THE HASHEMITE KINGDOM OF JORDAN

MINISTRY OF TOURISM AND ANTIQUITIES

THE WORLD BANK

THIRD TOURISM DEVELOPMENT PROJECT

SECONDARY CITIES REVITALIZATION STUDY

Karak

Environmental assessment

Annex 4

JOINT VENTURE OF COTECNO WITH ABT ALCHEMIA CDG MGA

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Table of contents

1. Executive summary

The objectives of the EA study are to assess the environmental issues of the target area and to validate the CRP as a whole from an environmental point of view, by examining the project's potential negative and positive environmental impacts.

A number of site visits by the different members of the technical team were organized during the course of the study. The visits were carried out during the months of October and December 2004. Site visits covered most of the districts of Karak historic core, proposed location for the projects, neighbourhood residential areas and other infrastructure facilities within the project areas.

The technical team undertook intensive consultations with the officials, technicians and public at the Municipality of Karak City, Ministry of Environment, Ministry of Tourism and the local communities. Consultations were carried out through official meetings, site visits, scoping sessions and public consultations.

Karak lies at the geographic heart of Karak Governorate, about 116 km south of Amman. The boundaries of the Governorate are defined by the Dead Sea to the west, Wadi El Mujib to the north, Wadi El Hasa to the south, and the boundary of Ma'an Governorate to the east. Old Karak is located at an altitude of 1000 meters on the western edge of the Karak Plateau. It holds a strategic position astride the ancient Kings Highway, at the head of Wadi-Al Karak.

The Karak region experiences a heavily degraded Mediterranean **climate** characterized by cool, wet winters and hot, dry summers, with generally very short springs and autumns. Rainfall and temperature in the Governorate are highly influenced by altitude. Rainfall is currently showing a decline over time. Winter temperatures can be low, especially in the mountainous areas where annual minimum temperatures can be below – 4 C.

The geology of the Karak region comprises Pre Cambrian basement complex rocks overlain by sedimentary rocks of Ordovician to lower Cretaceous age. These have been extensively deformed by tectonic activity associated largely with the adjacent Dead Sea Fault. The area is still **seismically active**, and evidence from historic records suggests that a major earthquake capable of causing significant damage will occur along or close to the Jordan Rift Valley every 150 years.

Karak lies in an area of great **landscape** variety and beauty. The character of the landscape reflects the underlying landform and climate, and the vegetation and cultural and historic environment that has evolved from this. A number of distinct landscape character areas can be discerned in a relatively small geographical area around Karak.

Air quality and **noise** are not considered to be a problem in Karak, either as a danger to health or as a more general public nuisance.

The current conditions of the **traffic** inside the city is really alarming. Moreover, the city faces a **high parking demand**, and a lack of parking spaces. Due to its current role as a center for governmental buildings, a tourist destination, and an attraction point for residents of the surrounding villages, who come to Karak for recreation and shopping, the available parking spaces are failing to accommodate the current demand.

The quality of the natural and general environment will support and encourage the continued attraction of the region. The protection of its environmental quality is a major policy consideration, which could affect its future potential both as a place to live and work and as a tourist attraction.

After presenting the current conditions of the project area; the technical, financial and social aspects of the proposed actions; and the anticipated environmental impacts on the physical, ecological and socio-economical aspects of the environment, it can be concluded that the proposed projects will have a net positive socio-economic impacts on the residents and environment of Karak City. The positive impacts in the short, medium and long term exceeded the anticipated negative impacts during the construction and operation phases.

2. Introduction

According to the Terms of Reference (ToR), the scope of the whole study is to contribute to the ten-year strategy for tourism whose aim is to "*develop the potential of regional centres such as Karak, Jerash and Madaba in order to increase their contribution to the value added by the national tourism sector and benefit the population of these cities and their respective regions*". An explicit link is proposed between the need for an urban regeneration of the city centre and the improvement of tourism facilities in order to achieve the following goals:

- Spread the impact of increased numbers of tourists having longer stays;
- Provide the opportunities for local business growth and employment;
- Benefit the local population by job creation.

Tourism is to be considered as an engine for an overall socio-economic development of the regional centres and urban regeneration is a crucial issue for such a tourism development: it is essential in order to promote the identity of each regional centre, to improve the quality of the urban fabric in the old cities, and to enrich the experience of visitors. At the same time, an enhanced urban environment and a better livelihood for both residents and visitors, are conditions to maximize the effects of public investments and favour private initiatives.

The ToR stress that "*the objectives of tourism promotion should not overshadow the general analysis of the need for sustainable urban regeneration for the benefit of the local population in the living commercial and administrative centre*", and the goals of the Study are defined as follows:

- To develop a medium term development strategy for the city of Karak, with the emphasis on the potential links between the two terms of the tourism promotion and the urban re-generation.
- To identify priority urban regeneration and tourism-related projects and cultural heritage conservation activities for the city of Karak and its immediate attraction zone.

2.1 OBJECTIVES OF THE STUDY

The objective of this study is to reflect environmental resources of value, concern, and/or sensitivity, including sites having/needing official recognition and protection, urban practices to be changed, if any. In more specific the main assignments will consist of:

- **Assessment environmental issues** of the study area including sites that are/should be listed/protected, management practices to be changed, etc…
- **Validation of the city revitalisation program** as a whole from an environmental point of view, by examining the project's potential negative and positive environmental impacts.

  This shall be done by means of an evaluation matrix project actions/environmental impacts. The matrix shall take into account (a) the natural environment (air, water, and land); (b) human health and safety; and (c) social aspects (involuntary resettlement, and cultural property).

2.2 DELINEATION OF THE PROJECT AREA

This Report will discuss the case of Karak City, located at around 150 km to the south-west of Amman City, and accessed through the Desert Highway that connects Amman with all the southern regions.

AERIAL PHOTO OF KARAK WITH THE CRP AREA

3. Environmental Assessment Methodology

3.1 PURPOSE AND OBJECTIVES

An Environmental Assessment (EA) and environmental validation of the proposed actions in the city of Karak was requested by the Client, in parallel with the final design of the project and prior to the implementation. The EA will consider the potential locations used by the project.

This EA Study, commissioned on October 2004, has as its target the preparation of Environmental Impact Assessment Study Report of the third tourism development project.

In this study, there will be a focus on the following aspects:

- Research into the current environmental situation at the proposed sites for further actions and its surroundings.
- Description of the current site operation and the site conditions.
- Evaluation with regard to compatibility with minimum environment requirements.
- Assessment of the sensitivity of the surroundings of the action site (nature, human welfare, land use, surface / groundwater situation).

3.2 STUDY PROCESS AND METHODS

This section covers all methods used for completing this study. Before the project was officially launched, a base line research was carried out for the proposed sites. This was followed by the site visits to the project areas. Following this, information was gathered from different ministries and other sources that would be important to the study. Next a scoping meeting was held with various stakeholders, officials and community representatives in Karak Governorate in order to discern their opinion of the project and the potential impacts it could have. At that stage the communities were involved formally with their opinions regarding the possible effects the project that could raise on the environment.

Finally combining all this information, community consultation and field visits feedback enable the consultant to define the major environmental impacts, assessed, evaluated and mitigation measures were recommended in the form of environmental management plan.

3.2.1 STUDY AREA RECONNAISSANCE

A number of site visits by the different members of the technical team were organized during the course of the study. The visits were carried out during the months of October and December 2004. Site visits covered most of the districts of Karak old city, proposed location for the projects, neighbourhood residential areas and other infrastructure facilities within the project areas.

The technical team undertook intensive consultations with the officials, technicians and public at the Municipality of Karak City, Ministry of Environment, Ministry of Tourism and the local communities. Consultations were carried out through official meetings, site visits, scoping sessions and public consultations.

Officials at the MOTA and the Municipality were very cooperative and helpful to the technical team. All the meetings in Karak were arranged with consultation of the project manager.

3.2.2 LITERATURE REVIEW

During the visits of the technical team to the concerned agencies, most of the relevant data and information were collected and reviewed. The collected data were in the form of reports, maps, recent studies by the local agencies, public consultations, suggestions and comments of the communities and officials.

These data include but are not limited to the following:

INFORMATION GATHERED	SOURCE
Aerial photo scale 1:10 000	Royal Geographic Centre
Tourist Map scale 1: 5 000	Royal Geographic Centre
Topographic Map scale 1: 10 000	Royal Geographic Centre
Information on the History of Karak	Department of Antiquities
Temperature, Rain and Humidity information	Meteorological Department
More information regarding the proposed future actions	Study of the second tourism development project

TABLE 1 - INFORMATION GATHERED AND SOURCE

3.2.3 SITE VISITS

Site visits were conducted during the months of November and December 2004 to the proposed locations for the new actions in Karak City in order to gain more information about the project sites. The team visited the targeted locations and surroundings, and the market nearby. The visit was very useful in clarifying the details of the project. From these visits, more information was gathered and it also became clear that the following information was needed.

- Information concerning the residential areas close to the sites,
- Information concerning the material to be used for construction,
- What facilities will be provided for visitors,
- What safety measures will be adopted,
- Parking and traffic information,
- Method of solid waste collection and disposal, and
- Drainage system capabilities.

The missing information were gathered from the different parties, MOTA, the municipality and other related organizations.

The missing information were gathered from the different parties, the Ministry, the municipality and other related organizations.

3.2.4 COMMUNITY CONSULTATION

In order to involve the communities within the targeted areas, a city consultation workshop was held at the City Hall attended by the Mayor, government officials and key representatives from the community. The workshop was held on Thursday 9/12/2004. The aim of the workshop is to present a preliminary project outline and introduce the concept of the City Revitalization Pact and obtain comments and feedback. The workshop began with a presentation of the preliminary project outline and the communication was completely held in Arabic. The presentation was followed by a series of questions, discussions and feedback on the proposed actions.

Another meeting was held with the Mayor of Karak on the 26th of January, 2005. More discussions were carried out between the technical team and the officials.

A lot of suggestions and proposals came out concerning possible project actions, both in the public sector area and from the private sector. A specific points that were raised during the meeting and related to environmental aspects can be summarized as follows:

- The essentiality of public participation and community consultation during all the phases of the project.
- Emphasizing on the public awareness during the planning and implementation phases of the action project.
- The priority for employing the labour forces should be from Karak.
- Encouraging the private sector participation.
- Traffic management is a crucial matter for enhancing the accessibility to the old town and attracting more visitors to the city.
- Drainage system is required to scale down the flooded water pounding at the streets during winter season.

4. Description of site and surrounding areas

Karak is essentially a Citadel town and closely related in both form and function to its Castle. Likely to have been established in the late Bronze or early Iron Ages around 1,200 BC. Karak would most certainly have been defensive in character and the site of the present Castle would have been of great strategic value.

4.1 NATURAL RESOURCES AND ENVIRONMENTAL ISSUES

This section outlines the natural and man made features that make up the environmental resources of Karak and the surrounding area. The first part provides a brief geographical overview of the Karak Governorate, intended to provide a general environmental context, highlighting any major constraints and resource implications of the development of Karak. It also draws attention to the environmental resources of the wider region that may attract new or increased tourist interest in the future. The second part of this section is focused upon the old city, its historic and cultural environment, landscape setting, and a summary of townscape and urban character. Existing environmental conditions such as water supply, and waste collection and disposal are also covered.

4.1.1 LOCATION

Karak lies at the geographic heart of Karak Governorate, about 116 km south of Amman. The boundaries of the Governorate are defined by the Dead Sea to the west, Wadi El Mujib to the north, Wadi El Hasa to the south, and the boundary of Ma'an Governorate to the east.

Three distinct geographic zones can be distinguished, running north–south through the region. To the west is the Dead Sea, about 400m below sea level and the lowest land, and the most saline waters on earth. This is border by the steep cliffs of the Jordan Rift Valley Escarpment, which rises to a height of over 1000m in the Governorate, and extends eastwards from the Dead Sea for a distance of between 10 to 20 km. The Escarpment culminates in the Karak Highland Plateau, an undulating plain that gradually decreases in height towards the desert to the east.

Old Karak is located at an altitude of 1000metres on the western edge of the Karak Plateau. It holds a strategic position astride the ancient Kings Highway, at the head of Wadi-Al Karak.

4.1.2 CLIMATE

The Karak region experiences a heavily degraded Mediterranean climate characterised by cool, wet winters and hot, dry summers, with generally very short springs and autumns. Rainfall and temperature in the Governorate are highly influenced by altitude.

On the high-lands around Karak, and the mountains to the north and south, annual rainfall averages about 350mm but falls rapidly to an average of less than 100mm to the west at the Dead Sea and to the east towards the Desert Highway at Al Qatranah. However these averages hide very wide annual variations, for example, in the mountainous area around Karak, annual rainfall can range between 200mm and 650mm. Rainfall is currently showing a decline over time.

Annual mean temperatures range from 15.5 C at Karak (Mu'tah University) to 17 C at Al

Qatranah and over 25 C at Al Safi at the southern end of the Dead Sea. In the highland areas around Karak, average maximum summer temperatures do not exceed 37 C but inland towards Al Qatranah they reach 40 C and at Al Safi 45 C. Winter temperatures can be low, especially in the mountainous areas where annual minimum temperatures can be below –4 C.

Winds can be relatively high, and when they blow from the desert, they are cold in winter and hot and dusty in the summer. Winds are predominantly from the west and southwest, however, and they provide some cooling during the summer, especially on the higher areas around Karak.

Air quality and noise are not considered to be a problem in Karak, either as a danger to health or as a more general public nuisance.

4.1.3 GEOLOGY

The geology of the Karak region comprises Pre Cambrian basement complex rocks overlain by sedimentary rocks of Ordovician to lower Cretaceous age. These have been extensively deformed by tectonic activity associated largely with the adjacent Dead Sea Fault.

The area is still seismically active, and evidence from historic records suggests that a major earthquake capable of causing significant damage will occur along or close to the Jordan Rift Valley every 150 years[1].

Karak City and much of the highland plateau are characterised by mainly limestone rocks, although to the east, north and south there are areas of predominately volcanic rock.

A band of sandstone rocks runs north south along the lower reaches of the escarpment, and on the edge of the Dead Sea are outcrops of Early Palaeozoic rocks. The bottom of Wadi Al Karak comprises gravels and conglomerates.

4.1.4 AGRICULTURE AND FORESTRY

Agricultural is one of the most important sectors of the regional economy, and it is the Department of Agriculture's aim that farming should continue to develop in a sustainable manner and provide further jobs and improved incomes. About a quarter of the land area of the region is considered suitable for agriculture, although less than 60% of this is actually used.

The upland areas account for over 80% of agricultural production, the bulk of it being rain fed crops. Out of a total of over 20,000ha of upland farmland, 16,000ha is in arable production, 3,000ha is devoted to tree crops and a further 1,000ha produce vegetables. The best areas for rain fed agriculture lie fairly close to the Kings Highway, and farming becomes less viable further east as rainfall levels decline.

In addition, livestock and poultry account for a large part of the agricultural resource of the Govenorate. The recent expansion of intensive chicken farming in the desert areas west of Al Qatranah, has made the area a large exporter of meat and eggs.

Extensive irrigated farming, predominantly vegetables is undertaken in the Ghor Safi area. Farming in the Dead Sea Escarpment is generally concentrated in the upper wadis, where seasonal rivers and perennial springs are used to support large areas of tree crops, principally olives, and also other crops such as vegetables and fruit. Wadi Al Karak and Wadis Al Mujib and Al Hasa have extensive areas of such planting. The extension of agricultural activities in Wadi Al Karak is currently being developed through the Karak development project that is being supported by the Spanish Government. This area was identified in the Jordan Rift Valley Master Plan as having the potential to support additional rain fed tree crops.

Much of the agricultural production of the area is consumed locally, although some surplus produce is sent to the market in Amman, including much of the output of the broiler chicken industry.

Water supplies for certain agricultural crops and forestry are supplemented in the Wadi Al Karak through the use of treated sewage effluent.

[1] *The Harza JRV Group. Jordan Rift Valley Integrated Development Study Final Report – Master Plan. Annex B – Environmental Profile. August 1997*

Agriculture is currently under pressure from the rapid expansion of urban areas on the Highland plateau, which is leading to a steady loss of upland agricultural land. This is particularly evident in the areas around Karak and Al Mutah. Large forests are believed to have once existed in the region and extensive re-afforestation is currently being promoted by the Government as an environmental and recreational resource. A good example of recent tree planting is the Jubilee Forest, which overlooks Karak from the north. It provides a valued recreational resource for the local population and an attractive landscape backdrop for the city. It comprises 150ha of land, planted in a naturalistic manner largely with Syrian and Mediterranean Pine.

4.1.5 TRAFFIC CONDITIONS

The layout of the city is characterised by a grid of streets, the principal streets running in a northeast direction parallel with each other, down hill and away from the castle. The streets vary in width but the majority are narrow, or of medium width, and are at most suitable only for one-way traffic.

Road junctions are all poorly defined and pedestrian crossing facilities absent. At the two busiest road intersections, Al Mujamma Junction and Al Montazah Junction, this is a particular problem and a potential safety hazard to all road users.

Most streets have pedestrian footpaths on both sides but these are usually of very short length and run level with individual shop units rather than the street. Due to the steepness of the streets, changes of level between the street and the footway can be very marked and, since there are no dropped kerbs walking can be hazardous

Car parking is in very short supply in the centre, and adequate space for bus stops and lay over areas is particularly problematic. As a result there is a great deal of traffic congestion and wasted travel time caused by vehicles looking for parking or stopping areas.

Old Karak is the commercial centre for a wide geographical area, and attracts a large number of people to its main commercial areas, particularly, Al Malik Hussein Street, Al Khider Street, Al Maidan and Al Omari Streets. The centre is lively and bustling, with displays of goods often spilling out onto the footways. Whilst this is picturesque, it does tend to block pedestrian passage, and, coupled with the constant breaks in the footway and changes in levels, encourages people to walk in the road rather than on the footways. Vehicle parking or the unloading of delivery trucks often restricts the usable width of the road to a single lane. As a result pedestrians and vehicles jostle for supremacy along the streets, and the town centre is very congested, despite low overall traffic levels.

The road network in the Governorate of Karak consists of 671 Km of paved and unpaved roads as shown in the following table. This figure excludes all agricultural roads built by the Jordan Valley Authority and Municipality roads.

TYPE OF ROAD	LENGTH (KM)	%
Primary Roads	285	43
Secondary Roads	171	25
Village Roads	215	32
Total	671	100

TABLE 2 - ROAD NETWORK

The major primary and secondary regional highways from and to Governorate of Karak are:

- Desert Highway (Route 15),
- Dead Sea Highway (Route 65),
- . Kings Highway (Route 35) and,
- . Route 50.

Desert Highway

Desert Highway (Route 15) is a primary dual 2-lane highway, with a 15-m width, running from north to south connecting the capital city, Amman with the port city of Aqaba approximately 350-Km apart (Figure 7.2). It is the main route for transit truck traffic from Aqaba to neighbouring Arab countries; domestic import traffic and phosphate export traffic through Aqaba. Access to Karak is via the secondary road, route 50, which extends east to west and connects Desert Highway to the Kings Highway. The distance to Karak from the Desert Highway is approximately 34 Kms. Although at the time of this study no historical traffic volume was available, many site observations showed no serious capacity problem on the Desert Highway. It is in moderate physical condition, due to the high volumes of cars and heavy goods vehicles, but it is rehabilitated annually at certain sections.

Dead Sea Highway

The Dead Sea Highway (Route 65) is north-south primary single lane carriageway that connects Amman, Dead Sea and Aqaba. It is 7.2 m wide with 3-m shoulder in each direction. It is secondly most used after the Desert Highway. Access to Karak is via Route 50 that connects the Ghor region with the Desert Highway. Site visit showed no major capacity problems. It has the best physical condition among all highways, due to its recent completion and rehabilitation.

Kings Highway

The Kings Highway (Route 35) is a north-south secondary single carriageway, with 7-m width, that connects Amman, Madaba, Karak, Tafila and Petra. The physical conditions of this Highway are poor, where it passes through mountainous regions with very steep terrain. Between Rabba and Qaser, in the Governorate of Karak, it is dual 2-lane with an excellent physical condition. Site visit again showed very low volume of traffic, the lowest among all highways.

The sections of the primary and secondary road network most used by tourist and recreation traffic are concentrated in the areas around the Dead Sea, and the Kings Highway between Karak and Madaba.

Route 50 (Qatraneh-Dead Sea)

Route 50, is a secondary east-west single carriageway that connects the Dead Sea Highway, Kings Highway and the Desert Highway. It is about 55 Kms long, and it passes through the City of Karak. It is mainly used as a collector-distributor route, carrying very low volume of local traffic to the main regional highways. It is inconsistent in its physical condition and width, where the section between Qatraneh and Karak, 34 Kms long, is currently under rehabilitation. It starts at Qatraneh as dual 2-lane for 6.5 Kms, but it remains in good to bad condition, with 7-m width, until it reaches the City of Karak. The section between Karak and the Dead Sea is in bad physical condition, passing through mountainous regions and steep terrain. It remains as a 7-m wide single carriageway, until it connects with Dead Sea Highway, where it widens and improves in condition.

A recent study for the traffic management in Karak figured out the following principal conclusions:

- Overall traffic exiting the City of Karak During the 12-hour weekday and a 5-hour Friday, are 7,313 and 2,014 vehicles respectively,
- Majority of Traffic leaves Karak at the Mujamma junction,
- In the weekday survey, cars constitute 39%, public transport 30%, vans 24% and trucks 7% of the total,
- In the Friday survey, cars constitute 50%, followed by public transport with 22%, vans 21% and trucks 7% of the total
- The highest peak hour traffic exiting Karak from the three junctions in the weekday, is 832 vehicles, which occurs during the lunch time hour,

- The highest peak hour traffic exiting Karak from the three junctions on Friday, is 498 vehicles, which occurs during the lunch time hour and,
- The total 5-hour Friday outbound traffic, is 79% of the weekday traffic for the corresponding hours.

4.1.6 PARKING

The Old City of Karak faces a high parking demand, and a lack of parking spaces. Due to its current role as:

- a center for governmental buildings,
- a tourist destination, and
- an attraction point for residents of the surrounding villages, who come to Karak for recreation and shopping, the available parking spaces are failing to accommodate the current demand.

There are only two off-street parking lots in the Old City. The first one is located at Nuzha Street, with a capacity of 35 cars and a cost of 0.25 JD for the whole day. It is privately owned, usually full and highly used by the employees of the Municipality and the six surrounding banks. The second park is governmental, used by heavy vehicles, with an approximate area of 450 m^2 .

A 70 m long, 4 m wide parking space is available in Hizam Street. Large tourism coaches waiting to pick up tourists after they finish their tour, currently use it. Because this area is relatively far from the major residential and commercial areas, it is unlikely to serve as an attractive car park for private cars.

Another area for car parks is available in Hizam Street, 50 m long and 7 m wide. This area, close to the Christian Cemetery, is also away from major residential units but is opposite to a stairway that leads to the Karak Secondary School. It is unlikely to be an attractive parking space because of the dangerous pedestrian crossing.

STREET NAME	LENGTH (M)	AVAILABLE LENGTH FOR PARKING (M)	NUMBER OF PARKING SPACES
Malik Hussein	345	320	55
Qal'a	360	345	60
Khider	550	535	93
Jami' Umari	330	310	53
Maydan	760	715	124
Amir Hasan	245	230	40
Malik Talal	675	625	108
Nuzha	140	130	22
Total	3405	3210	555

TABLE 3 - ESTIMATED NUMBER OF PARKING SPACES IN THE OLD CITY

It was concluded from street inventories that no additional parking spaces could be provided. The only solution lies in decreasing the parking demand. This can be achieved, by relocating the bus stops and the governmental buildings to areas out of the Old City.

The high parking demand in the Old City arises from many factors. These include governmental and tourist activities, large number of buses and bus stops in the City and drivers' lack of discipline. They are discussed thoroughly in the following sections.

4.1.7 LANDSCAPE

Karak lies in an area of great landscape variety and beauty. The character of the landscape reflects the underlying landform and climate, and the vegetation and cultural and historic environment that has evolved from this. A number of distinct landscape character areas can be discerned in a relatively small geographical area around Karak.

The Dead Sea

The Dead Sea and its narrow shoreline and small river deltas comprise a dramatic landscape of quiet beauty, the blue of the sea contrasting with the white salt deposits and narrow, steep shoreline. The mountains of the escarpment reach right down to the road and create a sense of enclosure. Canyon like gaps in the mountains appear where wadis debauch into the sea, notably at Wadi al Mujib. The small river deltas at these points are very distinctive landscape elements. Vegetation along the Dead Sea is sparse.

The Dead Sea Escarpment

Rising steeply from the Dead Sea, the Escarpment is characterised by rocky outcrops and steep cliffs, much weathered and broken by extreme temperatures, wind blown sand and rain. Wadis, some of which are of immense size, grandeur and wildness, such as Wadis al Mujib and al Hasa frequently bisect the mountains. Others such as Wadi Bin Hammad are

more intimate in scale and the valley bottoms are distinguished by lush vegetation either side of flowing water, hot springs. Small agricultural plots are dotted about the valley sides. Wadi al Karak by contrast, is far larger in scale and less austere and towards Karak is dotted with villages and cultivated land and trees.

The Karak Highlands Plateau

The Karak Highlands Plateau lies between 800 and 1100m above sea level and a further 400m above the Dead Sea. It is a heavily cultivated landscape of undulating hills and wadis, linked by the Kings Highway, which has provided a spine running north-south through Jordan for centuries. North of Al Qaser it is lined on either side with roadside trees, providing both a useful windbreak and attractive visual feature. It also provides the main link through this large agricultural area. Settlements and other man made features now sprawl across the landscape but fields of wheat and other arable crops are still a dominant feature.

The landscape of the region is a considerable tourist asset, and one that needs to be protected from inappropriate development and despoliation. Enhancement by extension of the roadside planting would much improve the approaches to Karak.

4.1.8 BIODIVERSITY

Karak region covers a number of different biogeographical zones, reflecting the varied topographical and climatic conditions found from the Dead Sea Basin (DSB) in the west, to the desert in the east.

The Dead Sea and Dead Sea Escarpment

Fish do not live in the Dead Sea but some species survive in the fringing ponds or drainage ways where fresh water enters from wadis. A number of fish species are also to found in the Mujib River and the many springs in the mountains.

Along the Dead Sea shore, flora is characterised by *Tamarix* and *Phoenix dactylifera.* The major wadi systems, small, seasonal wadis and hot and cold springs that run into the Dead Sea support larger communities of *Tamarix* spp, *Phragmites communis, Acacia* spp, *Ziziphus* spp, *and Juncus* spp.

The mountainous terrain surrounding the Dead Sea supports considerable wildlife, some of it locally endemic. The Wadi Mujib Wildlife Reserve, on the boundary of the Karak Region to the north, is a particularly important ecological resource, and is home to many rare and endangered species. These include the golden jackal, Grey wolf, Blandfords fox, honey badger, striped hyena, and the caracal. It is of particular note that eco-tourism is an important source of revenue for the Royal Society for the Conservation of Nature (RSCN), who are responsible for the protection and management of the Wadi Mujib Wildlife Reserve.

Many of the larger wadis that cut through the escarpment are disturbed by human activity, particularly agriculture. Despite this, these areas are also believed to support a significant wildlife population, particularly the more inaccessible ones.

The Jordan Rift Valley is perhaps the most significant bird migration route in the world. Substantial numbers of birds pass through the Valley twice a year. The abundance of fresh and brackish water in the wadis and the relatively undisturbed landscape also supports a large resident population of birds.

There is a currently a proposal from the Friends of the Earth Middle East (FOEME) that the Dead Sea Basin be designated as a Biosphere Reserve and World Heritage Site. The concept of both a Biosphere Reserve and World Heritage Site have been developed by UNESCO. The “Man and the Biosphere” Programme was launched by UNESCO in 1970 and a total of 356 Biosphere’s have been established in over 90 countries. Amongst the objectives of the designation of the Dead Sea as a Biosphere are the co-ordinated and sustainable development of the area through international co-operation between Israel, Jordan and Palestine and local community involvement and participation. The whole of Karak Governorate between the Dead Sea and the Kings Highway would fall within the proposed Biosphere.

A list of fish species, amphibians and reptiles, and mammals recorded in the Dead Sea Basin (DSB) and adjoining wadis are given in Appendix 1 to this report.

The Karak Highland Plateau

The Karak Highland Plateau is extensively cultivated and settled, and is, therefore, less of a wildlife resource than the less populated Dead Sea and wadi areas. Nevertheless to the south-east of Karak city is an area of 189km^2 which the RSCN is proposing to establish as a protected area. The proposed Abu Rukbeh Protected Area is a good example of a semi-desert environment and comprises three biogeographical zones - Arid Mediterranean, Irano-Turanean and Saharo- Arabian. The area contains a number of noteworthy flora and flora, including a number of threatened species such as the Arabian Wolf (Canis Lupus) and Stripped Hyena (Hyaena hyaena).

In summary, the Karak region possess very interesting and varied wildlife resources, not just in the existing or proposed protected areas but throughout the region, particularly in the many wadi areas. Such resources need to be nurtured, both for their intrinsic value, and also as a base for expanding eco-tourism in the area. Wadi Mujib is already an internationally successful eco-tourism destination. Other locations in the area, for example Wadi Hamad may also have potential as additional centres, or to take the pressure of Wadi Mujib as this reserve continue to grow in popularity.

It has been noted earlier that the Jordan Rift Valley is a major bird migration flightpath of international significance. The construction of new dams at Wadi Al Mujib and Wadi Al Hasa (the Tannur Dam), together with increases in irrigated farmland, should provide additional breeding and feeding grounds for passing birds. The feasibility of developing a location in the Karak area as a bird watching centre should be investigated.

Sympathetic land use planning, and agricultural policies and practices will need to be encouraged in order to preserve these resources, and consideration given to extending protection to additional habitats or areas should it be required.

The following tables shows the lists of species recorded in the Karak region - Dead Sea Basin

COMMON NAME	LATIN NAME	HABITAT
AMPHIBIANS		
Green Tree Frog	Hyla savignyi	Dead Sea springs
Green Toad	Bufo viridis	Dead Sea shores and springs
March Frog	Rana ridibunda	Wadi Mujib
Reptiles		
Turkish Gecko	Hemidactylus turcicus	Ghor Safi
Lobe footed Gecko	Ptyodactylus hasselquisistii	Wadi Mujib, Suweimeh
Spotted Gecko	Stenodactylus stenodactulus	Dead Sea Basin
Pigmy Gecko	Tropiocolotes steudneri	Dead Sea Basin
Starred Agama	Agama stellio	Wadi Mujib
Pale Agama	Agama Pallida	Wadi Mujib
Sinai Agama	Agama Sinaita	Dead Sea Basin
Sand Lizard	Acanthodactulus bokkianus	Dead Sea Basin
Lizard	A. opheodurus	Ghor Safi
Small Spotted Lizard	Mesalina quttylata	Ghor Safi
Desert Lacerta	Mesalina schmidti	Dead Sea area
Orange-tailed Skink	Eumeces Schneideri	Dead Sea sandstones
Eyed shink	Chalsides ocellatus	Ghor Safi
Ornate Dabb-Lizard	Urmastix ornatus	Ghor Safi
Common Chameleon	Chamaelon Chamaelon	Ghor Safi
Palestine Viper	Vipera palaestinae	Dead Sea Basin
Horned Viper	Cerastes Cerastes	Dead Sea Basin
Persian False Hornviper	Pseudocerastes fieldi	East Dead Sea Basin
Montpellier Snake	Malpolon momspessulanus	Dead Sea mountains
Tiger Snake	Telescopus dhara	Dead Sea mountains
Tessellated Snake	Natrix tessellata	Mujib River
MAMMALS RECORDED		
Long-eared Hedgehog	Hemiechinus auritus	Wadi Al-Karak
Lesser White-toothed Shrew	Crocidura saveolens	Wadi Al-Karak
Egyptian Fruit Bat	Rousettus aegyptiacus	Ghor Safi
Tomb Bat	Taphoxous perforatus	Ghor Safi
Trident Leaf-nosed Bat	Asellia tridents	Ghor Safi
Bodenheimer's Pipstrelle	Pipistrelius bodenheimeri	Ghor Safi
European Free-tailed Bat	Tadarida teniotis	Ghor Safi
Arabian Hare	Lepus capensis arabs	Dead Sea Basin
Indian Crested Porcupine	Histrex Indica	Wadi Mujib
Asian Garden Dormouse	Eliomys malanurus	Wadi Mujib
Sinai Spiny Mouse	A. Cahirinus dimidiatus	Wadi Al-Karak
Rock Hyrex	Procavia Capensis	Wadi Mujib
Red Fox	Vulpes Vulpes	Wadi Mujib
Blandford's Fox	V. cana	Wadi Mujib
Rueppel Fox	V. rueppelli	Lisan Peninsula
Arabian Wolf	Canis Iupus	Wadi Mujib
Stripped Hyena	Hyaena hyaena	Wadi Mujib
Eurasian Badger	Meles meles	Wadi Mujib
Marbled Polecat	Vormela peregusna	South east of Dead Sea
Egyptian Mongoose	Herpestes Ichneumon	Wadi Mujib
Wild Cat	Felis silvestric tristramii	Wadi Mujib Radas

COMMON NAME	LATIN NAME	HABITAT
Nubian Ibex	Capra Ibex Nubiana	Wadi Mujib
Blue Checked Bee-eater	Merops superviliosus	Spring migrant
BIRD SPECIES IDENTIFIED		
Bee-eater	Merops spiaster	Spring migrant
Roller	Cocacias garrulus	Spring migrant
Hoopie	Upupa epops	Spring migrant
Dunn's Lark	Eremalauda dunni	Spring migrant
Desert Lark	Ammomanes deserti	Resident
Reed Warbler	Acrocephalus scirpaceus	Resident
Olivaceous Warbler	Hippolais pallida	Spring, autumn migrant
Garden Warbler	Sylvia borin	Spring, autumn migrant
Arabian Babler	Turdoides squamiceps	Restricted to the area
Rock Dove	Columba livia	Resident
Palestine Sunbird	Nectarinia osea	Resident
Coloured Dove	Streptopellia decaocto	Resident
Palm Dove	S. senegalensis	Resident
Thrush Nightingale	Luscinia luscinia	Spring migrant
Great Spotted Cuckoo	Clamator glanalaris	Spring migrant, Ghor Safi
Cuckoo	Cuculus canorus	Spring, autumn migrant
Little owl	Athene nectua	Resident
Hume's Tawny Owl	Strix butleri	Resident
Alpine Swift	Apus melba	Summer migrant
Little Swift	A. affinis	Winter migrant
Crag Martin	Ptyonoprogne rupestris	Winter visitor
Redumped Swallow	Hirundo dourica	Summer visitor
Swallow	H. rusica	Spring, autumn migrant
House Martin	Delichon urbica	Spring migrant
Long-billed Pipit	Anthus smilis	Resident
Meadow Pipit	Anthus pratensis	Winter visitor

Source: Jordan Rift Valley Integrated Development Study. Master Plan Annex B- Environmental Profile. Harza Group 1997.

TABLE 4 - SPECIES RECORDED IN THE KARAK REGION

4.1.9 HISTORIC BACKGROUND

The Karak region possess a rich and varied cultural history and remains from many past cultures and civilizations are to be found, together with a number of sites of great significance to the followers of Islam, Christianity and Judaism.

Karak plateau is a productive, rain fed agricultural land that has been settled since prehistoric times. It sits astride the Kings Highway, so called on account of the Biblical story of four kings who invaded the area and carried away Abraham's nephew Lot. It is an ancient trade route that has linked the main centres of population and civilisation in the Middle East and the eastern Mediterranean for thousands of years. The empires of Assyria, Persia, Greece under Alexandra the Great, the Ptolomaic Egyptians, Rome, Byzantium, Abbyasid, Mamluki and the Ottoman Turks have all impacted upon the region, either directly through conquest and settlement, or indirectly through trade, travel and culture.

The region has also been the home to important indigenous cultures and civilisations, most notably being the Biblical Kingdom of Moab, which emerged during the late Bronze Age - early Iron Age, and the Nabateans, who from their base in Petra, established a thriving Kingdom, which included the Karak region..

Historic remains and sites are scattered throughout the region and the landscape still reflects past activities and cultures. Hilltop sites are often toped by remains of castles or fortified structures and remains of large agricultural based towns can be found throughout the Karak plateau. The Kings Highway is still an important transport route, and the Hijaz Railway, which was constructed in the 20th Century to take pilgrims to Mecca, is still extant, although it is only used occasionally.

Many of the regions historic resources have not yet been fully explored or interpreted. Such is the historic heritage of the region, that it is highly likely that many other archaeological features remain undiscovered, and represent a future resource of unknown value. The successful interpretation of the recently discovered Lots Cave and Monastery site in the west of the region is a good example of the great potential for archaeological sites to become significant tourist attractions of benefit for the Karak regional economy.

At present, cultural heritage features do not appear to be under pressure from tourist activities because of the very low numbers involved. The largest threat to these resources would appear to be from the encroachment of urban development, agriculture, and the local practice of the digging up of graves and old cemetery sites. This is a particular problem with pre-Islamic sites, and has resulted in the loss of a substantial amount of historic data and information of potentially great value.

SITE OR LOCATION	PERIOD/S	DESCRIPTION OF FEATURE
Karak Old City	From at least Chalcolithic to Modern period	Crusader castle dating from 1136 CE, believed to be constructed on top of Moabite fortress. Later additions by the Mamluki. Town walls and a number of substantial towers, notably the round Burj al Banawi, Burj al Saub, and Burj al Zahir(1227) remain, together with original subterranean entrance gates to the town. Crusader cathedral converted into jami, now replaced on same site by early 20th Cent. Mosque. Greek church(St.George?) 19th Cent reconstruction of Byzantine structure. Shrine of Khider(St. George) medieval(?)/Ottoman. Tomb of Noah (19Cent?) Ottoman administrative buildings
Al Rabbah	Moabite, Nabatian, Roman, Byzantine	Roman temple and ponds still extant.
Al Qaser and Khirbet Faris	Nabatean/Roman	Second Century Palace still standing . Known locally as Beit Karam. Other related sites nearby at Khirbet Faris
Basheer Palace, Abu Al Kharq Palace & Ala'l Palace, north-west of Al Qatranah	Nabatian / Byzantine	A ring of three fortified hilltop strongholds that guarded the fertile plateau and the Kings Highway to the west. The fortress of Basheer (288-355CE) is particularly impressive.
Lajoun & Al Fityan	Bronze Age and Roman/later	Important early- middle Bronze Age site includes 16 Monoliths/Menhirs. Roman sites are remains of two linked military and agricultural settlements. (Lajoun = battalion). Remains of 500 year old church built on top of a Roman temple found
Mu'tah	Byzantine/later	The site of the important Battle of Mu'tah in 629 BCE is marked by a ruined structure marking commemorating Jab'r Ibn Abi Talib.
Mazar	Islamic/Modern	Tombs of four "Companions of the Prophet", now enclosed in two new religious complexes. Attractive Mamluke Mosque
Al Qatranah	Ottoman	Well restored fort constructed to guard Haj pilgrims. The Hejaz Railway, station and some original rolling stock in excellent state of preservation nearby.
Nekhel	Roman/Byzantine	Extensive ruins of a large settlement. Remains of a large number of churches found.
Um Hmat	Greek/Roman/Byzantine	Remains largely swallowed up in modern village.
Muhay	Nabatean/Byzantine	Strategic frontier settlement A large buildings still standing, built on top of a Nabatean temple. Byzantine cemetery now looted.

SITE OR LOCATION	PERIOD/S	DESCRIPTION OF FEATURE
That RAS	Nabatian/Roman	Possibly "Tharais"on the Madaba Mosaic. Extensive remains dating to 2nd or 3rd Century within the exiting village. Includes a temple still standing.
Ain I'Bata Monastery/Lots Cave	BronzeAge /Roman/Byzantine	Remains include mosaics, inscriptions mentioning prophet Lot, water reservoir, pottery and cave reputed to be where Lot's sons, Moab and Amoun, where born.
Qasr Abu Rukba & Qasr Tamra	Nabatean	Ruined structures – fortified?
Al Mreigha	Pre-Nabatean	Extensive ruins, needs investigation
Khirbet Shihan	Pre-Nabatean?	Hilltop ruins overlooking Wadi Mujib
Majdalein	Nabatean/Byzantine?	Extensive ruins north of Al Qaser

TABLE 5 - SUMMARY OF CULTURALLY IMPORTANT SITES IN KARAK GOVERNORATE

4.1.10 CONCLUSIONS

Karak is located at the centre of a varied and interesting region and has many environmental assets including:

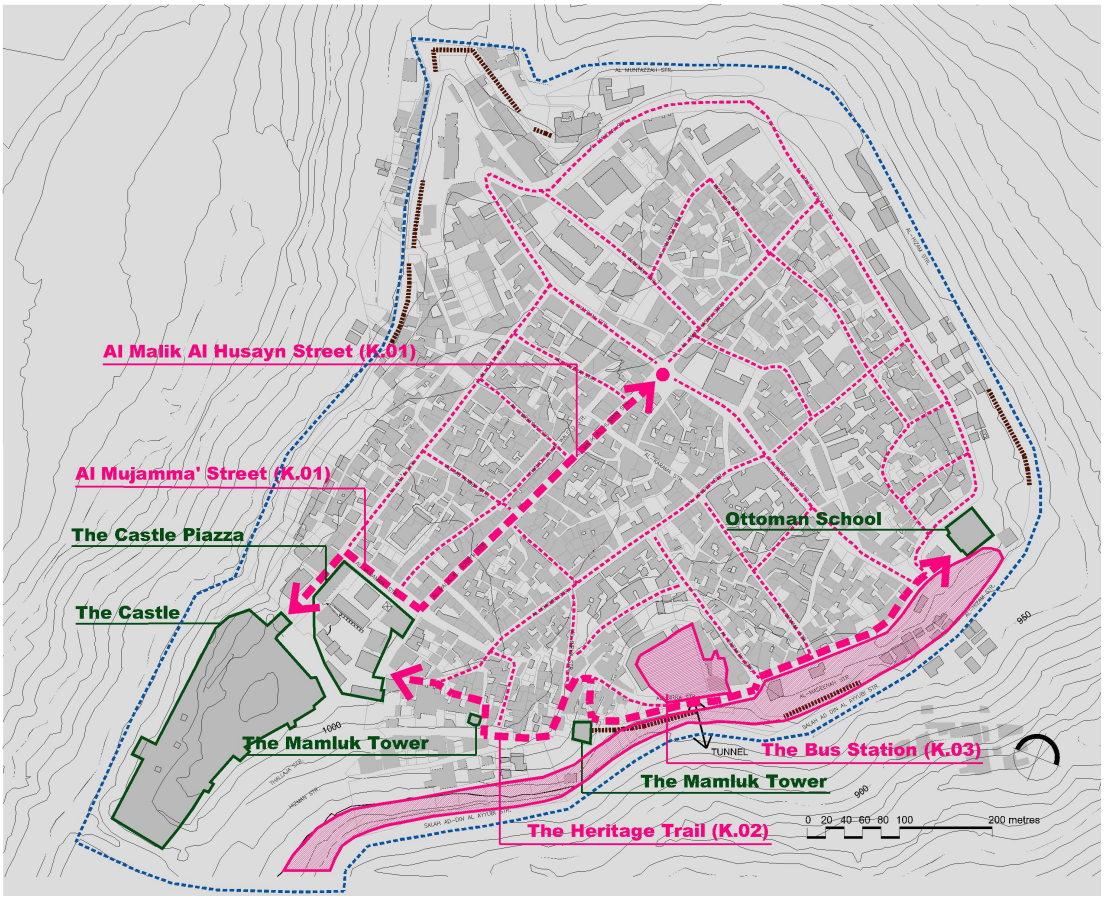
- A rich and varied historic and cultural heritage;
- A variety of wildlife habitats and areas natural flora and fauna;
- An extensive range of landscape types providing large areas of outstanding natural beauty;
- An excellent quality of physical environment with good air quality, an absence of pollution and a lack of intrusive noise;
- Interesting urban areas, which reflect modern life in Jordan as well as its historic urban traditions.

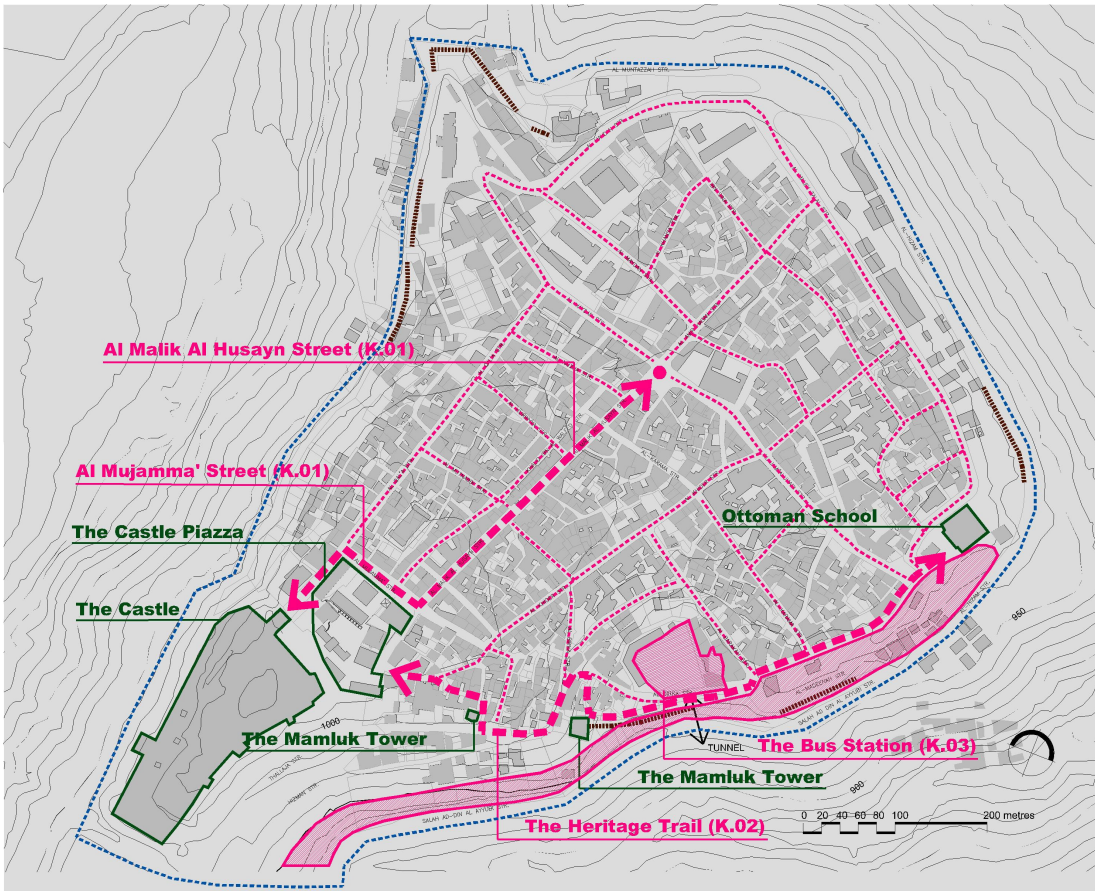
There are few constraints to diminish the potential of the region, although the climate in summer is harsh the elevation of the Karak plateau reduces its worse effects making it generally pleasant throughout the greater part of the year.

The quality of the natural and general environment will support and encourage the continued attraction of the region. The protection of its environmental quality is a major policy consideration, which could affect its future potential both as a place to live and work and as a tourist attraction.

5. Environmental assessment of the city revitalisation program

All the proposed actions will be assessed from the environmental point of view as one package, but description of each of these actions is necessary to pin point the particularities of each of these projects.





OVERALL STRUCTURE OF THE PROPOSED CITY REVITALISATION PROGRAM

5.1 ABSTRACT OF THE PROPOSED PROJECTS

In the following sub sections an abstracts of each of the proposed actions:

5.1.1 K.01 - UPGRADING OF STREET NETWORK

The project focuses on the solution of the following site specific problems:

- The rationalization and beautification of the street sections of Al Malik Hussein Street and Al Mujamma Street;
- The landscape enhancement of the street section of Salah Ad Din Al Ayyubi Street;
- The rationalization and beautification of the Salah Ad Din Al Ayyubi/Al Madeeneh street junction.

5.1.2 K.02 - THE NEW "HERITAGE TRAIL" ALONG THE EASTERN SIDE OF KARAK

The project aims at the creation of a new pedestrian path along the south eastern portion of the old city wall linking the heritage Ottoman school to the renovated main bus station. The new heritage trail will then proceed flanking the two existing Mameluke towers in the direction of the Crusader Castle.

The new heritage trail will provide an alternative pedestrian approach to the Castle characterized by an outstanding panoramic view onto the surrounding landscape.

The project proposes a panoramic protected pedestrian promenade enhancing the role of the newly renovated main Bus station as an important enclave for urban social gathering whilst acting as the new gateway to the old city.

Below-grade infrastructural refurbishment will be provided in connection to the proposed road works including the provision of an efficient storm water drainage system.

5.1.3 K.03 - REDESIGN OF THE EXISTING BUS STATION

The Main Bus Station is one of the principal communications centres in the Municipality and is presently heavily congested with buses and other vehicles. Its influence on the urban structure of this part of the Old City is strong and improvements are required to establish a catalyst to encourage its rehabilitation. The following Immediate Actions are proposed:

- The re-design of the bus waiting areas to improve efficiency, increase capacity and reduce congestion;
- Improvement of nearby road junctions to increase vehicle capacity and improve road safety;
- Incorporation of the Main Bus Station into the traffic management system proposed for the Old City in order to improve safety by reducing vehicular congestion and pedestrian / vehicular conflicts;
- Re-establishment of the historical underground passageway which once formed the western gate to the Old City in order to improve pedestrian access, reduce nuisance and provide a feature of considerable historical interest;
- Establishment of a garden area and footpath along the historical line of the Old City Walls. This will enhance pedestrian access to the Main Bus Station, improve the appearance of the area and provide an amenity for local residents.

Longer term opportunities exist to introduce employment uses into this part of the Old City through sensitive redevelopment. Such actions may include:

- Private sector redevelopment, when opportunity and conditions permit, of a number of sites around and including the present Main Bus Station. The redevelopment would provide an undercover bus station, improved more efficient and attractive commercial floor space with parking provision;
- The rehabilitation of the adjacent Mamluk Tower and its incorporation into a tourist walk linking with the Castle and part of the proposed Main Bus Station garden area.

5.2 ENVIRONMENTAL ELEMENTS IDENTIFICATION

To fulfil the World Bank requirement for project appraising, the (operational manual, Bank Procedures, BP 4.01- Annex B, January 1999) will be considered for the analysis.

The following table shows the key environmental issues, which should be studied to establish their baseline and to be assessed in the EA study:

ENVIRONMENTAL ISSUES	PROJECT PHASES	
Physical and ecological conditions	**Construction**	**Operation**
Water and Wastewater	X	X
Solid Waste	X	X
Air	X	X
Biodiversity		
Species (flora, fauna)	X	
Socio – Economic Conditions		
Public Health		
Dust	X	X
Noise	X	X
Solid waste	X	X
Social aspects		
Employment	X	X
Land value		X
Landscape	X	X
New business	X	X
Life quality		X
Infrastructure	X	X
Land acquisition	X	
Occupational health and safety	X	X
Cultural features		X

TABLE 6 - ENVIRONMENTAL ELEMENTS UNDER ASSESSMENT

5.3 PHASES OF THE EA STUDY

The EA study included the (construction and operation) phases throughout its stages.

STAGES OF EA STUDY

The assessment included the following stages; scoping, assessing, mitigation, monitoring, reporting, and reviewing.

ANALYSES ENTAILED

- Distinguish between positive, negative, direct, indirect impacts, reversible, irreversible, geographical extent, frequency and duration of impacts.
- Predict significance of impacts.
- Quantify impacts if possible.

IMPACT MANAGEMENT (MITIGATION AND MONITORING)

This study identified environmental issues, and propose proper mitigation and monitoring recommendations to prevent or minimize negative impacts and to protect the environment. Environmental Management Plan (EMP) shall be produced.

5.3.2 ACTIVITIES IN RELATION TO PHASES

CONSTRUCTION PHASE

The general activities that are part of most of the proposed actions entailed, but not limited to:

- Land preparation (excavations and filling, demolitions and removal of all non required elements)
- Construction of Parking area and service roads cover with bituminous asphalts
- Construction of Sidewalks tiled with concrete modular units
- Construction of Curb stones border (concrete), separating the pathways from the parking areas
- Storm water drainage
- Signage (horizontal and vertical)
- Swing bar with access control
- Construction of service buildings for caretakers and toilets
- Planting grills with agricultural soil
- Plantation: trees (ailanthus, acer, platanus, carubs, acacia, oak)
- Soft landscaped area with greeneries, evergreen grass, pebbles
- Pathways tiled with various size modular units of natural stone
- Public lighting
- Garbage cans
- Benches
- Fences with stone wall

OPERATION PHASE

- Maintenance (preventive and corrective maintenance).
- Cleaning the developed areas.
- Utilities (domestic wastewater treatment, domestic solid waste management).
- Recruitment.
- Social issues.
- Accidents due to the increase of vehicles.
- Interference with current traffic directions.
- Generation of solid waste, emissions, noise and dust.
- Maintenance of the storm water drainage system.

5.4 IMPACTS IDENTIFICATIONS

The following tables summarize the issues and concerns that are believed relevant to the proposed actions and of environmental importance related to the construction and operation phases respectively.

IMPACT OF
Excavation and construction works on workers working in confined space
Dust on workers and public
Local employment
Removal of present plants and habitats
Noise on workers and public
Land acquisition of private estates
Resettlement of current residents
Visual impact from access debris and piling the construction materials
Domestic solid waste impact on workers
Priority for local sub-contractors.
Interfering with paths to the archaeological sites.
Absence of safety equipments
Road accidents due to traffic interference

TABLE 7 - ISSUES AND CONCERNS IDENTIFIED FOR CONSTRUCTION PHASE ACTIVITIES

IMPACT OF
Walking and crossing of children close to the proposed developed areas, parking areas, new buildings..etc.
Impact of noise on the public and employees
Impact of emissions and dust on public and employees
Generated waste from the newly developed areas
Equal job opportunities
Handling and disposal of generated wastes (liquid, solid, oil from maintenance operations)
Impacts on improving the tourist activities
Life quality
Impacts on delivering more fresh water to the proposed activities and the load on the collection sewer system

TABLE 8 - ISSUES AND CONCERNS IDENTIFIED FOR OPERATION PHASE

5.5 VALUED ENVIRONMENTAL COMPONENTS

All issues and concerns identified in the previous tables were analyzed and studied. Potential interaction of these issues were specified and evaluated with respect to the following valued environmental components (VECs).

- Public and Occupational health and safety.
- Socio-economic conditions.
- Bio-diversity.
- Physical conditions (water, wastewater and air)
- Physical conditions (dust, emissions and noise) and generated solid waste
- Land acquisition

The level of significance for every issue was evaluated taking into consideration the relevant VEC and the following criteria:

- The level of impact was ranked as : 1 (low), 2 (moderate) and 3 (high).
- The likelihood and frequency of occurrence was ranked as: a (high), b (moderate) and c (low).

- All interactions ranked 2a, 2b, 3a, 3b, 3c have environmental impact and will be assessed in the EIA study.

Evaluations of issues and concerns identified for construction and operation phases of the proposed actions are shown in Tables 5 and 6 respectively. Table 7 summarizes the potential anticipated interactions during accidental incidents.

IMPACT OF	SIGNIFICANCE	IMPACT	VEC
Excavation and construction works on workers working in confined space in terms of accidental injuries	2b	Yes	Occupational health and safety
Dust on workers and public	3b	Yes	Physical and Occupational health and safety
Local Employment	3a	Yes	Socio-economic
Removal of present plants and habitats	1b	Yes	Biodiversity
Noise on workers	2b	Yes	Occupational health and safety
Visual impact from access debris and storage of aggregates	2b	Yes	Socio-economic
Domestic solid waste impact on workers	2b	Yes	Occupational health and safety
Priority for local sub-contractors	2a	Yes	Socio-economic
Emissions on workers	2b	Yes	Occupational health and safety
Noise on public	1c	Yes	Public health
Road accidents	2b	Yes	Public health
Land acquisition	2a	Yes	Socio – economic
Resident resettlement	2a	Yes	Socio – economic

TABLE 9 - EVALUATION OF ISSUES AND CONCERNS IDENTIFIED FOR CONSTRUCTION PHASE

IMPACT OF	SIGNIFICANCE	IMPACT	VECS
Crossing the children close to the parking areas	2a	Yes	Public health
Impact of noise on the public	2b	Yes	Physical and Occupational health and safety
Impact of emissions and dust on public	3a	Yes	Physical and Occupational health and safety
Generated waste from the developed areas	1b	Yes	Occupational health and safety
Emissions and dust on employees	2b	Yes	Physical and Occupational health and safety
Noise on employees	2b	Yes	Occupational health and safety
Load on water supply and collection system	2b	Yes	Physical
Equal job opportunities	3a	Yes	Socio-economic
Improving the tourist activities due to improving the infrastructure	3a	Yes	Socio-economic
Life quality	3a	Yes	Socio-economic
Handling and disposal of waste oil from maintenance operations	2b	Yes	Occupational health and safety

TABLE 10 - EVALUATION OF ISSUES AND CONCERNS IDENTIFIED FOR OPERATION PHASE

VALUED ENVIRONMENTAL COMPONENTS (VECS)	ROAD ACCIDENTS	OCCUPATIONAL ACCIDENTS
Public health		
Occupational health and safety		/
Socio-economic conditions	/	/
Physical	/	/
Ambient air quality		/

TABLE 11 - POTENTIAL INTERACTIONS DURING ACCIDENTAL INCIDENTS

5.6 POTENTIAL IMPACTS OF PROJECTS' ACTIVITIES ON VALUED ENVIRONMENTAL COMPONENTS

The following sections summarize the issues having environmental impacts with respect to the valued environmental components. Each of these VECs will be analysed separately to show its particularities.

5.6.1 PUBLIC HEALTH

Public health may be affected through different phases as follows:

CONSTRUCTION PHASE

- Road accidents: Impacts on public in case of accidents due to the use of heavy trucks to transport construction material and workers.
- Dust and emissions: Impacts on public due construction activities, such as excavation and storage of aggregate.

OPERATION PHASE

- Injuries on children: Impacts on public in case of children playing or crossing in front of the parking areas

5.6.2 OCCUPATIONAL HEALTH AND SAFETY

Occupational health and safety may be affected through different phases as follows:

CONSTRUCTION PHASE

- Accidents on workers: Construction workers might be exposed to high risk during hand excavation.
- Dust and emissions: Workers and public will be exposed to high level of dust during construction activities.
- Domestic solid waste: generated domestic solid waste might affect workers health if not disposed properly.
- Noise: impact of noise on workers and public health due to the use of heavy machinery during construction activities (Heavy bulldozers, Hammers, vibrators and compressors).

OPERATION PHASE

- Domestic solid waste: The public and drivers may be affected due to improper collection and disposal of domestic solid waste.

- Generated wastewater from the facilities: it will be necessary to connect the sanitary facilities to the collection system.
- Dust and emissions: (Drivers) and surrounding neighbourhood will be exposed to high level of dust and emissions during operation activities.

5.6.3 PHYSICAL COMPONENTS

Physical environmental components may be affected as follows:

CONSTRUCTION PHASE

- Air quality will be affected by emissions and dust: construction activities will generate dust, which will raise the levels of dust and emissions in the ambient air.
- More load on the fresh water resources due to the need for the new development areas.
- More load on the existing wastewater collection network due to the load generated from the new development areas.
- Soil may be affected / polluted due to the solid and liquid waste dumps during construction and the possible oil spillage from trucks.

OPERATION PHASE

- Air quality will be affected negatively by the increase of dust and emissions levels during operation phase.
- Loads on the fresh water resources to deliver enough water to the proposed activities.

5.6.4 BIODIVERSITY

Biodiversity may be affected as follows:

CONSTRUCTION PHASE

- Removal of present plants and habitats: Excavations will remove soil cover and destroy flora and habitats present at the sites. This may also affect fauna and migratory birds in particular.
- Dust: construction activities will generate dust, which might affect flora and fauna.

OPERATION PHASE

- Dust on flora and fauna during operation phase.

5.6.5 SOCIO-ECONOMIC CONDITIONS

Key issues and concerns regarding socio-economic conditions are as follows:

CONSTRUCTION PHASE

- Local employment: Locals should be given a fair job opportunities and fair share of jobs during all construction activities.
- Visual impact: people might be affected socially due to disturbing the natural seen as a result of improper disposal of debris. In addition to that, residents will be affected negatively due to changing an existing land use in front of their houses, from residential to commercial.
- Priority for sub-contractors: During executing construction phase, sub-contractors should be given fair opportunity.

- Road accidents: Roads may be affected as result of increasing transportation activities (increasing the possibility of accidents) in order to deliver building materials.
- Land acquisition: the private land owners should be compensated fairly for using their private lands. There should be other alternatives to share them in the business. Otherwise there will be negative impacts on the owners.

OPERATION PHASE

- Equal job opportunities: there would be a negative impact if locals do not have fair job opportunities.
- Improve the life quality due to the creation of new jobs and improving the tourist activities and sight seeing.

5.6.6 ARCHEOLOGY

During the construction phase, archaeological remains (if any) might be affected by excavation, site preparation and plant construction activities.

The major issue concerning archaeology was destroying archaeological sites while excavation and site preparation activity in the construction phase; and discovering any archaeological remains while excavation in the project construction activity during the construction phase.

Karak City in general is rich with archaeological sites, therefore there is a potential for discovering some archaeological sites during excavation activities. The importance of the discovered sites is decided by the Department of Antiquities.

5.7 CONCLUSIONS AND RECOMMENDATIONS

There is no doubt that the proposed actions are essential for the project of revitalization of Karak City and the efficient tool for attracting more tourists and more private sector investments. That will generate positive impacts from the economical point of view, but not necessarily from the environmental aspects.

The current conditions of the traffic inside the city is really alarming, the parking facilities are below the requirements and the roads are in poor conditions. Any project that is related to enhance the traffic and parking inside the city should be given the first priority. The access to the Castle area and other archaeological sites has one big challenge, the traffic and parking inside close to the potential sites.

After presenting the current conditions of the project area; the technical, financial and social aspects of the proposed actions; and the anticipated environmental impacts on the physical, ecological and socio-economical aspects of the environment, it can be concluded that the proposed projects will have a net positive socio-economic impacts on the residents and environment of Karak City. The positive impacts in the short, medium and long term exceeded the anticipated negative impacts during the construction and operation phases.