livestock do not enter the quarry site and run the risk of injury.	2A	2A
Noise & Vibrations	• Increase of ambient noise levels with the potential of disturbance to local	• Increase of ambient noise levels with the potential of disturbance to local	• Installation of temporary noise barriers and using appropriate equipment fitted with noise mufflers • Maintaining an active community	• Select low noise equipment, install mufflers at air inlets and outlets of the fans and air compressors; • Install sound insulation cover (room) for	2A	2B

Receptor	Impacts		Mitigation Measures		Final Rating	
	Construction	Operations	Construction	Operations	C	O
	communities.	communities. • Damage to local structure due to vibrations	consultation and positive relations with local residents will assist in alleviating concerns and resolve any potential noise complaints. • Provide adequate Personnel Protective Equipment (PPE) to construction workers at all noisy activities/locations that exceed permissible occupation noise level limits set in the Syrian Permissible threshold Occupational noise level standards in different work areas.	equipment with higher noise; • Place noisier sources farther away from sensitive receptors in the overall design; • Build sealed or semi-sealed workshops for noisier production processes; • Build 2 m high concrete wall around the cement plant premises; • Grow high-rise and thick trees around the plant and quarry premises. • Proper route planning, traffic planning • Install high noise warning boards which will be displayed in areas of noise levels and mandate ear protection the identified high risk area. • Noise level monitoring should be conducted regularly to ensure that noise levels during all times are within national noise exposure standards. • Additional noise level control measures and occupational/community health preventive measures will be considered following IFC EHS guidelines. • Timing between blast set to produce minimum vibrations • Blasting needs to be restricted to a limited part of the day. • Covering the detonating fuse with at least 150 mm thick cover of sand or drill cuttings • Supervision of drilling and blasting operations to ensure the designed blast geometry. • Avoid blasting when strong winds are blowing towards the residence. • Further based on the safe blasting limits it is recommended that the peak particle velocity (ppv) should be kept at 10 mm/sec.		
Infrastructure and Traffic	• Stress on local traffic infrastructure; • Public health risk from waste transport and	• Stress on local traffic infrastructure; • Public health risk from waste transport and	• A Traffic Management plan would need to be implemented	• In consultation with local inhabitants identify an alternative route for the road through an area that is less populated. This may require the need to purchase agricultural land from	3B	2B

Receptor	Impacts		Mitigation Measures		Final Rating	
	Construction	Operations	Construction	Operations	C	O
	disposal; • Traffic congestion; and • Public safety risk.	disposal; • Traffic congestion; and • Public safety risk. • Air, dust and noise pollution in villages, • Loss of livestock due to collisions on the roads •		local farmers in order to re-route the road • Construct/upgrade the road to the standard required to carry the load and volume of traffic required to deliver basalt to the plant • Enforce strict restrictions on the speed at which the trucks are allowed to travel and the hours of operations • Where necessary implement stop/go zones which will allow a single truck to pass at a time • Construction of a new intersection on the Aleppo- Al Hassakeh Highway at the entrance to the plant • Clear signage on the roads • Education of local communities, staff and transport contractor		
Archaeological	• Alteration of and/or damage to archaeological resources, from construction works which require the physical excavation (blasting, site clearance, trenching etc.)	• Visual intrusion on the setting and amenity of the above-ground archaeological mound during construction and operation and potential loss of access to the archaeological site;	• Proper and careful planning of any work carried out near mound so as to avoid any potential damage to the sensitivities and artefacts; • Prevent all theft attempts and postponing any damaging activities until further instructions from SCC	• Proper and careful planning of any work carried out near mound so as to avoid any potential damage to the sensitivities and artefacts; • Prohibiting all theft attempts and postponing any damaging activities until further instructions from SCC	1A	1A
Socio-Economic & Public Health	• Local spending and positive impact into the local economy • Creation of job opportunities for local residents; • Generation of employment for local workers • Public health risks from large scale use of immigrant workers and stress on local healthcare	• Local spending and positive impact into the local economy • Creation of job opportunities for local residents; • Generation of employment for local workers • Public health risks from large scale use of immigrant workers and stress on local healthcare	• Encouraging participation of locals at early planning stage • Consultation with potentially affected communities prior to building the construction camps; • Proper training of crew members on camp regulations, code of conduct, and local cultural behaviour and awareness training of the workforce on responsible community interactions; • Proper implementation of external security including adequate fencing and signage around the cement plant site as well as quarry sites, establishing tower guards to	• Encouraging participation of locals at early planning stage • Investigating the feasibility of SCC to conduct social assistant programs in the local area. • Having a Traffic Management Plan (TMP) and ensuring that the Contractor complies with TMP requirements at all times; • Allowing only certified and trained drivers to carry out transportation related activities; • Having an plan for Emergency Response Procedures in place • Maintaining and immediate repairing of any damages caused by the project operation on public or private structures (e.g. electric	3B	1B

Receptor	Impacts		Mitigation Measures		Final Rating	
	Construction	Operations	Construction	Operations	C	O
	infrastructure and other social facilities	infrastructure and other social facilities • Anti-social behaviour of immigrant workers	move away local pedestrians and livestock from the operation and all open pits so as to prevent injury / entrapment or death to any person and/or grazing animals; • Communicating the availability of job opportunities to the local community in the project area; • Maintaining and immediate repairing of any damages caused by the project operation on public or private structures (e.g. electric cables, water network supplies and irrigation channels, etc.) • Investigating the feasibility of SCC to conduct social assistant programs in the local area. • Having a Traffic Management Plan (TMP) and ensuring that the Contractor complies with TMP requirements at all times; • Allowing only certified and trained drivers to carry out transportation related activities; • Having an plan for Emergency Response Procedures in place	cables, water network supplies and irrigation channels, etc.) • Proper implementation of external security including adequate fencing and signage around the cement plant site as well as quarry sites, establishing tower guards to move away local pedestrians and livestock from the operation and all open pits so as to prevent injury / entrapment or death to any person and/or grazing animals;		

*The impacts and mitigation measure included in this table are not exhaustive but summarize the main issues

6. DISCUSSION OF ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS

The impacts described in Table 5-2 and Table 5-3 are a reflection of the key aspects associated with the project. They can be further summarized in that the key impacts will be realized in the following environments:

- Ambient Air Quality;
- Land-use and Visual
- Water Resources (geology, groundwater and surface water);
- Biodiversity (fauna and flora);
- Noise and Vibration;
- Infrastructure and Traffic
- Archaeological;
- Socio-Economic and Cultural Heritage Environment;

Taking all of these factors into account, the following can be concluded:

1. **Degree of impact on public health and safety**
   - Public health and safety will be placed under the greatest risk through the effects of traffic and transportation, blasting and through dust impacts.
2. **Degree to which effect on the human environment is highly uncertain or involve unique or unknown risks;**
   - All risks are known and have been described (either quantitatively or qualitatively).
3. **Irreversibility of impact**
   - Most of the impacts described are reversible. Irreversible impacts (associated with landscape changes and habitat disturbance are manageable or considered to be of relatively low importance.
   - The significance of archaeological impacts is considered to be low.
4. **Action affects the functioning of life support systems, natural amenities, cultural resources etc**
   - The function of life support systems and/or natural amenities will be impacted by the project; however with appropriate mitigation measure these impacts can be limited to acceptable levels.
   - Key mitigation measures includes:
     - Exploiting the deep limestone aquifer to reduce stress on shallow aquifers
     - Lining of septic tanks and areas were oil and fuels are handled to prevent contamination of ground water
     - Re-routing road from basalt quarry to avoid villages and construction of intersection to facilitate exit and entry of trucks onto the highway
     - Implementation of various dust reducing techniques including the wetting of dry surfaces

5. Violation of the spirit of the law

- In review of performance against specified standards and guidelines, the project is not expected to exceed International and Syrian National Ambient Air Quality Standards for dust and NOx and SOx emissions.
  - The expected minimum and maximum total amounts of SO_2 emissions ranges between 990 and 14,850 tons/year; which are equivalent to stacks emissions between 861 mg/m3 and 1,888 mg/m3. The modelling of the SO_2 dispersion of the gases emitted by both sources (kiln + power plant), conclude a maximum yearly concentration at ground level of 6µg/m3 or 13µg/m3, depending on the sulphur retention scenario (95% or 99%). These concentrations are calculated for the most exposed villages in the dispersion pattern, namely, Kharab Eshek & Kharab Eshek Janoubi. The concentrations re compliant with European directives 80/779, 85/203 and amendments and they are representative of industrial areas in Europe
  - The expected minimum and maximum total amounts of NOx emissions ranges between 73 and 1097 mg/m3 with an emissions limit of 600 mg/m3 guaranteed by the supplier. The modelling of the NO_2 dispersion of the gases emitted by both sources (kiln + power plant) conclude a yearly concentration of between 3µg/m^3 & 6 µg/m^3 at ground level in the nearest village shown in the dispersion pattern. This is well within international standards for air quality. To put this in perspective a city like Paris, where air quality has improved over the years, 2008 registered concentrations of NO_2 between 34µg/m^3 & 43µg/m^3 depending on the air station location (district)
  - The daily expected minimum and maximum concentrations of dust emissions ranges between 2 to 73 mg/m^3 respectively
  - The expected amounts of CO_2 emission for the cement plant are 2,047,815 ton /year. The CPP will add an additional 429,720 ton of CO_2 / year.
- The project is expected to exceed ambient limits for noise levels and vibration, especially during blasting activities at the quarry sites. While unavoidable this can be mitigated as indicated in Table 1-4 above.
- The project is expected to extract large volumes of groundwater which may potentially impact on other resource users. However exploitation of the deep limestone aquifer, will help reduce the impact of the project on the shallower aquifers used by the local population, Preventative measure as outlined in Table 1-4 above will ensure impacts are prevented, while frequent monitoring of both water quality and quantity with allow immediate remedial action to be taken in the unlikely event that any impacts should emerge.

6. Limitations for future actions

- The project is unlikely to prevent further activities from taking place in the region. It is, in fact, likely that the project will generate additional opportunities for downstream industry.

7. Nature of cumulative effect

- Cumulative impacts have been assessed and are considered in the significance ratings summarised in Table 5-2

8. Social costs absorbed as private costs

- Private social costs are unlikely to accrue as a result of the project.

Therefore, while there are a number of environmental concerns associated with the project that need to be managed, none are considered to be of such significance that they cause concern for long-term risk and/or are of such importance that they should prevent the project from proceeding.

7. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The ESMP addresses the main impacts identified in the ESIA, in particular:

- Mitigation measures to be implemented during the construction phases;
- Waste management and disposal methods;
- References to control guidelines and standards;
- Responsibilities for the implementation of the ESMP;
- Verification, monitoring, and training requirements; and
- Reporting requirements.

The ESMP has been based on the ISO14001 Environmental Management Systems standard. This is not to say that the programme will pursue certification, but simply that it will be based on a robust management philosophy. For this reason, the programme is structured to reflect a description of the overall approach; where after the individual elements of the management programme are presented in detail. It is also important to emphasise that the ESMP logically follows from the EIA and has been developed specifically in response to the mitigation measures stipulated.

The ESMP has been divided into the construction and operational phase, and key elements are depicted in Figure 1-2 and Figure 1-3 below.

Figure 7-1: Summary of Environmental requirements during Construction

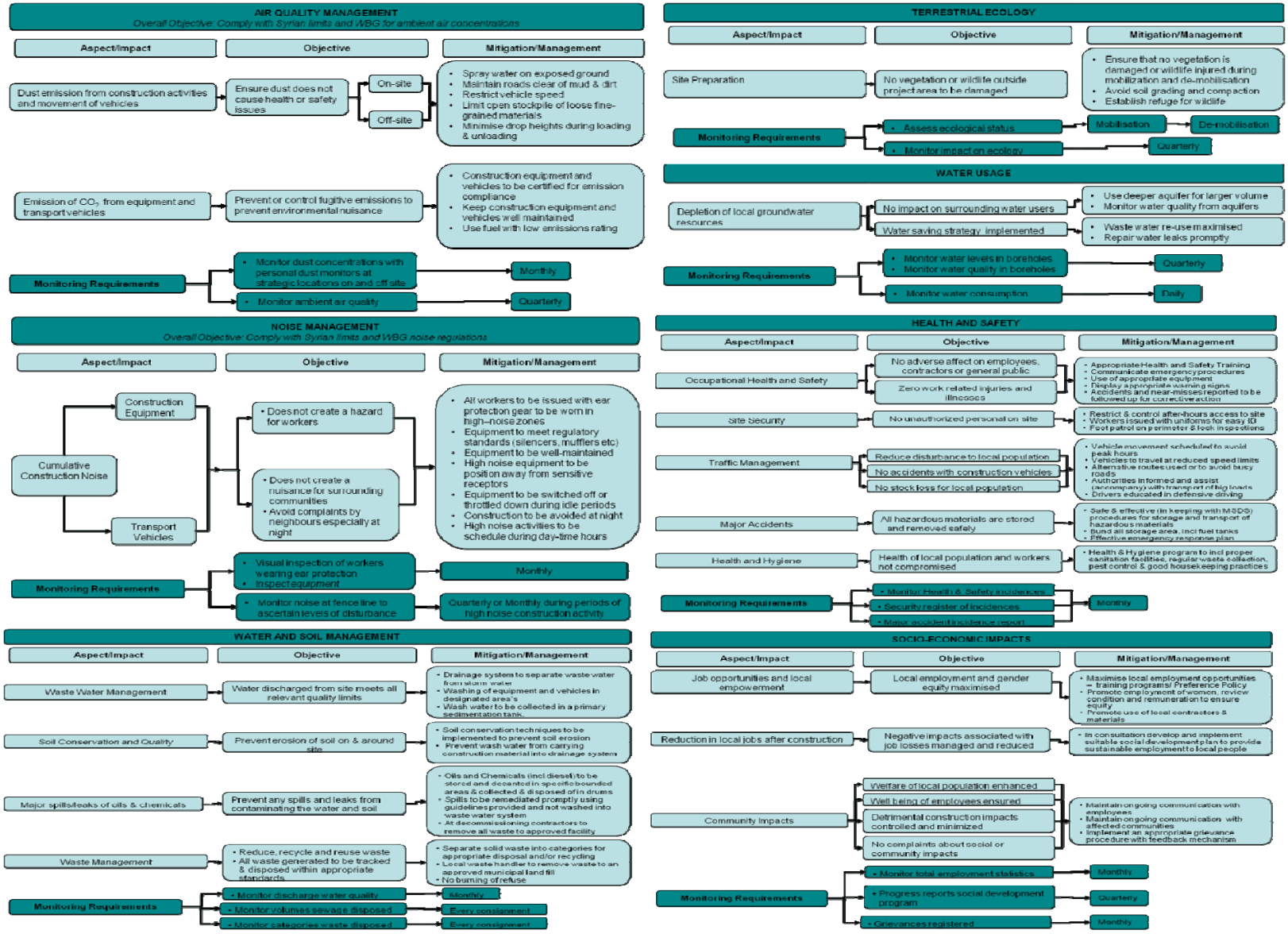

Figure 7-2: Operational Environmental and Social Management Plan