

Badia Ecosystem and Livelihoods Project (BELP)
Environmental Management Plan (EMP)



September 2015

Prepared by:





An EMP Technical Summary is provided as stand-alone document where assessed impacts, developed mitigation and monitoring measures are presented in tabular form. For correct implementation of this EMP the implementers and reviewers should refer to the detailed EMP version as the formal reference on this regard.

1 Abbreviations and Acronyms

| | |
|-------------|--|
| BELP | Badia Ecosystem and Livelihoods Project |
| EIA | Environmental Impact Assessment |
| EMP | Environmental Management Plan |
| ETDP | Ecotourism Development Plan; Key consultancy of component one of the Jordan Badia Ecosystem and Livelihoods Project (BELP) which concerns planning and feasibility assessment for the development of eco-tourism in the Northern and Eastern Badia of Jordan |
| IBA | Important Bird Area |
| IPA | Important Plant Area |
| KBA | Key Biodiversity Area |
| PA | Protected Area |
| RSCN | Royal Society for the Conservation of Jordan |

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2 None-Technical Summary

About the Development Area

The proposed development is planned to take place in the Eastern Badia of Jordan, an area hosting considerable abundance of life forms supported by ecologically important, sensitive and fragile ecosystem and habitat. It constitute two Important Plant Area (IPAs: Burqu and Lava Safawi), Seven Important Bird Areas (IBAs: Shaumari, Azraq, Rajel, Al Hazem, Qa'a Al Bqe'awiyah, Salam-El Hashad and Burqu), two established protected areas (Azraq Wetland Reserve and Shaumari Wildlife Reserve) and two proposed protected areas (Burqu and Rajel). It also hosts and supports many species of less favorable conservation status (endangered, threatened, vulnerable and near threatened).

About Development Activities

The construction phase of the proposed development is planned to include construction of Burqu lodge, establishment of eco-tourism campsite at Al-Wisad in addition to the construction of visitors facilities (small kitchen and bathrooms), construction of terrace (wooden) at Dahik, and construction of stairs at Tel Qurma site.

The operation phase will constitute eco-tourism operations including off-road driving between the different attraction sites along the eco-tourism routes, hiking and on-foot eco-tourism activities, accommodation and food services, in addition to related services and staff activities.

Impacts versus Mitigation

The EMP main document discuss in detail all development (eco-tourism corridor) anticipated impacts on the environmental and socioeconomic components. A summary of these impacts are provided in tabulated form in the EMP Technical Summary Report. These tables briefly explains anticipated impacts, impacts sources and causes, receptors and magnitude for each identified and scoped-in valued environmental component (VEC).

During the construction phase, most of the anticipated impacts are of low significance and are mainly related to land preparation, cut-fill activities, use of heavy machineries, materials pilling and waste management. Impacts identified include possible change in land cover, soil erosion, change in natural water flow patterns (in wadis), noise, dusting and pollution. Associated consequences of these impacts extends to impacts on biodiversity and local community, but mostly expected to be of insignificant to low significance.

Impacts on land cover and water flow (medium significance) and the generation of large amounts of waste materials are considered the main impacts to be addressed by the EMP. Other identified impacts can be easily, and mostly on no addition cost basis, be avoided through compliance with local regulations and standards.

With regard to the operation phase, waste management, noise and possible disturbance to wildlife are assessed to be of medium to high significance depending on level of awareness of visitors and employees, and their compliance with the EMP measures. Avoidance measures are suggested and can effectively contribute to positive environmental performance of the proposed development.

EMP Rationale, Framework and Policy

The key principle behind EMP development is ensuring appropriate, wise and conscious implementation of the proposed mitigation and monitoring measures in order to ensure environmentally sound development.

EMP is integrated in nature since it recognizes all environmental components and addresses a set of considerations important to management and must be factored into the decision making process. The EMP development and implementation is a dynamic process, and has significant influence on the Corridor achievements and sustainability.

The proposed EMP addresses the issue of local communities and NGOs involvement in the Corridor, environmental awareness and environmental training, whereby environmental training needs of staff at business units are determined in order to design and implement suitable training interventions.

To comply with the Jordan environmental policy, a planning phase to formulate a framework for this EMP was completed during the environmental and social assessment phase. The EMP is structured as follows:

1. Policy
2. Legal Requirements
3. Organization
4. Environmental Objectives
5. Register of Significant Aspects
6. Environmental Impact Mitigation and Management Programs
7. Environmental Monitoring
8. EMP Control System
9. Implementation including training, communication and awareness program

The Corridor policy is to comply with relevant legislation as a minimum while implementing all Corridor activities and to ensure sustainable development and sound nature conservation in the Corridor area.

To achieve the above goal, and to comply with national and organizational (i.e. RSCN) policies, the proposed programme/Corridor should:

-
- Operate in conformance with all regulatory requirements and environmental, social, health and safety standards and policies.
 - Involve and strengthen relevant stakeholders including NGOs, CBOs and local community groups in the Corridor areas.
 - Strengthen the Corridor proactive environmental, health and safety culture by increasing awareness and knowledge among all levels of partners and employees and committing to the protection and well-being of each level.
 - Promote impact avoidance with the emphasis on minimization of disturbance to the existing environmental and social systems and utilities, and include environmental, health and safety considerations among the criteria by which Corridor construction, operation and remediation are evaluated.
 - Assess the Corridor environmental performance and commit to continuous improvement towards the Corridor target goals of least negative environmental and social impacts.
 - Communicate the Corridor commitment to the Corridor partners, employees, local communities and other stakeholders.

Structure and Responsibility

For the purpose of this EMP, it is defined that the "**Corridor Management Unit (CMU)**" from the RSCN will undertake the implementation of the Corridor activities including the overall management and supervision on construction and operation activities during the period of Jordan BERP Component One Funding Duration. After the completion of the Component activities and the end of the funding, i.e. the operation phase of the Corridor, and as part of the component sustainability choices which is being integrated in the RSCN institutional reform, all related operations will be under the under revival **RSCN Eco-tourism Unit (ETU)**.

Upon completion of the implementation of the ecotourism corridor plan as described in the ETDP, the eco-tourism programme and all constructed facilities and equipment's will be managed by the RSCN which in turn may hire operators from Jordan (probably from the local community) to manage related operations under a contract to be arranged for this purpose and under strict supervision on contractor(s) compliance with applicable national regulations, RSCN policy and the World Bank requirements by the RSCN.

It is the responsibility of the RSCN to implement and operate the EMP, where the RSCN should strictly adhere to the suggested mitigation measures and EMP programs, and define new aspects and mitigate impacts. Also, the RSCN should monitor the environmental and social indicators, and document for precautions and actions made. More specifically:

A. For the Construction and Corridor Development Phase:

- a. The CMU will hold the responsibility of the overall EMP implementation and supervision on behalf of the RSCN.
- b. Whenever a Contractor is hired to construct facilities or infrastructures, it is the responsibility of the Contractor to implement and operate the EMP, where the Contractor should strictly adhere to the suggested mitigation measures and EMP programs, and define new aspects and mitigate impacts under the supervision of the RSCN and under the enforcement mandate of related governmental organizations.
- c. RSCN should ensure compliance of the Corridor Development and its implementation with the legal requirements and the EMP recommendations. Also, the RSCN is responsible for monitoring the environmental and social aspects, the Corridor conformance/non-conformance, performance auditing, and the construction completion evaluation.
- d. Environmental Audit should be carried out by external environmental auditors. While the World Bank Auditors have the right for auditing and evaluating the implementation of the EMP.

B. For the Operation Phase:

- a. The CMU will be transformed into RSCN Eco-tourism Unit (ETU) which will be responsible for the overall management, administration, marketing and sales, future developments, supervision, monitoring and evaluation of eco-tourism activities and programmes within the Eco-tourism Corridor issue of this EMP in addition to other eco-tourism corridors and destinations managed by the RSCN. Accordingly the ETU will inherit all CMU responsibilities and mandate related to the proposed corridor.
- b. RSCN ETU may hire contractors to undertake the management of some or all of the corridor facilities, and some or all of eco-tourism operations within the corridor. In such a case the contractors and sub-contractors will be fully responsible for the implementation and full compliance with the EMP requirements and measures, and also shall comply with all applicable national regulations and respective World Bank Operational Policies triggered by the Jordan BERP project. RSCN will remain accountable and responsible for the overall compliance of this component and also the environmental performance of its contractors.
- c. Since the Jordan BERP project will be completed toward the completion of the establishment of the eco-tourism corridor and perhaps soon after the

commencement of corridor operational activities, therefore RSCN will inherit the responsibilities of the PMU-M&E responsibilities related to the monitoring and evaluation of the corridor environmental performance. The ETU is suggested to hold responsible for compliance monitoring while the **RSCN Biodiversity Monitoring Centre (BMC)** is suggested to takeover monitoring of corridor related impacts on biodiversity (e.g. habitat degradation, impacts on species conservation, etc.).

It is important to note the CMU team will form the core team of the to-be ETU at RSCN. Accordingly it is not anticipated to have management gap during the process of transforming the CMU into ETU with regard to the implementation of the EMP.

Jordan BLP PMU, and specifically the project Monitoring and Evaluation Officer, are responsible for monitoring and evaluating component one safeguard compliance, and accordingly ensuring (through monitoring, auditing and evaluating) the component overall compliance with the World Bank Operational Policies and with applicable national regulations.

Related governmental bodies (i.e. Ministry of Environment, Ministry of Agriculture and Ministry of Tourism and Antiquities, etc.) are legally authorized and obliged to supervise and monitor compliance with Jordanian environmental legislations.

Mitigation and Monitoring Plan

Few negative impacts are anticipated to take place of consequence to the construction of management and tourism support facilities, and from operating excursion trips and accommodation services. Furthermore, most of the expected impacts are positive and will participate in providing solutions for some of the existing environmental challenges in the eco-tourism corridor area as it will offer environmentally sound economic alternative to some of the ongoing overexploitation of natural resources (overgrazing, wood collection, hunting, etc.).

This EMP developed mitigation measures which should be strictly adhered to, in order to avoid impact, risk or hazard whenever anticipated. When the impact is unavoidable, it should be minimized to the extent possible and the settings should be rehabilitated appropriately to restore the natural condition. The proposed mitigation measures are presented separately for: (i) establishment of the proposed facilities; and (i) operation of eco-tourism programme. The success of the mitigation measures depends largely on proper training and awareness to Corridor staff and efficiency of restoration when required.

EMP Administration and Control

The EMP should be armed with tools to ensure the adherence of the various parties to its components and to measure the effectiveness of the defined set of actions within it. To achieve this, a control system needs to be implemented. The elements of this control process are to include:

- 1- **Document and Record Control:** This is a procedure through which all EMP associated documentation and records are stored and distributed. This will include the maintenance and updates of the register of environmental aspects and the responsibility for the dissemination of information to involved parties.
- 2- **Checking and Corrective Action:** This dictates that all incidents of deviation from the planned criteria or activities to be reported and action to be taken to rectify the situation and minimize the chance for its recurrence.
- 3- **Claims:** A provision should be made to register and review incident or other claims made against the Corridor or Corridor related personnel or activities by the public or any party. Action needs to be taken to address any such claims where they are shown to be valid and requiring such action.
- 4- **Auditing:** The implementation of the EMP should be audited on a regular basis. Audit reports are the basis for verification of the compliance of the various parties, the completion and implementation of programs and restoration plans, and the effectiveness of such actions and other elements of the EMP. The audit will be used for review and will rely on the monitoring data.
- 5- **Review Process:** A periodic (annual) review of the EMP and environmental incidents needs to be done through the course of the Corridor construction, operation and future development stages. Necessary modifications and adjustments could be decided through this formal and timely review process. Changes and new issues need to be communicated.

Estimated Costs

Most of the identified mitigation and monitoring measures are developed based on avoidance and standard operations conditions in similar projects as governed by applicable national regulations, specifications and codes. Therefore this EMP requires no additional costs for similar measures. Other costs items are already budgeted for as part of the estimated costs for the construction actions as provided in the Feasibility Study including waste water management, solar energy, materials, etc.

The cost items estimated for this EMP are related to the implementation of the monitoring measures by the Component during the construction phase and the first three years of operations, in addition provisional budget lines for restoration and rehabilitation actions, involuntary resettlement measures and for the conservation of archaeological resources which will be needed only if the impacts are unavoidable.

The total estimated costs as per of the above explanation is Two Hundred and Twenty Seven Thousand and Two Hundred US\$.

3 Introduction

This Environmental Management Plan (EMP) is prepared for Component one of the Badia Ecosystem and Livelihoods Project (BELP), "Community-Centered Ecotourism in the Northern Badia" concerning the proposed Eco-tourism Development Project in the Eastern Badia.

This EMP is submitted to The **Royal Society for the Conservation of Nature** by **DAR AL-OMRAN Infrastructure & Environment** and **Enviromatics**.

Environmental Management Plan (EMP) is a tool developed to ensure that appropriate environmental practices are followed during the project construction and operation, overall to avoid/reduce anticipated negative environmental impacts, capitalize on positive environmental returns from the investment, and to overall achieve sustainability.

An EMP is usually drawn up after an EIA has been conducted, often as a requirement of the record of decision drafted by the Ministry of Environmental. The EMP is then implemented during the construction phase and, thereafter, throughout the project life-cycle up to, and including, decommissioning.

However, in terms of the phasing of the EIA and EMP, completing the EMP as part of the EIA can be problematic. Often EIAs tend to be based on preliminary planning which doesn't necessarily give an indication of, for example, the approach to construction. A clear understanding of the management challenges for the construction phase often only develops once the detailed design are in place.

This Environmental Management Plan is planned to be annexed to the ETDP and included in the contractors bidding documents. EMP Technical Summary is provided as stand-alone document were assessed impacts, developed mitigation and monitoring measures are presented in tabular form. For correct implementation of this EMP the implementers and reviewers should refer to the detailed EMP version as the formal reference on this regard.

3.1 Background

The Badia Ecosystem and Livelihoods Project (BELP) is one of five projects under the Middle East and North Africa Desert Ecosystems and Livelihoods Program. The BELP objective is to support sustainable livelihoods and enhance ecosystem services through participatory approaches in selected areas of the Jordan Badia.

Component one of the BELP project aims to expand ecotourism into the northeast Badia by using the Royal Society for the Conservation of Nature (RSCN)-managed Al Azraq and Shaumari

reserves and attached facilities as a starting point, from which a 250 km ecotourism corridor will be developed ending at Burqu' Protected Area (PA).

RSCN plans to establish Al Azraq/Shaumari-Burqu' ecotourism corridor and developed Ecotourism Development Plan (ETDP) laying out the vision of the corridor, exact siting, intervention points, services and products to be developed.

The ETDP was prepared for the RSCN by Via Nova; a Jordanian consultancy firm with particular experience in the development of eco-tourism programmes. It was developed with the aim to assess the commercial and financial feasibility for establishing Azraq Burqu Ecotourism Corridor as part of the Badia Ecosystem and Livelihoods Project, and it concluded that from a commercial perspective, the project will consist of the following main components:

- **Burqu Ecolodge:** around 1,200 Sqm Ecolodge in the adjacent area to Burqu' castle. The lodge will feature a desert-inspired architecture and will include 12 rooms, in addition to reception, restaurant, shop, interpretation room and a training room.
- **Azraq-Burqu Ecotourism Corridor:** two excursion tracks approximately covering major archeological and natural attractions across the 320 KM path from Azraq to Burqu. The corridor will be utilized as an excursion path, featuring genuine desert experience and Bedouin lifestyle, with a wide range of activities that would be primarily offered by local communities across the corridor.
- **Al Wisad Camp Sit:** Construction of minimum service infrastructure made of toilets (10.6 m X 8.6m), kitchen area and Ready Portable Tent Platforms at Al Wisad area and close to the Bedouin Police station.
- Construction of wooden view point platform at Al Dahik location can serve as a view point **Al Dahik View Point (Terrace):** for the stunning surrounding landscape.
- **Qurma Infrastructure:** Construction of stone and cement based access stairs to deliver visitors to the top of Qurma

Throughout the feasibility assessment, it was assumed that the components above are commercially and financially autonomous.

4 Objectives and Approach

4.1 Objectives of the Assignment

The objective of this assignment is to prepare an Environmental Management Plan (EMP) specific for investments planned under component One of the Project. Specifically the EMP shall at least involve the following aspects:

1. To identify, and assess environmental impacts that may result from the activities of component one of the project both during implementation and operation stages as stated in the ETDP.
2. To identify, assess and recommend appropriate and practical mitigation measures to remove or minimize the identified negative environmental impacts.
3. To identify, assess and recommend impact monitoring programs and compliance auditing programs.

4.2 Approach

The development of the Environmental Management plan requires deep analysis of the project features in order to clearly identify the set of mitigation, monitoring, and institutional measures that should to be taken during construction and operation phases to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels.

Therefore the approach adopted and implemented for this project is based on the following principles:

1. ENSURE THE EMP WILL INTEGRATE THE BEST MANAGEMENT PRACTICES

The development of this EMP took into consideration best international practices, principals and guidelines for the development of eco-tourism businesses within and outside protected areas. It was also prepared in a way to facilitate smooth and direct integration with other development management plans to ensure full compliance with applicable national legislations and obligations under ratified multilateral environmental agreements.

The following are the key references which provide guidance and best international practices on this respect:

- Ceballos-Lascurain, H. (2001). Integrating Biodiversity into the Tourism Sector: Best Practice Guidelines.
- Drumm, A., Moore, A., Soles, A., Patterson, C., Terborgh, J. (2004). Ecotourism Development – A Manual for Conservation Planners and Managers, Volume II: The Business of Ecotourism Management and Development. The Nature Conservancy, Arlington, Virginia, USA.

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- Eagles, Paul F.J., McCool, Stephen F. and Haynes, Christopher D.A. (2002). *Sustainable Tourism in Protected Areas: Guidelines for Planning and Management*. IUCN Gland, Switzerland and Cambridge, UK. xv + 183pp.
 - *Indigenous and Traditional Peoples and Protected Areas: Principles, Guidelines and Case Studies*. No. 4. Javier Beltrán, (Ed.), IUCN, Gland, Switzerland and Cambridge, UK and WWF International, Gland, Switzerland, 2000, xi + 133pp.
 - Wood, M. (2002). *Ecotourism: Principals, Practices and Policies for Sustainability*. UNEP.

Another reference on best practices and lessons learned which was considered in the development of this EMP is: Ervin, J., N. Sekhran, A. Dinu. S. Gidda, M. Vergeichik and J. Mee. 2010. *Protected Areas for the 21st Century: Lessons from UNDP/GEF's Portfolio*. New York: United Nations Development Programme and Montreal: Convention on Biological Diversity.

2. USER-FRIENDLY FORMAT

The format of this EMP constitute narrative and tabular discussion of current state of the environment within the study area, anticipated impacts from the proposed development, in addition to suggested mitigation and management measures. The tables presented in the environmental management chapter provides summary of the management measures discussed in the text including mitigation and monitoring which can be easily used for day-to-day management check and reporting.

3. IN LINE WITH PROJECT PROCESS FRAMEWORK AND WORLD BANK POLICIES

With reference to the ESIA and ESMP prepared for the BERP Project, the undertaking of environmental and social assessment and the development of this EMP is prepared in accordance with World Bank Safeguard Policies that BERP trigger (OP 4.01, OP 4.04 and OP 4.11).

The following diagram illustrate key elements of the approach adopted for the delivery of the contracted services and the development of the management plan for the proposed development.

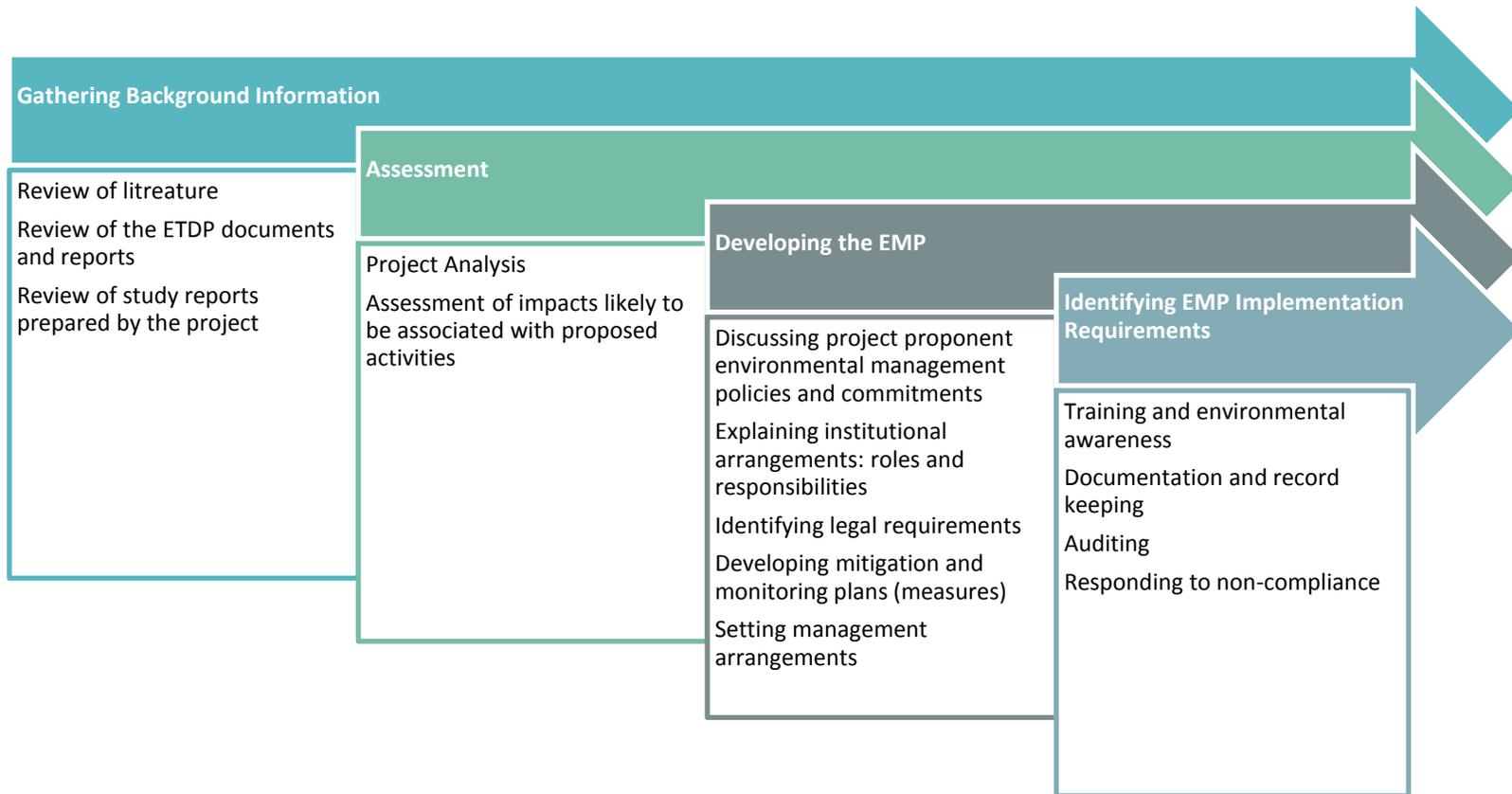


Figure 1: Illustration of key elements of the adopted methodology

5 Environmental Baseline

5.1 Biogeography and Climatic Zones

Jordan is influenced by four major biogeographic regions. Vegetation cover, soil texture, altitude and annual rain fall are among the major factors that shaped these biogeographic regions. Al-Eisawi (1985) and Disi & Amr (1998) agreed on the delineation of these four regions based on vegetation cover as well as animal distribution in Jordan.

Two biogeographical elements characterize the eastern desert of Jordan. The Irano-Turanian region that forms a narrow strip that extends along the Syrian borders, and is characterized by higher altitude (400-1200 m). The Saharo-Arabian region is wide and constitutes more than 70 % of the total study area (Figure 2).

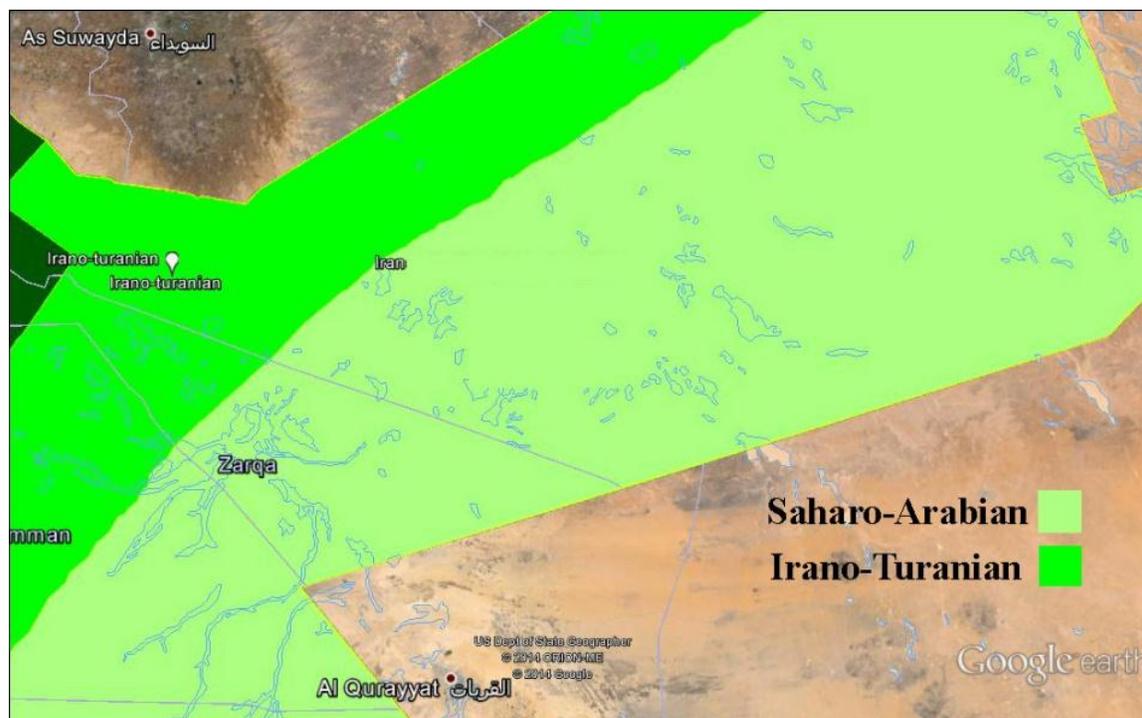


Figure 2: Biogeographic regions

1. Irano-Turanian region: This region is represented by a narrow strip that surrounds the Mediterranean ecozone except in the far north. The Irano-Turanian region extends to the north-east, joining the Syrian Desert. The vegetation is dominated by *Anabasis articulata*, *Artemesia herba-alba*, *Astragalus spinosum*, *Retama raetam*, *Urginea maritima*, *Ziziphus lotus*, *Zygophyllum dumosum*. The altitude ranges from 400 to 700 m asl, with average annual rainfall of 50-100 mm. The layer of surface soil is very thin or absent in some instances and surface rockiness is very high.

2. 4. Saharo-Arabian region: This is the largest biogeographical region of Jordan and covers over 70% of the total area of the country. It is located to the east bordering the Irano-Turanian region from the west and the Sudanian Penetration region from the southwest. The sand dune desert vegetation is dominated by *Haloxylon persicum*, *Hammada scoparia* and *Ochradenus baccatus*. Open areas and wadi beds are characterized by *Achillea fragrantissima*, *Artemisia herba-alba*, and *Astragalus* sp. The altitude ranges from 100 m bsl to 800 m asl, with rainfall not exceeding 50 mm annually. Within this region, Azraq Oasis, stands as landmark in the middle of Jordan's eastern desert.

5.2 Ecosystems

The proposed Corridor area exhibits three ecosystems, namely; the black lava desert (Harra), sand dunes and Hammada.

1. The Black Lava Desert:



Figure 3: Black lava boulders of various sizes that extends for long distances in the eastern Badiya.

A typical phenomenon of the eastern desert is the presence of huge areas covered by basalt lava desert, locally called "*harra*". The Jordanian part of basalt plateau is between 50 and 170 km wide and extends over 180 km from north to south. It extends northwards into Syria and southwards into northern Saudi Arabia, the Jordanian part of the basalt-covered area is more

than 11000 km² (for the rough distribution of basalt desert see the map). Extensive occurrence of basalt resulted mostly from volcanic activity during the late Tertiary and Quaternary, having the centre in the Jabal ad Duruz (Jabal al Arab) mountains in Syria. It begun 25 million years ago and stopped relatively recently, less 1 million years ago. Usually, four specific basalt types re recognised: Abed (ca. 9 mil. years old), Salaman (8.45 mil years old), Mahdala (extruded between 2 and 3.5 mil. years ago), and the youngest Bishriyya, which is „only“ 0.1 to 1.45 mil years old. Generally, landscape development and its current appearance is linked with the age of described lava flows. Since volcanic activity ceased, the climate throughout the Near and Middle East fluctuated between periods of wetter and drier weather. Mainly wetter periods promoted more intense weathering of lava massifs and distinct landforms have evolved. The oldest lava flows are under longest weathering pressure and have gentle, rounded topography with convex slopes and well developed wadis. In contrast, the most recently extruded basalts of Bishriyya are typical in having rugged topography and poorly developed surface drainage.

The above mentioned erosion in the extreme desert climate led to the formation of lava boulders of various sizes, covering hundreds of square kilometres of the Jordanian Badia. Size of basalt boulders depends on the basalt type, boulders belonging to Abied basalt are the largest, being separated by exposed bare sediments. In contrast, the Salaman basalt is typical by more or less continuous and dens cover of small rock fragments. The presence of basalt boulders is almost ubiquitous, the only places without lava boulders are either depressions filled with sediment or places with exposed bedrock. However, basalt boulders were in many places locally removed by people to facilitate the agricultural land use.

Extensive fields covered by lava boulders are typical for upper parts and slopes of undulating basalt plateau. In contrast, closed terrain depressions are filled with fine, soil like sediment deposited there by irregular ground water flows. The largest of these sediment filled pans, fed by excessive network of wadis are known as *Qa*. Since *Qa* are regularly or irregularly filled with water, they are discussed again in chapter devoted to wetlands. The second type of sediment pan, known as „*marab*“, forms typically along larger wadis and developed in locations, where wadi increases its width and water then spreads across a wider area. Third form of sediment pans are small closed depressions without outward drainage.

The mosaic of basalt filed and sediment filled pans form a unique environment with several types of microhabitats. Generally, fauna and flora of basalt plains differs from those of *qa* and *marabs*. However, in many regions, lava stones are covered by several species of lichens, which give them much lighter coloration than is the original dark colour of basalt stones. Intensity of lichen cover depends on the altitude, air humidity, season and probably also other, hardly predictable conditions.

2. Sand Dunes:

Sandy habitats represent probably the most diversified desert habitat, both for animals and plants. Animals inhabiting the sand dunes (so called psammophilous species) possess several adaptations, enabling them to exploit extreme conditions of sand fields. Only in particular habitats, typical communities, narrow, sharp margins - in Jordan also north most limit, some more, some other less dependent on sand, penetration into other habitats. Vegetation cover varies in these dunes, with leading species such as *Seidlitzia rosmarinus*, *Artemesia herba-alba*, *Zilla spinosa* and *Achillea fragrantissima*.

These sand dunes or sheets changes from time to time, forming passages for many desert adapted species. This may contributes to range expansion of these species over their long history of existence in these habitats (Figure 4).



Figure 4: Sand sheets resulted from blown sand . This pattern changes from time to time according to wind direction.

3. Hammada:

Hamada is a rocky desert, or desert region, which does not have surficial materials and which consists mainly of boulders and exposed bedrock (Figure 5). The dominant form in the eastern

desert is known as the pebbly hamada, it cuts across sedimentary material and mantled with bedrock fragments. (Figure 6).



Figure 5: Gravel Hamada hamda type of desert covered by small gravel.

The Hamada covers most of the Saharo-Arabian ecozone. Al-Eisawi (1996) recognized four subdivisions of the Hamada vegetation in Jordan; gravel, pebble, run-off and sandy. Al Hazim represents the run-off Hamada with the Wild Palm tree, *Phoenix dactylifera* and dominated by *Nitraria retusa* shrubs. Gravel Hamada is the dominant form in the eastern desert and is comprised mainly of clayey loam soil covered by gravels. The leading plant cover is mostly *Seidlitzia rosmarinus* and other annual herbs and succulent plants.

Pebble Hamada extends from Mafraq plains reaching Ruwshid area to the east, stretching to the Syrian borders to the north. It is characterized by black pebbles with chenopod vegetation cover that consists mainly of *Salsola vermiculata* and *Halopeton* sp. In other parts, the soil is firm with reddish colouration and covered by small pebbles of basaltic rocks. Vegetation cover is sparse and usually does not exceed more than 10%. Leading plants include *Anabasis articulata* and *Seidlitzia rosmarinus*. In addition, scattered occurrence of *Astragalus spinosus* and *Atriplex hamulus* are among the known.



Figure 6: Pebble Hamada desert with relatively larger black lava rocks.

The little lake at Burqu' is an example. It contains up to a million cubic meters of water in a region where annual evaporation exceeds three meters, and there is water here even in the driest years. The Nabataeans built the waterworks, the Romans built a fort, and the place was used in Byzantine and early Islamic times. The remains of what is said to be an Umayyad hunting lodge stand at the water's edge—and so do Bedouins' tank trucks, sucking up water for sheep and goats. The only other visitors are migrating birds

5.3 Biodiversity Important Areas

Biodiversity important areas known within the study area includes protected areas (established and proposed) and key biodiversity areas (KBAs: important plant areas and important bird areas).

5.3.1 Protected Areas

Two operating and two proposed nature reserves are within the boundaries of the study area. Core proposed reserves, Burqu' and Rajel are within the heart of the proposed route (Figure 7).

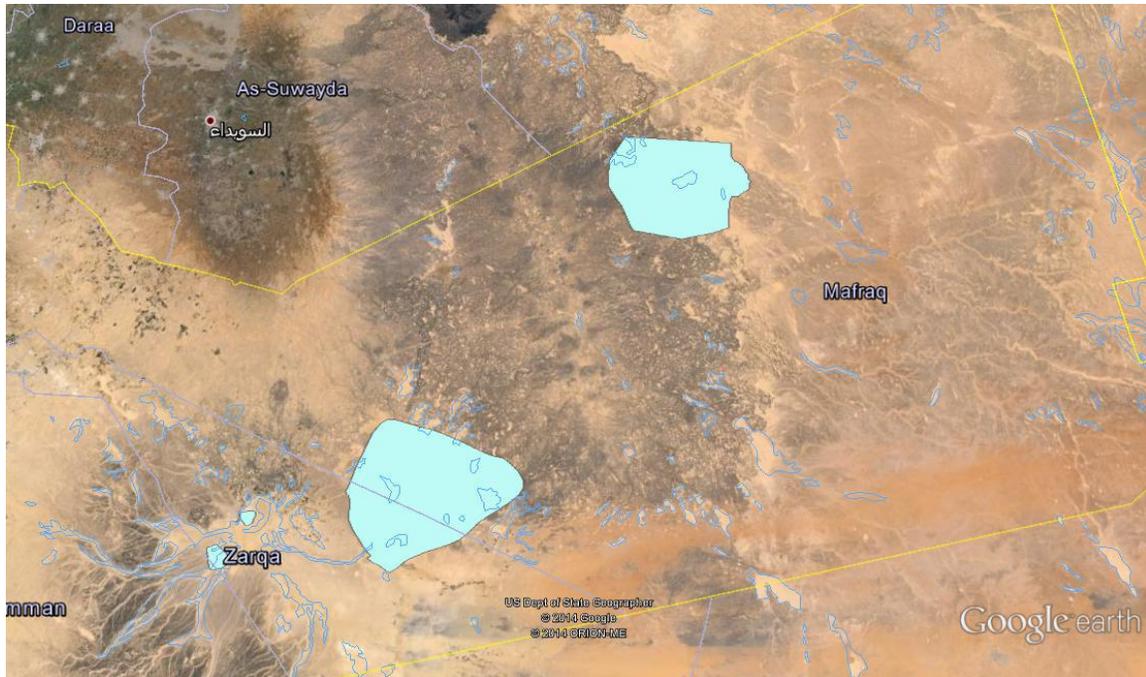


Figure 7: Protected areas along the proposed route

5.3.1.1

| Protected Area | Status | Total Area (Km ²) |
|-------------------------------|------------------------|-------------------------------|
| Shaumari Wildlife Reserve | Established, Operating | 20.2 |
| Azraq Wetland Reserve | Operating | 9 |
| Rajel Proposed Protected Area | Proposed | 904.3 |
| Burqu Proposed Protected Area | Proposed | 748.45 |

5.3.2 Key Biodiversity Areas

5.3.2.1 Important Plant Areas

Al-Eisawi (2011) identified three IPAs close to or within the study area; including Azraq, Burqu' and lava Safawi (Figure 8). No details were given on the natural flora of these areas. Burqu' remains the IPA since it is located within the study area.

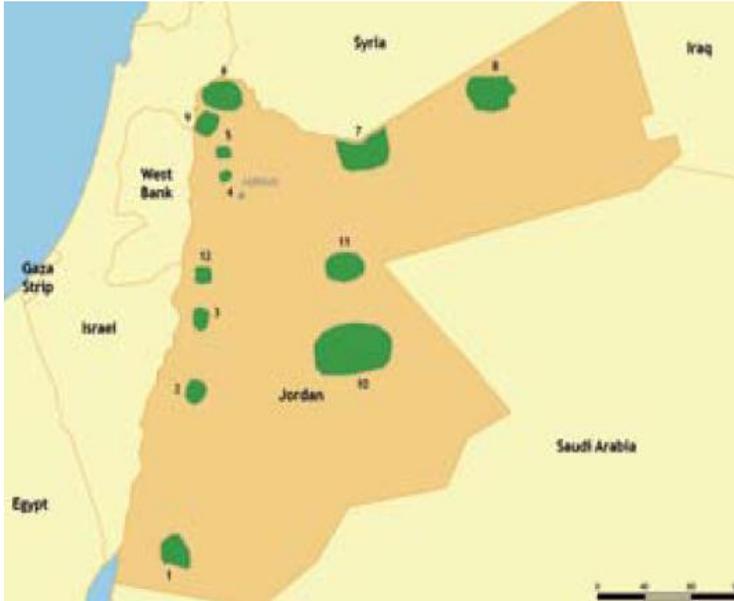


Figure 8: Important plant areas in Jordan (source: Al-Eisawi, 2011)

5.3.2.2 Important Bird Areas

Seven IBAs are located around or within the study area, four of which are within the heart of the route (Figure 9, Table 1). Only three of these IBA's are recognized by Birdlife International (Azraq, Shaumari and Burqu'), while the other four are listed locally as IBA's (Al Hazim, Rajel, Qa el bqe'awieh, Wadi Salma and El Hashad). Burqu' IBA is the largest in size, with a wide range of desert birds as well as aquatic migrant species.

Table 1: List of IBAs located along the proposed project route / area

| IBA | 5.3.2.3 Total Area (Km ²) |
|----------|---------------------------------------|
| Shaumari | 278.53 |
| Azraq | 216.81 |
| Al Hazim | 85.2 |
| Rajel | 213.68 |

| | |
|------------------|--------|
| Qa el bqe'awieh | 48.27 |
| Salma- El Hashad | 190.52 |
| Burqu | 748.45 |



Figure 9: IBAs of Jordan

5.4 Spatial Description of Biodiversity with the Proposed Route

5.4.1 Al Dahik

This is a unique geological formation with many caves and crevices providing shelter for animals. It encompasses gypsum cliffs and muddy qa'a. Leading species are *Achilea fragrantissima*, *Tamarix aphylla*, *Capparis leucophylla*, *Seidlitzia rosmarinus*, *Atriplex leucoclada*, *Plantago* spp. and *Filago desertorum*.



Figure 10: Landscape of Al Dahik.

The Caracal, *Caracal caracal*, and the Striped Hyaena, *Hyaena hyaena* were reported from Al Dahik. Both are key species with special conservation status. In addition, the Pharaoh Eagle Owl, *Bubo ascalaphus*, was found to live in small crevices and caves on the ledges of Al Dahik.

Other mammals include the Ethiopian Hedgehog, *Paraechinus aethiopicus*, European Free-tailed Bat, *Tadarida teniotis*, Kuhl's Pipistrelle, *Pipistrellus kuhli*, Three-toed Jerboa, *Jaculus jaculus*, Grey Hamster, *Cricetulus migratorius*, The Libyan Jird, *Meriones libycus*, and Sundevall's Jird, *Meriones crassus*.

Eighteen species of birds were recorded from Al Dahik area (Green & Thomas, 2008). Important species include the Short-tailed Snake Eagle (Table 2).

Table 2: Birds reported from Al Dahik area (Green & Thomas, 2008).

| Common Name | Species |
|---------------------------------|--|
| Common Kestrel | <i>Falco tinnunculus</i> |
| Short-tailed Snake Eagle | <i>Circaetus gallicus</i> |
| Eurasian Stone-curlew | <i>Burhinus oedicephalus</i> |
| Alpine Swift | <i>Tachymarptis melba</i> |
| Common Swift | <i>Apus apus</i> |
| Isabelline Shrike | <i>Lanius isabellinus</i> |
| Great Grey Shrike | <i>Lanius excubitor</i> |
| Brown-necked Raven | <i>Corvus ruficollis</i> |
| Thick-billed Lark | <i>Rhamphocoris clotbey</i> |
| Greater Hoopoe Lark | <i>Alaemon alaudipes</i> |
| Common House Martin | <i>Delichon urbicum</i> |
| Sand Martin | <i>Riparia riparia</i> |
| Eurasian Skylark | <i>Alauda arvensis</i> |
| Blue Rock Thrush | <i>Monticola solitarius</i> |
| Rufous-tailed Thrush | Rock <i>Monticola saxatilis</i> |
| Hooded Wheatear | <i>Oenanthe monacha</i> |
| Ménétries's warbler | <i>Sylvia mystacea</i> |
| Great Grey Shrike | <i>Lanius excubitor</i> |

5.4.2 Al Hazim

Al-Hazim is located near the Jordanian-Saudi border. Both have exceptional uniqueness in terms of habitats and vegetation. This is a distinctive region with a diverse ecosystems ranging from silt marshes to sand dunes to hilly sand plateaus rich in palm thickets.



Figure 11: Landscape of Al Hazim.

Sand dunes vegetation is the dominant form. Leading species are considered salt tolerant, including Date Palm, *Phoenix dactylifera*, Salt Tree, *Nitraria retusa*, that forms large bushes on sandy hills. Other species include *Aleropus littoralis*, *Calligonum comosum*, *Artemisia herba alba*, *Capparis leucophylla*, *Zilla spinosa*, *Salsola vermiculata*, *Saeda vera*, *Anabasis setifera*, *Peganum harmala*, *Retama, raetam*, *Malva sylvestris* *Frankenia pulverulenta*, *Juncus littoralis*, *Sonchus maritimus*, *Prosopis fracta* and *Alhagi murrorum*.

Majority of resident birds are Saharo-Arabian restricted breeders including Desert lark, Hoopoe Lark, Temminck's, Sand Partridge and Desert Wheatear. The site is of major significance to migratory birds most of which are passerines.

In terms of reptiles, Al Hazim hosts two unique species known from Jordan and represents the only available localities; The Persian Agama, *Trapelus persicus fieldii* (Figure 12), which is usually observed on top of the Salt Tree, and the Blacktail Toadhead Agama, *Phrynocephalus maculatus*, that prefers salt silt (Sabkha) areas (Figure 13). Species of local conservation status are represented by the Egyptian Spiny Lizard, *Uromastyx aegyptia microlepis* and the Desert Monitor, *Varanus griseus*. Other reptiles that have been recorded in Al Hazim are summarized in Table 3.



Figure 12: The Persian Agama, *Trapelus persicus fieldii*, resting on the Salt Tree in Al Hazim.



Figure 13: The Blacktail Toadhead Agama, *Phrynocephalus maculatus* and its habitats.

Table 3: Reptiles reported from Al Hazim area.

| Family | Species | Common name |
|------------|--|--------------------------------------|
| Gekkonidae | <i>Bunopus tuberculatus</i> | The Baluch ground Gecko |
| | <i>Stenodactylus doriae</i> | Middle Eastern Short-fingered Gecko |
| Agamidae | <i>Trapelus agnetae</i> | Pale Agama |
| Lacertidae | <i>Acanthodactylus boskianus</i> | Bosk's Fringe-toed Lizard |
| | <i>Acanthodactylus ophiodurus</i> | Arnold's Fringe-fingered Lizard |
| | <i>Acanthodactylus schmidtii</i> | Schmidt's Fringe-fingered Lizard |
| | <i>Ophisops elegans</i> | Snake-eyed Lizard |
| | <i>Mesalina brevirostris</i> | Blanford's Short-Nosed Desert Lizard |
| | <i>Mesalina guttulata</i> | Small-spotted Lizard |
| | <i>Mesalina olivieri</i> | Olivier's Lizard |
| Scincidae | <i>Chalcides ocellatus</i> | Ocellated Skink |
| | <i>Eumeces schneideri</i> | Schneider's Skink |
| | <i>Scincus scincus meccensis</i> | Sandfish Skink |
| Colubridae | <i>Platycephalus rogersi</i> | Moila Snake |
| | <i>Rhagerhis moilensis</i> | Moila Snake |
| | <i>Spalerosophis diadema cliffordi</i> | Clifford's Royal Snake |
| Elapidae | <i>Walterinnesia aegyptia</i> | Black Desert Cobra |
| Viperidae | <i>Cerastes gasperettii</i> | Arabian Horned Viper |
| | <i>Pseudocerastes fieldi</i> | Field's Horned-viper |

Within Al Hazim area, the Sand Fox, *Vulpes rueppellii*, the Asiatic Jackal, *Canis aureus*, and the Caracal, *Caracal caracal*, were reported. These carnivores are key species with special conservation status. Other small mammals reported from the area are listed in Table 4.

Table 4: Mammals reported from Al Hazim area.

| Family | Species | Common Name |
|------------------|--------------------------------|---------------------------|
| Erinaceidae | <i>Paraechinus aethiopicus</i> | The Ethiopian Hedgehog |
| Molossidae | <i>Tadarida teniotis</i> | European Free-tailed Bat |
| Vespertilionidae | <i>Pipistrellus kuhli</i> | Kuhl's Pipistrelle |
| | <i>Otonycteris hemprichi</i> | Hemprich's Long-eared Bat |
| Dipodidae | <i>Jaculus jaculus</i> | Three-toed Jerboa |
| Muridae | <i>Gerbillus cheesmani</i> | Cheesman's Gerbil |
| | <i>Gerbillus nanus</i> | Baluchistan Gerbil |
| | <i>Gerbillus henleyi</i> | Pygmy Gerbil |
| | <i>Meriones libycus</i> | The Libyan Jird |
| | <i>Meriones crassus</i> | Sundevall's Jird |

Few bird species have been reported from Al Hazim area, most of which are breeding desert birds (Table 5).

Table 5: Birds reported from Al Hazim area (Green & Thomas, 2008).

| Common Name | Species |
|----------------------------|----------------------------|
| Pallid Swift | <i>Apus pallidus</i> |
| Great Grey Shrike | <i>Lanius excubitor</i> |
| Greater Hoopoe Lark | <i>Alaemon alaudipes</i> |
| Lesser Whitethroat | <i>Sylvia curruca</i> |
| Scrub Warbler | <i>Scotocerca inquieta</i> |
| Ménétries's Warbler | <i>Sylvia mystacea</i> |
| Stonechat | <i>Saxicola rubicola</i> |

5.4.3 Al Ghamar

This part of the route passes through degraded habitats. Many parts of Al Ghamar are used for farming of vegetables and other summer crops (Figure 14). The undeveloped sections are covered by sand with *Seidlitzia rosmarinus*.

Perhaps some Persian Agama, *Trapelus persicus fieldii*, can be observed on scattered Salt Trees. No key species are known in this area, except for the Desert Monitor, *Varanus griseus* and the Egyptian Spiny Lizard, *Uromastyx aegyptia microlepis*, along gravelly wadi edges. Small mammals include various gerbil species (*Gerbillus cheesmani* and *Dipodillus dasyurus*).



Figure 14: Farming in Al Ghamar

5.4.4 Al Wisad

The red sand dune areas were seen as either patches in the middle of the Hammada vegetation around Al Wisad, or as thickly vegetated low wadis surrounded by a series of rocky cliffs and basaltic mountains of the Harra vegetation as in Al Wisad area. The sand dunes are dominated mainly by *Hammada salicornica*.

The occurrence of the Southwest Asian Garden Dormouse, *Eliomys melanurus*, in this desert habitat is noteworthy since it is originally an arboreal rodent. This is a relict species with disjunct distribution.

The Striped Hyaena, *Hyaena hyaena*, was reported near Beer Al Wisad. Other small mammals recorded include the Three-toed Jerboa, *Jaculus jaculus*, and Cheesman's Gerbil, *Gerbillus cheesmani*, The Libyan jird, *Meriones libycus*. Wagner's Gerbil, *Dipodillus dasyurus*

Reptiles known to occur along this stretch include *Ptyodactylus puiseuxi*, *Pseudotrapelus sinaitus*, *Trapelus agnetae*, *Acanthodactylus boskianus*, *Acanthodactylus grandis*, *Acanthodactylus opheodurus*, *Acanthodactylus robustus*, and *Malpolon insignitus*.



Figure 15: Landscape of Al Wisad.

5.4.5 Burqu' area



Figure 16: Burqu' Castel surrounded by black lava rocks

The area consists of three typical habitats; black lava rocky area with scarce vegetation cover, *marab* areas with dense vegetation and mudflats that are void of vegetation.

1. **The Black Lava desert** (Figure 17 A): it lies within the Saharo-Arabian region which constitutes the majority of the country, locally known as “*harra*”, where it is covered with the bare black basaltic boulders originated from ancient volcanic activities. Vegetation of the area is poor, with occasional few shrubs in some cleared areas. Lichens cover most rocks in the area turning them white. Within the study area, the black lava desert is situated more or less to the north, west and to a lesser extent to the east. Fringes of black lava rocks and boulders demark the boundaries with *marabs* and *Qa'a* habitats. Density or rock coverage varies in the study site. In some areas rock density is very high and is almost covers 90% of the upper soil. Additionally, rock and boulders size varies accordingly.
2. **Marabs areas** (Figure 17 B): Plant cover is concentrated in the *marab* and small wadis where soil moisture is greatest. In the *marab* vegetation cover is highly dependent on the season. Dominant plants include: *Artemisia* spp., *Origanum* spp. and *Achillea fragrantissima*. Seasonality in vegetation emergence was evident, during April, the marabs were dominated by *Achillea fragrantissima*, that was then transformed into a mixture of other large communities of *Caparis* sp. and *Citrullus colocynthis*.
3. **Qa'a habitat** (Figure 17 C): This habitat type is characterized by its dry and hard soil. *Qa'as* are formed in the lowest altitudes around the black larva rocky habitats. It is void of vegetation and the soil is covered by water on seasonal basis. After the rain season, water evaporates leaving cracked hard soil. *Qa'as* usually forms on the edges of either black lava rocky areas or close to *marab*.

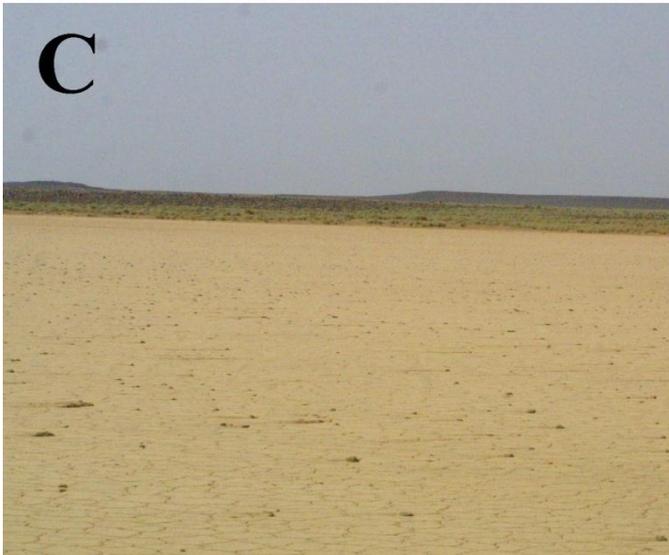


Figure 17: Habitats of Burqu' area. A. Black Lava rcks. B. *Marabs*. C. *Qa'a*.

Several species of mammals have been reported from Burqu' area and its vicinity (Table 6), including at least five key species of carnivores, all of which have special conservation status (Table 7). The Sand Cat is among the most important species known from the area and deserves very strict conservation issues. Also, the Arabian Sand Gazelle, *Gazella subgutturosa*, was reported previously from Hibar, Safawi, Al Masmah, Burqu'a, and Hedlat, , and can in some occasion be seen around Burqu' area.

Table 6: Mammals recorded from Qaser Burqu'a and its vicinity.

| Family | Species | Common Name |
|------------------|--------------------------------|-------------------------------------|
| Erinaceidae | <i>Hemiechinus auritus</i> | Long-eared Hedgehog |
| | <i>Paraechinus aethiopicus</i> | The Ethiopian Hedgehog |
| Vespertilionidae | <i>Otonycteris hemprichi</i> | Hemprich's Long-eared Bat |
| | <i>Tadarida teniotis</i> | European Free-tailed Bat |
| Canidae | <i>Vulpes vulpes</i> | The Red Fox |
| | <i>Vulpes rueppilli</i> | The Sand Fox |
| Felidae | <i>Felis margarita</i> | The Sand Cat |
| | <i>Felis silvestris</i> | Wild Cat |
| | <i>Caracal caracal</i> | The Caracal |
| Hyaenidae | <i>Hyaena hyaena</i> | Striped Hyaena |
| Leporidae | <i>Lepus capensis</i> | The Arabian Hare |
| | <i>Allactaga euphratica</i> | Five-toed Jerboa |
| | <i>Jaculus jaculus</i> | Three-toed Jerboa |
| Muridae | <i>Dipodillus dasyurus</i> | Wagner's Gerbil |
| | <i>Gerbillus henleyi</i> | Pygmy Gerbil |
| | <i>Meriones libycus</i> | The Libyan Jird |
| | <i>Meriones crassus</i> | Sundevall's Jird |
| | <i>Eliomys melanurus</i> | The Southwest Asian Garden Dormouse |
| | <i>Acomys russatus lewisi</i> | Lewis Spiny Mouse |

Table 7: Key mammals known from Burqu' area.

| Family | Species | Common Name |
|-----------|-----------------------------|--------------------------|
| Felidae | <i>Caracal caracal</i> | The Caracal |
| | <i>Felis margarita</i> | The Sand Cat |
| Canidae | <i>Vulpes rueppellii</i> | The Sand Fox |
| Hyaenidae | <i>Hyaena hyaena</i> | Striped Hyaena |
| Bovidae | <i>Gazella subgutturosa</i> | The Arabian Sand Gazelle |

Twelve species of reptiles have been recorded from Burqu' area and its surroundings. Key species include the Egyptian Spiny-tailed Lizard and the Desert Monitor (Table 8).

Table 8: Reptiles recorded from Burqu' area.

| Family | Species | Common name |
|------------|-------------------------------------|-------------------------------------|
| Agamidae | <i>Pseudotrapelus sinaitus</i> | Sinai Agama |
| | <i>Laudakia stellio picea</i> | Black Lava Desert Agama |
| | <i>Trapelus pallidus agnetae</i> | Pale Agama |
| | <i>Uromastyx egyptia microlepis</i> | Egyptian Spiny-tailed Lizard |
| Lacertidae | <i>Mesalina brevirostris</i> | Short Snout Desert Racer |
| | <i>Mesalina guttulata</i> | Small-spotted Lizard |
| | <i>Acanthodactylus boskianus</i> | Bosk's Fringe-toed Lizard |
| | <i>Hemidactylus turcicus</i> | Mediterranean Gecko |
| | <i>Ptyodactylus puiseuxi</i> | Levant Fan-footed Gecko |
| Varanidae | <i>Varanus griseus</i> | Desert Monitor |
| Colubridae | <i>Psammophis schokari</i> | Schokari Sand Racer |
| Elapidae | <i>Walterinnesia aegyptia</i> | Black Desert Cobra |



Figure 18: . Reptiles known from Burqu' area. A.: *Trapelus pallidus agnetae*. B. *Pseudotrapelus sinaitus*. C. *Uromastyx egyptia microlepis*. D. *Laudakia stellio picea*. E. *Acanthodactylus boskianus* F. *Mesalina brevirostris*. G. *Ptyodactylus puiseuxi*.

Burqu' area is listed as one of the Important Bird Areas in the eastern desert. It was subjected to several studies, and many key species are present (Table 9).

Table 9: Key species of birds known from Burqu' area

| Common name | Scientific name | IUCN Status |
|--------------------------|--------------------------------|-----------------|
| Imperial Eagle | <i>Aquila heliaca</i> | Vulnerable |
| Lanner Falcon | <i>Falco biarmicus</i> | Least Concern |
| Saker | <i>Falco cherrug</i> | Endangered |
| Pale Rock Sparrow | <i>Carospiza brachydactyla</i> | Least Concern |
| Crane | <i>Grus grus</i> | Least Concern |
| Montagu's Harrier | <i>Circus pygargus</i> | Least Concern |
| Pallid Harrier | <i>Circus macrourus</i> | Near Threatened |

Seventeen species of birds were listed by Birdlife International (Table 10), however, Green & Thomas (2008) recorded some 51 species including the Mallard, The Northern Shoveler, Pintail, Garganey and the Common Crane (Table 11).

Table 10: Birds reported from Burqu' area (Source: Birdlife International)

| Common Name | Species | IUCN Category |
|-------------------------------|---------------------------------|---------------|
| Sand Partridge | <i>Ammoperdix heyi</i> | Least Concern |
| Lanner Falcon | <i>Falco biarmicus</i> | Least Concern |
| Saker Falcon | <i>Falco cherrug</i> | Endangered |
| Eastern Imperial Eagle | <i>Aquila heliaca</i> | Vulnerable |
| Greater Sandplover | <i>Charadrius leschenaultii</i> | Least Concern |
| Cream-coloured Courser | <i>Cursorius cursor</i> | Least Concern |
| Brown-necked Raven | <i>Corvus ruficollis</i> | Least Concern |
| Greater Hoopoe-lark | <i>Alaemon alaudipes</i> | Least Concern |
| Thick-billed Lark | <i>Rhamphocoris clotbey</i> | Least Concern |
| Bar-tailed Lark | <i>Ammomanes cinctura</i> | Least Concern |
| Desert Lark | <i>Ammomanes deserti</i> | Least Concern |

| | | |
|-------------------------------|-------------------------------|---------------|
| Temminck's Lark | <i>Eremophila bilopha</i> | Least Concern |
| Streaked Scrub-warbler | <i>Scotocerca inquieta</i> | Least Concern |
| Mourning Wheatear | <i>Oenanthe lugens</i> | Least Concern |
| White-tailed Wheatear | <i>Oenanthe leucopyga</i> | Least Concern |
| Desert Wheatear | <i>Oenanthe deserti</i> | Least Concern |
| Pale Rock Sparrow | <i>Petronia brachydactyla</i> | Least Concern |
| Trumpeter Finch | <i>Bucanetes githagineus</i> | Least Concern |

Table 11: Bird species recoded by Green & Thomas (2008).

| Common Name | Scientific Name |
|------------------------|---------------------------------|
| Common Teal | <i>Anas crecca</i> |
| Mallard | <i>Anas platyrhynchos</i> |
| The Northern Shoveler | <i>Anas clypeata</i> |
| Pintail | <i>Anas acuta</i> |
| Garganey | <i>Anas querquedula</i> |
| Common Crane | <i>Grus grus</i> |
| Black-winged Stilt | <i>Himantopus himantopus</i> |
| Little Ringed Plover | <i>Charadrius dubius</i> |
| Kentish Plover | <i>Charadrius alexandrinus</i> |
| Greater Sand Plover | <i>Charadrius leschenaultii</i> |
| Lesser Sand Plover | <i>Charadrius mongolus</i> |
| Grey Heron | <i>Ardea cinerea</i> |
| Purple Heron | <i>Ardea purpurea</i> |
| Little Egret | <i>Egretta garzetta</i> |
| Great Egret | <i>Egretta alba</i> |
| Egyptian Vulture | <i>Neophron percnopterus</i> |
| Booted Eagle | <i>Hieraaetus pennatus</i> |
| Steppe Buzzard | <i>Buteo buteo</i> |
| Pallid Harrier | <i>Circus macrourus</i> |
| Crane | <i>Grus grus</i> |
| Broad-Billed Sandpiper | <i>Limicola falcinellus</i> |
| Greenshank | <i>Tringa nebularia</i> |
| Green Sandpiper | <i>Tringa ochropus</i> |
| Wood Sandpiper | <i>Tringa glareola</i> |
| Common Sandpiper | <i>Actitis hypoleucos</i> |
| Little Stint | <i>Calidris minuta</i> |

| Common Name | Scientific Name |
|----------------------|-----------------------------------|
| Dunlin | <i>Calidris alpine</i> |
| Ruff | <i>Philomachus pugnax</i> |
| Black-headed Gull | <i>Chroicocephalus ridibundus</i> |
| Bluethroat | <i>Luscinia svecica</i> |
| Black-tailed Godwit | <i>Limosa limosa</i> |
| Turtle Dove | <i>Streptopelia turtur</i> |
| Hoopoe | <i>Upupa epops</i> |
| Bee-eater | <i>Merops apiaster</i> |
| Crested Lark | <i>Galerida cristata</i> |
| Desert Lark | <i>Ammomanes deserti</i> |
| Hoopoe Lark | <i>Alaemon alaudipes</i> |
| Temminck's Lark | <i>Eremophila bilopha</i> |
| Bar- Tailed Lark | <i>Ammomanes cincturus</i> |
| Barn Swallow | <i>Hirundo rustica</i> |
| Yellow Wagtail | <i>Motacilla flava</i> |
| Northern Wheatear | <i>Oenanthe oenanthe</i> |
| Isabelline Wheatear | <i>Oenanthe isabellina</i> |
| Finshe's Wheatear | <i>Oenanthe finschii</i> |
| Black-Eared Wheatear | <i>Oenanthe hispanica</i> |
| Chiffchaff | <i>Phylloscopus collybita</i> |
| Great Gray Shrike | <i>Lanius excubitor</i> |
| Woodchat Shrike | <i>Lanius senator</i> |
| Red-Backed Shrike | <i>Lanius collurio</i> |
| Trumpeter Finch | <i>Bucanetes githagineus</i> |
| Hill Sparrow | <i>Petronia brachydactyla</i> |

5.4.6 Al Qatafi

This area enjoys gravel Hamada in most of its part, interrupted by small wadi systems with scattered patches of vegetation. It is also surrounded by gentle hilly areas covered by small lava rocks (Figure 19).



Figure 19: Landscape of Al Qatafi area.

Typical small reptiles and mammals as those known from the surrounding Ghamar area are present. Thirty species of birds have been recorded from Al Qatafi. This include some game species such as the Sand Partridge (Table 12).

Table 12: Bird species recoded from Al Qatafi by Green & Thomas (2008).

| Common Name | Species |
|-----------------------------|----------------------------|
| Sand Partridge | <i>Ammoperdix heyi</i> |
| Hen Harrier | <i>Circus cyaneus</i> |
| Long-legged Buzzard | <i>Buteo rufinus</i> |
| Common Crane | <i>Grus grus</i> |
| Little Ringed Plover | <i>Charadrius dubius</i> |
| Lesser Sand Plover | <i>Charadrius mongolus</i> |

| | |
|----------------------------------|---------------------------------|
| Greater Sand Plover | <i>Charadrius leschenaultii</i> |
| Spotted Redshank | <i>Tringa erythropus</i> |
| Green Sandpiper | <i>Tringa ochropus</i> |
| Wood Sandpiper | <i>Tringa glareola</i> |
| Little Stint | <i>Calidris minuta</i> |
| Dunlin | <i>Calidris alpina</i> |
| Ruff | <i>Philomachus pugnax</i> |
| Common Swift | <i>Apus apus</i> |
| Eurasian wryneck | <i>Jynx torquilla</i> |
| Woodchat Shrike | <i>Lanius senator</i> |
| Bimaculated Lark | <i>Melanocorypha bimaculata</i> |
| Dunn's Lark | <i>Eremalauda dunn</i> |
| Eurasian Skylark | <i>Alauda arvensis</i> |
| Graceful Warbler | <i>Prinia gracilis</i> |
| Scrub Warbler | <i>Scotocerca inquieta</i> |
| Eastern Bonelli's Warbler | <i>Phylloscopus orientalis</i> |
| Lesser Whitethroat | <i>Sylvia curruca</i> |
| Common Whitethroat | <i>Sylvia communis</i> |
| Pied Wheatear | <i>Oenanthe pleschanka</i> |
| Black-eared Wheatear | <i>Oenanthe hispanica</i> |
| Desert Wheatear | <i>Oenanthe deserti</i> |
| White-crowned Wheatear | <i>Oenanthe leucopyga</i> |
| Meadow Pipit | <i>Anthus pratensis</i> |
| Corn Bunting | <i>Miliaria calandra</i> |

5.4.7 Buqay'awiyah

This area is considered as a land depression with limited Qa. It is surrounded by black lava stones of different sizes. During winter, flood water covers a substantial part of the area, making a semi-permanent water pool that holds water for most of the year. The most distinctive feature of this area is the presence of a large old tree of the Atlantic Pasticcio, *Pistacia atlantica*. Other common vegetation includes *Anabasis articulata* and *Achillea fragrantissima*.



Figure 20: Historical tree in Al Buqay'awiyah

Several species of reptiles and one species of amphibians have been recorded from this site (Table 13). Key species include the Desert Monitor, *Varanus griseus*.

Table 13: Reptiles and amphibians recorded from Buqay'awiyah

| Family | Scientific Name | Common Name |
|--------|---------------------|-------------|
| Bufo | <i>Bufo viridis</i> | Green Toad |

| | | |
|------------|---------------------------------|-----------------------------|
| Gekkonidae | <i>Hemidactylus dawudazraqi</i> | Mediterranean Gecko |
| | <i>Stenodactylus grandiceps</i> | Jordan Short-fingered Gecko |
| | <i>Ptyodactylus puiseuxi</i> | Levant Fan-footed Gecko |
| Agamidae | <i>Stellagama stellio picea</i> | Black Lava Desert Agama |
| | <i>Trapelus agnetae</i> | Pale Agama |
| Varanidae | <i>Varanus griseus</i> | Desert Monitor |

Several birds have been reported in Buqay'awiyah, some are considered as key species (Table 14). Other species found include Greater Sand Plover, *Charadrius leschenaultia*, the Kentish Plover, *Charadrius alexandrinus*, The Black Kite *Milvus migrans*, The Steppe Eagle *Aquila nipalensis*, the Common Buzzard, *Buteo buteo*, the Desert Lark, *Ammomanes deserti*, the Common Crane, *Grus grus*, the Pied Stilt, *Himantopus himantopus* and The Sand Partridge, *Ammoperdix heyi* (Figure 21).

Table 14: Key birds known from Buqay'awiyah (Source: Important Bird Areas in the Hashemite Kingdom of Jordan, 2000)

| Species | Common Name | Status |
|-------------------------------|---------------------|----------------------------------|
| <i>Chlamydotis undulata</i> | The Houbara Bustard | Globally Threatened |
| <i>Ammoperdix heyi</i> | The Sand Partridge | Species known to the Middle East |
| <i>Recurvirostra avosetta</i> | The Pied Avocet | 1% or more of total bird counts |



Figure 21: The Sand Partridge in the vicinity of Buqay'awiyah.

6 Project Description

6.1 General Description

According to the route plan prepared by Via Nova the starting point will be at the eco-tourism hub which constitute Azraq lodge, Azraq wetland reserve and Shumari Wildlife Reserve. The final destination will be Burqu in the north-eastern edge of the route, not far much from the Syrian borders.

The route order is as illustrated in Figure 22 constitutes, in addition to the on-road/off-road driving within the route; stop over sites, camping area and two eco-tourism hubs one at Azraq and the other in Buqu. The stop over sites are mainly sites of particular eco-tourism and scenic attraction (e.g. wetland, birds, geology, etc.) and the main activities would be limited to short walkovers (probably for an hour or so at each location), birdwatching, photography and seeing, short standing at view points within short route circuits, snakes and coffee breaks, use of rest-rooms, etc.

As for the activities planned/expected at the route driving it is mainly driving and site seeing while driving. The route constitute limited sections of asphalted road and the remaining are dirt roads used frequently by locals, shepherds and others.

At Azraq Wetland Reserve and Shaumari Wildlife Reserve the activities are the same as currently operated which include walkovers, visitor centre activities (nature shop, coffee and snacks, rest rooms, training/meeting room). Such activities are limited to day time, however night safari are occasionally practiced in Shaumari Reserve.

Accommodation, food and drinks services are limited to Azraq lodge, Buqu lodge and the camp site at Al Wisad area. More details about the project can be found in the ETDP Document (2015).

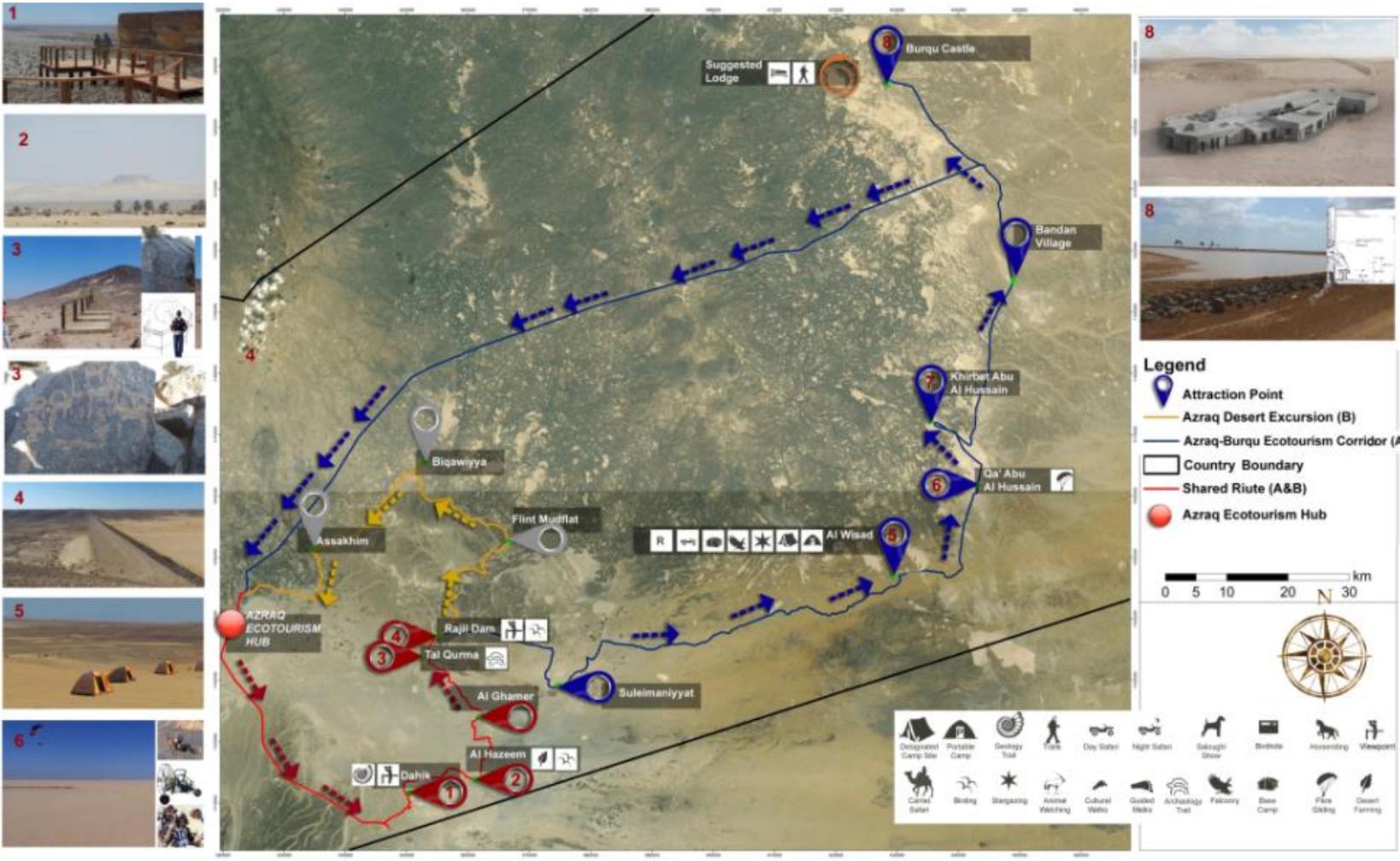


Figure 22: Proposed eco-tourism corridor (ETDP, 2015)

6.2 Assumptions

The following summarizes the assumptions considered as part of the overall comprehension of the proposed development and accordingly for the assessment of the development anticipated impacts on the environmental and socio-economic receptors.

6.2.1 Components and Responsibilities

- The proposed corridor constitutes construction and operation phases.
- The construction and operation phases are the responsibility of RSCN.
- RSCN may hire/employ local CSOs or private sector for the management of eco-tourism facilities and operations.

6.2.2 Location, Routes, Facilities and Occupancy Rates

- The provided tourism routes are final (see the Corridor description section for more details).
- Construction works subject to this EMP are understood to be limited to:
 - Construction of Burqu Eco lodge: 1,266Sqm Eco lodge (1.224Sqm of roofed area and 42sqm of unroofed area) in an area with view of Burqu' castle. The lodge will feature a desert-inspired architecture and will include 12 room.
 - Construction of wooden view point platform at Al Dahik location can serve as a view point for the stunning surrounding landscape.
 - Al Wisad campsite will include the construction of 85sqm kitchen area & the construction of 68sqm (10.6 m X 8.6m) separate Male & Female Toilets & Shower Facilities. The base camp at Al Wisad will be equipped with Ready Portable Tent Platforms for 20 visitors.
 - Construction of stone and cement based access stairs to deliver visitors to the top of Qurma
- The detailed specifications for Campsite facilities, Al Dahik platform and Qurma access stairs are yet to be prepared by the PTDR Consultant.
- The location for the construction of Burqu lodge and the camp site are not yet determined and the RSCN is still in the process of identifying the required land for the lodge in cooperation with Ministry of Environment.
- Burqu is a proposed protected area and its boundaries are not yet finalized. On this regard it shall be noted that according to RSCN, and in all cases, the lodge will not be established close to the castle and proposed protected area.
- Azraq Lodge is already constructed and operational with 16 rooms. Occupancy rate of the lodge averaged 29% in year 2013, and high season occupancy which was estimated at 36%. Occupancy rate estimated by EDTP during high season is 40%

- It is estimated that the proposed lodge will enjoy an average occupancy rates of 30% during high season and 15% during low season, averaging 23% year-round. Occupancy growth was forecasted to grow at 5% annually, reaching a maximum achievable capacity of 40%.

6.2.3 Number of visitors and accommodation nights

For the purpose of environmental assessment we assume that the operations may constitute, for low and high seasons, three groups of visitors staying at and using accommodation services/facilities at Azraq Lodge, Al Wisad Base Camp and Burqu Lodge on the same day at the same time. This assumption is based on very optimistic / best case scenario for operations which is also considered as the worst case scenario from environmental perspective given the relationship between impacts versus number of visitors relationship.

The feasibility study used benchmark with Azraq lodge to estimate rooms occupancy rates, and it was assumed that 80% of rooms at Burqu will have single occupancy at any given time, while 20% will have double occupancy. Regarding the campsite, only travellers across route A will sleep at the campsite; i.e. will be the same as for Burqu Eco lodge.

The following estimates of the number of tourists within the route are obtained from the PTDRA thus to calculate the maximum possible / anticipated waste generation and water consumption volumes.

| Monthly Occupancy | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 |
|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| Average | 16% | 28% | 33% | 38% | 40% | 40% | 40% | 40% | 40% | 40% |
| Mar | 12% | 21% | 25% | 28% | 30% | 30% | 30% | 30% | 30% | 30% |
| Apr | 23% | 40% | 47% | 54% | 58% | 58% | 58% | 58% | 58% | 58% |
| May | 20% | 35% | 41% | 48% | 51% | 51% | 51% | 51% | 51% | 51% |
| Jun | 18% | 32% | 38% | 44% | 47% | 47% | 47% | 47% | 47% | 47% |
| Jul | 7% | 12% | 14% | 17% | 18% | 18% | 18% | 18% | 18% | 18% |
| Aug | 7% | 13% | 15% | 18% | 19% | 19% | 19% | 19% | 19% | 19% |
| Sep | 12% | 21% | 24% | 28% | 30% | 30% | 30% | 30% | 30% | 30% |
| Oct | 18% | 32% | 38% | 43% | 46% | 46% | 46% | 46% | 46% | 46% |
| Nov | 23% | 39% | 47% | 54% | 57% | 57% | 57% | 57% | 57% | 57% |
| Dec | 17% | 30% | 36% | 41% | 44% | 44% | 44% | 44% | 44% | 44% |

| Number of visitors | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 |
|--------------------|------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Total | 680 | 1,188 | 1,404 | 1,620 | 1,728 | 1,728 | 1,728 | 1,728 | 1,728 | 1,728 |
| Mar | 52 | 90 | 106 | 123 | 131 | 131 | 131 | 131 | 131 | 131 |
| Apr | 99 | 172 | 203 | 235 | 250 | 250 | 250 | 250 | 250 | 250 |
| May | 87 | 152 | 179 | 207 | 220 | 220 | 220 | 220 | 220 | 220 |
| Jun | 80 | 139 | 164 | 189 | 202 | 202 | 202 | 202 | 202 | 202 |
| Jul | 30 | 53 | 63 | 72 | 77 | 77 | 77 | 77 | 77 | 77 |
| Aug | 32 | 56 | 66 | 76 | 81 | 81 | 81 | 81 | 81 | 81 |
| Sep | 51 | 89 | 105 | 121 | 129 | 129 | 129 | 129 | 129 | 129 |
| Oct | 79 | 137 | 162 | 187 | 200 | 200 | 200 | 200 | 200 | 200 |
| Nov | 98 | 170 | 201 | 232 | 248 | 248 | 248 | 248 | 248 | 248 |
| Dec | 75 | 130 | 154 | 177 | 189 | 189 | 189 | 189 | 189 | 189 |

Regarding the campsite, only travellers across route A will sleep at the campsite.

| Total Passengers | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 |
|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| Route A | 136 | 238 | 281 | 324 | 346 | 346 | 346 | 346 | 346 | 346 |

6.2.4 Water Supply and Energy

As provided in the EDTP,

- Fresh water is assumed to be obtained for Burqu lodge and for Al Wisad base camp from perched aquifers located at Biyar el Ghussein, Biyar el Mahdath and Biyar el Khudari in Al Ashqaf Area. Burqu Lodge water supply will be purchased from the local communities and will be provided through water tanks supply. Water supply for Azraq lodge is through the local freshwater network operated by the Water Authority. We also assume that the Corridor does not have plans to operate fresh water treatment system.
- Azraq lodge currently obtains electricity from the national grid, however solar panels will be purchased and installed at Azraq lodge in the next couple of months. As for Burqu lodge it is assumed that there will be use of solar energy panels to generate electricity for the facility in addition to an emergency diesel-based electricity generators. As for the base camp, we assume that solar panels will be installed for minimum use (charging cell phone, small fridge, etc.)

6.2.5 Waste management

- Construction waste is to be used as much as possible as fill material, however if such re-use is not possible, then recoverable materials (e.g. metal) are to be separated and transferred to the nearest recycling facility. Residual construction waste is assumed to be temporarily stored (piled) within pre-selected parcel close to the construction site for short duration (i.e. less than a month) and then transferred to the closest landfill in Ruwashed area. As far as we know Ruwashed waste disposal facility is operated as open dumpster and is not a proper lined landfill, however this is the only option available.
- workers domestic waste is assumed to be collected and transferred every day or two to the closest waste disposal facility.
- Solid waste expected from the operations are assumed to be collected daily basis and transferred to the closest waste disposal facility. The volume of waste expected will be calculated based on average generation rate of one kilogram per day per person and its composition is assumed to constitute at least 70% organic matter. The remaining 30% are assumed to include plastic and other non-hazardous waste.
- Hazardous waste is expected to be limited to household chemicals (e.g. washing detergents, detergent containers, etc.).
- Waste water expected from the operations will be calculated by assuming average daily consumption of 170 liters of fresh water per person per day for all domestic purposes. Reject waste water is estimated at two thirds of consumption (66.66%, equaling 113.32 liters per person per day) which will include grey water from hand washing, showers, dishwashing, cloths washing, facility cleaning, etc. and blackwater from the toilets.
- It is assumed that Burque facility will include grey water separation and reuse system in addition to waste water treatment unit. As for Azraq lodge we understand that it is already connected to sewer collection system. Accordingly we assume that the Corridor will not establish or use cesspits or cesspools in the two locations.
- As for the base camp at Al Wisad, we assume that use cesspits or cesspools will be used.

6.2.6 Number of vehicles operated within the corridor

The number of vehicles assumed to be operated within the corridor on every day basis include four off-road vehicles for the visitors across the routes, one pickup for the Burqu lodge and one mini bus for labor transport.

7 Assessment of Anticipated Impacts

7.1 Approach

Environmental and socio-economic impacts likely to result from the proposed Corridor are discussed in this chapter taking into account causality of the impact. More specifically, proposed Corridor activities may cause direct or indirect stress on the environmental and socio-economic receptors of the host environment, and consequently the stress causes impact on one or more environmental receptor.

The evaluation of impacts significance follows the methods explained below, and it meets the requirements of the EIA regulation in Jordan, and complies with best international practices including the World Bank Operational Policy for EIA (OP/BP 4.01).

The adopted methodology in the evaluation of the impacts of the proposed Corridor is based on the appreciation of a synthesis indicator which constitutes the significance of the impact. This indicator gives a judgment on the importance of the gains and losses for the natural and human components of the environment related to the proposed activities. The established judgment represents the integrated result of three components, including the intensity, the extent and the duration of the impact. Figure 23 graphically presents the main process allowing the impact evaluation.

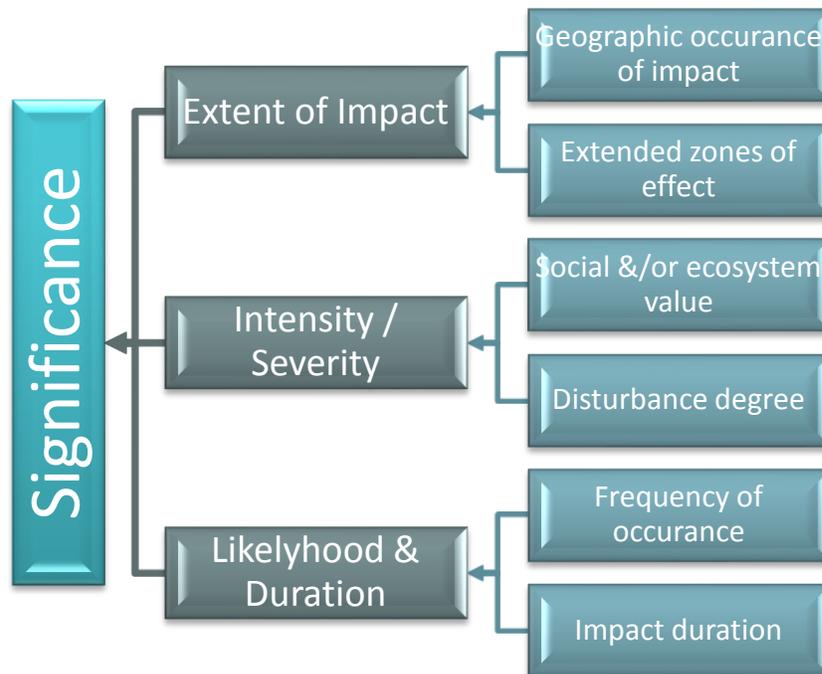


Figure 23 : Procedure of Impact Evaluation

The identification and listing of anticipated impacts for the scoped-in Valued Environmental Components (VECs) took into account the activities likely to cause the impacts and affected environmental sensitive receptors and areas. Anticipated impacts were listed out against each

aspect/VEC and then was followed by aspects evaluation on a risk basis, taking into consideration both the severity of the aspect (mainly as extent and intensity) and its likelihood occurrence (mainly as duration of impact occurrence potential). From this, each aspect was assigned a significance ranking of High, Medium, or Low based on relative risk, as outlined in Environmental Aspect Relative Risk and Significance Matrix.

7.1.1 Intensity / Severity

The impact intensity and severity shows the relative significance of the consequences attributable to the observed alteration of a component. It compiles the social and the ecosystem value of the component along with the anticipated disturbance degree of this component.

The combination of the disturbance degree and the value assigned to the component allows obtaining three levels of impact intensity: high, moderate and low.

- **Very High**, when the impact severally and near completely modifies the quality or significantly limits the usage of a component presenting a main interest and exceptional qualities, whose conservation or protection are subject to a formal legislation or a general consensus. Sever negative impact on environment with potential long term effects (Score = 5).
- **High**, when the impact highly modifies the quality or significantly limits the usage of a component presenting a main interest and exceptional qualities, whose conservation or protection are subject to a formal legislation or a general consensus. High negative impact on environment with potential long term effects (Score = 4).
- **Moderate**, when the impact reduces the quality or the usage of the component having a certain social value and/or recognizable qualities without necessarily compromising its integrity. Moderate negative impact on environment with short term effects (Score = 3).
- **Slight / Low**, when the impact modifies only in a little manner the quality, the usage or the integrity of an environmental component whose interest and quality do not constitute any growing concern. Minor negative impact on environment without any noticeable effects (Score = 2).
- **Negligible**, when there is no negative impact or when the impact modifies only in a very little manner the quality, the usage or the integrity of an environmental component whose interest and quality do not constitute any growing concern and as long as there is immediate recovery of the affected VEC. No negative impact on environment or almost immediate recovery (Score = 1).

7.1.2 Extent

The impact extent stands for the range or the spatial coverage of the effects generated by the intervention on the site. This concept refers either a distance or a surface over which the observed modifications felt by a component or else by the proportion of population being

touched by these modifications. The three levels, being considered in quantifying the impact extent are:

- **Regional extent**, when the impact affects a wide space or many components, being located within an important distance of the Corridor or being felt by the whole population or by a large proportion of the population of the study area;
- **Local extent**, when the impact affects a relatively limited space or a certain number of components located inside, nearby or at a certain distance from the Corridor site, or when it is felt by a limited proportion of the population in the study area (i.e. a village);
- **Site Specific**, when the impact affects only a very limited space or a component being located inside or nearby the Corridor site, or it is felt only by a limited number of Individuals of the study area.

7.1.3 Likelihood and Duration

Likelihood of an impact is referred to the occurrence potential of the respective impact as a direct or indirect result of the Corridor development or one of its components/activities, the frequency of occurrence of similar impacts during a period of a year or five years from similar projects/developments/technology. Likelihood scoring of environmental aspects and impacts is to be arranged as follow:

- **Very Unlikely**, Occurred or heard of in the eco-tourism industry but never occurred in the developer (i.e. RSCN) (Score = 1)
- **Unlikely**, Has occurred in the developer but not more than once in 10 Years (Score = 2)
- **Possible**, Has occurred in the developer not more than once in 5 Years (Score = 3)
- **Likely**, Has occurred in the developer not more than once per year (Score = 4)
- **Very Likely**, Has occurred more than once per year in the developer (Score = 5)

The impact duration indicates its time extent, defined as being the period of time during which the imposed modifications will be felt by a developer. The used method distinguishes the following impacts:

- **Permanent**, whose effects are felt in a continuous manner during the service life of the equipment/activity or even beyond ;
- **Temporary**, whose effects are felt during a limited time period, generally corresponding to the construction period.

7.1.4 Significance

The interaction between the severity/intensity and likelihood allows to define the significance level of the impact affecting components touched by the Corridor. Table 15 presents the environmental aspect relative impact matrix adopted by this EMP to evaluate the significance of anticipated impacts.

Table 15: Environmental Aspect Relative Impact Matrix

| | | Severity | | | | |
|------------------|-------------------|----------------|-------------|--------------|-------------|---------------|
| | | Negligible (1) | Slight (2) | Moderate (3) | High (4) | Very high (5) |
| Likelihood Score | Very Unlikely (1) | LOW (1) | LOW (2) | LOW (3) | LOW (4) | MEDIUM (5) |
| | Unlikely (2) | LOW (2) | LOW (4) | LOW (6) | MEDIUM (8) | MEDIUM (10) |
| | Possible (3) | LOW (3) | LOW (6) | MEDIUM (9) | MEDIUM (12) | HIGH (15) |
| | Likely (4) | LOW (4) | MEDIUM (8) | MEDIUM (12) | HIGH (16) | HIGH (20) |
| | Very Likely (5) | LOW (5) | MEDIUM (10) | HIGH (15) | HIGH (20) | HIGH (25) |

7.2 Impacts Assessment Results

Impacts assessment matrix was prepared to provide summary of impacts anticipated from the Corridor/programme preparation/construction and operation phases respectively. Both tables briefly explains anticipated impacts, impacts sources and causes, receptors and magnitude for each identified and scoped-in valued environmental component (VEC). This matrix is provide in the stand-alone EMP None-Technical Summary (Appendix 1). Detailed account of assessed impacts is provided in the sections below.

It is important to note that the assessment of magnitude is provided as a range (either low to medium, or medium to high significance) for some of the anticipated impacts. This is mainly due, from one hand, to the fact that difference receptors react differently to the same stressor, and from the other hand that the level of stress anticipated is variable from one case to the other depending on the scale of stress on the receptors (e.g. number of vehicles on the track, frequency of off-roading from the main track, number of tourists, etc.) and also depending on compliance with the management and mitigation measures designed to address such impacts.

7.3 Impacts Anticipated During Construction

7.3.1 Physical Environment

7.3.1.1 Anticipated Impacts from Construction Works and Contractors Camps

Following are the potential impacts that may result during the construction phase from construction works and contractors camp if arranged within Burqu area and not at Ruwashed town.

❖ **Disturbance of Natural Landscape**

Such impact may occur during the construction and operations of the Corridor camps due to the following implemented activities

- The excavation works for constructing both of the construction/contractor camp.
- Preparing the temporary access roads to the camps (if required)
- Piles formulation by materials excavated through land preparation, and by different types of spoils and surplus materials.
- The accumulation of solid wastes that will result from different construction activities during this phase.
- Domestic fluid and solid wastes that will be generated by the Corridor staff during the operation stage of the camps.
- The movement of Corridor vehicles/machinery from and to the Corridor facilities.

Such impact is evaluated to be local (site specific extent), of low intensity, temporary, and thus, the overall significance of the said impact is very low.

❖ **Deteriorating Soil's Surface Layer**

Site preparation at the proposed construction sites of the proposed facilities in addition to off-roading are expected to cause important perturbations on soil, which are light and exposed to intense erosion effects. The impact is expected at the construction sites and across the route for movement of vehicles. Nevertheless, the sedimentary dynamics, controlled by the wind effects, will re-establish the upper soil's layer profiles in the long term. Therefore the impact intensity is considered as low, with temporary duration and regional extent, thus, the significance of the impact is evaluated as low.

❖ **Polluting Soil**

Soil pollution may result during the construction and preparation of the main camp due to the accidental spillage of any construction fluid materials such as paints or the spillage of oil /fuel from construction machinery. Its impacts on the soil are expected to be minimal, especially if the spillage or the leakage was cleaned immediately or within the short time interval.

While during camps operation phase, soil pollution may occur from inappropriate management of generated fluid and solid wastes by the workforce. Furthermore, soil pollution may occur due

to inappropriate management of fluid and solid wastes generated from daily operations of the camp workshops and maintenance yards that will be established in the Corridor camps.

Such impact is evaluated to be of low intensity, temporary, and with site specific extent, thus, the overall significance of the said impact is very low.

❖ **Polluting Natural Water Resources**

Natural surface water resources are all intermittent for very short duration and come in the form of flash floods consequent to short-duration and high-intensity rain, which in turn are of low frequency. Perhaps with exception to Burqu basin and the desert dams and water harvesting basins constructed by the Ministry of Agriculture and the Ministry of Water and Irrigation in many localities within the Badia of Jordan.

Therefore it is anticipated the impacts related to pollution from the construction and operations by the proposed Corridor are possible but of low significance.

As for groundwater, contamination might result (similar to soil) from possible accidental spillage of construction fluid materials such as paints or the spillage of machinery oil /fuel. While during the operation phase, groundwater pollution may occur from inappropriate management of fluid and solid wastes generated by the workforce in the Corridor facilities and camps. Furthermore, the inappropriate management of Corridor generated fluid and solid wastes daily operations is also considered possible but of low to medium significance, if it happens.

In general, such impacts on the groundwater resources are expected to be minimal as the depth to groundwater level within the main groundwater aquifer/s in the Corridor camps areas exceeds to more than 100m. Nevertheless, the possible pollution of the shallow groundwater bodies within the Corridor area needs to be taken into consideration. Thus, such impact is expected to be of low intensity especially if the spillage or the leakage was cleaned immediately or within the short time interval. Also, this impact is, limited to the construction areas and camp sites and temporary as it is related to the implementation phase of the Corridor. Accordingly, such impact is of very low significant.

❖ **Overconsumption of Water**

Such impact is not anticipated during the construction phase given that the number of workers at the site is not anticipated to exceed 20 at any given day. Assuming 20 workers per day, demand on fresh water for labour uses based on a daily per capita of 170 l per day will be 3.4 m³ per day to cover all water demands by the Corridor workers and for general cleaning purposes. Water demand for construction works cannot be estimated at this stage of the study.

Such impact is evaluated to be insignificant.

❖ **Mismanagement of Generated Solid Wastes**

- **Non-hazardous solid wastes** and include :
 - Domestic solid wastes that will result by the construction activities and the workers/contractor camp users. To calculate the expected maximum volume of the said wastes, the following scenario is applied for the sake of this assessment:
 - The figure 1.37 kg/capita/day¹ as the overall daily solid waste produced per capita at household level, however from practice it is estimated that workers generate about 1.0 37 kg/capita/day , and
 - 20 persons as the maximum number of the Corridor workers whom will be active in the construction site and/or contractor camp.
 - Accordingly, the maximum estimated volume of solid wastes that will be resulted on daily bases is 20 Kg.
 - Non-combustible & combustible waste generated due to the different conducted works at the Corridor camps ; and might include debris, bricks, concrete aggregates and scrap metal ; waste paper, wood , plastic and cardboard
- **Hazardous waste** such, paint cans and empty chemical containers

Absence of or noncompliance with appropriate solid wastes management system, the accumulation of the above defined types of solid wastes will have a direct negative impact on the surrounding environment and on workers and public health. If not avoided (i.e. occurrence of mismanagement), then such impact is likely to occur with low to moderate intensity (taken into consideration the number of workers & and the duration of the Corridor that will be close to one year), with site specific extent and temporary duration; thus; the said impact will be of low significance.

❖ **Fluid Wastes Generation**

During this phase the expected fluid wastes stream to be resulted include:

- Domestic fluid wastes generated by the work force. By assuming that 2/3 of the consumed water for domestic demands will end as fluid waste, thus the maximum expected volume of fluid wastes that will result on daily bases is about 2.267 m³/day.
- Fluid wastes that might result from the regular cleaning processes at the different parts of the Corridor.
- Hazardous fluid wastes, such as the used oils and lubricants that results from the regular maintenance operation for the Corridor machinery and vehicles.

¹ A.Al Yaqout & M.Hamoda: Prediction of Contaminants Migration at unlined landfill sites in An Arid Climate – a Case Study – Water, Air & soil Pollution, 2005, V.162, No.1-4.

Absence of appropriate fluid wastes management system will increase the possibility of occurrence of negative impacts on the surrounding environment and to public health. In conclusion, such impact is possible to occur with moderate intensity (taken into consideration the number of workers & and the duration of the Corridor construction works that will be close to one year), with site specific extent and temporary duration; thus; the said impact will be of low significance.

❖ **Impact on Air Quality**

The atmospheric emissions from land preparation and construction activities will result from mobile equipment (trucks, bulldozers) and power generation sources. Emissions will be constituted of NO_x, SO₂, CO and TSP. In addition and during line clearance dust will be generated and may be made worse due to strong winds.

The construction contractors needs to ensure that equipment is fit to purpose, in good condition and well maintained to minimize atmospheric emissions. In addition, the combined effects of the wind and the high temperature of exhaust gases will facilitate a rapid dispersion of atmospheric pollutants.

Taking into account the overall climatological conditions within the summer time and the limited number of equipment used in the Corridor construction activities and the fact that all operations will be conducted in areas away from the populated areas, thus, such impact is evaluated to be of low significance, temporary, and of regional extent, thus, the overall significance of the said impact is low.

❖ **Impacts of Noise**

During the construction phase, the use of heavy machinery and equipment naturally generates noise. Hence wildlife within the Corridor area are considered sensitive to similar impacts, therefore such impacts can be of low to medium significance on wildlife. Noise levels expected from heavy machineries and construction works are expected to range between 70 dB and 110 dB.

7.3.1.2 Aesthetic and Scenic

Generally the proposed construction components of the Corridor are not expected to cause negative aesthetic and scenic impacts, on the contrary, it is expected to positively contribute to scenic attractions for the best interest of visitors. Exception to this is possible from the construction of Burqu eco-lodge in an area that cause visual impact on the castle and the landscape. However t=since the lodge location is not yet determined accordingly site selection criteria can be applied to avoid such impacts.

7.3.2 Socio-economic

7.3.2.1 Involuntary Resettlement

The Corridor demand for land is limited to the proposed facilities at Burqu, Al Wisad, Qurma and Ad-Dahik. According to the project management the targeted land parcels are all governmentally owned. Also, the proposed Corridor is not expected to compulsory acquire any land, restrict access to areas or to cause resettlement.

7.3.2.2 Employment, Income and Poverty

The proposed Corridor is expected to create temporary jobs for the construction works and as guards, it is assumed that between 20 and 30 temporary jobs will be available for construction workers and guards for a period of about one year. Wages for similar works is about JOD 300 for guards (usually monthly instalments), and about 25 to 35 JOD per worker per day for the construction workers (usually daily basis). However it is not expected to see many locals working in construction, and it is expected that most of the construction workers will be non-Jordanians, while the guards are expected to be locals.

7.3.2.3 Safety and Security

❖ “ OHSE” threats To The Work force Due To The Weak Implementation Of The Corridor “OHSE” Plan

The following threats for the occupational health and safety of the Corridor workers and the locals might occur in the absence of a comprehensive “OHSE” plan:

- Different types of work incidents that might occur for the Corridor workers during the preparation and construction of the Corridor camps, that usually result from the following hazards:
 - Work at height
 - Sunstrokes.
 - Electrical shocks
 - Wrong usage of electro-mechanical equipment
 - Traffic accidents

While the following incidents may occur due to workers misconduct:

- Incidents related to the low hygiene level in the Corridor camps and include such as food poisoning.

- Fire incidents at the camp site
- Different types of incidents that might occur for the workers in the outdoor, as a result of :
 - Work under heat stress, taking into consideration the weather conditions during the summer time in Eastern badia of Jordan.
 - Use dangerous equipment and tools.
 - Sunstroke: Workers can be subjected to sunstrokes during long work periods under the sun without wearing appropriate PPEs and without drinking enough quantities of water.
- Traffic accidents due to over speeding on-road and off-road.

As an overall evaluation, any of the above listed hazards are likely to occur (without the implementation of the appropriate occupational health and safety plan and procedures). Furthermore, it was decided to consider the intensity of such hazards to be high due to the fact that, many of these hazards can cause human fatality, while the extent is considered local and the duration temporary, thus, such issue is considered to be of moderate to high significance.

❖ **Safety Risks / Incidents For The Public**

Such risks may result from driving risks, or getting into proximity of risky points at the construction sites. Overall, the said impact is considered of low to medium intensity with regional extent and temporary duration, thus, its significance is considered relatively low.

7.3.3 Biological Environment

7.3.3.1 Impacts on Habitats

- **Habitat loss and fragmentation:** significant land preparation and construction works/activities are limited to Burqu eco-lodge and Al Wisad campsite, and it is likely to result in removal of vegetation (due mainly to site clearance) within the sensitive ecological areas and as such cause deleterious changes in the biological habitats within the operations zones in these areas. The magnitude of this impact is anticipated to be of low to medium significance within the proposed construction areas, and of low significance elsewhere along the route.
- **Noise and vibration:** where increased and elevated noise levels are expected to cause disturbance to wildlife. Noting that Local fauna in the area is generally mobile and tends to move away from sources of disturbance, therefore the magnitude within the IBAs and protected areas is expected to be moderate to high, however it is anticipated to be of low significance within non-construction areas along the corridor. At the construction site of Burqu and Al Wisad, construction and machinery noise is likely to range between 65 dB and 110 dB, elsewhere noise levels are likely to be ambient with short duration

higher noise from the movement of construction machineries and Corridor vehicles to the construction sites. Within the ecologically sensitive areas the magnitude of impact will become high during the breeding season, and in particular the breeding seasons for mammals and birds discussed in the baseline section.

7.3.3.2 Impacts on Species Diversity and Abundance

The proposed Corridor is not expected to cause impacts on species diversity and abundance in the proposed Corridor areas. This should be read with caution that the exact location for the construction of Burqu eco-lodge is not yet determined and shall be subject to ecological assessment and application of the selection criteria discussed in the mitigation chapter of this document.

7.3.3.3 Collection of Biodiversity (Hunting, collection of plants, etc.)

Increased hunting pressure is possible however is assumed to be avoided and of significance due to the strict measures set by the Corridor. If non-compliance occur then the magnitude of such impact can be moderately significant within the terrestrial habitats of the IBAs and non-protected areas (given scale of non-compliance and the characteristics of violations), and of low significance elsewhere given the current severe deterioration of the biological environment almost all over the territories outside the sensitive ecological areas mentioned. The magnitude of this impact is totally dependent on the enforcement of strict mitigation measure like strict prohibition of unnecessary and unplanned off-road driving, strict prohibition of shooting and active taking of animals and birds, active enforcement of relevant hunting regulations in addition to other measures.

7.3.4 Archaeology and Cultural Heritage

The proposed study area shows a number of archaeological and cultural heritage resources including Burqu Castel, Tel Qurma and a number of abandoned police stations. These are assessed to be at no or low risk from the proposed Corridor operations as long as the proposed construction of Burqu eco-lodge is in a safe distance from the castle and accordingly the castle will not be impacted by dusting, vibrations, etc.

It should also be noted that the identified eco-tourism corridor, and based on history of the area, holds relatively moderate potential for chance find of archaeological remains, and perhaps sites which could not be revealed until today due to the limitation of archaeological exploration studies over such a vast area of land. The castle and tel Qurma are perhaps the most important locations of such moderate potentials.

7.4 Impacts Anticipated During Operation

7.4.1 Physical Environment

7.4.1.1 Geomorphology and Topography related impacts

The proposed Corridor is not expected to cause impacts related to the topography and geomorphology of the accessed areas due to Corridor activities in the operation phase.

7.4.1.2 Land Use

Impacts related to land use in the area are particularly related to Corridor ability to grow eco-tourism sector in the Corridor areas, development and enforcement of land use policies and regulations by the government, and the awareness of locals.

In case of lacking adequate and efficient land use regulations and enforcement by the government, and once the Corridor witness substantial growth in the number of tourists visiting the area and using the facilities, this might attract investors and locals to create facilities (camp sites, lodges, etc.) within the proposed eco-tourism corridor. Such activities are likely to be deleterious and cause impacts to land use in the area, and consequently to biodiversity.

7.4.1.3 Water Resource

Corridor demand for water for its operations is limited to the capacity of facilities and the number of personnel expected in the site. Overall, the highest demand expected in case of 100% occupancy of Burqu lodge (80% single occupancy) and Al Wisad campsite on the same day, and by assuming 20 staff members, and assuming demand of 170 l per capita per day for all operations, accordingly the daily demand by all Corridor operations will be 9.25 m³. This demand is considerate of insignificant impact to water resources in the area.

7.4.1.4 Waste and Pollution

Corridor operations is limited to the capacity of facilities and the number of personnel expected in the site. Overall, the highest expected generation of waste in case of 100% occupancy of Burqu lodge (80% single occupancy) and Al Wisad campsite on the same day, and by assuming 20 staff members, and assuming generation of of 1 kg per capita per day for all operations, accordingly the daily demand by all Corridor operations will be 54.4 kg. This volume of waste is likely to constitute 70% organic matter and it is considerate of low to moderate impact depending n compliance with the best practices in solid waste management.

As for pollution, this is not expected from Corridor operations.

7.4.1.5 Air Quality

Impacts to air quality due to operations in the proposed facilities and movement of eco-tourism vehicles along the corridor are expected to be insignificant.

7.4.1.6 Noise

Impacts to air quality due to operations in the proposed facilities and movement of eco-tourism vehicles along the corridor are expected to be insignificant.

7.4.2 Socio-economic

7.4.2.1 Employment, Income and Poverty

The proposed Corridor is expected to create temporary jobs for the construction works and as guards, it is assumed that between 20 and 30 temporary jobs will be available for construction workers and guards for a period of about one year. Wages for similar works is about JOD 300 for guards (usually monthly instalments), and about 25 to 35 JOD per worker per day for the construction workers (usually daily basis). However it is not expected to see many locals working in construction, and it is expected that most of the construction workers will be non-Jordanians, while the guards are expected to be locals.

It should be noted that the targeted areas are among Jordan areas with highest poverty and unemployment rates. Accordingly the proposed Corridor is expected to positively contribute to addressing these problems.

As for the operation phase, the proposed Corridor is expected to create about 20 full time jobs for eco-tourism operations. Wages will range from JOD 250 to JOD 500. Indirect beneficiaries from these full time jobs are the dependants of the employees, and by using the average family size of seven for these areas, and assuming that all of them are dependants on the employee, accordingly it is estimated that the indirect beneficiaries are about 120 persons.

7.4.2.2 Safety and Security

Safety and security risks are mainly anticipated to be associated with the following:

- Incidents related to the low hygiene level in the Corridor camps and include such as food poisoning.
- Fire incidents at the camp site or lodge.
- Different types of incidents that might occur for the outdoor activities, as a result of :
 - Work under heat stress, taking into consideration the weather conditions during the summer time in Eastern badia of Jordan.

- Accidents during walkovers and hiking.
- Sunstroke: Visitors and staff can be subjected to sunstrokes during long hiking periods under the sun without wearing appropriate PPEs and without drinking enough quantities of water.
- Poisoning from animal bits.
- Traffic accidents due to over speeding on-road and off-road, improper driver behavior, etc..

As an overall evaluation, any of the above listed hazards are likely to occur (without the implementation of the appropriate occupational health and safety plan and procedures). Furthermore, it was decided to consider the intensity of such hazards to be high due to the fact that, many of these hazards can cause human fatality, while the extent is considered local and the duration temporary, thus, such issue is considered to be of moderate to high significance.

7.4.3 Biological Environment

7.4.3.1 Impacts on Habitats

The ecological footprint of the eco-tourism excursions is limited to the excursions route (driving by car, walking on foot or riding animals). Off-roading beyond designed and existing tracks will cause impacts on habitat equal to the area affected, however this is expected to be minimal.

7.4.3.2 Impacts on Species Diversity and Abundance

Disturbance to wildlife, especially during their breeding seasons remains a possibility but given the proposed Corridor activities and management approach, and also the number of visitors expected, such impacts are assumed to have low intensity and of low magnitude.

7.4.3.3 Collection of Biodiversity (Hunting, collection of plants, etc.)

Collection of wildlife shall be prohibited, and accordingly the impact of such activities totally depend on tourists behaviour and enforcement of such prohibition.

8 Environmental Management Plan

The Environmental and Social Management Plan (EMP) detailed below deliberates the mitigation and monitoring activities suggested against the assessed anticipated impacts to be generated by the intended Corridor/programme. This plan also describes the management objectives, responsibilities and frameworks of actions for implementing the ESA mitigation and monitoring activities.

This management plan takes into account information available from studies and planning documents prepared by the project prior to the commencement of EMP preparation. This include the Eco-tourism Development Plan (ETDP), and the Corridor Socio-economic Study. It also uses information available from secondary sources including published books, technical reports and scientific papers.

In particular with regard to socio-economic impacts, the following can be summarized:

- Based on the information available from the Corridor planning documents and the ETDP, the proposed Corridor is not expected to encounter involuntary resettlement or any resettlement-like activities.
- The results of the social assessment revealed that the majority of the anticipated impacts were positive in nature.
- The proposed Corridor is planned to address benefit-sharing requirements by engaging local civil society organizations in the development and implementation of the eco-tourism programme and services, and accordingly to benefit from the returns on investment as operators, in addition, the Corridor will hire and train locals to work in the Corridor/programme, and will consider additional means of benefit sharing with the communities.

This EMP notes the following policy considerations and track records of similar programmes by the implementing organization; RSCN:

- The RSCN policy is to integrate local communities in the development and implementation of its programs and projects. Even more, the RSCN recognizes local communities as partners in conserving nature within their territories and works extensively in educating and empowering these communities to ensure more productive and successful environmental management;
- Seven successful cases from similar RSCN experiences in Jordan including Azraq area (Shaumary Wildlife and Azraq Wetland Reserves), Al Yarmouk reserve, Ajlune Reserve and Dibeem reserve in northern parts of Jordan, Dana and Mujib reserves located in the Jordan Rift Valley and southern highlands All these protected areas and its eco-tourism programmes demonstrate clearly RSCN's commitment to its declared policy, where the rights of locals living in the established reserves or its surroundings have been protected, including grazing rights in well-developed grazing plans.

- The project work approach described in the EDTP will be to involve local communities and work closely with them in the development and operation of the eco-tourism programme. This is expected to constitute capacity building and strengthening of civil society organizations along the eco-tourism corridor.
- RSCN successfully implemented many projects funded by the GEF/World Bank, GEF/UNDP and USAID which all required full compliance with applicable national regulations, World Bank Operational Policies and/or IFC Performance Standards. This include those related to EIA, Involuntary Resettlement and Indigenous Communities.

8.1 Rationale and Justification

ETDP is key consultancy of component one of the Jordan Badia Ecosystem and Livelihoods Project (BELP), noting that BELP is being implemented in Ma'an and Mafraq governorates under the regional MENA Desert Ecosystems and Livelihoods Program (MENA-DELP). The goal BELP is to capture and harness the value of desert ecosystems in order to optimize the flow of goods and services for environmentally and socially sound development of deserts.

The intended project; i.e. ETDP, is defined as an environmental management project as the Corridor activities are designed to (1) enhance eco-tourism as economic alternative to existing ecosystem threatening businesses (overgrazing, wood cutting, hunting, farming in fragile habitat and soil, etc.), (2) encourage environmentally sound tourism in replacement of existing unsustainable tourism, (3) and to capitalize on eco-tourism potentials of the targeted corridor to efficiently contribute to improved livelihood of the locals and to nature conservation programmes in the eastern badia of Jordan.

The key principle behind EMP development is ensuring appropriate, wise and conscious implementation of the proposed mitigation and monitoring measures in order to ensure environmentally sound development.

EMP is integrated in nature since it recognizes all environmental components and addresses a set of considerations important to management and must be factored into the decision making process. The EMP development and implementation is a dynamic process, and has significant influence on the Corridor achievements and sustainability.

The first stage involves undertaking environmental assessment, which includes analysis of the Corridor scope and activities, identification of environmental concerns, compilation of environmental and social aspects registers, setting of objectives and targets, and suggestion of suitable mitigation measures.

The second stage of the process is implementation where the Corridor implementation will undertake all mitigations, monitoring, auditing and evaluation tasks discussed herewith.

The third and final stage includes evaluating the deterioration and/or recovery of affected areas and valued environmental components (if any incurred), and evaluating the efficiency of

mitigation, thereto set plan adaptation measures and establish restoration activities if necessary. Such adaptation will take into consideration and address non-compliances and new realities likely to arise during the construction and operation phases

Updating and adaptation of the EMP is a continuous process and involves gathering feedback on the progress indicators, and it is a key element to the Corridor overall sustainability and environmental sensibility.

An organizational structure has been developed in order to enable effective implementation of the proposed EMP. This structure defines responsibilities related to the environmental requirements raised by the proposed Corridor and responses necessary to cope with these requirements in an effective fashion. This structure cross-cuts with the developed Corridor organizational structure described in the Corridor documents.

The proposed EMP addresses the issue of local communities and NGOs involvement in the Corridor, environmental awareness and environmental training, whereby environmental training needs of staff at business units are determined in order to design and implement suitable training interventions.

8.2 EMP Framework

To comply with the Jordan environmental policy, a planning phase to formulate a framework for this EMP was completed during the environmental and social assessment phase. The EMP is structured as follows:

10. Policy
11. Legal Requirements
12. Organization
13. Environmental Objectives
14. Register of Significant Aspects
15. Environmental Impact Mitigation and Management Programs
16. Environmental Monitoring
17. EMP Control System
18. Implementation including training, communication and awareness program

Summary of anticipated impacts, in addition to mitigation, management and monitoring measures suggested by this EMP is provided in the Mitigation and Monitoring Matrix in the None-Technical Summary (See Appendix 1).

8.3 Environmental Policy and Commitment

As manifested in Jordan new Environmental Strategy (2015-2019), Biodiversity Strategy and Action Plan (2015-2019) and Jordan Environment Protection Law, the government of Jordan is committed to achieving sound environmental management and performance. The Ministry of Environment Mission is *"to improve and protect the environment of Jordan, to conserve Jordan natural resources, and to achieve sustainable development through the development and enforcement of practice environmental policies, strategies and regulations, and through environmental monitoring and mainstreaming environmental priorities in national development plans"* (Ministry of Environment Website).

At the implementing agency level, it is the RSCN policy to *"conserve the biodiversity of Jordan and integrate its conservation programs with socio-economic development, while promoting wider public support and action for the protection of the natural environment within Jordan and neighbouring countries"* (RSCN Website).

Also it is important to re-mention that ETDP is being implemented under Jordan BELP and accordingly is required to fully comply with the World Bank Operational policies.

At Corridor level, the proposed Corridor aims to develop and maintain environmentally sound and sustainable eco-tourism programme (facilities, operations, etc.) in the eastern badia of Jordan for the best interest of nature conservation and improved livelihood of the locals.

The Corridor policy is to comply with relevant legislation as a minimum while implementing all Corridor activities and to ensure sustainable development and sound nature conservation in the Corridor area.

To achieve the above goal, and to comply with national and organizational (i.e. RSCN) policies, the proposed programme/Corridor should:

- Operate in conformance with all regulatory requirements and environmental, social, health and safety standards and policies.
- Involve and strengthen relevant stakeholders including NGOs, CBOs and local community groups in the Corridor areas.
- Strengthen the Corridor proactive environmental, health and safety culture by increasing awareness and knowledge among all levels of partners and employees and committing to the protection and well-being of each level.
- Promote impact avoidance with the emphasis on minimization of disturbance to the existing environmental and social systems and utilities, and include environmental, health and safety considerations among the criteria by which Corridor construction, operation and remediation are evaluated.

- Assess the Corridor environmental performance and commit to continuous improvement towards the Corridor target goals of least negative environmental and social impacts.
- Communicate the Corridor commitment to the Corridor partners, employees, local communities and other stakeholders.

8.4 Structure and Responsibility

8.4.1 Institutional and Organizational Issues

As explained above, eco-tourism development within the above discussed corridor will be implemented by the RSCN under the first component of Jordan BELP Jordan titled "**Community-Centered Ecotourism in the Northern Badia**". Jordan BELP in turn is one of five projects under the MENA-BELP. Jordan BELP organization Structure is show in Figure 24.

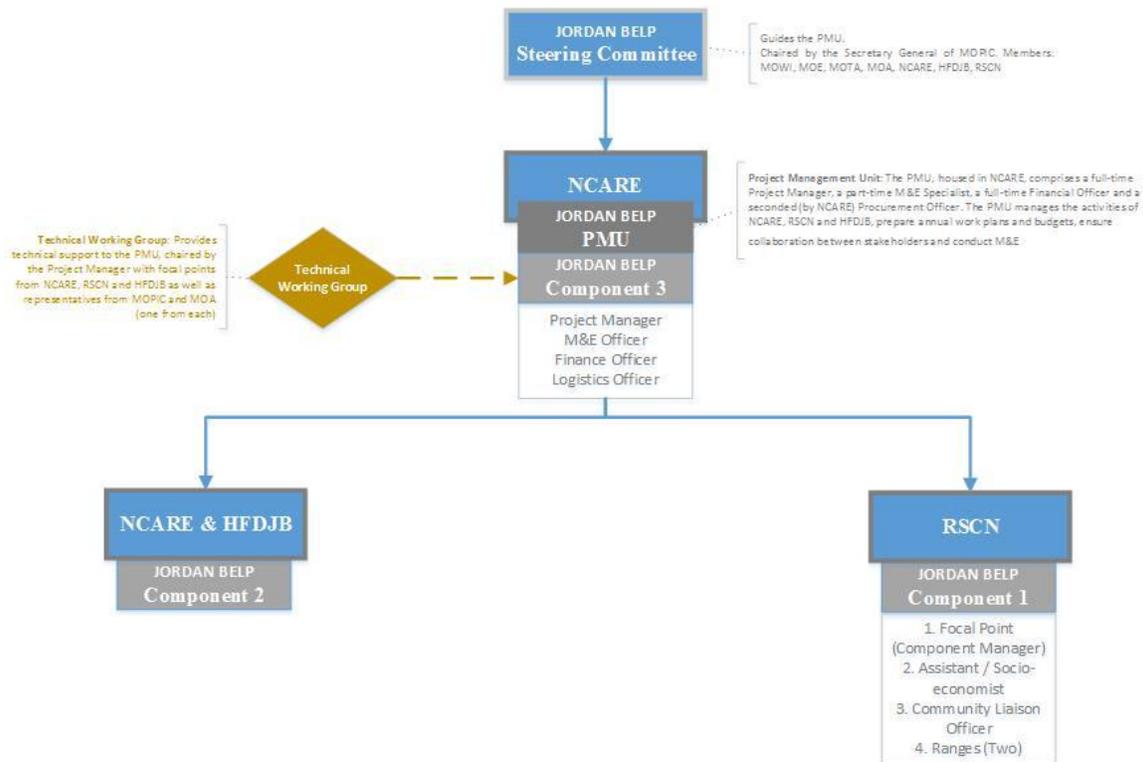


Figure 24: Jordan BELP organization structure

The eco-tourism development corridor forms the core element of component one of the Jordan BELP, and currently operates as a unit under RSCN umbrella where its day-to-day management is handled by full-time Component Focal Point (Component Team Leader). The component current organization structure is show in Figure 24.

RSCN is undergoing reform of its organization structure in order to enhance its operational efficiency and the boost its sustainability. This process is suggested to revive two units; (1) the eco-tourism unit which will be fully responsible for the development, implementation, marketing and sales, and monitoring of all eco-tourism programmes within protected areas and along the eco-tourism corridors including the corridor under establishment by Jordan BELP, and (2) the socio-economic development unit which will be responsible for the development of micro and small economic businesses as alternative to unsound environmental businesses within the protected areas managed by the RSCN and its surrounding, and also as source of income for locals and for nature conservation.

The eco-tourism unit re-establishment process is ongoing and it is planned to be completed by the time of completion of Component One of Jordan BELP. The new organization structure of RSCN is shown in Figure 25, and the organization structure (details) for its Eco-tourism Unit is shown in Figure 26 .

8.4.2 Assumptions and Considerations

This EMP assumes that the Component Team, hereinafter referred to as the "**Corridor Management Unit (CMU)**" from the RSCN will undertake the implementation of the Corridor activities including the overall management and supervision on construction and operation activities during the period of Jordan BELP Component One Funding Duration. After the completion of the Component activities and the end of the funding, i.e. the operation phase of the Corridor, and as part of the component sustainability choices which is being integrated in the RSCN institutional reform, all related operations will be under the under revival **RSCN Eco-tourism Unit (ETU)**.

Upon completion of the implementation of the ecotourism corridor plan as described in the ETDP, the eco-tourism programme and all constructed facilities and equipment's will be managed by the RSCN which in turn may hire operators from Jordan (probably from the local community) to manage related operations under a contract to be arranged for this purpose and under strict supervision on contractor(s) compliance with applicable national regulations, RSCN policy and the World Bank requirements by the RSCN.

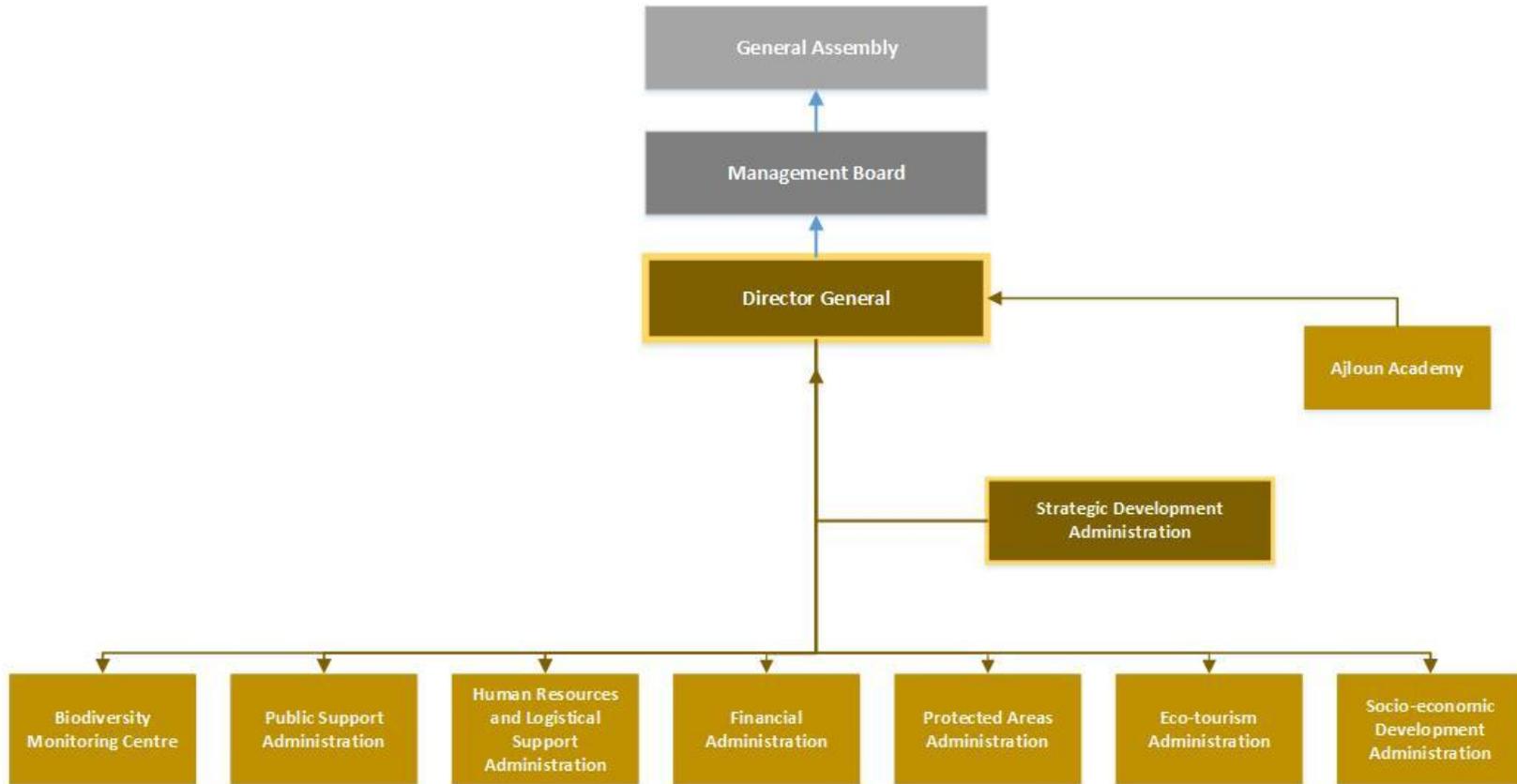


Figure 25: The new organization structure of the RSCN

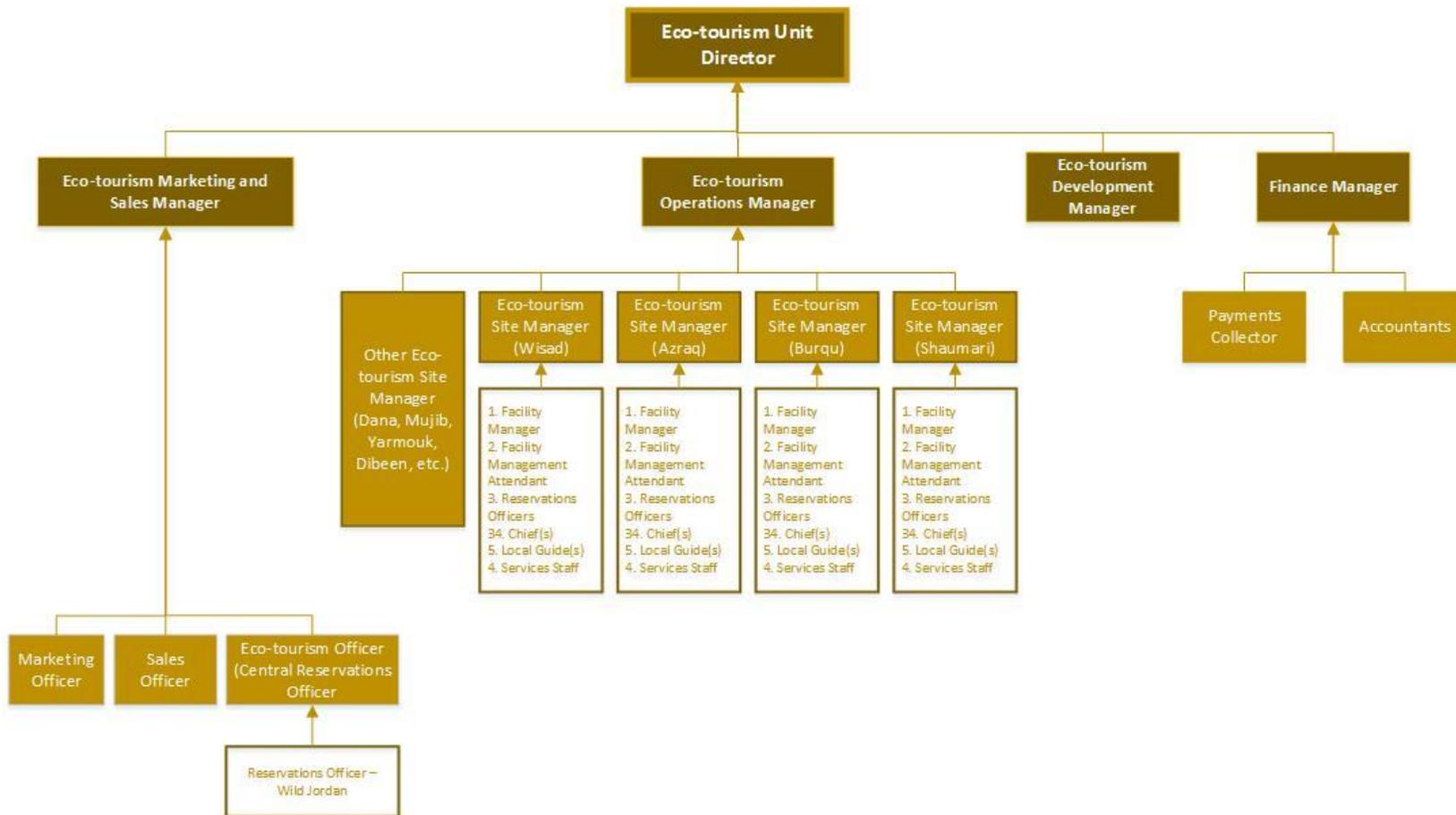


Figure 26: Organization structure of the RSCN revived eco-tourism unit

Accordingly RSCN will be responsible for implementing the EMP, however, the responsibilities of implementing certain mitigation measures extends to other involved parties including the contractors who will be contracted to undertake construction works, operations, management and/or eco-tourism support services.

It is the responsibility of the RSCN to implement and operate the EMP, where the RSCN should strictly adhere to the suggested mitigation measures and EMP programs, and define new aspects and mitigate impacts. Also, the RSCN should monitor the environmental and social indicators, and document for precautions and actions made. More specifically:

C. For the Construction and Corridor Development Phase:

- a. The CMU will hold the responsibility of the overall EMP implementation and supervision on behalf of the RSCN.
- b. Whenever a Contractor is hired to construct facilities or infrastructures, it is the responsibility of the Contractor to implement and operate the EMP, where the Contractor should strictly adhere to the suggested mitigation measures and EMP programs, and define new aspects and mitigate impacts under the supervision of the RSCN and under the enforcement mandate of related governmental organizations.
- c. RSCN should ensure compliance of the Corridor Development and its implementation with the legal requirements and the EMP recommendations. Also, the RSCN is responsible for monitoring the environmental and social aspects, the Corridor conformance/non-conformance, performance auditing, and the construction completion evaluation.
- d. Environmental Audit should be carried out by external environmental auditors. While the World Bank Auditors have the right for auditing and evaluating the implementation of the EMP.

D. For the Operation Phase:

- a. The CMU will be transformed into RSCN Eco-tourism Unit (ETU) which will be responsible for the overall management, administration, marketing and sales, future developments, supervision, monitoring and evaluation of eco-tourism activities and programmes within the Eco-tourism Corridor issue of this EMP in addition to other eco-tourism corridors and destinations managed by the RSCN. Accordingly the ETU will inherit all CMU responsibilities and mandate related to the proposed corridor.
- b. RSCN ETU may hire contractors to undertake the management of some or all of the corridor facilities, and some or all of eco-tourism operations within the corridor. In such a case the contractors and sub-contractors will be fully

responsible for the implementation and full compliance with the EMP requirements and measures, and also shall comply with all applicable national regulations and respective World Bank Operational Policies triggered by the Jordan BERP project. RSCN will remain accountable and responsible for the overall compliance of this component and also the environmental performance of its contractors.

- c. Since the Jordan BERP project will be completed toward the completion of the establishment of the eco-tourism corridor and perhaps soon after the commencement of corridor operational activities, therefore RSCN will inherit the responsibilities of the PMU-M&E responsibilities related to the monitoring and evaluation of the corridor environmental performance. The ETU is suggested to hold responsible for compliance monitoring while the **RSCN Biodiversity Monitoring Centre (BMC)** is suggested to takeover monitoring of corridor related impacts on biodiversity (e.g. habitat degradation, impacts on species conservation, etc.).

It is important to note the CMU team will form the core team of the to-be ETU at RSCN. Accordingly it is not anticipated to have management gap during the process of transforming the CMU into ETU with regard to the implementation of the EMP.

Jordan BERP PMU, and specifically the project Monitoring and Evaluation Officer, are responsible for monitoring and evaluating component one safeguard compliance, and accordingly ensuring (through monitoring, auditing and evaluating) the component overall compliance with the World Bank Operational Policies and with applicable national regulations.

Related governmental bodies (i.e. Ministry of Environment, Ministry of Agriculture and Ministry of Tourism and Antiquities, etc.) are legally authorized and obliged to supervise and monitor compliance with Jordanian environmental legislations.

8.4.3 EMP Management Structure and Implementation Responsibilities

As discussed in the sections above, it is understood that Jordan BERP PMU and possibly missions from the World Bank will be undertaking supervision, monitoring and evaluation of EMP implementation as part of its mandate and responsibility to supervise and monitor the whole Jordan BERP (Safeguard Compliance).

The proposed EMP implementation and operation management structure reflects the assigned responsibilities as part of the overall Corridor management structure. As explained above, RSCN CMU will be responsible for the overall management, administration and supervision on the

implementation of the EMP during the construction phase while the ETU will inherit these responsibilities for the operation phase. The contractors and operators in turn will be responsible for full compliance with EMP and with other applicable national regulations related to their contracts.

EMP monitoring and auditing can be, and are encouraged to be, undertaken by a third party hired by CMU, however it can also be handled by RSCN given RSCN position and previous record in implementing similar projects.

The RSCN should ensure effective EMP implementation and operation. This can be achieved through ensuring that:

- A. Roles, responsibilities and authorities are defined, documented and communicated.
- B. Management is committed to providing resources essential to the implementation and control of the EMP. These include the human resources and specialized skills, technology and financing.
- C. The CMU Team Leader (ETU Director) should hold responsible for:
 - a. Ensuring that the EMP requirements are established, implemented, and maintained in accordance with the stated legal requirements and approved standard.
 - b. Reporting on the performance and effectiveness of the EMP to RSCN top management and using this reporting as the basis for Management Review. RSCN is to report the above to BERP-PMU.
 - c. Ensuring all contractors, sub-contractors and operators compliance with the EMP requirements, and other related national regulations and World Bank Operational Policies.

With regard to day-to-day administration and supervision of corridor activities compliance with the requirements of the EMP, national regulations and World Bank Operations Policies, it is suggested that the project hire competent EMP Field Officer, preferred to be from the local community along the corridor, to undertake on site EMP monitoring and management actions. This officer is to report directly the CMU Team Leader during the construction phase, and accordingly to the ETU Director during the operation phase.

The EMP Officer will hold the responsibilities relevant to the following objectives:

- A. To ensure that roles, responsibilities and authorities are defined documented and communicated.
- B. To monitor, audit and evaluate the Corridor environmental and social aspects as per the aspects register.
- C. To monitor, audit and evaluate the efficiency of EMP implementation and operation.
- D. To evaluate and update the aspects register.

- E. To ensure efficient implementation of the EMP programs and procedures. This can be achieved by the following operational objectives:
- a. Ensuring that the EMP requirements are established, implemented, and maintained in accordance with the stated legal requirements and approved standard.
 - b. Reporting on the performance and effectiveness of the EMP to top management and using this reporting as the basis for Management Review.
 - c. Supervising, monitoring and evaluating all contractors, sub-contractors and operators compliance with the EMP requirements, and other related national regulations and World Bank Operational Policies.

One of the major assignments of the EMP officer is to establish the baseline condition for the monitoring program during the pre-construction (planning) phase with relevant measures taken to establish, as far as possible, the ambient condition. The detailed duties of the EMP Unit/Officer are explained more in **Table 16**.

Figure 27 and **Figure 28** illustrate the suggested organizational structure for EMP implementation during the construction and operations phases respectively.

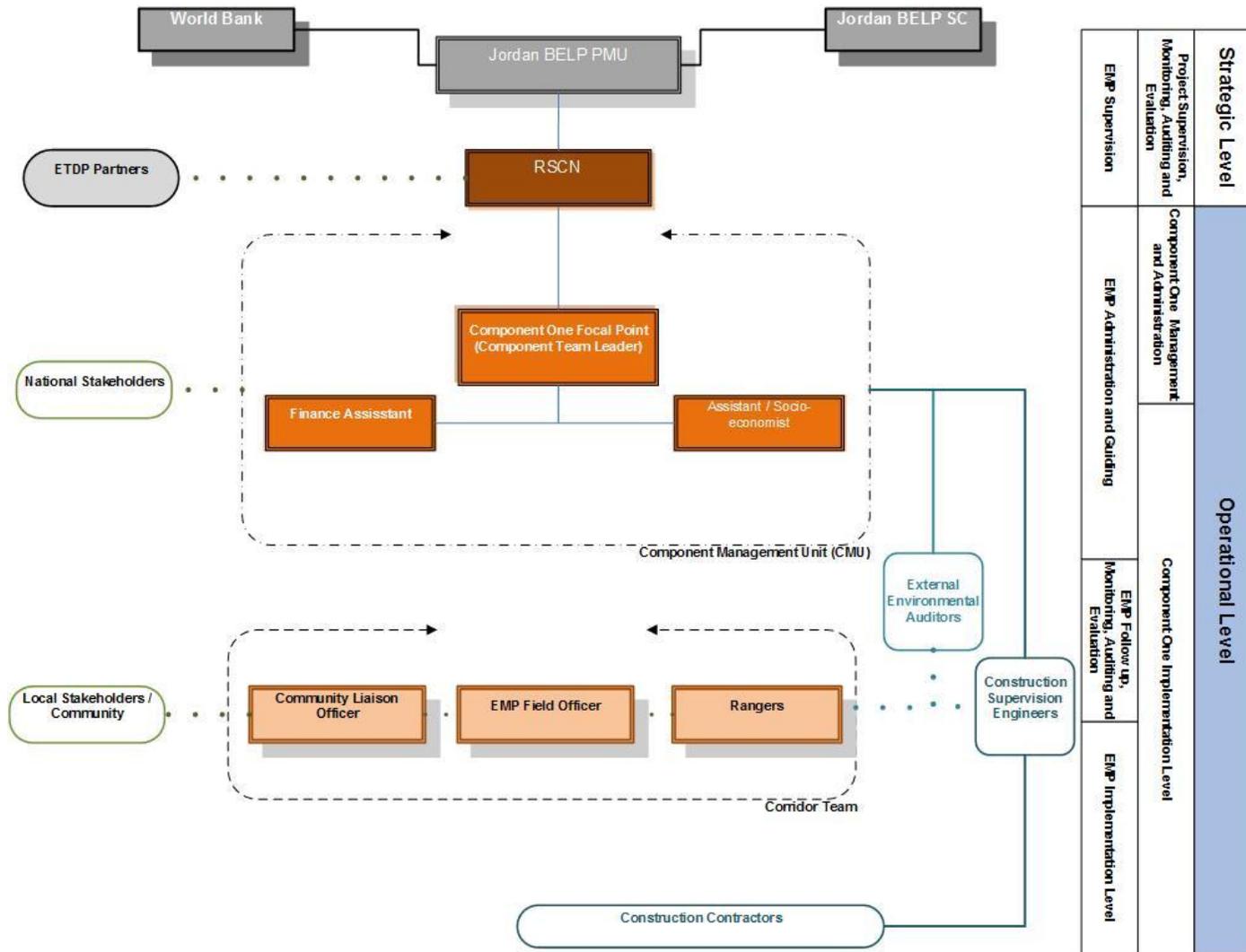


Figure 27: Suggested EMP Organizational Structure for the Construction Phase

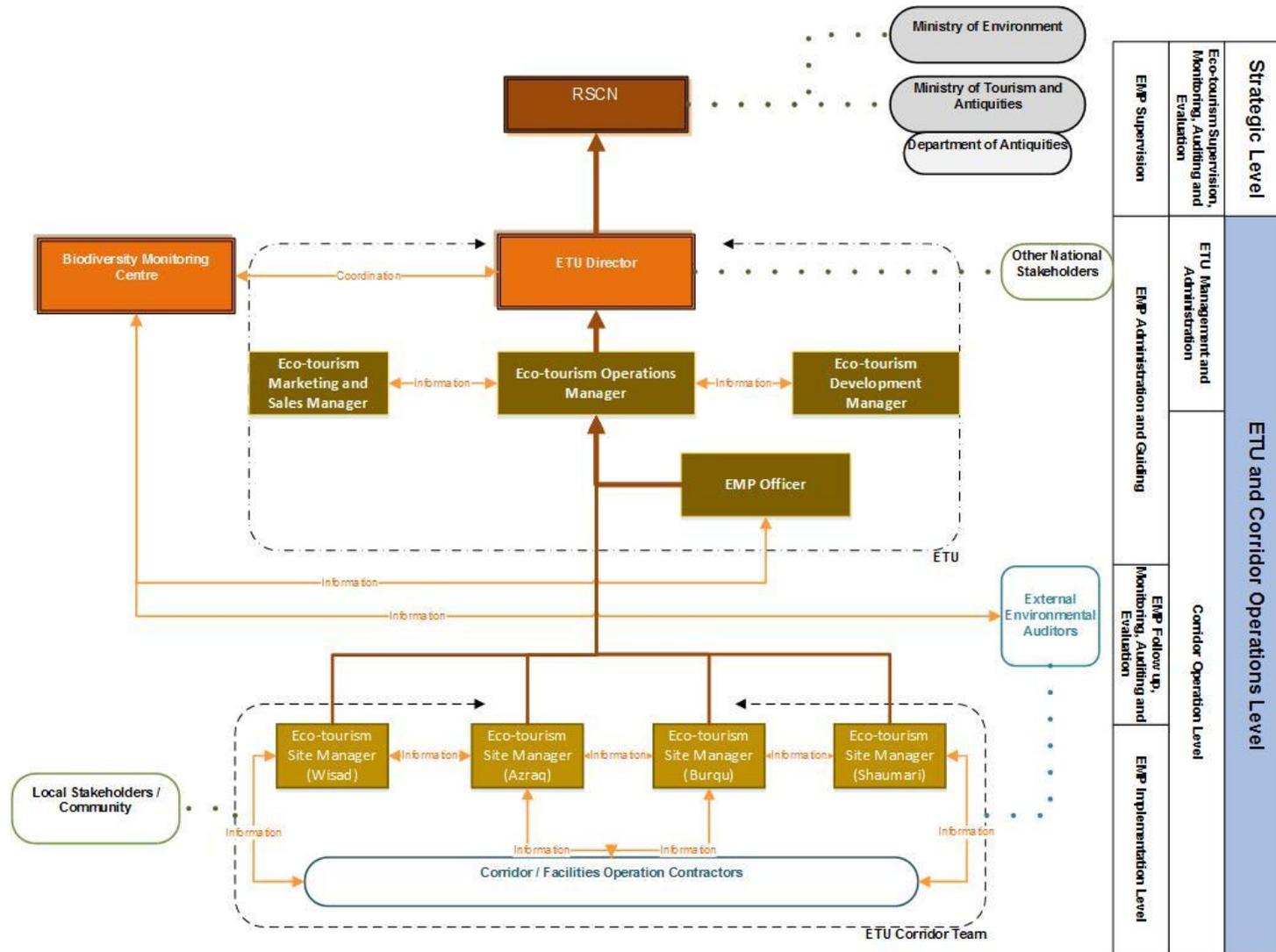


Figure 28: Suggested EMP Organizational Structure for the Operation Phase (Post Jordan BELP Project)

Table 16: The detailed duties of the proposed Corridor EMP Officer

| Phase | Responsibilities |
|-------------------------------------|---|
| Pre- Construction (Planning) Phase | <ul style="list-style-type: none"> ▪ Develop Environmental Management (EM) Statement prior to each construction/sub-project implementation phase. These statements should detail to the EM procedures applicable to mitigate anticipated impacts. ▪ Ensure efficient implementation of the Precautionary EMP Mitigation Programs and Procedures with regard to the sites and construction activities selection/designation criteria. ▪ Ensure effective communication and cooperation with local communities especially in and surrounding the proposed protected areas. ▪ Undertake assessment of the locations proposed for the construction of new facilities and ensure its compliance with the sites selection criteria discussed in this EMP. ▪ Evaluate and update the aspects register. ▪ Reporting to the CMU. |
| Implementation (Construction) Phase | <ul style="list-style-type: none"> ▪ Ensure efficient implementation of the EMP mitigation programs and procedures. ▪ Coordinate and follow up with responsible governmental and non-governmental agencies working in the fields of environment protection, antiquities, agriculture and social/labour affairs on aspects related to the implementation of the Corridor EMP. ▪ Ensure continuous and efficient communication with local communities and ensure they are sufficiently and satisfactorily involved in the implementation. ▪ Implement the EMP monitoring programs and evaluate compliance with the EMP mitigation programs and procedures through: <ul style="list-style-type: none"> ○ Monitoring, auditing and evaluating the Corridor environmental and social aspects as per the aspects register. ○ Monitoring, auditing and evaluating the efficiency of EMP implementation and operation. ○ Evaluating and updating the aspects register. ▪ Give a special attention to the issues of public and workers safety, and insure the continuous application of these measures during the construction of management and tourism support facilities. ▪ Reporting to the CMU. |

| Phase | Responsibilities |
|--------------------------------|---|
| Operation and Adaptation Phase | <ul style="list-style-type: none"> ▪ Ensure efficient implementation of the EMP mitigation programs and procedures. ▪ Coordinate and follow up with responsible governmental and non-governmental agencies working in the fields of environment protection, antiquities, agriculture and social/labour affairs on aspects related to the implementation of the Corridor EMP. ▪ Ensure continuous and efficient communication with partners and local communities and ensure they are heavily involved in the implementation. ▪ Since the location of Burqu eco-lodge is yet to be determined, therefore, ensure application of the site selection criteria for as part of the planning process for the development of the eco-lodge at Burqu in coordination and cooperation with the Ministry of Environment, and other related stakeholders. ▪ Implement the EMP monitoring programs and evaluate operations and contractors compliance with the EMP mitigation programs and procedures through: <ul style="list-style-type: none"> ○ Monitoring, auditing and evaluating the Corridor environmental and social aspects as per of the aspects register. ○ Monitoring, auditing and evaluating the efficiency of EMP implementation and operation. ○ Evaluating and updating the aspects register. ▪ Give a special attention to the issues of alternative livelihoods adopted by local communities. ▪ Evaluate the suitability of mitigation measures, and update and adapt the EMP based on the monitoring and evaluation findings. ▪ Identify Corridor sustainability tools. ▪ Reporting to the CMU. |

8.5 Facilities and Construction Areas

Proposed construction works are mostly limited to small-scale tourism staging areas and viewpoints (Qurma and Ad-Dahik), camp site (Al Wisad) and eco-lodge at Burqu. With exception to Burqu facility, the other facilities are consider of no or extremely limited impact on the environmental and social valued components and local receptors. However the construction of Burqu eco-lodge is likely to have environmental impacts that require particular attention and efficient mitigation.

It worth mentioning that the locations for the proposed facilities at Qurma, Ad-Dahik and Al Wisad are already identified, however three alternative locations are currently being considered for Burqu eco-lodge.

The operations of eco-tourism activities other than the proposed facilities will be limited to excursion trips along its two routes, noting that the trips will be on-board highly equipped 4x4 vehicles and will run in convoys of at least two vehicles, with a total capacity of 8 passengers (excluding drivers).

8.6 Environmental and Social Objectives

The Corridor environmental and social objectives are established based on the findings of the assessment discussed above. Such objectives and targets are subject to the approval of the Corridor top management and should be reviewed and updated on periodic basis to ensure consistency with the overall environmental policy.

The overall objectives include:

- Integrate impact assessment process and this EMP into planning, policy making and overall Corridor management.
- Apply environmentally sensitive site selection criteria for identifying the specific location for Burqu eco-lodge and other facilities planned in the future.
- Avoid, to the extent possible, the occurrence of impacts by the Corridor on the environmental and social settings.
- Minimize, to the extent possible, any unavoidable impacts.
- Restore the impacted social and environmental settings rapidly.
- Compensate for non-restorable settings and for interim disruption whenever needed.
- Ensure that returns from investment are providing benefits to locals livelihood and to nature conservation.

The detailed environmental and social management objectives and targets identified for the proposed Corridor are presented below in terms of mitigation and monitoring objectives as part of the Corridor EMP Matrix.

8.7 Environmental and Social Aspects

Environmental and social aspects register has been developed during the ESA and forms an integral part the EMP. It provides an account of the identified impacts during the assessment.

The register is the result of detailed investigation of the environmental and social valued components, Corridor activities and impacts. On an on-going basis, the Corridor management may identify new environmental aspects, or invalidate previously identified aspects. New environmental aspects may also be identified through the management review or by internal or external audits of the Environmental and Social Management Progress. The Corridor should respond accordingly to the significant aspects and complications addressed by the local

communities and defined stakeholders where efficient communication and public participation should be ensured on regular basis.

Any modification to the aspect register shall be reviewed, maintained and documented by the EMP Unit/Officer. Validation of significant aspects should account for the severity of associated impacts, probability of occurrence, and other relevant factors. Validated significant aspects shall be reported by the unit/officer to the Corridor Manager, who shall notify the Steering Committee and the Donor.

The environmental and social aspects register (Impacts Summary Sheet) is presented in the EMP Matrices in the stand alone **EMP Technical Summary**.

8.8 Management Programs for Mitigation of Impacts

Few negative impacts are anticipated to take place of consequence to the construction of management and tourism support facilities, and from operating excursion trips and accommodation services. Furthermore, most of the expected impacts are positive and will participate in providing solutions for some of the existing environmental challenges in the eco-tourism corridor area as it will offer environmentally sound economic alternative to some of the on-going overexploitation of natural resources (overgrazing, wood collection, hunting, etc.).

Environmental management programs are being compiled in all aspects where site-specific features are taken into account. These management programs are designed to ensure that set objectives and targets are accomplished and responsibilities, methods, and time frame for completion are established.

Each program includes one or more procedure that tends to achieve the stated objective(s) as appropriate.

The following mitigation measures should be strictly adhered to, in order to avoid impact, risk or hazard whenever anticipated. When the impact is unavoidable, it should be minimized to the extent possible and the settings should be rehabilitated appropriately to restore the natural condition. The proposed mitigation measures are presented separately for: (i) establishment of the proposed facilities; and (i) operation of eco-tourism programme.

The following are the proposed mitigation measures for the expected negative impacts. The success of the mitigation measures depends largely on proper training and awareness to Corridor staff and efficiency of restoration when required.

It also worth mentioning that the existence of the proposed Corridor facilities provides opportunity for improved monitoring, control and law enforcement with regard to illegal hunting, as these facilities can be used as hub for RSCN rangers during their patrols in the eastern desert. Such an opportunity is suggested to be further studied by the owner.

8.8.1 Proposed Mitigation Measures for the Planning and Designs Phase

At the beginning of this section, it should be noted that mitigation or restoration requirements are concerned with to the proposed small-scale construction activities within the Corridor sites, visitors and management support facilities, in addition to operation of eco-tourism services.

8.8.1.1 Design and Planning related Measures

The proposed Corridor activities are generally simple and does not require large-scale construction or land preparation works. It worth notifying that the eco-tourism hub and facilities at Azraq are already operational and the proposed Corridor do not have plans for further construction works. As for Ad-Dahik and Qurma site preparations and constructions, those are limited to construction of stairs to ease access to tell Qurma view point, medium size wooden terrace at the view point selected at Ad-Dahik, in addition to interpretation panels.

With regard to the excursion routes, the Corridor is planning to use existing off-road tracks which are currently being used the locals and others visiting the area, and there will be no need for additional land preparations or construction wors on these tracks.

However the establishment of Al Wisad camp and Burqu eco-lodge will entail earthworks, land preparation and levelling, and construction of visitors facilities. The exact location for the construction of both sites are yet to be undertaken by the developers, and currently there are some options which are being investigated. The identified alternatives are not within existing protected areas, however they are located within important bird areas.

It also worth mentioning that RSCN was authorised by the Ministry of Environment to undertake construction of facilities required for the management and operations within the protected areas without the need for further authorizations (See Figure 29). The consultant verbal communication with the EIA Directorate at the Ministry of Environment concluded that RSCN is mandated to undertake all necessary constructions within mandated protected areas for management offices, visitors facilities, environmental education facilities, fencing and enclosures, terraces and view point facilities, etc. without the need for undertaking EIA process.

THE HASHEMITE KINGDOM OF JORDAN
Ministry of Environment
AMMAN

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



المملكة الأردنية الهاشمية
وزارة البيئة
عمان

Ref. : _____
Date : _____

الرقم : ٣٠٧٩ / ٣ / ٩
التاريخ : _____
الموافق : ٢٠١٤ / ١٥ / ٢٠١٤

السادة الجمعية الملكية لحماية الطبيعة

إشارة إلى الاتفاقية المبرمة بين الجمعية الملكية لحماية الطبيعة ووزارة البيئة والمتعلقة بتفويض الجمعية الملكية بإدارة المحميات الطبيعية والعمل على ديمومة المحميات القائمة وتحديثها وإنشاء المحميات الجديدة حسب الشبكة الوطنية للمحميات. أود إعلامكم بموافقتي على إنشاء المرافق الضرورية داخل المحميات حسب خطط تقسيم المناطق والخطط الإدارية لهذه المحميات.

وتفضلوا بقبول فائق الاحترام

المهندس خالد أنيس الإبراهيمي

وزير البيئة

المهندس أحمد القطارنة

مساعد الأمين العام

الجمعية الملكية لحماية الطبيعة / الرسائل الواردة
رقم التسجيل :
التاريخ :
القسم :

السيد محمد (الملك)

هاتف : ٥٩٦-١١٢ - فاكس : ٥٩٦-٢٨٨ - ص.ب ١٤٠٨ عمان - ١١٩٤١ - الأردن
Tel. 5560113 - Fax 5560288 - P.O. Box 1408 Amman - 11941 - Jordan
E-mail: moenv@moenv.gov.jo
Web site : www.moenv.gov.jo

Figure 29: Letter from the Ministry of Environment authorizing the RSCN to undertake all necessary construction for its programme within protected areas

The above interpretation takes into consideration RSCN national position as leading nature conservation in Jordan, and being authorized by the government of Jordan to undertake enforcement of nature conservation related laws and mandated the establishment and management of national protected areas. This also takes into consideration RSCN long track record of implementing similar construction works within its mandated protected areas.

Therefore, and as mitigation measure to avoid causing significant impacts on the environment and social receptors, the site selection criteria presented in Table 17 are highly recommended to be applied for the section of the specific location for the proposed facilities.

Table 17: Site selection criteria

| Component | Criteria |
|---|--|
| 1. Topography and land cover | Away from floods hazard (wadi courses), do not cause obstruction of natural water flow, located in a barn land with no or least value and low density vegetation cover, do not influence the visual character of the area, require least land works and land preparations, do not cause limitation on access to surrounding areas for locals and wildlife, |
| 2. Soil characteristics | To be selected in areas with soil cover suitable for similar constructions, do not cause soil erosion within the surrounding of the site, require least possible cut and fill operations. |
| 3. Biodiversity characteristics | |
| a. Habitat ecological importance | The selected site should be of least ecological importance as habitat especially for endemic, endangered or threatened species. The area of the site and its location not to cause habitat fragmentation or isolation of particular habitat from its regional context. |
| b. Habitat sensitivity to the proposed development | The selected site is to be least sensitive to similar construction works. All fragile, sensitive and difficult to restore habitat shall be avoided. This in particular concerns riparian habitats, The flat low land areas (marab), wadi beds, and lands with tree stands. |
| c. Presence of endangered, endemic or rare species | Strictly avoid locations know or previously recorded as breeding grounds for endangered, threatened or endemic species. And preferred for be outside the home range for similar species. This also needs to consider known migratory birds roasting areas which shall be avoided. |
| 4. Water availability and quality | To be on a safe distance from major wadis and streams, water basins, and known ground water replenishment sites which are usually within the wdies, shall not obstruct running or intermittent water courses and shall avoid causing any change to natural water flow in the area |
| 5. Infrastructure, location and accessibility to the site | Preferred to be selected in an area close to infrastructure to avoid the need for other construction works (e.g. roads/tracks, electricity, water supply), however if this is not possible then the site selected should meet the above |

| Component | Criteria |
|---|---|
| | criteria in addition to offer enough space to construct local infrastructure (solar system, small waste water treatment unit, solid waste temporary storage, etc.). |
| 6. Archaeological and cultural heritage resources | To be on a safe distance from archaeological and cultural heritage resources to avoid impacts or damages from vibration, dusting or even direct damage. Obtain approval from DOA. |

As for the designs of the proposed facilities, and the design criteria explained in the ETDP, this EMP finds these designs environmentally sound and encourages full compliance with the existing design criteria and conditions, in particular with regard to natural ventilation and lightning, use of natural stones from the area (mostly from the area cleared from the construction site, not exceeding two floor, use of solar systems, installing appropriate and efficient waste water treatment unit, installation of water saving devices and maintain efficient management of water resources, landscaping using native plants from the area, etc.).

8.8.2 Proposed Mitigation Measures for the Preparation and Construction Phase

8.8.2.1 Control and Supervise the Construction Activities

The construction sites and zones shall be identified taking into account justifiable site selection criteria. These criteria should include habitat sensitivity, fragility, restoration applicability, presence of feeding or breeding ranges of threatened species, accessibility, etc.

All Contractors should apply the maximum care not to conduct unnecessary excavation and unnecessary damage to the local landscape and natural resources. All trees and natural vegetation must be conserved and protected from the damage that might result from the construction activities. Under any condition, no tree should be cut down for the purpose of constructing any of the Corridor facilities.

Other avoidance activities include:

- Avoid unnecessary excavation processes and off-road activities beyond the existing off-road tracks especially at fragile and sensitive habitats and utilize the existing roads instead of making new ones whenever applicable.
- Avoid accumulation of excavation piles during rainy season.
- Avoid as much as possible removal of green cover.
- Avoid accumulation of excavated material through synchronizing excavation and filling processes.
- Avoid accumulation of excavation materials and other solid wastes.

- Avoid planting or seeding of crops and exotic species.

Moreover, and after work completion, all work areas should be smoothed and graded in a manner to confirm the natural appearance of the surrounding landscape. Re-vegetation of affected vegetation cover beyond the direct construction area shall be restored or at least rehabilitated with native plants from the area.

Natural water flow shall be maintained during and after the construction phase, and all affected wadi networks, streams and riparian habitat shall be restored to its original condition at the time immediately before the commencement of construction works, if not improved.

The above listed mitigation measures should be applied and taken into consideration during site selection and establishing any facility.

8.8.2.2 Establish Appropriate Fluid Waste Collection System

During the Corridor preparation stage, the contracting company should construct an appropriate temporary liquid wastes collection system in the construction locations. The recommended method is the impermeable cesspits that will be discharged on regular basis and transferred via fluid waste tanker for dumping into the closest approved liquid wastes dumping site.

Establishing this system by the contractor requires the approval from RSCN and MOE representatives and from the concerned authority in the sub-Corridor area (i.e., Municipality). The suitability of the proposed site for wastewater collection should be investigated with regard to the physical characteristics of the ground.

The construction contractor is obliged to ensure efficient performance of excavation machinery and ensure their mechanical condition is excellent to avoid leakage of liquid wastes from construction machineries. Periodic maintenance for the machines is prohibited within the Corridor sites and in particular at sensitive biological habitats either located within the Corridor boundaries or outside it. Those machines and vehicles should be maintained at appropriate and specialized maintenance stations.

In order to control expected liquid waste that might result from machinery and maintenance vehicles, the following article should be included in the contractor contract ***“All machineries and vehicles should be in good mechanical condition. Periodic maintenance for the machines is prohibited within the Corridor sites and those machines and vehicles should be maintained at the appropriate and specialized maintenance stations”***.

8.8.2.3 Implementing Appropriate Solid Waste Collection System

Cut materials will be a major source of solid wastes. To reduce effect of this impact, it is highly recommended to use these materials in the construction activities in each site whenever applicable.

In order to manage the other types of solid wastes (construction material and domestic waste), a specific area should be designated as a temporary solid waste dumping area. This area should be segregated into different sub-segments each one suitable for a specific type of waste. The generated solid wastes should be placed in that area, and emptied on a weekly basis, and transferred to the nearest solid waste dumping areas. Using runoffs, wadis and Sabkha habitat areas as temporary solid waste storage ground should not be allowed.

Unnecessary burning and accumulation of solid waste is totally prohibited, and permanent or prolonged disposal of generated waste at the construction site and/or sensitive biological habitats is forbidden.

After the completion of each phase, the temporary solid waste dumping site should be rehabilitated.

8.8.2.4 Mitigating High Noise Levels

To mitigate expected high noise levels associated with the construction activities, working night shifts should be prohibited or at least reduced as much as possible.

Generally the construction contractor should apply the Jordanian Regulation for ambient noise levels during this phase (see **Table 18**), especially in designing the construction activities schedule. However since the Jordanian regulation does not state maximum allowable noise level for wilderness areas, and noting the ecological character of the proposed construction sites, it is therefore suggested that:

- Noise levels not to exceed 65 dB as a guideline for all construction works, and
- Whenever exceeding 65 dB is not avoidable then to limit such activities causing higher noise levels to day time, with the condition that noise levels from construction machineries and works not to exceed 75 dB at a distance of 15 meters from the source at any given time.

Additionally, This should be supervised by the EMP Management Unit and MOE.

Table 18: The Jordanian Regulations for Ambient Noise Levels

| Area | Maximum Allowable Noise level (dB) | |
|--|------------------------------------|-------|
| | Day | Night |
| Residential areas in cities | 60 | 50 |
| Residential areas in towns | 55 | 45 |
| Residential areas in villages | 50 | 40 |
| Residential areas with light industries | 65 | 55 |
| Areas of Heavy industries | 75 | 65 |
| Areas for educational, health and religious services | 45 | 35 |

Source: Official newspaper, No.4238 Nov.1997

8.8.2.5 Protection of Biological Diversity

In addition to what is stated above as mitigation measures, the following actions should be strictly adhered to in order to mitigate the Corridor anticipated impacts on the biological environment. These mitigation measures include:

- 6- Avoidance actions: Precautionary approach is often the most cost effective one. These include:
 - a. Forbid the removal of trees and other green cover.
 - b. Avoid as much as possible carrying out constructions at or near wadis and seasonal streams.
 - c. Avoid night activities.
 - d. Forbid wildlife persecution, hunting, animal and plant collection.
 - e. Avoid unnecessary movement of Corridor staff mainly at night.
 - f. Forbid planting or seedling of crops and exotic species.
 - g. Forbid introduction of pets.
 - h. Avoid sensitive and fragile habitat.
 - i. Avoid unnecessary burning and accumulation of waste.
 - j. Report observations of wildlife especially carnivores, snakes and scorpions from the site and its immediate surroundings to the EMP Officer.

7- Restoration actions

This is upon incidence of impact and mainly directed to the restoration actions mentioned above. Such restorations should ensure the restoration of biological diversity and biological communities' characteristics and features.

8.8.2.6 Resettlement Framework

As discussed above, the proposed Corridor is not expected to witness, perform or inquire involuntary resettlement of people or to cause or resettlement like impacts due to the Corridor direct or indirect activities. However, two points have to be made in this respect:

- It is recommended to hire Corridor staff from the local communities whenever applicable. Also, they should be trained and educated to ensure that they are capable of carrying out the duties of their jobs.
- The Corridor is encouraged to foster direct and indirect economic benefits for CSOs and locals in the area mainly through direct and indirect employment. Indirect employment may include purchasing the fabric for tents from the locals, buying dairy products (of course health requirements are to be applied), training them to become tourism guides, etc.

8.8.2.7 Formulate Public Safety Program for the Locals and the Workers in the Corridor Construction Areas

Construction of buildings and infrastructure associated with the intended Corridor are limited to the management and eco-tourism facilities to be established within the proposed localities. No construction is intended in other proposed eco-tourism development sites since Azraq lodge and related eco-tourism facilities in Azraq area are already established.

During the course of the work, the construction contractor, under the EMP Officer and the Corridor Manager supervision should be responsible for providing and properly maintaining all public and workers safety measures including warning signs, signals, barriers and other safety measures that can assist in conserving the public and the workers safety.

First aid tools should always be available and easily accessible by all construction workers. This includes anti-venom against snakes and scorpions bites. Safe and quick access to the construction sites should be maintained for emergency.

As the construction sites are in remote areas it is recommended to arrange for emergency car ready at all times of working hours at the site to provide emergency treatment and to transfer casualty if happens to the nearest hospital. If such arrangement is not possible then a 4WD car with trained staff on first aid should always be maintained in perfect condition and ready to mode in case of accidents during all working hours of the construction staff.

Speeding over off-roads and on-road are considered serious risk of car accidents. Therefore speed limits shall be strictly enforced, driving at night on off-roads and remote areas shall be limited to its minimum or avoided, and drivers behaviour shall be monitored on real-time basis. Use of GPS-based vehicles tracking systems is highly recommended.

Work and employment conditions within the area should fully comply with applicable national regulations. No employment of child's should be allowed, all workers by the contractor should have contracts with terms acceptable to the Ministry of Labour regulations and guidelines, and shall not violate minimum wages regulations.

Work at the site shall be put on hold whenever climatic conditions like heavy rainfall and very high temperature are causing safety and health risks to the workers, especially to those working outdoors.

The construction workers should be educated and made aware of the environmental and safety issues prior to their involvement in the construction activities. This includes educating them about poisonous snakes and scorpions in each location.

8.8.2.8 Conservation of Archaeological and Cultural Resources

Negative impacts to the archaeological and cultural heritage resources are anticipated to be insignificant or worst case scenario of low significance during the construction phases. This is due to the fact that construction activities will be limited to very few facilities.

However, the Jordanian Antiquities Law and the Regulations of Archaeological Excavation and Surveys provide the basis for the conservation of archaeological sites in Jordan. The mitigation measures for possible impacts on archaeological sites have been formulated to comply with the above-mentioned law and regulation.

In general, while there is no requirement for any site discovered during the survey to be destroyed, “No Destroy” protection measures are recommended. On the other hand, whenever impact is expected, the mitigation measures might include one or more of the following:

- 1- Cultural Resources Management (CRM) implementation in addition to coordination of responsibilities with CRM monitoring groups including the Department of Antiquities / Ministry of Tourism.
- 2- Penalties for non-compliance.
- 3- Shifting the construction activities for a distance that is enough as to protect the site, whenever an archaeological site is identified within or close to the construction zone.
- 4- Following “Chance-find” Procedures.
- 5- Exclusion areas.
- 6- Adopting special procedures in the vicinity of sites defined as requiring protection. These include protecting the site by fencing, conducting site rescue excavation, conducting site restoration, and implementing signage system to the site.

Once the final demarcation of the construction sites have been fixed and the extent of any earthworks and burrow pits is known, sites that remain classified as not threatened should be revisited and fully documented for record purposes.

In addition, details of the site specific measures outlined in the next section will be provided as instructions to the contractor.

In general, for corridor facilities and components entering the construction stage, three points could be added to contract documents which would be beneficial for the protection of archaeological sites:

- 7- **Burrow Areas:** The locations of borrow areas and quarry sites selected by the contractor should be approved by the Department of Antiquities to prevent antiquities being damaged by quarrying or burrow excavation. Such inspection should not be unreasonably delayed.
- 8- **Observation of Construction Excavation:** In areas where the Department of Antiquities knows or suspects the existence of remains under the surface, but where there is insufficient time for archaeological excavation (or the importance of the site does not warrant full scale investigation prior to construction), a representative of DOA should be present during the opening of any excavation or burrow pit to identify and record any archaeological remains found.
- 9- **Additional Salvage Excavation:** In areas where DOA has determined that further salvage excavation will be necessary, based on the information developed during the Final Design phase, salvage excavation will be carried out at the beginning of the construction phase. Construction activities should be scheduled so as to leave any such area until late in the construction process, and thus construction activities would not be delayed by the archaeological excavation.

It is also advised that the Corridor obtain clearance from the Department of Antiquities with regard to the selection of sites for the construction of the proposed facilities, and to obtain their approval and advice with regard to the location of the proposed eco-lodge in Burqu in relation to its proximity to the Castle. It should be noted that dusting and vibrations, if within close distance to the castle, can cause significant impacts. However this cannot be assessed at this stage given that the location of the proposed lodge is not yet defined.

8.8.3 Programme Implementation and Services Operation Phase

8.8.3.1 Health and Safety

- Provide antivenins for scorpions and snakes that are found in the route and camping sites.

Saudi Arabia National Antivenin and Vaccine Production Centre

Al Haya Medical Company

P.O. Box 442

Riyadh 11411, Saudi Arabia

Telephone: 00966 1 4655075

Fax 00966 1 4652354

- Black scorpion (*Androctonus crassicauda*), death stalker/yellow scorpion (*Leiurus quinquestriatus*).
- Polyvalent (equine) for desert-horned viper (*Cerastes cerastes*), desert black snake/desert black cobra (*Walterinnesia aegyptia*).

- Training of staff for first aid protocols for snake bites and scorpion sting accidents.
- Produce a field manual for identification of venomous animals and other arthropods that may inflict health hazards to tourists.
- Identify closest hospitals and clinics in case of emergency, along with evacuation plan.

8.8.3.2 Conservation of water and energy

Water is very scarce in the Corridor areas and electricity is expected to be provided from solar system for basic needs. The proposed Corridor is encouraged to utilize all possible mechanisms and tools to control visitors demand and consumption rates, achieve conservation of water and energy, and to secure maximum efficiency of both sources. This include application of water saving devices, using water efficient toilet flushing units, measures to limit time at showers to less than five minutes with optimum shower flow rate, apply grey water separation to be used in irrigating the landscape and other possible uses, etc.

It is also encouraged to adopt and implement the measures explained in the IUCN "My Hotel in Action" guidelines which targets environmentally sound operations in tourism facilities.

8.8.3.3 Fluid Wastes Management System

At the proposed facilities at Burqu and Al-Wisad, it is recommended that the established cesspit during the construction phase are upgraded and enlarged to cover the expected fluid wastes resulted from the management team and the visitors to the lodge and campsite. Furthermore, emptying the content of this cesspit should be done on regular basis and transported to the nearest fluid wastes dumping site via a special fluid wastes tanker.

The cesspits should be fenced and provided with signage to avoid access to it by unauthorized staff for safety reasons.

8.8.3.4 Solid wastes Management System

The recommended solid waste management system to be implemented in the proposed facilities and along the route should include:

- Prohibit littering and arrange for all tourism and management vehicles to have either small waste containers or bags to collect garbage and solid waste generated during the excursions. These containers are to be emptied in municipal waste containers or in the

- waste containers in one of the facilities owned by the Corridor to be later transferred to the landfill.
- Produce and distribute awareness materials to the site visitors and to the employees encouraging them to practice waste source reduction and sorting at the facilities and during the excursions.
 - Provide the proposed tourism facilities with adequate solid waste collection containers which can be closed to avoid attracting feral animals. The solid waste containers should be emptied regularly and transferred to the nearest approved solid waste disposal facility.
 - Source separation is highly recommended.

One of the major concerns within the implementation of the Eco-tourism theme is the expected solid wastes that might result due to the expected influx of tourists who visits the area on their own or through tour operates not coordinating with RSCN and its contractors. To overcome this problem, the visited sites need to be equipped with solid wastes collection containers. These containers need to be emptied on regular basis and transferred to the appropriate solid waste dumping sites “and/or” to a recycling project (if applicable) after conducting the appropriate separation processes.

The following additional measures are also advisable

- Ensure that all forms of garbage (plastic bottles, cartons, paper, food remains), glass bottles, polyethylene products) are disposed away from the camping site or the permanent sites to the nearest municipality for proper disposal (e.g. Azraq, Safawi, Al Ruwished).
- Field latrines should be installed in the camping area, along with timely schedule for removal to the nearest sewage treatment area.
- Fixed bathrooms should be established away from any water source and flood plains, with proper structure that prevent leakage.
- Prepare instruction sheets for tourist on how to handle garbage and other remains.

8.8.3.5 Scenic and Aesthetic factors

- Construction of any permanent structures should be in harmony with the surroundings, especially around Burqu’ Castel.
- Location of any permanent structure or temporary camping area should be away from wadi systems and flood plains.
- Location of permanent structures and temporary camping sites should be in areas with low vegetation cover, and avoid radical changes in the surrounding environment.

8.8.3.6 Protection of Biological Diversity - Collecting and gathering samples or stone objects

- Instruct tourists that they are not allowed to collect animal or plant samples from the route area in any form.
- Instruct tourists that they are not allowed to collect stones with drawings or engravings from the route area in any form.
- Instruct tourists and staff not to cut woody plants or shrubs for making fire.
- Prevent hunting in any form within the area.

8.8.3.7 Movement and noise pollution

- Avoid movement at night in order to not disturb carnivores and other nocturnal animals.
- Keep sound as low as possible, and not use loud music or any form high pitched sounds
- Avoid use of light at night especially around camping sites.

8.8.3.8 Solar System

The proposed solar system is expected to be of small scale and to produce electricity for basic needs. Environmental impacts from installing similar system are expected to be minimal, if any, however since the system will constitute using batteries to store electricity, therefore a plan for the management of these batteries and its recycling is important to be arranged in coordination with service providers. Disposal of damaged or malfunctioning (non-usable and non-recyclable) batteries shall be arranged only in approved and certified hazardous waste management facility.

8.8.3.9 Tourists Environmental Performance and Code of Conduct

Tourist environmental performance along the eco-tourism corridor and at the proposed facilities is an important issue which require particular attention from the Corridor. It is expected that the visitors and users of the corridor will include organized groups by RSCN in addition to other groups or individuals coming to the area on their own. Therefore the following are recommended:

- An awareness kit and code of conduct is to be prepared and distributed to all tour operates with interest in arranging tours within the eco-tourism route concerning the ecological sensitivity of the area, its importance, code of conduct for visitors of the area

(respect of locals and local traditions, water and energy conservation, littering and waste handling, causing damage to wildlife, collection of wildlife, etc.).

- All electronic and printed materials needs to highlight the sensitivity of the ecosystem along the corridor and needs to convey awareness messages to visitors.
- Interpretation panels needs to encourage the visitors to abide by the visitors code of conduct, to respect the environment and to contribute to nature conservation.

8.8.3.10 Interaction with the Decision Makers, the Private Sector and the Local Community along the Eco-tourism Corridor

To ensure the maximum understanding of the eastern badia unique environment, and the need to conserve and protect it from the environmentally unsound and unsustainable human activities, the Corridor needs to interact and outreach all key stakeholders within their activity areas and beyond. This interaction needs to be on three levels. These are:

- **Governmental level:** At this level, the interactions will focus on further developing eco-tourism policies, strategies and regulations to ensure environmentally sound and sustainable development of eco-tourism programmes, and to establish linkages with other eco-tourism programmes in Jordan. This also needs to emphasize the adoption of nationally and environmentally accepted code of conduct for all organizations and individuals engaged in eco-tourism operations, including the tourists themselves. The Corridor is encouraged to share and disclose lessons learned from the Corridor with related governmental organizations, and to maintain regular communication to ensure mainstreaming eco-tourism global principals and nature conservation targets in the government agenda.
- **Private Sector Level:** At this level, the Corridor teams need to clarify the importance of the eastern desert environment for the private sector in order to be considered when planning for future eco-tourism development Corridors. RSCN needs to set the model for future investments in this sector in the eastern badia and elsewhere in Jordan, and to establish strong and long term relationships with private sector companies with interest in investing in this sector thus to direct sector orientation toward best possible environmental performance. Furthermore, the Corridor teams will work on providing the environmental advice to tour operators and to related organizations.
- **The Local Community Level:** At this level, the Corridor teams will provide awareness programs to the different sectors of the local community about environmental conservation and protection. The Corridor will also need to higher liaison officer(s) (one has already been hired by RSCN) to maintain communication and outreach of local communities, contribute to the raising of their environmental awareness, implementing and deliver training based on the results of the training needs analysis recently

undertaken by the RSCN for those interested in taking part in eco-tourism development (as employees, service providers, etc.), and to document and address grievances by locals. Equally important, the Corridor is encouraged to contribute to enhancing and supporting local CSOs in the Corridor areas to obtain their support to sustainable and environmentally friendly eco-tourism development along the corridor, and to explore benefit sharing opportunities.

8.8.3.11 Develop and Implement Public Communication and Participation Program

A public communication and participation program should be established for the Corridor and detailed action plan should be produced and implemented along the corridor. This plan should identify the different communicators including partners, local community leaders of opinion, beneficiaries/partner, awareness targets, etc. Also, it should identify the communication themes, channels, objectives, messages and tools.

It is highly recommended to establish atmosphere of trust and confidence with the Corridor stakeholders through implementing sequential layers of communications, starting with opinion pull, awareness raising, community organization for eco-tourism activities, problem and needs assessment through PRA, identification and establishing strong communication channels with the local leaders of opinion, ensure participatory identification of constraints in the sustainable resource use, develop alternatives or mediating measures in cooperation with community members, monitor results involving stakeholders and discuss options for improved coordination and collaboration.

8.9 Environmental Monitoring

The monitoring program is a research program to develop the tools necessary to monitor and assess the environmental and social settings status and trends in response to the different Corridor activities. Also, it is necessary to assess the Corridor performance against the desired mitigation measures, and compliance with the regulations and standards in order to protect people's health and safety, and the environment health and performance.

Monitoring activities should be applied to direct monitoring indicators whenever applicable. Indirect indicators can be monitored instead of direct ones whenever it would provide acceptable indication to the impact occurrence and/or performance non-conformance.

8.9.1 Monitoring Measures for the Preparation Stage

It is recommended to appoint a "technical/environmental" officer (with acceptable technical qualifications and level of experience) to work in this Corridor in the EMP Management Unit. The Corridor Manager Assistant / Monitoring and Evaluation Officer can be assigned these

responsibilities if, for any reason, hiring new staff for EMP management is not possible. The assignments for this officer will be during the Corridor preparation, construction and operation stages, and are as follows:

| | |
|---|---|
| A- Planning Phase: | Participate in the planning and design process. In particular for the selection of sites for the construction of Burqu eco-lodge and Al-Wisad campsite. |
| | Coordinate with the governmental agencies to get the required approvals. |
| B- Construction Phase: | Participate in supervising the high tech. construction activities. |
| | Ensure the full implementation of the recommended mitigation measures for this phase. |
| C- Implementation Phase (in association with the Corridor core teams): | Ensure the full and continuous application of all the recommended mitigation measures for this phase. |
| | Supervise the required quality control. |
| | Supervise the public health and safety measures at the sites. |

8.9.2 Monitoring Measures for the Construction Phase

8.9.2.1 Conserving the Local Morphology and Landscape Issues

It is the responsibility of the Corridor Manager and the Corridor EMP Officer to ensure that the contractor is fully implementing the construction mitigations. The monitoring indicators are primarily related to compliance with the suggested mitigation measures in addition to changes in general landscape, establishment of temporary waste disposal sites, extended construction zones and the deterioration in fragile and sensitive habitats.

The monitoring should also include monitoring of the prolonged accumulation of solid waste, incorrect selection of the temporary waste disposal locations and disposing solid waste outside the defined temporary waste disposal locations. It also need to monitor any possible impacts or changes in natural surface water flow due to construction works or accumulation of cut and fill materials, disposal of construction waste or any temporary or permanent structures.

8.9.2.2 Full implementation of the Fluid and Solid Wastes Management Plan

It is the responsibility of the Corridor Manager and the Corridor EMP Officer in association with representatives from the MOE to conduct site inspection to check the correct construction of the fluid wastes cesspits and ensure that emptying of these cesspits is conducted on regular basis.

The monitoring of solid waste management operations should cover the following:

- Solid waste generation, including quality and quantity.
- Site selection and management of the temporary solid waste disposal site.
- Collection and transportation efficiency.
- Suitability of final disposal sites.
- Solid waste accumulation within the corridor in terms of volumes and frequency of removal.

8.9.2.3 Biological Environment Monitoring

For the biological environment, the frequency of monitoring is mostly periodical monitoring (every month) combined with follow up on daily basis and annual auditing through the whole construction period.

The following are the biological environment monitoring indicators and responsibilities:

- Runoffs and fragile habitats are maintained.
- Natural vegetation cover is maintained.
- Hunting is banned.
- Accidental kills are avoided.
- Breeding seasons are undisturbed.
- Migration seasons are avoided.
- Noise levels are within level during birds migration season and endangered species breeding seasons in particular in areas located close to endangered, threatened and/or endemic species breeding grounds.

The monitoring methodology consists of the following activities:

- Monitor the natural conditions of surface water flow between pre- and post-Corridor activities including runoffs habitat and geomorphology.
- Monitor plant communities' changes.
- Monitor habitat deterioration.
- Monitor accidental killing of animals.
- Monitor migratory bird species.
- Monitor key herpeto-faunal and faunal species.
- Monitor oil spills and solid waste accumulation.
- Monitor accessibility to remote areas.
- Monitor elevated noise levels in construction areas within or in proximity to endangered, threatened and/or endemic species breeding grounds.

8.9.2.4 Monitoring Social Aspects

The following social component should be monitored as part of the EMP monitoring program:

- Level of employment, which includes the percentage of locals and foreigners to the total employment.
- Public safety measures and public safety program implementation and efficiency.
- Occupational accidents, road accidents, injuries or fatalities due to construction operations, etc.
- Locals complains about Corridor related disturbances, accessibility, noise and health aspects.
- Drivers behavior, speeding, car accidents, unnecessary off-roading or driving outside approved off-road tracks in unpaved roads.

8.9.2.5 Archaeological and Cultural Heritage Sites Monitoring

The following components should be monitored on regular basis:

- Cultural Resources Management (CRM) implementation in addition to coordination of responsibilities with CRM monitoring groups including the Department of Antiquities / Ministry of Tourism. This includes monitoring disruption to the archaeological features.
- Compliance / non-compliance with the stated mitigation measures
- Shift the construction activities for a distance that is enough to protect the site.
- Follow “Chance-find” Procedures.
- Exclusion areas.
- Special procedures in the vicinity of sites defined as requiring protection. These include:
 - Site by fencing
 - Site rescue excavation
 - Site restoration
 - Signage system to the site

8.9.3 Monitoring Measures for the Implementation, Operation and Adaptation Phase

8.9.3.1 Monitoring of Eco-tourism Statistics along the Corridor

Maintaining accurate, precise and periodic log of eco-tourism operations statistic in the proposed facilities and along the eco-tourism corridor is the responsibility of the Corridor EMP officer, in association with the managers of the facilities (each in his area). Monitoring data to be collected and maintained include number of visitors including those through operators or individuals, their nationalities, number of days/nights of service (visit duration), connections with other eco-tourism areas (e.g. Wadi Rum, Mujib, etc.) water and energy consumption per facility and tourist, waste generation per facility per day/month, etc.

Such information, in addition to feedback and remakes from the visitors are to be used in the evaluation of tourism operations and its environmental consequences as part of the overall Monitoring and Evaluation Process.

8.9.3.2 Implementation of the Fluid and Solid Wastes Management System

Ensuring the full and continuous implementation of the recommended fluid and solid wastes management system in the proposed facilities and along the eco-tourism corridor is the responsibility of the Corridor EMP officer, in association with the managers of the facilities (each in his area).

8.9.3.3 Executing Solid Waste Management System in the Eco-Tourism Sites

It is a joint responsibility between the managers of the eco-tourism facilities and operations staff and the local municipalities to ensure the full implementation of the recommended solid wastes management system.

8.9.3.4 Biodiversity Related Monitoring

Monitoring of activities to be maintained during all operated tours in addition to observations from the eco-tourism staff as part of their daily/weekly reporting including off-roading beyond approved eco-tourism tracks, tree cutting and wood collection by the visitors with the operation areas, accidental kill or collection of wildlife, hunting, and littering impacts on wildlife.

Annual monitoring of changes in the status of endangered and threatened species, and their breeding habitat with particular emphasis on impacts caused by the Corridor.

8.10 EMP Control

The EMP should be armed with tools to ensure the adherence of the various parties to its components and to measure the effectiveness of the defined set of actions within it. To achieve this, a control system needs to be implemented. The elements of this control process are to include:

- 10- **Document and Record Control:** This is a procedure through which all EMP associated documentation and records are stored and distributed. This will include the maintenance and updates of the register of environmental aspects and the responsibility for the dissemination of information to involved parties.
- 11- **Checking and Corrective Action:** This dictates that all incidents of deviation from the planned criteria or activities to be reported and action to be taken to rectify the situation and minimize the chance for its recurrence.
- 12- **Claims:** A provision should be made to register and review incident or other claims made against the Corridor or Corridor related personnel or activities by the public or any party. Action needs to be taken to address any such claims where they are shown to be valid and requiring such action.
- 13- **Auditing:** The implementation of the EMP should be audited on a regular basis. Audit reports are the basis for verification of the compliance of the various parties, the completion and implementation of programs and restoration plans, and the effectiveness of such actions and other elements of the EMP. The audit will be used for review and will rely on the monitoring data.
- 14- **Review Process:** A periodic (annual) review of the EMP and environmental incidents needs to be done through the course of the Corridor construction, operation and future development stages. Necessary modifications and adjustments could be decided through this formal and timely review process. Changes and new issues need to be communicated.

8.11 Implementation and Operation

Implementation and operation of this EMP plan should evolve from deep understanding and appreciation of RSCN policies and also appreciation of the Corridor nature, environmental and social requirements, and should demonstrate the integration of EMP as part of the overall Corridor management. It should also comply with Government of Jordan regulations and World Bank Safeguard Policies.

Effective implementation and operation of the EMP require clear-cut identification of responsibilities that will guide assigning tasks. Other implementation related components include:

- Training, awareness and competence
- Communication
- Environmental Management Documentation

- Document Control
- Operational Control
- Emergency Preparedness and Response

8.12 Training, Awareness and Competence

Capacity development of the Corridor staff, partners (governmental and non-governmental organizations) and civil society organizations in the implementation areas relevant to the intended Corridor, as well as implementing effective environmental public awareness programs are considered of particular importance for successful implementation of the Corridor and to ensure environmental sustainability of eco-tourism programmes in similar desert ecosystems.

However, efficient implementation and operation of the EMP require the Corridor Management and the construction Contractor to have competent capacities, wise management and environmentally aware employees in particular with regard to ecological sensitivity of the whole eco-tourism corridor areas. The EMP Officer should have sufficient experience in environmental and social management, and good communication skills, while the technical support staff should have considerable experience in environmental monitoring, auditing and evaluation.

On the other hand, the Corridor employees and the construction contractors should be environmentally aware of the Corridor nature and impacts, so they would develop their appreciation and thorough commitment to the EMP requirements, complexity and integrity. Furthermore, acting according to the EMP programs and procedures is obligatory, where similar awareness and training activities will ensure faithful and competent commitment of the employees to these requirements, and reduce the cost of enforcement.

Each employee should be educated and motivated to appreciate and act according to the issued mitigation measures. Such requirement should be tackled in the planning/pre-construction phase in order to have the employees acting as per of the stated course of procedures and actions. During the construction/implementation phase, the employees' acts and awareness level should be monitored and developed.

Adequate training of senior staff and orientation of Corridor staff is also considered as a cost effective means to reduce impacts. The EMP officer should ensure the following in order to fulfil the awareness and training requirements:

- Training needs are identified. Training requirements for each operational unit within the Corridor are established.
- Personnel are trained in their specific environmental responsibilities that are directly related to significant aspects, targets, and objectives of the EMP.
- Personnel that do not have a significant role, receive awareness training.
- New-hires, re-assigned personnel, construction contractors and the sub-projects implementation partners are given appropriate training on the specific aspects of their new positions and relevant to their specific activities.

- Personnel are kept abreast of regulatory changes that impact their job performance.
- Training includes communication of the following:
- Requirements of the EMP and the importance of regulatory compliance with policy.
- Potential effects of the employee's work, both negative and positive.
- Responsibility in achieving compliance with policies, regulations and EMP requirements.
- Consequences of failure to comply with the above.

For example, of the main issues for which such training and awareness should be delivered are:

- Safety measures relevant to construction (for the public and the employees).
- The ecological importance of sensitive habitats and wildlife conservation ethics.
- Avoiding environmentally unsound activities and practices such as mismanagement of generated construction and domestic waste, and destruction of archaeological and cultural heritage resources.

The proposed awareness and training sessions can be conducted by either the EMP officer or by an independent reputable consultant.

8.13 Communication

Efficient communication should be maintained at both external and internal levels. The external communication can be demonstrated in three main channels:

- RSCN – Project Partners and Key Stakeholders
- Corridor Manager and EMP Officer – Construction Contractor
- EMP Officer – Local and National Stakeholders

The overall advantage of this communication program is to ensure that the anticipated adverse impacts and risks can be effectively mitigated.

The EMP Officer should effectively communicate internally with the variant Corridor components and divisions, and externally through the defined channels and about the public concerns and complains of implementing the proposed Corridor, Corridor effects on their health, wealth and environment. Also, the Corridor Manager and the EMP Officer should communicate and cooperate on continuous basis with the related authorities, projects and utilities providers in order to avoid or minimize, to the extent possible, disruptions.

Particular consideration of an outreach and communication programme targeting tour operators and other organizations and individuals currently involved, planning to get involved in, or expected to have engagement in the future in eco-tourism operations along the eco-

tourism corridor should be developed, implemented and monitored effectively. The main message from such communication programme is to ensure that all people and organizations involved in eco-tourism in the area do appreciate the value of biodiversity within the corridor and the need to conserve it while undertaking eco-tourism activities.

Communicating internally and externally- if effective- will ensure:

- Better understanding and appreciation of target groups to the proposed project conditions and benefits.
- No or minimum disruption by the Corridor to other developed/under-development projects and vice versa.
- Minimum impacts and risks.
- Community participation in helping and making choices to develop suitable and acceptable avoidance/mitigation scenarios.

The communication responsibilities include the following:

- A documented procedure is maintained for communication of internal and external environmental information regarding environmental issues and concerns.
- Processes for receiving and responding to internal and external interested parties concerns relative to the environment are established.
- The environmental policy and performance is communicated both internally and externally. This includes the results of the environmental audits and other analyses.
- The documented communication procedure was adequately developed to foster continual improvement.

With regard to field operation staff, the following communication requirements are highly advisable:

- Obtain professional automated tracking system to help drivers to stay on tract and to locate transport vehicles in case of emergency or any mishap.
- Vehicles should be equipped with effective tracking systems (GPS tracking devices, navigators, GPS tracking services and central fleet management system) to improve the dispatching and head office automated communication.
- Vehicles should be equipped with first aid kits, camping gear and other field equipment's.
- Employ an up-to-date system of communications between transport vehicles and the Head office.
- Ensure the presence of two different communication systems available to the drivers and the head office for communication to overcome any emergency situation when one of these systems is down.

- Mark the track(s) by poles or any visible signs that are weather proof and that cannot be removed to help the driver to identify the route.
- Navigation

8.14 Emergency Preparedness and Response

Emergency preparedness should be given the priority during the EMP implementation and operation, where all key procedures should be reviewed for emergency preparation, including the construction-related health and safety programs (for public and employee communities) that have to be established in compliance with the Jordanian standards issued by the Ministry of Public Works and Housing, Ministry of Labour, Ministry of Health and the Ministry of Environment. Other health and safety measures and relevant emergency preparedness and responses should be established for research and eco-tourism related activities.

The EMP Officer in coordination with the Corridor Manager should develop procedures for managing these potentialities and to train key personnel on these procedures. Also they should ensure that adequate and correct emergency equipment are available where they should be.

After incidents occurrence, these processes should be reviewed and modified.

8.15 Checking and Corrective Action

The EMP implementation and performance should be monitored continually; performance, conformance and non-conformance audit should be applied on quarterly basis in order to update and modify the plan by adopting effective corrections whenever needed. Environmental audit (Eco-Audit) should be conducted on annual basis.

All records should be stored in a well-ordered and easily accessible manner, enabling individual items to be located easily and ensuring that the records are protected. The audit reports should be reported in accordance to the stated reporting structure. Also, it should be available to the public and stakeholders through accessible information centres.

The auditors selected should hold acceptable experience with relevant tasks and capable of undertaking such responsibilities. The corrective and preventive actions based on audit findings and their consequences are monitored. The audit findings per audit cycle are summarized into an audit report and reviewed during the management review meeting.

8.16 Management Review

A top management review of the EMP should be applied on a periodic basis as per a documented procedure to ensure its continued suitability and effectiveness. During the review, management will effectively utilize all available information, including internal and external audit findings, environmental concerns, objectives, targets, non-conformance, and corrective and preventive actions in order to improve the EMP Implementation.

The review results will be recorded and maintained and the resultant decisions and actions taken will be implemented by the concerned personnel.

9 Estimated Costs

Most of the identified mitigation and monitoring measures are developed based on avoidance and standard operations conditions in similar projects as governed by applicable national regulations, specifications and codes. Therefore this EMP requires no additional costs for similar measures. Other costs items are already budgeted for as part of the estimated costs for the construction actions as provided in the Feasibility Study including waste water management, solar energy, materials, etc.

The cost items estimated for this EMP are related to the implementation of the monitoring measures by the Component during the construction phase and the first three years of operations, in addition provisional budget lines for restoration and rehabilitation actions, and for the conservation of archaeological resources which will be needed only if the impacts are unavoidable.

Provide summary of costs and cost items.

Table 19: Summary of costs and cost items

| No. | Cost Item / Line | Cost (US\$) | Notes | Cost Centre |
|-----|--|-------------|--|---|
| 1 | Implementation of the environmental avoidance measures | 0 | These measures are to be considered contractually as standard business operations (terms of contract) for this and other similar projects. Costs are to be estimated by the contractor as part of his bid/offer. For the purpose of this EMP the costs are accordingly considered as Zero | Contractor |
| 2 | Implementation of the environmental minimization and control measures | 0 | These measures are to be considered contractually as standard business operations (terms of contract) for this and other similar projects. Costs are to be estimated by the contractor as part of his bid/offer. For the purpose of this EMP the costs are accordingly considered as Zero | Contractor |
| 3 | Implementation of the environmental restoration and rehabilitation of affected environmental/ecological components | 50000 | Provisional budget line equaling 5% of the total value of the construction contract to be allocated as contingency for this activity. It can be used wither as motivation or as penalty for compliance/non-compliance by the contractor with regard to the implementation of respective measures and also to his overall environmental performance under the respective contract | Contractor |
| 4 | Contractor Public Health and Safety Program development and implementation | 0 | These measures are to be considered contractually as standard business operations (terms of contract) for this and other similar projects. Costs are to be estimated by the contractor as part of his bid/offer. For the purpose of this EMP the costs are accordingly considered as Zero | Contractor |
| 5 | Communication and outreach | 0 | Considered Zero cost for this EMP as Component one of the BELP Project (under implementation by the RSCN) constitute all related activities and is already budgeted for | RSCN-Component (1) of the BELP Jordan Project |

| No. | Cost Item / Line | Cost (US\$) | Notes | Cost Centre |
|-----|---|-------------|--|---|
| 6 | Contractor staff training | 0 | These measures are to be considered contractually as standard business operations (terms of contract) for this and other similar projects. Costs are to be estimated by the contractor as part of his bid/offer. For the purpose of this EMP the costs are accordingly considered as Zero | Contractor |
| 7 | RSCN Operation Team Training | 20000 | Provisional for training on environmental monitoring, health and safety issues | RSCN-Component (1) of the BELP Jordan Project |
| 8 | Conservation of Archaeological and Cultural Resources | 25000 | Provisional budget line equaling 2.5% of the total value of the construction contract to be allocated as contingency for this activity. | Contractor |
| 9 | Cost of Monitoring Measures during the construction phase | 52200 | Assuming it will be handled by part time Environmental Consultant (mainly for mentoring the field Environmental Officer and for undertaking monthly Audit and reporting, 7 working days a month for 12 months) and Full-Time Environmental Officer in the site for the construction period of One Year. Consultant transportation costs are not included and are to be provided by the Component vehicles. | RSCN-Component (1) of the BELP Jordan Project |

| No. | Cost Item / Line | Cost (US\$) | Notes | Cost Centre |
|--|--|---------------|--|---|
| 10 | Cost of Monitoring Measures during the operation phase | 30000 | Assuming it will be handled by part time Environmental Consultant for the first year of operations (mainly for mentoring the field Environmental Officer and for undertaking Environmental Audit and reporting on Semi Annual basis, 20 working days per year for 3 years). Monitoring within the corridor is to be undertaken by the Full-Time Operations and Environment Officer (as supervisor and/or team leader), the managers of the facilities, the tourism guides, and the RSCN rangers active along the corridor. Costs of the Component/RSCN staff are not included as the monitoring tasks will be assigned to current staff to be undertaken as part of their daily operations. Consultant transportation costs are not included and are to be provided by the Component vehicles. | RSCN-Component (1) of the BELP Jordan Project |
| <i>Sub-total for the Construction Phase:</i> | | 134700 | US\$ | |
| <i>Sub-total for the Operation Phase:</i> | | 42500 | US\$ | |
| TOTAL: | | 177200 | US\$ | |

10 References

10.1 Cited References

- Abu Baker, M. & Amr, Z. 2003. A morphometric and taxonomic revision of the genus *Gerbillus* in Jordan with notes on its current distribution. *Zoologische Abhandlungen (Dresden)* 53:177-204.
- Abu Baker, M. & Amr, Z. 2003. Rodent diversity in the Northeastern Desert of Jordan, with special reference on the ecology of *Gerbillus cheesmani*. (Mammalia: Rodentia). *Casopis Národního Muzea, Rada prirodovedná*, 172:141-152.
- Abu Baker, M., Široký, P., Amr, Z. & Modrý, D. 2005. The discovery of a population of *Phrynocephalus maculatus* Anderson, 1872 (Sauria: Agamidae) in the Hashemite Kingdom of Jordan. *Herpetozoa*, 18(3/4):107-113.
- Amr, Z. 2000. Conservation of the carnivores of the Northeastern Badia. *World Conservation* 2:24.
- Amr, Z. 2008. Biodiversity of Reptiles and mammals in the Eastern Desert. In: *Jordan's Arid Badia: Deepening our Understanding*. Editors: Dutton, R. & Shahbaz, M., Smith Gordon & Co. UK.
- Amr, Z. S. & Disi, A. 2011. Systematics, distribution and ecology of the snakes of Jordan. *Vertebrate Zoology*, 61:179-266.
- Benda, P., Lučan, R. K., Obuch, J., Reiter, A., Andreas, M., Bačkor, P., Bohnenstengel, T., Eid, E. K., Ševčík, M., Vallo, P. & Amr, Z.S. 2010. Bats (Mammalia: Chiroptera) of the Eastern Mediterranean and Middle East. Part 8. Bats of Jordan: fauna, ecology, echolocation, ectoparasites. *Acta Societas Zoologicae Bohemicae*, 74:185–353.
- Bunaian, F., Hatough, A., Ababaneh, D., Mashaqbeh, S., Yuosef, M., Amr, Z. 2001. The Carnivores of the Northeastern Badia, Jordan. *Turkish Journal of Zoology*, 25:19-25.
- Bunaian, F., Mashaqbeh, S., Yousef, M., Budairi, A. & Amr, Z. 1998. A new record of the Sand Cat, *Felis margarita* Loche, 1858 from Jordan. *Zoology in the Middle East*, 16:5-7.
- Disi, A. M. & Amr, Z. S. 1998. Distribution and ecology of lizards in Jordan (Reptilia: Sauria). *Faun. Abh. Mus. Tierkd. Dresden*, 21 (Suppl. In: Fritz, U., F. J. Obst & B. Andreas (eds.): Contribution to a "Herpetologia arabica", Nr. 6: 43-66.
- Disi, A. M., Modry, D., Bunian, F., Al-Oran, R & Amr, Z. 1999. Amphibians and reptiles of the Badia region of Jordan. *Herpetozoa*, 12 (3-4):135-146.
- Qarqaz, M., Abu Baker, M. & Amr, Z. S. (2004): Status and ecology of the Striped Hyaena, *Hyaena hyaena*, in Jordan. *Zoology in the Middle East* 33:87-92.

- Rifai, L. B., Al-Melhim, W. N., Gharaibeh, B. M. & Amr, Z. 2000. The diet of the Desert Eagle Owl, *Bubo bubo ascalaphus*, in the Eastern Desert of Jordan. *Journal of Arid Environments*, 44(3):369-372.
- Green, M. & Thomas, C. J, 2008. Birds of the Badia region of Jordan. *Sandgrouse*, 30:125-133.
- Al-Eisawi, D. 2011. Jordan. In: Radford, E.A., Catullo, G. & Montmollin, B. de. (eds.) *Important Plant Areas of the south and east Mediterranean region: priority sites for conservation*. IUCN, Gland, Switzerland and Malaga, Spain. Gland, Switzerland and Malaga, Spain: IUCN. VIII + 108 pp.

10.2 Additional Readings

- Ashley, Caroline, Dilys Roe and Harold Goodwin, 2001, *Pro-Poor Tourism Strategies: Making Tourism Work for the Poor*, Pro-Poor Tourism Report No. 1, Overseas Development Institute, Nottingham, UK www.propoortourism.org.uk/strategies.html
- Boo, Elizabeth, 1990, *Ecotourism, Potentials and Pitfalls*, World Wildlife Fund, Washington, D.C. USA
- Bosselman, Fred P., Craig A. Petersen, and Claire McCarthy, eds, 1999, *Managing Growth Strategies*, Island Press, Washington, DC USA
- Blangy, Sylvie and Megan Epler Wood, 1993, *Developing and Implementing Ecotourism Guidelines for Wildlands and Neighboring Communities* in *Ecotourism, A Guide for Planners & Managers Volume I*, TIES, Burlington, VT USA
- Brandon, Katrina and Richard Margoluis, 1996, *The Bottom Line: Getting Biodiversity Conservation Back into Ecotourism*, in *The Ecotourism Equation*, Bulletin Number 99, Yale University, New Haven, CT, USA
- Charters, Tony and Kerren Law, eds., 2000, *Best Practice Ecotourism in Queensland*, Tourism Queensland, Brisbane, Queensland, Australia
- Chattopadhyay Suhrid Sankar, 2002, *Towards Responsible Tourism*, Frontline, Volume 19 - Issue 04, Feb. 16 - Mar. 1, 2002, <http://www.frontlineonnet.com/fl1904/19040830.htm>
- Christ, Costas, Oliver Hillel, Seleni Matus, Jamie Sweeting, 2003, *Tourism and Biodiversity, Mapping Tourism's Global Footprint*, Conservation International, Washington, D.C., USA www.uneptie.org/pc/tourism/documents/tourism%20and%20biodiversity
- Eagles, Paul, Stephen F. McCool, Christopher D. Haynes, 2002, *Sustainable Tourism in Protected Areas*, IUCN 2002, Gland, Switzerland <http://www.uneptie.org/pc/tourism/library/st%20in%20prot.areas/Best-Practice-8.pdf>

Epler Wood, Megan, 1998, *Meeting the Global Challenge of Community Participation in Ecotourism*, Working Paper No 2, America Verde, The Nature Conservancy, Arlington, VA, USA

www.conserveonline.org/2003/10/m/en/D.4.c_Comm_Particip_Ecotour_Eng.pdf

Epler Wood, Megan, 2002, *Ecotourism: Principles, Practices & Policies for Sustainability*, UNEP, Paris, France & TIES, Burlington, VT USA

www.uneptie.org/pc/tourism/library/ecotourism.htm

EplerWood International, in press, *A Review of International Markets, Business, Finance & Technical Assistance Models for Ecotourism in Developing Countries*, World Bank/IFC/GEF, Washington, D.C., USA

Font, Xavier, (2003), *Critical review of Certification and Accreditation in Sustainable Tourism Governance*, Discussion Paper, Leeds Metropolitan University, Leeds, UK

Gibbs, W. Wayt, November 2001, *On the Termination of Species*, Scientific American

Giongo Francesca, Jean Bosco-Nizeye, and George Wallace, 1993, *A Study of Visitor Management in the World's National Parks and Protected Areas*, Professional Paper, Colorado State University, Fort Collins, CO, USA

Halpenny, Elizabeth, 2002, *Marine Ecotourism Guidelines*, TIES, Burlington, VT, USA

Hawkins, Donald E., Kristin Lamoureux and Auliana Poon, 2002, *The Relationship of Tourism Development to Biodiversity Conservation and the Sustainable Use of Energy and Water Resources :A Stakeholder Management Framework*, A UNEP Report, Paris, France

InWent, 2002, *Training Manual for Community-based Tourism*, InWent – Capacity Building International, Zschortau, Germany, authors: Nicole Hausler & Wolfgang Strasdas

International Union for the Conservation of Nature (IUCN), 2003, *Recommendations of the Vth World Parks Congress*, <http://www.iucn.org/wpc2003/pdfs/outputs/wpc/recommendations.pdf>

Lash, Gail and Alison Austin, 2003, *Rural Ecotourism Assessment Program (REAP)*, EplerWood International, Burlington, VT USA, www.eplerwood.com

Lindberg, K. 2001. Protected Area Visitor Fees: Overview. Report for The

The International Ecotourism Society, Burlington, VT, USA

Maldonado, Carlos, 2002, *Servicios Empresariales Para el Desarrollo del Enoturismo Comunitario en Bolivia, Ecuador, y Peru*, Equipo Tecnico Multidisciplinario Para Los Paises Andinos, Ofician Internacional Del Trabajo, Geneva, Switzerland <http://www.ivsde.microempresa.org/pdf/cmaldonado.pdf>

- Maldonado, Carlos, 2001, *Turismo: Mercado y Sostenibilidad*, Equipo Tecnico Multidisciplinario Para Los Paises Andinos, Oficina Internacional Del Trabajo, Geneva, Switzerland
- Margoulis, Richard, Cheryl Margoulis, Katrina Brandon and Nick Salafsky, 2000, *In Good Company*, Biodiversity Support Program, Washington, D.C. USA
- Mastny, Lisa, 2002, *Traveling Light: New Paths for International Tourism*, Worldwatch Paper 159: Worldwatch Institute, Washington, D.C., USA
- Marshall, John, 2003, *Death by Myth: Part 5 of A Kalahari Family*, Documentary Educational Resources, <http://www.der.org/films/a-kalahari-family.html>
- Mehta, Hitesh, Ana Baez, and Paul O’Laughlin, 2002, *International Ecotodge Guidelines*, TIES, Burlington, VT USA
- MesoAmerica IYE Conclusions, 2002, <http://www.world-tourism.org/sustainable/IYE/quebec/cd/regional/pdfs/rmesoaen.pdf>
- Multilateral Investment Fund (MIF), 2003, Document of the Inter-American Development Bank. International Accreditation system and Consolidation of National Systems for Sustainable Tourism Certification to Facilitate SME Competitiveness and Market Access (TC-03-030-02-4-RG) <http://www.iadb.org/mif/v2/projectview.asp?ID=1763&C=8>
- National Ecotourism Assessment Program (NEAP), 2002, Ecotourism Association of Australia, <http://www.ecotourism.org.au/neap.asp>
- Otavalo, 2001, *Declaracion de Otavalo sobre Turismo Sostenible, Competitivo, Comunitario y con Identidad*, Otavalo, Imbabura, Ecuador
- Protected Areas Conservation Trust (PACT), 2001, *2000 Annual Report*, Belmopan, Belize
- Rome, Abi, 1999, *Ecotourism Impact Monitoring : A Review of Methodologies and Recommendations for Developing Monitoring Programs in Latin America*, The Nature Conservancy, Arlington, VA, USA, http://www.conserveonline.org/2001/06/s/Ecotourism_Impacts_Monitoring;internal&action=cs.plain.action
- Sanders, Edward G. and Elizabeth Halpenny, 2001, *The Business of Ecotodges*, TIES, Burlington, VT USA
- SECA, 2000, *European Donor Funding of Ecotourism within Environmental Programmes*, SECA, Montpellier, France
- Spergel, Barry, 1996, *Belize’s Protected Area Conservation Trust: A Case Study*, World Wildlife Fund-U.S., Washington, D.C., USA

- Steck, Birgit, Wolfgang Strasdas and E. Gustedt, 1999, *Tourism in Technical Cooperation: a guide to the conception, planning, and implementation of project accompanying measures in regional rural development and nature conservation*, GTZ, Eschborn, Germany
- SustAinability, 1996, *Engaging Stakeholders: Volume 1 The Benchmark Survey*, London, UK
- The International Ecotourism Society (TIES) 1993, *Ecotourism Guidelines for Nature Tour Operators*, TIES, Burlington, VT, USA
- Tim-Team, Clearing House for Reviewing Ecotourism, 2002, www.twinside.org.sg/title/iye.htm
- Wang, Chih-Yung and Paul S. Miko, 1997, *Environmental Impacts of Tourism on U.S. National Parks*, Journal of Travel Research, Spring 1997
- World Tourism Organization (WTO), 2002, *World Ecotourism Summit Final and Preparatory Meeting Reports*, World Tourism Organization, Madrid, Spain, http://www.world-tourism.org/sustainable/IYE/quebec/anglais/index_a.html
- World Wildlife Fund International, 2001, *Guidelines for Community-based Ecotourism Development* World Wide Fund for Nature (WWF), Gland, Switzerland, author: Richard Denman http://www.wwf.no/pdf/tourism_guidelines.pdf
- Ziffer, Karen, 1989, *Ecotourism: The Uneasy Alliance*, Conservation International, Washington, D.C. USA