



UNDP Project Document

Government of Libya

United Nations Development Programme

Establishment of an Environmental Geographic Information System

Brief description

This project is designed to help Environment General Authority (EGA) establish an Environmental Geographic Information System (EGIS) in collaboration between Environment General Authority (EGA) and UNDP.

The ultimate goal of the project is to support the Environment General Authority (EGA) in the planning, design and implementation of a Geographic Information System (EGIS) to better support EGA responsibilities, e.g. monitoring, assessing and responding to various environmental conditions and emergencies that occur in Libya. It will also help in building institutional capacity and qualifying EGA's staff to effectively run the system in a sustainable manner.

The EGIS will be developed in a manner such that the fundamental technology will be logically and functionally integrated into the organization's operational processes.

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1 – SITUATION ANALYSIS

The unregulated exploitation of natural resources in Libya has increasingly degraded the environment and encroaches on arable lands, forests, and coastal areas, and has jeopardised the reproductive capacity of the natural environment.

Environmental problems include Salinization of the coastal zone, deforestation, loss of soil fertility and erosion, degradation of coastal areas, and air and water pollution, and in some places, permanent damage to ecosystems. The consequences of over-exploitation and pollution include decreased agricultural production and fish catches deleterious effects on human health, and decreased biological diversity.

These ecological and socio-economic impacts raise an urgent need for the establishment of appropriate technological system that helps implementing policies for the sound management and use of natural resources and control of pollution in Libya, based on cross-sectoral planning. However in order to achieve this, the institutional capacity of Environment National Authority (EGA) which is responsible for the planning and implementation of programmes to regulate the conservation and use of the natural resources of Libya requires strengthening and several base levels of inventory and monitoring of the natural resource base have to be undertaken/ and or integrated to create a multi-purpose resource database which will provide a holistic appraisal of the current situation upon which sound management scheme and monitoring can be put in place or alternative scenarios simulated.

The proactive environmental legislation, public awareness campaigns reflect acceptance of sustainable development principles and the imperative of holistic, scientific approaches to ecosystem management. However, the adoption and effectiveness of such management schemes depends crucially on the quality and extent on the underlying information-base. Operational management of sensitive environments and associated resources requires time series of spatially-referenced, multivariate data on key parameters and resource dynamics that are coupled with information on area usage. It also necessitates an efficient information infrastructure, one capitalizing upon advanced technologies for data acquisition, integration and dissemination. Despite pressing need for environment protection in Libya, the necessary base-line data and information infrastructure is currently lacking. This has recently prompted urgent calls for the establishment of an Environmental Information Management System to support improved management. But, the technical portion of this system alone will not enhance the ability of decision-makers to redress the environmental problems without sensitizing stockholders.

In order to translating the above into practical terms, the project is meant to be an instrument to provide the adequate knowledge and technology that EGA requires for the planning, design and implementation of an Enterprise Geographic Information System (EGIS) that EGA requires to be proactive and to fulfill its responsibilities, e.g. monitoring, assessing and responding to various environmental conditions and emergencies that occur in Libya.

The EGIS will be developed in a manner such that the fundamental technology will be logically and functionally integrated into the organization's operational processes.

2 - GIS & Environment

ESRI believes that geography is the key component for successful environmental management. The idea of using geography as the intellectual backbone to which all environmental data can be attached by location was the foundation that ultimately led to the development of GIS.

Natural resources—whether terrestrial, marine, or atmospheric—are finite, and the measurement and management of these resources are gaining importance as increased demands are put upon them.

Environmental management and stewardship programs integrate a broad spectrum of data with the analysis tools of GIS to provide a better understanding of how elements of natural communities interact across a landscape. GIS can cover all environment media and can be used to:

- Monitor and manage Water resources to ensure water quality mapping and planning
- Monitor and manage Land resources to support in the decision making of what to protect and how to protect it
- Monitor and manage Air quality in terms of pollution sources and pollution concentration

GIS covers as well a wide spectrum of areas in managing environment and natural resources that can be represented in, but not limited to, the following:

Biodiversity

Substantial alterations to and losses in biodiversity can be monitored and quantifying which will allow protective mechanisms to be developed and enforced in an attempt to preserve these genetic resources. GIS has been widely used in this field because of its integrated data collection, analysis, and reporting functionality.

Environmental Law

The use of GIS in both the creation and enforcement of environmental legislation is increasing. One of the driving forces of this increase is the availability of satellite imagery at a resolution sufficient to highlight legislative infractions.

Hazard and Risk Analysis

Mitigating the effects of natural hazards and providing potential risk analysis for communities is a common application area for GIS. This subject, perhaps more than any other, demonstrates the ability of GIS to create shared resources among varying professional disciplines.

Impact Assessment

GIS improves the process for assessing the effect of change on a location's resources, natural or man-made. Using GIS gives you the ability to measure areas, calculate degrees

of change visualize changes over time and report and share findings. More important is the fact that it can be used to simulate possible impacts of planned events.

Pollution Management

Pollution can be defined as the contamination of soil, water, or the atmosphere by the discharge of harmful substances. GIS is used at all stages of pollution management. Before pollution has occurred, avoidance and prevention management benefits from GIS.

Regulatory Compliance

Private business and public authorities are bound by environmental legislation. To operate, such entities require the issuance of permits that would control any operations potentially detrimental to the environment. The idea that location is important in the granting of environmental permits is not new, but GIS technology that helps the process is. In all stages of the permit process, GIS plays a part.

Resource Management

Natural resource management is a broad subject area and is, therefore, complicated. The data on which decisions are made can have limitless scope and be dynamic in the extreme. GIS can support decision makers with this seemingly mix of information by providing structure to the data and analytical capabilities and distribution mechanisms of information to all concerned parties.

3 – STRATEGY

The project purpose is crystallized in cooperating with the Environment General Authority (EGA) in a manner that UNDP provides expertise, supplies equipment and facilitates contracting for establishing GIS for environment management, while EGA funds the project, assigns staff and offers political and logistical support as and when needed and under NEX modality as NEX now is the dominant way for implementing UNDP projects.

In course of implementation the project will also enlist the support of key stakeholders – civil society organizations, communities, urban local bodies, international agencies and the private sector.

UNDP in agreement with EGA will provide support for sub-contracting all or part of the project's activities and for monitoring and evaluation. Country Office support may be provided in other areas also as agreed between UNDP and EGA. Such support activities will be carried out in accordance with UNDP rules and procedure.

The principal outputs/results of the project will be:

1. Outlining the EGIS development concept, general qualifications and the philosophy for carrying out such work
2. Detailing the blueprint of the system
3. Developing a Strategic Plan
4. Developing a Pilot Program
5. Staff Training Program

4 – Management Arrangements

The project will be nationally executed by EGA. EGA will appoint a senior government official to act as the National Project Director (NPD). The NPD will be responsible for mobilizing project inputs and achieving outputs in line with the project objectives. EGA in co-ordination with UNDP will also undertake the necessary arrangements for the establishment of the Project Management Unit (PMU). The PMU will be the nucleus for the commencement of project implementation. It will consist of a full time National Project Coordinator (NPC paid by the project), assistant, specialized short-term Senior National Advisor(s) as needed (SNA) on various aspects of GIS and capacity building. The NPC will be responsible for the daily management and operations of the project, while the SNA will provide overall technical backstopping and advice to the project. The NPC will also be responsible for submitting quarterly work plans and progress reports to UNDP. S/He will oversee selection of providers of supplies and services, will be submitting payment requests to UNDP, and will be providing regular guidance and direction to the project office. The NPC (supported by the NPD, PSC, and the SNA) will also oversee organization of project workshops and the meetings of the PSC. S/He will ensure project delivery on a timely and efficient basis.

A Project Steering Committee will be formed, headed by the NPD, and its functions will be in line with UNDP project management framework under NEX guidelines. Its members would be representatives of specialized officials in the cross-sectoral organizations in the country.

The established Project Steering Committee (PSC) will provide overall guidance and supervision to the project at the highest level. At the project start-up, the PSC will be fully briefed on the project scope, implementation approach and activities. The PSC will also provide political and institutional support to the project to ensure that project outcomes are perceived by all stakeholders at the highest level. Towards project end, the PSC will support formally the endorsement of the project assessment, strategy and action plan by the usual political channels in Libya.

The PSC should meet regularly during the life of the project, and should be called upon to make key project managerial decisions. The PSC will feed the EGA senior management of the project's progress and outcomes.

The project will also consult broadly with concerned elements and entities in the society. These consultations may lead to the identification of experts and expertise that can be drawn upon in later stages of the project.

EGA will provide the adequate funding to implement the project. This will include, but will not be limited to office space, office equipment and supplies, time of the NPD and other members of the PSC, facilities for meetings and consultations, political support.

All purchases of services and supplies shall be done fully in line with UNDP rules and procedures. The UNDP CO will play a key role in guiding activities and ensuring they are in line with UNDP development goals. This will include ensuring an appropriate focus on system level capacity needs, ensuring the consultative process is appropriately

broad, and, where appropriate, ensuring that the project focuses on issues cutting across all the areas of concern.

The Executing Agency, EGA, shall at all times, ensure compliance with the NEX guidelines and also comply with the requirements contained in the UNDP procedures for national execution (April 1998) to the extent they do not conflict with the said NEX Guidelines.

In case of sub-contracting, subcontractor will be providing overall project oversight as concerns its work and ensuring timely achievement of project milestones as to technical aspects, noting that subcontractors should adhere to the standard subcontracting agreements signed with UNDP. All subcontractors will work on a time and materials basis and be required to track hours and expenses. Milestones will be set to measure progress and to provide interim deliverables to the client.

In parallel, a Project Review Committee, comprised of EGA, subcontractor(s), when exist, and UNDP will be responsible for reviewing project progress reports and making recommendations/decisions that ensure that milestones are reached on a timely basis and in accordance within the project budget. The Committee will be the primary entity for regular communication between EGA, subcontractor(s) and UNDP regarding project expectations.

UNDP assistance will be provided subject to the satisfactory fulfillment of the financial coverage and the other prerequisite resources. If anticipated fulfillment of one or more of these fails to materialize, UNDP may, at its discretion, either suspend or terminate its assistance.

5 - Monitoring and Evaluation

The project will be subjected to annual review in accordance with the UNDP procedures and will be provided by the project team, subcontractors and the UNDP Country Office (UNDP-CO). The Logical Framework Matrix provides performance and impact indicators for project implementation along with their corresponding means of verification. These will form the basis on which the project's Monitoring and Evaluation system will be built. The project has to comply with regular UNDP requirements, namely the Annual Project Report (APR) and the associated Tripartite Review meeting (TPR). Important monitoring tools also include preparation of quarterly progress reports and the annual updating of the work plan by the project implementation team. The project will not, however, be subjected to a mandatory independent evaluation. Furthermore, a long-term plan for ongoing monitoring will be developed for implementation by the concerned institutions. The Environment General Authority is the executing agency involved in the monitoring and review of activities.

Subcontractors will use project status evaluations to assess and report on progress. These evaluations will assess progress toward milestones according to the project workplan and estimated costs for each activity.

For effective and results-oriented project implementation, the Project Steering Committee shall complement the cited monitoring process with evaluation(s) as and when necessary. In general, UNDP prefers outcome evaluation, that is, evaluation of a cluster of projects contributing to a given outcome rather than individual project evaluation. A detailed M & E strategy will be chalked out at the beginning of the project.

6 – Legal Context

This project document shall be the instrument referred to as such in Article 1 of the Standard Basic Assistance Agreement (SBAA) between the Government of Libya and the United Nations Development Program which was signed by the parties in 1976.

The host country-implementing agency shall, for the purpose of the SBAA, refer to the government co-operating agency described in that Agreement.

The following type of revisions may be made to this project document with the signature of the UNDP Resident Representative only, provided she or he is assured that the other signatories of the project have no objections to the proposed changes:

- a) Revisions in, or additions to, the project document which do not involve significant changes in the immediate objectives, outputs or activities of the project, but are caused by the re-arrangement of inputs already agreed to or by increases in costs due to inflation, and
- b) Mandatory annual revisions which rephrase the delivery of agreed project inputs, or which increase expert or other costs due to inflation or take into account the agency expenditure flexibility.

7 - RESULTS AND RESOURCES FRAMEWORK

Intended Outcome as stated in the Country Result Framework: Greater awareness, capacities, and means to monitor and preserve the environment at global, national and local levels.
Outcome indicator: Geographical Information System (GIS) needed for the local and global environment is produced. Strategy and Action plan for capacity development activities is developed and validated.
Baseline: Electronic environmental data is lacked as well as the relevant capacity.
Applicable MYFF Service Line: National/Sectoral policy and planning to control emissions of Ozone-depleting substances and persistent organic pollutants.
Partnership Strategy: The project will be executed by EGA in close cooperation with all concerned national agencies, government entities, sectors and people's committees involved in the environmental management process in Libya: Agriculture; Irrigation; Education; Resources, Environment and Urban Planning; General Planning; Economic Production; Finance; Services; Economy and Trade; National Authority for Oil; Livestock; Fisheries; Industry; Tourism; Public Information; Urban Planning; the Farmers' Union; Engineers' Union; Medical Doctors' Union. EGA is also providing the financial and other resources and the GPC is providing the technical support, while UNDP is expected to assume the

	coordination role. Advanced GIS	1) GIS and Spatial Analysis; 2) Introduction of Remote Sensing; 3) Cartographic Design.	
Intended Outputs	Output targets	Indicative activities	Inputs
Strategic Planning and Capacity Building	Inception Activities	Kick-off meeting, Orientation seminar	<ol style="list-style-type: none"> 1. Adequate funding 2. International consultants 3. National experts 4. Motivated national staff 5. Hardware 6. Software 7. Satellite Imageries 8. International training firms 9. Efficient logistics
	Refine User Interviews	Refined User Needs Report (may include detailed description and prioritization of needs, description of key gaps with recommendations, business process models for principle EGA functions, etc)	
	Data Inventory and Assessment	1) Data Inventory and Assessment Report (detailed assessment of EGA data, including quality, suitability for GIS, compilation strategy, etc), 2) Metadata Database, 3) Data Sample Archive	
	Requirements Analysis	Requirements Analysis Report (Draft and Final)	
	System Design and Implementation Strategy	Conceptual Design and Implementation Strategy Report (draft and final)	
Pilot Program	Pilot Design and Strategy	Pilot Design and Strategy Report (Draft and Final)	
	System Installation	System installation for EGA EGIS Pilot and manual describing install specifications and methods	
	Data Conversion and Automation	EGA environmental data 'warehouse' organized along clusters of related information topics	
	Assemble Environmental Database	Environmental GIS database, Logical database design schematic	
	Generate Outputs	Production of high priority mapping products	
Training Program	IT Systems Administration	Introduction to IT Systems Administration.	
	PCs and MS Office	1) Introduction to Personal Computers; 2) Introduction to the MS Office Suite.	
	Introductory GIS	1) Introduction to GIS; 2) Introduction to GIS Database Design; 3) Introduction to Metadata Requirements.	

8 – RISKS

The risks regarding the project are related to external and internal factors. The internal factors are:

- The possibility of not finding skilled and motivated personnel
- The development of the Center, unless target group-oriented, could lead to overload of the existing capacity
- Failure to establish a recognized image as an independent and reliable source of information among the main users of information: NGO community, mass media, scientific sectors.
- Failure to establish good relations with the main sources of information: government, municipalities, NGOs.
- The possibility of lack of adequate funding.

9 - The total workplan and budget

9.1 -Time schedule

The primary parts of the work program outlined in this document can be carried out between roughly 12 to 18 months. Achieving this schedule is highly dependent on the availability of government staff to meet the needs of the project, and in timely involvement and response from any involved stakeholders. During the project, it is fully expected that task assumptions and timing considerations will evolve, and changes will need to be made periodically to reflect any impacts to the time schedule. There are a large number of agencies involved in this effort, so it will be especially critical that the plan be kept up to date and stakeholders and other participants kept informed of the schedule to that they can plan accordingly. Outlined below is a tentative time schedule which may needed to complete each track.

Tasks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Track 1 Strategic Planning																
1.1 Inception Activities																
1.2 User Interviews																
1.3 Data Inventory and Assessment																
1.4 Requirements Analysis																
1.5 System Design/Implementation																
Track 2 Pilot Program																
2.1 Pilot Design/Strategy																
2.2 System Installation																
2.3 Data Compilation, Synthesis and Integration																
2.4 Data Conversion and Automation																
2.5 Assemble Environmental Database																
2.6 Generate Outputs																
Track 3 Staff Training Program																
3.1 IT Systems Administration																
3.2 Personal Computers and MS Office																
3.3 Introductory GIS																
3.4 Advanced GIS																

9.2 - Project costs

The total costs for carrying out the scope of work outlined in all three tracks are estimated to be around \$860,000 (USD), subjected to increase. Please note that the following budget includes all services needed to achieve an Enterprise GIS for EGA, largely delivered by international experts working closely with internal EGA staff. These estimates are based on similar engagements elsewhere. The budget can be adjusted depending on the level of involvement EGA staff are able to commit and the scope of services desired. Further discussions will be required to fine-tune this budget to fit EGA budgetary concerns.

Ser. No.	Item	Cost (\$)
1	Chief Technical Advisor (CTA)	150,000
2	National Project Coordinator (NPC)	24,000
3	International Consultants	100,000
4	Local Consultants	45,000
5	Administration	8,000
6	Project Steering Committee (PSC)	26,000
7	Trainees	5,000
8	Training	50,000
9	Sub-contracting	250,000
10	Travel	10,000
11	Hardware	150,000
12	Software	250,000
13	Satellite Images	50,000
14	Sundries	5,000
15	Miscellaneous	10,000
16	Transportation	120,000
17	Project Team	50,000
18	Total	1,303,000

Annexes

(Taken from the proposal of University of Redlands, The Redlands Institute Redlands, California USA and GPC, Inc., Running Springs, California USA)

I - Equipment:

Hardware/Software Specifications

Please note that the specifications provided below are based on US prices and these prices can be adjusted based on local distributor costs and EGA needs.

NO.	UNIT	DESCRIPTION	UNIT_COST (US\$)	SUBTOTAL
HARDWARE				
1	Server	Intel Pentium 4 Xeon Processor, 2 CPU-2800 MHz, 4 GB Memory	\$20,000	\$20,000
1	UPS		\$10,000	\$10,000
1	Additional Data Storage	Storage Array, 400+ GB Usable Disk	\$10,000	\$10,000
1	Local Area Network (LAN)		\$10,000	\$10,000
1	A0 Plotter A3 Color		\$15,000	\$15,000
1	Printers/Scanner		\$8,000	\$8,000
3	PC Workstations	3 GHz, 2 GB RAM, 40 GB HD including installation and implementation	\$4,000	\$12,000
1	PC Laptops	3 GHz, Pentium 4, 80GB HD and 1 GB RAM.	\$4,500	\$4,500
1	EA	Various supplies	\$3,000	\$3,000
1	EA	Furniture allowance	\$10,000	\$10,000
1	EA	Transportation allowance	\$1,000	\$1,000
			Subtotal	\$103,500
SOFTWARE				
2	GIS Core Software Viewer GIS	Full function GIS software to support metadata publishing, geospatial data editing, processing, and loading	\$15,000	\$30,000
3	Software Spatial Analysis		\$5,000	\$15,000
2	Modules Remote Sensing		\$3,000	\$6,000
1	Software Cartographic		\$10,000	\$10,000
1	Prod. Modules		\$2,000	\$2,000
1	RDBMS	Database management system (server and client side). Price range depends on RDBMS vendor. Licensing for 1 CPU	\$50,000	\$50,000
			Subtotal	\$113,000
			Total	\$216,500

II - The Project's Activities in Detail:

Environmental GIS Specific to EGA

Information gained via interviews between the EGA and GPC provides insights into EGA's business operations, and how an EGIS can be best developed to suit their specific needs.

The EGA is responsible for monitoring, assessing and responding to environmental conditions and emergencies within Libya. More specifically, the range of EGA responsibilities span from assisting local agencies to assess and respond to local environmental pollution problems and events, review of environmental impact assessment (EIA) documents, assessment of environmental issues at local, national and international scales, ensure compliance with international treaties and conventions, plan for and respond to catastrophic events, and ensure conservation of sensitive species and habitats. Therefore, the core duties of the EGA are complex, dealing with phenomena that are spatial in nature, across multiple scales and agencies.

These complex relationships are what an EGIS is best suited for. International experience suggests that an Enterprise GIS is an integrated, multidepartmental system composed of interoperable components. It provides broad access to geospatial data, a common infrastructure upon which to build and deploy GIS applications, and significant economies of scale. Possible benefits of an EGIS include:

- Significant reduction of data redundancy
- Improved accuracy and integrity of geographic information
- Efficient and timely data sharing
- Improved enterprise-wide knowledge management and decision support capabilities
- High level of interoperability between GIS and non-GIS applications
- More effective use of departmental GIS skills and resources
- Reduced overall GIS maintenance and support costs

Several EGA departments within the central office and regional branch offices were identified:

- Administration and Finance Department
- Research and Studies Department
- Planning and Information Department
- Emergency and Planning Department
- Environmental Protection Department
- Inspection and Control Department
- Nature and Natural Resources Conservation Department
- Computer and Automation Department

All the above departments have a stake in the development of the EGIS. Therefore, direct involvement from representatives of each department is required to develop a system that is effective and provides the functional capabilities to accommodate data

sharing, communication, access and analytical capabilities among all departments, all in an effort to build an efficient and practical organization for the protection of human environmental health and safety, and protection of Libya's extensive natural heritage.

The capabilities and benefits derived from the development of an EGIS would complement Libya's involvement with various international treaties, agreements, conventions and cooperative activities. Of note:

- The State of the Environment Report, a collaborative project with the UNEP in 2002, outlined the major natural resources of Libya, the development pressures on these resources, and the various intervention strategies available for mitigation.
- The Mediterranean Action Plan strives to protect the environment and to foster sustainable development in the Mediterranean basin.
- The Mediterranean Marine Gap Analysis, a study conducted by the World Wildlife Organization (WWF) in 2000, concluded that two significant areas (out of a total 13 for the Mediterranean region) of marine biodiversity occur in Libya. As a response, the WWF recommended regulations for coastal trawling and construction and adoption of international pollution legislation for the Mediterranean.
- Discussions between GPC and the EGA found that various environmental studies being conducted by the EGA lacked consistency, baseline information and long term monitoring capabilities to better estimate the state of the environment over time. These types of outcomes are common in organizations conducting similar activities throughout the world, and it is exactly these types of scenarios that the concept of EGIS was conceived to help resolve.
- Agenda 21, of the Rio Declaration on Environment and Development, is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments and Major Groups in every area in which human impact the environment.
- The Ramsar Convention, signed in Ramsar, Iran in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for conservation and proper use of wetlands and their resources.
- The Barcelona Convention of 1976, amended in 1995, aim to reduce pollution in the Mediterranean Sea and protect and improve the marine environment in the area, thereby contributing to sustainable development.
- The Convention on the Conservation of Migratory Species, an intergovernmental treaty sponsored by UNEP, aims to conserve terrestrial, marine and avian migratory species throughout their range.

The incorporation of EGIS programs in environmental agencies has been ongoing worldwide over the past two decades. To learn from these examples and implement best practices into the EGA's EGIS initiative, the GPC Team will acquire a subject matter expert (SME) in the environmental field. This SME will have years of practical agency experience in similar initiatives, and provide insights and best-practice experience towards the construction of an effective conceptual framework and design strategy for the EGA EGIS program.

1. SOW TRACK 1 – STRATEGIC PLAN AND CAPACITY BUILDING

This section describes a series of tasks. These tasks describe necessary steps needed to properly design an Enterprise GIS that fits the needs of the EGA users. This process is based on structured methodology that has been successfully implemented in many projects of a similar nature and scope.

1.1 Task 1.1 – Inception Activities

This task will comprise of activities needed to begin the EGIS process for the EGA. This will consist of beginning with “kick-off” meetings with EGA managers and necessary staff where a quick pass of EGA documents and information are gathered which assist in outlining EGA priorities. This information will be used as a basis for developing strategies with the EGA managers on next steps, which includes the groups and individuals that should be included in the interviewing process. In addition, an orientation seminar will be held to introduce EGA staff to GIS concepts and the overall workplan for the EGIS.

1.1.1 SubTask 1.1.1 - Kick-off Meetings

The consultants/experts will hold a series of kickoff meetings with the EGA, conduct a review of existing background materials to better understand the general scope and organization of the EGA, and meet with managers to strategize groupings for the interviews to be conducted later.

The first day of the kickoff meeting will allow the EGA management and related staff to meet with the consultants/experts, to review and confirm the general intent of the project, and to discuss communications, logistics and other project administration issues. Prior to the kickoff meeting, EGA staff will prepare a variety of appropriate background materials for review with the consultants/experts. The types of material that would be helpful include:

- Organizational charts and descriptions of departmental mandates and duties;
- Annual reports;
- Operating manuals;
- Previously prepared IT, CAD, GIS or related studies, reports, or plans.

Relevant background material will help the consultants to develop an understanding of the administrative and functional structure and range of activities carried out by the EGA at present. EGA staff will provide an overview of this information during the first day of meetings. The consultants/experts will then conduct a more detailed review of the material prior to the second day of meetings.

The second day will focus on meeting with each of the EGA managers and their representatives to discuss priorities and to strategize what groups and individuals should be included in the interviews to be carried out later. Prior to these meetings, the EGA project coordinator should confer with managers to brief them on the purpose of the project, and to ask them to assign representatives who will be available to participate

directly in the project. Representatives will participate in all the interviews within their department and will be available for consultation for the duration of the project. They will also be responsible for keeping departmental managers apprised of the progress and status of the project. Representatives should have a good overall knowledge of the workings of their department, some familiarity and/or interest in computer technology, and good working relationship with department staff.

The results of the kickoff meetings will be documented to a Technical Memorandum outlining the interview program. This will be developed in close coordination with the EGA Project Manager

Consultants/experts Responsibilities.

- Participate in 2-day kickoff meetings;
- Document draft interview plan;
- Discuss draft plan with Project Manager and prepare final.

Client Responsibilities.

- Collect relevant background materials;
- Arrange meetings with department managers;
- Participate in 2-day kickoff meetings;
- Review draft interview plan and provide comments.
- Commit an average of 4 hours per week following interview sessions, which will require 100% time commitment on days that departmental interviews occur.

1.1.2 SubTask 1.1.2 - Orientation Seminar

An orientation seminar will be held to present EGA staff with relevant aspects of GIS technology and its application to EGA and related issues in other organizations around the world. Information from the kickoff meetings will be used to determine what application areas will be of most interest to the participants. The seminar will also explain the procedures to be used in this study, and what will be expected from their participation in the user interviews and subsequent activities. The seminar will cover GIS concepts and how spatial analysis and data management capabilities of a GIS can be used for a variety of applications. A seminar workbook will be provided to each participant for reference during and following the presentation.

The seminar will be structured to last three to four hours. It will consist of two parts. The first part will focus on explaining GIS technology and recent trends, and the role it can play in supporting the activities of the EGA. The second part of the seminar will focus on explaining the steps to be followed in carrying out this study, including the overall process, purpose and objectives of each task, and what will be expected of the attendees.

Consultants/experts Responsibilities.

- Prepare orientation seminar materials;
- Deliver seminar.

Client Responsibilities.

- Arrange seminar logistics;

1.2 Task 1.2 – Refine User Interviews

In this task, the consultants/experts will conduct a series of detailed interviews to further explore the potential additional needs of the EGA for using GIS technology. This “enterprise” assessment approach will consider the full range of GIS-related operational responsibilities and activities of the various departments. The specific functional groups who will likely be interviewed in this task are listed below. This list will be further refined through discussions with the EGA project coordinator and department managers during Task 1.1 – Inception Activities.

- Administer the Authority
- Conduct Environmental Inventory and Assessment;
- Oversee, Monitor and Inspect Polluting Facilities;
- Conduct Environmental Monitoring, Research and Studies;
- Conduct Development Review and Comment;
- Identify and Follow Environmental Pollution Issues;
- Support Emergency Planning and Response;
- Support the Protection and Conservation of Nature and Natural Resources;
- Represent Libya in Environment-Related Conventions and Treaties;
- Compile, Manage, Analyze and Disseminate Environmental Information;
- Respond to Requests for Environmental Information;
- Conduct Public Outreach and Awareness;
- Conduct Internal Planning and Training;
- Administer Computing Infrastructure.

The interview task will focus primarily on the existing business operations of the departments and functions listed above, and the data management and analysis functions carried out in the context of these operations. Information about department needs will be collected through a series of group interviews. It is anticipated that there will be a need to conduct a total of approximately 12-15 group interviews, each requiring approximately 2-4 hours to complete. This assumed number of interviews will be confirmed or refined during the Task 1.1.

A structured interview technique will be used to effectively gather the required information, while allowing for sufficient interaction and idea-sharing with the participants. Needs assessment interviews will be focused around the following structured line of inquiry:

- Mandate and responsibilities;
- Existing work processes;
- Data used and generated;
- Data manipulation requirements (input, management, query, analysis and display);
- Computing infrastructure currently in use or planned for implementation in the near future;
- Existing staff computing skills and experience;
- Special concerns and issues;
- Coordination with the United Nations Environment Program and Mediterranean Action Plan environmental indicator requirements

Other topics and issues may be explored based on the specific situation of each group being interviewed. While all the potential application areas will be addressed at some level, special attention will be paid to those that were identified as special priorities during the Task 1.1.

Department interviews will be documented immediately and returned to the interviewees for review and confirmation. Information collected during the interviews will be compiled initially to a draft "Needs Assessment Report", inclusive of textual descriptions, process flow diagrams and other techniques for recording relevant aspects of the various departments and functional groups therein. In addition, an inventory of all the most important geographic and geographic-related data stores used by the departments will be compiled. This information will be documented to a User Needs Assessment Report and provided to the EGA Project Manager for review and comment. Specific input will be incorporated to a final version of the report.

Consultants/experts Responsibilities.

- Carry out 12-15 interviews (number to be confirmed);
- Prepare User Survey Report (draft and final copies).

Client Responsibilities.

- Attend interview sessions
- Review Needs Assessment Report
- Coordinate review feedback from the departments and forwarding them to the consultants/experts for incorporation into the final report
- Provide background documents, such as detailed process flows, forms, and copies of relevant regulations or procedures.

1.3 Task 1.3 – Refine Data Inventory and Assessment (DIA)

The LSDI stakeholder needs assessment has included an initial inventory of the basic data used or generated by the EGA. During this task, further samples of geographic or geographic-related data generated or used by the various groups will be collected and compiled to an organized data sample archive. In Task 1.4, the information will be analyzed to evaluate the range of data required and potential issues regarding data integration, automation and access. Characteristics of the data sources such as map accuracy and resolution, map scale and geographic extent, currency and quality, subject matter presented, and possible automation problems will be considered. Redundancy of data collection by different agencies, as well as inconsistencies between data sources of the same data theme will be evaluated.

This part of the work will focus on developing a comprehensive inventory of the "fundamental" geographic data to be considered in the conceptual design of the EGA's GIS program. Existing and planned systems for the management and manipulation of these data will also be inventoried. The inventory of the geographic data will include map and tabular (attribute) data as well as other forms and formats of data including drawings, text and graphics. Data sample information sheets will be prepared for each data sample obtained during the interviews. Emphasis will be placed on characteristics of the data,

and how they are used in support of decision making and day-to-day business operations of the EGA.

Consultants/experts Responsibilities.

- Conduct data inventory and evaluation;
- Produce initial metadata database;
- Prepare Data Inventory and Assessment (draft and final copies).

Client Responsibilities.

- Review and comment on Data Inventory and Evaluation document
- Provide raw data samples as needed
- Prioritize needs and wants

1.4 Task 1.4 – Requirements Analysis

Information gathered during the previous two tasks will be synthesized to analyze the EGIS requirements needed by the EGA. The user needs and the DIA will be cross referenced to investigate what data topics are required to fit the user needs. In addition, this information will be linked to hardware and software requirements as well as staff roles and responsibilities to determine the overall requirements needed for development of the EGA EGIS. A workshop will be held with key EGA managers and staff to discuss how the user needs are linked to the current DIA to ensure all aspects of the EGA business process are covered. A draft Requirements Analysis Report will be generated, beneficial for Task 1.5 – System Design and Implementation Strategy. In addition, the Requirements Analysis will set a timeline that guides future anticipated outcomes in terms of long-term objectives identified during the first two tasks.

Consultants/experts Team Responsibilities.

- Conduct Workshop
- EGIS Requirements Analysis Report (draft and final)

Client Responsibilities.

- Arrange workshop logistics
- Review final Requirements Analysis Report

1.5 Task 1.5 – System Design and Implementation Strategy

A conceptual system design articulates the "big picture" for the development of the EGA GIS over time. The design addresses all the five major components of a "system" including the data, hardware, software, people, and procedures. It also addresses organizational priorities by identifying what components should be implemented first, and what this might imply in terms of an evolutionary process by which an initial foundation system can be further expanded and refined over time.

The information collected in the previous tasks will be further analyzed and used to identify the GIS data and applications that will be needed to support the primary EGA applications. This will then be used to develop a "framework" conceptual design for the EGA GIS that will outline the basic structure and interrelationships between the needed applications, the databases to be maintained on the system, computing infrastructure

(hardware, software and communications network systems) requirements, a multi-leveled training program for EGA staff, and potential alternative administrative structures for managing the system. It will also include an implementation strategy that clearly identifies and articulates database and application priorities and the incremental steps that will be needed to implement the priority components of the overall system.

The Conceptual Design for the EGA GIS will be divided into the following five major components:

1.5.1 Administrative Framework.

There are various administrative approaches that the EGA may wish to consider for managing the GIS. A series of alternative scenarios will be outlined by the consultants/experts and discussed with the EGA departmental representatives and other management staff, as needed. If necessary, a special workshop could be conducted to explain the opportunities and constraints of various alternatives relative to the EGA's existing situation, and to facilitate discussion and consensus among concerned management staff.

Once a preferred alternative has been formulated, the consultants/experts will further articulate this to a section of the design report. The Administrative Framework component of the conceptual design will address several key factors, including:

- Preferred administrative structure;
- General staff roles and responsibilities;
- Policy-level committee structure;
- Technical-level committee structure;
- Technical support function;
- Capacity building within other agencies.

1.5.2 *Computing Infrastructure Framework.*

The EGA has already implemented some level of computerization throughout most of the departments. It will likely be necessary to build on, integrate with, expand and refine this existing capacity, and to build new components to accommodate the new GIS capacity. This section of the conceptual design will address the range of hardware, software and network issues that will need to be considered during the initial implementation of the EGA GIS, and on into the future extension of the system. Since technology is changing at a very rapid rate and will continue to do so into the foreseeable future, this framework design will address functional considerations and issues rather than detailed technical specifications.

1.5.3 *Application Software Framework.*

An application framework will be outlined to articulate the functional application software modules that will be needed to support the priority activities of each department. These will be mostly organized around the existing work processes of the individual organizations, and may also address opportunities for streamlining existing operations

based on technological opportunities. Application software module descriptions will include, at a minimum, the following:

- Application software objective;
- Workflow process to be supported;
- Number of users and benefits to be accrued;
- Basic functional description;
- Data stores maintained or used by application (graphic and non-graphic input and output);
- Data layer implications and recommendations (data format and content requirements);
- Computing infrastructure requirements and impacts (hardware and base software requirements, operating system implications, potential network traffic, and other issues);
- Implementation implications (potential for incremental implementation, dependency upon other functional modules, and other issues);
- Implementation costs and projected benefits (based on implementation options).

1.5.4 Data Framework.

A conceptual design for the EGA GIS database framework will be developed. This will focus on those “fundamental” data layers that are most needed by the EGA departments for carrying out their primary duties. The conceptual data framework design will summarize the content and form of the database, including the definition of graphic layers and non-graphic tabular data stores. The framework will be structured around appropriate geographic scales of concern needed to support the various department activities identified previously. Database conceptual design issues that will be addressed at a minimum include:

- Compilation scales. Two or three levels of data accuracy and resolution may be needed to address all the most important applications;
- Geographic data layers. The thematic spatial data layers that will need to be included in the system will be identified;
- Related tabular data files. Tabular files that may contain descriptive information, maintenance histories and other such data will be identified;
- Other related data. Other data that may need to be related to the geographic files will also be identified. These can include orthophotography, facility drawings, site photographs, and other such references.
- Supported applications;
- Sources and/or methods for initial data conversion;
- Basic data content and structure;
- Relationships and integration dependencies with other graphic layers;
- Relate key relationships to tabular data stores;
- Implementation implications (support for priority applications, potential to reduce data redundancy through integration of related themes, incremental implementation, dependencies with other data stores and applications and other issues);
- Implementation costs and benefits (based on implementation priorities).

1.5.5 Metadata Framework.

As GIS technology becomes more popular, the task of managing the information becomes more difficult. Metadata is information about a dataset, or a portion of it, such as a layer, an attribute, or specific features. Metadata tells what the database contains, how accurate the data is, and its intended uses, among other items. It tells where the data came from, who worked on it, and what was done to it. Metadata is anything that most users would need to know about the data in order to determine its appropriateness for use in their applications and decision-making processes. Metadata should be viewed as a component of the GIS data set that provides information supporting the use and application of the data set. As a dynamic component, it can be used internally by the organization as well as support the transfer of the spatial data to others.

A conceptual design for the Metadata database framework will be developed. The metadata preparation shall be based on:

- The uses of GIS data in an organization.
- The people in the organization that access the GIS system and the information that they need to properly use the spatial data.
- The information needed to respond to requests for spatial data.
- The information needed to manage the data sets both on line and in archive.
- The types of spatial and data base analysis that are done.

The GPC Team will work closely with EGA staff to devise a practical and strategic implementation plan for the incremental development of the EGA EGIS. This task will pull together all the findings from the previous tasks into a coherent and prioritized implementation sequence for the incremental and strategic development of the system over time.

Part of the implementation plan will include specifications for a pilot demonstration for a limited geographic area and/or range of topics (Track 2). The purpose of the pilot will be to develop a scaled-down version of selected aspects of the proposed EGIS as a way to demonstrate its form, basic function and benefits to the EGA staff.

Technology and organizations change, sometimes rapidly. It is therefore important that the implementation strategy be flexible to accommodate future refinement and adaptation. In addition to the pilot specification mentioned previously, the Implementation Plan prepared in this task will describe basic activities to be carried out in the initial system development phase, and will identify functional, technical, and administrative dependencies among components.

Consultants/experts Responsibilities

- Conceptual Design and Implementation Strategy Report (draft and final)

Client Responsibilities.

- Review draft Conceptual System Design and provide comments.

2. SOW TRACK 2 – PILOT PROGRAM

Track 2 consists of a pilot to demonstrate an EGA GIS as proof of concept. This track will help to refine the System Design and Implementation Strategy developed under Track 1 and result in the implementation of a node in the Libya SDI. Additional outcomes include staff and institutional capacity building and increased linkages to regional (Mediterranean, North African) environmental conservation and sustainable development initiatives, such as the Mediterranean Action Plan (MAP) and other UNEP initiatives.

2.1 Task 2.1 – Pilot Design and Strategy

This task involves developing the scope, specifications, resource requirements and phasing for the pilot program. One outcome of this task is a plan (document) that will guide implementation of the pilot. Another outcome is a logical database design for the EGA GIS.

The Pilot Design and Strategy will specify the geographic extent, topical focus, data requirements and geographic scales to be used in the pilot. These specifications will be based on the results of Track 1 Tasks, including the Data Inventory and Assessment and Requirements Analysis. It will also specify the process by which the data required for the pilot will be compiled, synthesized and incorporated into a pilot EGA GIS database. Additional outcomes of this task are 1) a logical model of the EGA GIS database and 2) conceptualization of high priority output products to be produced during Task 2.6.

The Strategy will also discuss the coordination mechanisms, resource needs (staff, hardware, software) and implementation plan produced during this task as a reference for pilot implementation. This plan will help the Pilot Management Team to measure progress against Pilot goals and to identify project dependencies and risks. This plan may ultimately be deployed on an enterprise-wide platform (such as Microsoft Project Server) for the purpose of staff time tracking.

It is estimated that development of the Pilot Design and Strategy will require three international staff (one senior technical, one technical and one mapping specialist) for three weeks of on-site work.

Consultants/experts Responsibilities.

- Pilot Design and Strategy Report (draft and final)

Client Responsibilities.

- Coordination with EGA managers, department heads and relevant staff to work with the consultants/experts in determining the Pilot Design and Strategy

2.2 Task 2.2 – System Installation

This task involves installation of the basic infrastructure for carrying out the pilot activities. Hardware, software and networking needs will have been defined during

Tasks 1.4 and 2.1. System maintenance and database administration training will occur as a part of Track 3.

It is estimated that System Installation will require 3 weeks of on-site (not all) work by a systems administrator. Get hardware from places/logistics; develop manuals, etc.

Consultants/experts Team Responsibilities.

- System installation for EGA EGIS Pilot and manual describing install specifications and methods

Client Responsibilities.

- Coordination with EGA IT staff to work with international IT expert
- Coordination with vendors to obtain necessary hardware/software

2.3 Task 2.3 – Data Compilation, Synthesis and Integration

This task involves bringing together a representative sample of information related to the topical focus of the Pilot. Information such as reports, plans, maps and tables may exist in a variety of hard copy and/or digital formats and distributed across one or several agencies. Reviewing this information and extracting 'data' from it is the principle activity under this task. The Data Inventory and Assessment conducted in Track 1 will be used in this task to track down the available sources of information.

It is estimated that the *Data Compilation, Synthesis and Integration* will require approximately three to four weeks of on-site work by one international data specialist with expertise in compiling environmental data. He or she will be partnered with at least 3-4 EGA counterparts, preferably one being a scientist. One to two international GIS specialists will also be required on-site during this period to facilitate data extraction into a GIS compatible format. These specialists will also partner with one or more local staff.

Consultants/experts Team Responsibilities.

- EGA environmental data 'warehouse' organized along clusters of related information topics

Client Responsibilities.

- Assistance from EGA staff in the assembling of relevant data sets

2.4 Task 2.4 – Data Conversion and Automation

This task involves conversion of the data collected in Task 2.3 into a GIS compatible format. This task will result in the development of several GIS datasets that will later be integrated into the Pilot EGA EGIS in Task 2.5. The team will digitize hardcopy maps, format and populate data tables and perform map and image rectification to a common geographic projection and coordinate system.

This task will also permit the project team to evaluate and refine the logical database design created during Task 2.1. In addition, this stage would also require final QA/QC of all data sets including the association of metadata for each.

This task will require approximately three weeks of on-site work by one international GIS specialist and one international GIS technician. Both of these international staff will be paired with local counterparts.

Consultants/experts Responsibilities.

- Environmental GIS database
- Logical database design schematic

Client Responsibilities.

- Assistance from EGA staff in the conversion and automation of data sets gathered in Task 2.3

2.5 Task 2.5 – Assemble Environmental Database

The environmental database developed for the EGA will in the form of a geodatabase populated with data identified in Tasks 1.3 and 2.3. This effort will leverage existing efforts, mainly the LSDI initiative, in its design concept. The geodatabase will focus on supporting the EGA's analysis and use needs by organizing data, along with the necessary topology and relationships, such that department heads and domain experts can easily find the data topics relevant to their areas of interest.

Development of the *Environmental Geodatabase* will require approximately 2-3 weeks of onsite work with one international GIS Specialist, one international GIS Technician and one local GIS Technician, who will have some training in these concepts by this time.

Consultants/experts Team Responsibilities.

- Environmental geodatabase for the EGA EGIS Pilot

Client Responsibilities.

- Coordination between GPC Team and EGA staff to ensure completion of the geodatabase

2.6 Task 2.6 – Generate Outputs

The consultants/experts will work with EGA staff to identify several products (maps, reports, GIS analyses) that will be produced as a pilot outcome. These products will be 'high priority' in regards to EGA research needs and serve to raise awareness about one or more environmental topics in Libya. The products will be targeted to raise EGAs profile as a leader in GIS technology in Libya and as a player in regional conservation issues.

The generation of the Outputs will require one international Mapping Specialist along with one Graphics Specialist along with collaboration with local EGA staff.

Consultants/experts Responsibilities.

- Production of high priority mapping products

Client Responsibilities.

- EGA staff coordination with GPC Team

3. SOW TRACK 3 – STAFF TRAINING PROGRAM

Some staff within the EGA are most likely already familiar with GIS principles and practices and the use of specific software. Other staff has no GIS experience, and expansion of the system to an EGA-wide implementation will inevitably require that a range of skills be developed among the staff who will be the primary users of the system. Also, it is important to consider that learning is an incremental process and any training program must take into account that information must be provided in a logical sequence, over a reasonable period of time. Several different training curricula will be developed for different levels of users, depending on their need.

3.1 Task 3.1 - IT Systems Administration

IT systems administration will offer the basics in setting up and designing a computing infrastructure including the necessary networks and communication needed between computers to have an efficient workflow. The class will be intended for those in charge of managing and maintaining such systems.

- Introduction to IT Systems Administration

3.2 Task 3.2 - Personal Computers and the MS Office Suite

Classes under this category are intended to help EGA staff better understand personal computer and some of the basic software used for management and communication of data and reports. The goals will be to orient the user around the basics of navigating through personal computer functions, while also introducing EGA staff to basic functionality of MS Office products such as Word, PowerPoint and Excel. Two classes will be offered:

- Introduction to Personal Computers
- Introduction to the MS Office Suite

3.3 Task 3.3 - Introductory GIS

Classes under this program are intended to provide the user with the basic knowledge necessary to navigate through a GIS, introduce, convert and manage data, and develop the necessary geospatial tables necessary to conduct basic analysis. Three classes will be offered:

- Introduction to GIS
- Introduction to GIS Database Design
- Introduction to Metadata Requirements

3.4 Task 3.4 - Advanced GIS

Classes under this program will provide users with advanced knowledge of GIS processes including spatial analysis and remote sensing. It is expected that students enrolling Advanced GIS classes already have basic GIS knowledge independently or via the Introductory GIS program.

- GIS and Spatial Analysis
- Introduction of Remote Sensing
- Cartographic Design

International experts will be invited to teach each course. In some cases, one expert could lead several of these courses while also considering that two experts might be needed for some of the courses to facilitate smaller group exercises. In addition, these courses will follow a logical sequence. For example, Advanced GIS will follow Introductory GIS. The schedule of the courses will be determined in consultation with the EGA managers and department heads, but should be oriented such that local EGA staff acquires the necessary GIS knowledge needed to assist the consultants/experts through the tasks identified in Tracks 1 and 2.

III - Supplementary work

Both Tracks One and Two will position EGA to carry out a number of subsequent activities designed to improve EGA's institutional capacity and to raise its profile as a leader in environmental monitoring in Northern Africa as well as further contributing to the Libya Spatial Data Infrastructure. Activities identified that will achieve these goals are:

- Coordinate and develop sector papers for principle domain areas (specializations)
- Develop Environmental Atlas for Libya

While the development of the activities listed above would be a great benefit, the EGA EGIS implementation strategy outlined in Tracks 1, 2 and 3 will also assist the EGA comply with the regional initiatives such as Blue Plan under the Mediterranean Action Plan. The Sector Papers and Environmental Atlas would be implemented under separate proposals if sought by the EGA.

10.1- Sector Papers

The purpose of developing sector papers is to assemble the 'state of knowledge' about Libya's natural environment. Sector papers will use the relevant UN standards framework for evaluating the state of knowledge for each sector. This framework includes an appraisal of Libya's environmental resources, an assessment of the pressures acting upon those resources (which result in resource degradation) and an evaluation of the response to those pressures, both in terms of environmental response and human response (policies, management practices, etc).

The process of developing sector papers results in institutional capacity building. Teams of domain experts from within EGA and subject matter experts SMEs from the international community will be paired up to assemble and synthesize all available information (published literature, reports, datasets) relevant to a sector in order to publish each sector paper. Also, technical experts in data synthesis and GIS (EGA staff paired with international counterparts) will support these sector-based teams, providing the required technical input towards sector paper development. In both cases, international

staff serves in a mentoring capacity with their local counterparts and will play a major role in the actual work of sector paper development.

The sector paper development process will result in strengthened relationships between EGA, other Libyan agencies and multilateral agencies (such as UNEP and UNDP) and donors. Since the sector papers will span domain areas outside of the mandate of EGA, it will be necessary for EGA to develop collaborative partnerships with other agencies in order to compile all available information and write the sector papers. The Pilot Design and Strategy Report, produced as an outcome of this track, will specify the agencies and multi-lateral institutions with whom EGA is most likely to partner.

3.5 State of the Environment Report

The State of the Environment (SoE) report for Libya will be published as a synthesis of the sector papers. The SoE report will follow the respective UN guidelines for content and be written for an international audience. This activity will involve an input from international experts with experience in developing this type of report and be carried out as a joint exercise between representatives of each sector. The SoE report will serve to raise awareness of the state of Libya's environment across the nation and raise Libya's profile as a key player in Mediterranean and North African-wide sustainable development initiatives.

3.6 Environmental Atlas for Libya

An environmental atlas for Libya could be developed as a capstone to work completed in this phase of the project. The atlas would depict in a highly graphic and compelling manner the wealth of Libya's environmental resources and their value to Libyan society as a whole. It would also summarize key national environmental concerns and their potential impacts on the Libyan natural environment and the Libyan population. The atlas would be designed both in digital and hardcopy versions where the digital copy would be highly interactive and contribute to EGA public outreach and awareness functional requirements.