



**United Nation Environment Program**



**Mediterranean Action Plan**

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Program for Assessment and Control of Marine Pollution

Strategic Action Programme SAP

# **The National Action PLAN**

**For the Libyan Coastal Area**

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LIBYA 2005

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## Preface

Following Stockholm Conference on Human Environment, Sweden, 1972, and the foundation of United Nations Environment Program (UNEP), there emerged Regional Seas Programs, aimed to regulate International Environmental Cooperation between States living in same maritime region. A main feature in these Programs is Mediterranean Action Plan (MAP). One of the priorities of the work plan, since its establishment in mid seventies of the last Century, was intensive work to integrate Mediterranean States efforts to protect the Mediterranean Sea from all forms of pollution accumulation. The Mediterranean Action Plan (MAP) work started with analytical studies, monitoring and data collection on all pollution forms and sources, which helped to establish the certainty among all Parties that the main source of pollution is human activities on the Basin Banks, which are known as Land-base Sources.

In 1983, the Protocol on the Protection of the Mediterranean Sea from pollution from land-based sources entered into effect. Protection here means taking the necessary protection measures, such as introducing legislation and guidelines concerned with definition of pollution levels reaching the Mediterranean Sea through Waste water, solid waste and others; and with environmental monitoring of pollutant concentration levels in Seawater.

Earth Summit 1992, and 21<sup>st</sup> Century Agenda resulted in the Programme for Assessment and Control of Marine pollution (MED POL), to control and assess marine pollution from land-based sources. Necessary amendments have been made to Barcelona Convention, and the Protocol on protecting the Mediterranean Sea from land-based sources. This prevention required taking all the necessary measures to reduce quantities of pollution reaching the Sea, by signatory states. Mediterranean States managed in 1997, to adopt Work Plan in this area under the name of Strategic Action Programme (SAP), which has been provided with financial support from the Global Environment Facility (GEF) in order to implement the First Phase in SAP, which will extend to year 2005.

This Phase will include the development of a National Action Plan (NAP) for individual countries, to be in line with all objectives and activities embodied in the Strategic Action Plan, which will undertake to control marine pollution from land-based source in the long run.

Considering that dense population settlements and major industrial activities existing on the Basin Banks, are main pollution sources, initial work in this plan included diagnosis of environmental situation in coastal areas, estimation of quantity and types on pollution emissions to the Mediterranean Sea, and determination of main pollution sources.

The Strategic Action Plan, through National Action Plan, is aimed to reduce the quantity of pollution emission from land-based source by a given percentage, in accordance to pollution forms and sources. Target reduction under this Plan will be 50% by 2010, at Mediterranean States level.

In accordance to contacts made between Plan coordination office and the Environment General Authority, Local experts have been assigned to prepare Studies and reports on SAP, whereas execution Phases of the Libyan Party obligations are divided as follows:

**National Diagnostic Analysis (NDA) for Coastal Area:**

Dr. Mahmoud ELFallah Western Region, from Ras Ajdir to Western limits of Sirt City. Dr. Farag El Durssi, Eastern Region, from Sirt on the West to Tubrouk to the East.

**Baseline Budget (BB) 2003.**

Dr. Mahmoud ELFallah Western Region, from Ras Ajdir to Sirt City.  
Dr. Farag El Durssi, Eastern Region, from Sirt on the West to Tobruk to the East,

**Sectoral Plans (SP) (Sectoral Activities connected with pollution Emission and Control).**

Dr. Ahmed B. S. MANSUR, Western Region from Ras Ajdir to the Western Limits of Sirt City.

Dr. Faraj El Mabrouk El Dirsi, Eastern Region from Sirt to the West up to Tobruk to the East.

**National Action Plan preparation Phase.**

Dr. Mahmoud El Fallah and Dr. Abdufatah M. BOARGOB

*Now that this work has been completed, we would like to present our thanks and gratitude to all Institutions and individuals who provided us with valuable information, and to all those who attended Tripoli and Benghazi Meetings (February 2005) to prepare Sectoral Plans.*

## **CHAPTER ONE: SCOPE OF NATIONAL PLAN**

### **1.1 Plan Definition: Nation Environmental Plan for Coastal area**

Considering the extreme and seas as sources of wealth that sustain human health and economic development, the International Community has taken all the necessary measures to limit pollution and damage to marine ecology from the land side. The Strategic Action Programme (SAP) for Mediterranean Countries, approved by Parties to the Agreement on protecting Mediterranean Sea from pollution, and its protocols, is considered as individual or collective commitment to the development and implementation of National and Regional Action Programmes and Plans, defining measures to reduce and control pollution from land-based sources and activities, in accordance to the Minutes of Mediterranean Sea Protection from land-based sources pollution.

SAP's objective is cover various sectors and activities confirmed to have great impact on coastal marine environments, mainly:

- Production of Electric Power, including all Electric Power Generation Plants, which depend on fossil fuel combustion.
- Discharge of Urban and Industrial sewage to Sea.
- Urban and Industrial Area solid waste management.
- Cement and steel iron industries.
- Petroleum refinery and petrochemical industries.
- Various chemical industries.
- Hazardous waste management, including collection, treatment and disposal.

Whereas Libya is a Contracting Party to Barcelona Convention and Protocols, it is bound to work within the framework of the Strategic Action Programme to develop a specific National Action Plan for coastal regions in order to achieve SAP objectives, by 2025, this will be achieved by means of reduction and control of marine environment pollutants from land-based sources.

## 1.2 Geographic Plan Limits

Libya is situated at the Northern part of the African Continent extending along a Mediterranean Coast of about 1900km in length. It is bounded to the East by Arab Republic of Egypt; to the South, by the Sudan, Chad and Niger; and to the West by Tunisia and Algeria. Total area of the country is 1775500 square kilometers, inhabited by about 5.6 peoples, most of them concentrated on coastal areas.

National Action Plan for the protection of Mediterranean Sea includes coastal area in the Libyan Jamahiriya between longitude  $11.35^{\circ}W$  and  $25.00^{\circ}E$ , including the coastal strip at about 25km in depth. The hinterland is not included in the Plan, being remote from the Sea. The National Plan, also, does not include offshore operations, whether exploration extraction, or transport of materials by vessels or pipes extending across Sea Bed. *Figure (1.1)* shows the geography of Mediterranean Sea Basin, and the position of the Libyan Coast. *Figure (1.2)* shows National Action Plan boundaries.



Figure (1.1) the geography of Mediterranean Sea Basin





*Figure (1.2) National Action Plan boundaries.*

### **1.3 Environmental Issues related to the plan**

Libyan, like other coastal States in the Mediterranean Basin, faces some environmental issues having impact on Mediterranean environment. The main issue is direct discharge from established points on the coast, or through transport means; in addition to land-based activities that have direct or indirect impact on maritime region.

Geographical and demographic factors in Libya, such as its extensive coastal area with low population in comparison to total population; the absence of permanent rivers or estuaries, or intensive industrial activity, all has helped to monitor and control, and even eliminate, of pollution resulting from land sources and activities, in accordance to the above-mentioned Minutes, and the Strategic Action Programme.

On the basis of the commitments of the Libyan Party to apply and execute the Convention on protecting the Mediterranean Sea from pollution and Protocols; and through Libyan participation in various activities, including “MED POL” Program, under which surveys are made to detect heavy elements, hydro-carbonates and beach pollutants. Since the establishment of the Central Environmental Institution, on 1984, the Jamahiriya has been keen to participate in all Contracting Parties Meetings, has been elected for two consecutive periods,

1997 – 2000, to the membership of the Executive Office of Contracting Parties, and elected for one time as member of Management Committee for Mediterranean Sustainable Development Commission. Also, the Jamahiriya has signed and ratified more than 36 Agreements and Protocols on Environmental Protection.

#### **1.4 Local Administrations within Plan Boundary Limits**

Local Administrations in Libya are represented by Shabeyat, which are Administrative Formations, with land boundaries, containing a number of urban settlement, having complete authority over local area Administration, through People's Congresses, which include all People living within the Congress area. Those people, in turn, elect a People's Committee (Executive Body) to manage the Shabeya; which, in certain regimes, are comparable to Provinces or States. Each Shabeya has its own budget, and have the right to utilize and manage its natural resources except for petroleum, which is considered as National Wealth.

Officials managing the Shabeya may issue the necessary decisions or instructions to manage financial, commercial administrative and environmental affairs within the Shabeya, in conformity with applicable legislation and laws at the National level. In environmental protection scope, the Shabeyat are responsible for securing environment health with regard to solid waste on sewage management, provision of drinking water, coast protection, and private small factories (it would be difficult to control big factories, power plants and cement factories). In accordance to the latest administrative division, the coastal region comprises eighteen Shabeyat, extending from East to West as per Table No. (1-1).

Local administration (Shabeya) has a significant role in the successful implementation of the National Plan for the coastal region. Diagnosis of the Libyan coastal environment revealed that the main sources of pollutants from land-based sources are urban and industrial sewage, in addition to solid waste which are under the responsibility of the Secretariat of housing, Utilities

and Environment, in the Shabeya besides other organs in the Shabeya, which run water supply, and sewage and public cleaning authority.

Table (1-1) The list of Shabeyat located in coastal area

	<b>Shabeya</b>	<b>The main coastal Cities</b>
1	Al Nigat Al Khams	Zuwarah and Al Ajaylat
2	Surman and Sabrata	Surman and Sabrata
3	Azzawiya	Azzawiya
4	Jifarah	Janzur
5	Tripoli	Tripoli
6	Tajura	Tajura
7	Tarhunah , Masallatah	Al Qarabulli
8	Al Mergib	Al Khums , Zliten
9	Misratah	Misratah
10	Sirt	Sirt, Ben-Jowad- RasLanuf -Al-Hisha
11	Ajdabiya	Brega -- Azwetina
12	Al-Hizam Al-Akhdar	Gemines- Deriana
13	Benghazi	Benghazi
14	AL-Marj	Tulmetha- Aguria -Batta
15	AL-Bieda	AL-Hania- Susa
16	AL-Ghobba	Ras AL-Hilal
17	Dernah	Dernah
18	EL-Batnan	Tobruk and Ammsad

The National Plan adopted a set of procedures and measures to be followed in order to achieve plan targets, especially solid waste and sewage management. Additionally, there are many plan support means, which must start at local level, initially focusing on environmental education and awareness programmes.

Mediterranean Strategic Action Programme philosophy depended on active participation of local administrations, being the principal beneficiary

from achieved plan objectives and impact, by raising health care standards, and sustainability of coastal resources and economic activities therein.

### **1.5 Coastal Region National Plan Preparation Methodology**

The National Action Programme methodology, approved by the Contracting parties, with its time schedule extending to 2025, has been adopted. By 2010, the first objective, which is to complete all the necessary measures to reduce marine pollution from land-based sources by the rate of (50%) fifty percent.

Since 1997, numerous local experts meetings in all Mediterranean States, in addition to workshops and National Coordinators' Meetings, were held. The Global Environment Facility (GEF), has contributed to the financial funding of this Programme, besides participation of some Mediterranean Countries in hosting a number of Meetings. Strategic Action Programme consists of four stages, developed to assist all Mediterranean States to prepare and approve specific National Plans for each State, to be applicable in accordance to local condition, plans and programmes. The four stages include:

- Environmental diagnosis of the coast region.
- Estimation of pollution from industrial activity on the coastal region, year 2003 being baseline year.
- Development of sectoral plans for seven pollutants.
- Development of the National Plan (represented in this report).

Local experts, supported by specialists from the Strategic Action Programme, has been assigned to complete the said four stages, in semi-uniform work techniques, in order to achieve homogeneity between all work teams. This is followed by discussion, assessment and approval of these reports, to be at disposal of Decision makers in their respective countries.

## **CHAPTER TWO: ENVIRONMENTAL ISSUES AT NATIONAL LEVEL**

### **2.1 Introduction**

Environmental issues priority differs with different countries. This is due to differences in ecosystems with geographic location, State economic activities, which mostly affect living standards and family income, and other factors. Countries that depend on tourism, has different environmental concerns from others that depend on natural resources like oil and gas, and those depending on industrial activity. Although environmental pollution problems concern air, water and the urban environment, braches into a great number of other issues, and might not be materially tangible, however, it has occasional signification, resulting from its cultural socialýor hiegenic effects in the long run.

### **2.2 Definition and Assessment of Mediterranean Sea Land-based Pollution Sources**

Before embarking on National Plan preparation, an environmental diagnosis has been made at National level to the Coastal zones, in implementation of the Strategic Action Programme (SAP). Purpose of this diagnosis was to determine pollution emission sites, and pollution quality, in order to deal with such sources in a detailed study to determine pollutant quantities and contents.

SAP has limited land-based source pollution to seven sectors, as follows:

- Urban Sewage
- Urban Solid Waste
- Air Pollution

- Pollution from heavy metal application (mercury – cadmium – lead)
- Insecticide and Herbicide management and Control
- Solid and liquid Industrial Waste
- Hazardous Chemical Compounds (i.e. PCBs, POPs, Oils)

In the course of Coastal zone environmental diagnosis accessibility of any of the above sector as a direct marine pollution source. Location remote from the Sea are excluded especially with absence of transport mediums, like rivers or other waterways. The environmental diagnosis resulted in a number of indicators, which helped to define broad outlines for the Plan, namely:

### 2.2.1 First Indicator: Coastal Cities

Pollution resulting from human activities has effect only if directly existing on Seashore. As for areas separated from the Sea by terrain 5km in depth, it has no effect, in most cases, particularly with the absence of transporting rivers and waterways, as in our study area. Table 2-1 shows average values (year 2000) for population in coastal population settlements, and distance from the Sea Coast.

Table 2-1 Average values (year 2000) for population in coastal population

	<b>City Name</b>	<b>Estimated Population</b>	<b>Distance from the sea</b>
1	<i>Abu Kamash</i>	<i>20,000</i>	<i>On shore</i>
2	<i>Zilten</i>	<i>12,000</i>	<i>5 km</i>
3	<i>Zuwarah</i>	<i>130,000</i>	<i>On shore.</i>
4	<i>Reqdalin</i>	<i>15,000</i>	<i>10 km</i>
5	<i>Al Jamayl</i>	<i>15,000</i>	<i>10 km</i>
6	<i>Al Ajaylat</i>	<i>15,000</i>	<i>8 km</i>
7	<i>Sabrata</i>	<i>20,000</i>	<i>On shore</i>
8	<i>Surman</i>	<i>40,000</i>	<i>On shore</i>
9	<i>Azzawiya</i>	<i>150,000</i>	<i>On shore</i>
10	<i>Janzur</i>	<i>250,000</i>	<i>On shore</i>
11	<i>Tripoli</i>	<i>750,000</i>	<i>On shore</i>
12	<i>Tajura</i>	<i>250,000</i>	<i>On shore</i>
13	<i>Al Qarabulli</i>	<i>25,000</i>	<i>5 km</i>
14	<i>Gasr Alkyar</i>	<i>5,000</i>	<i>7 km</i>
15	<i>Khums</i>	<i>100,000</i>	<i>On shore</i>

To be continued in the next page

	<b>City Name</b>	<b>Estimated Population</b>	<b>Distance from the Sea</b>
16	<i>Souk Alkamis</i>	<i>6,000</i>	<i>On shore</i>
17	<i>Zliten</i>	<i>80,000</i>	<i>On shore</i>
18	<i>Misratah</i>	<i>400,000</i>	<i>On shore</i>
19	<i>Tawargha</i>	<i>25,000</i>	<i>2 km</i>
20	Sirt	131,000	On Shore
21	Ras Lanuf	75,000	On Shore
22	Brega	80,000	On Shore
23	Ajdabiya	90,000	10 Km
24	Gemines	45,000	5 Km
25	Benghazi	815,000	On Shore
26	Susa	15,000	On Shore
27	Dernah	125,000	On Shore
28	Tobruk	95,000	On Shore

In addition, there are Coastal sites with commercial nature, such as Zuetina and Sedra Sea Ports, and small service sites, like Ben Gwad, Garef Basher, Sultan and others.

Population settlements, in the Table, has environmental impact on the Sea water, resulting from dumping solid waste, or discharge of waste water on the beach; or due to the existence of industrial activity in such settlements. Some of these areas are described as (Hot Spots), in MAP, for being the most polluted areas on the Mediterranean Coast, including at National level Janzur and Benghazi areas. Such areas should be taken into consideration in the National Action Plan. In accordance to population census estimates, the annual population growth rate in Libya is around 2.4, i.e., Coastal population number estimates should increase by 25% over table 2-1 rates by 2010.

Touristic activity in Libya is expected, by 2010, steady development. However there are no major engineering Projects in the Coastal region necessary to develop Coastal Tourism. Such touristic activities still depend on Desert Tourism. Under the General Plan for the Development of Tourism in the Great Jamahiriya (1999 – 2018), the most attractive coastal and destination for local and foreign tourists would be Sebratha, Khoms, Susa and

Tulmethia. The expected number of tourist attracted to such locations may not exceed 100,000 tourists by 2010.

### 2.2.2 Second Indicator: Urban Waste Water

It has been found that the main source of pollution to the Seashore is Urban waste water, directly discharged to Sea, due to breakdowns in pumping stations and treatment plants. In spite of extensive expenditure in infrastructure projects, during the Seventies and Eighties of the last Century, including wide extension of Urban sewage networks and run-off drains; the construction and equipment of waste water treatment plants, at least up-to secondary treatment level, to be used ( treated wastewater ) for agricultural irrigation purposes. However, neglect in operating such plants in the required form, and the economic embargo imposed on Libya during 1990s, greatly contributed to complete breakdown of many pumping station, treatment plants, permanently using emergency drainage outlet, to directly discharge waste water to the Sea, without any kind of treatment. Moreover, lack of sewage networks in some other areas, contributed to using beaches dumps for the disposal of. However, this does not impose significant danger, in quantitative terms, compared to Sea outlet discharges. Table 2-2 shows estimated quantities of wastewater, expected from population settlements on the Libyan Coast.

Table 2-2 Estimated quantities of wastewater

	City Name	Estimated Population	Estimate sewage quantities m <sup>3</sup> / d
1	Abu Kamash	20,000	4000
2	Zilten	12,000	2400
3	Zuwarah	130,000	26000
4	Reqdalín	15,000	3000
5	Al Jamayl	15,000	3000
6	Al Ajaylat	15,000	3000
7	Sabrata	20,000	4000
8	Surman	40,000	8000
9	Azzawiya	150,000	30000
10	Janzur	250,000	50000
11	Tripoli	750,000	150000
12	Tajura	250,000	50000
13	Al Qarabulli	25,000	5000
14	Gasr Alkyar	5,000	500



continued of table 2-2

	City Name	Estimated Population	Estimate sewage quantities m <sup>3</sup> / d
15	Khums	100,000	20000
16	Souk Alkamis	6,000	1200
17	Zliten	80,000	16000
18	Misratah	400,000	80000
19	Tawargha	25,000	5000
20	Sirt	130,000	26000
21	Ras Lanuf	75,000	15000
22	Brega	80,000	16000
23	Ajdabiya	90,000	18000
24	Gemines	45,000	9000
25	Benghazi	815,000	163000
26	Susa	15,000	3000
27	Dernah	125,000	25000
28	Tobruk	95,000	19000

Table 2-3 shows wastes water treatment plants locations, and existing conditions, in operational terms.

Table 2-3 Wastes water treatment plants in costal area

WTP <sup>1</sup> name	Treatment process	The operation status
Zuwarah	Activated sludge	Ready but not working
Sabrata	Activated sludge	Under over all maintenance
Azzawiya	Activated sludge	Ready but not working
Janzur	Activated sludge	Working but in low efficiency
Tripoli	Activated sludge	Under over all maintenance
	Trickling filter	Working
Khums	Activated sludge	Not ready
Zliten	Activated sludge	Working
Misratah	Activated sludge	Working
Sirt	Activated sludge	Ready (start up phase)
Ras Lanuf	Activated sludge	Working
Brega	Activated sludge	Working
Ajdabiya	Activated sludge	Under restarting process
Benghazi	Activated sludge	Under over all maintenance
	Trickling filter	Working
Dernah	Activated sludge	Not Working
Tobruk	Activated sludge	Under over all maintenance

<sup>1</sup> WTP = Wastewater Treatment Plant محطة معالجة مياه المجاري

### **2.2.3. Third Indicator: Solid Waste Management**

At National level, the National physical plan (long-term standard plan for overall strategies) is concerned with definition and assessment of available resources, in general, the condition of various service facilities, and ways and means to develop such facilities. However, the National physical Plan 1981 – 2000 (revised study 1985) drawn by the Secretariat of the General People’s Committee for Utilities, did not deal with solid waste management process within Chapter 23, concerned with Urban infrastructure. Therefore, such plans did not directly contribute to determining general strategies for solid waste management, or to conformity or homogeneity between Urban and Population Settlements in Urban cleaning terms, nor made any recommendations with regard to the importance of general plans for Urban solid waste and hazardous waste management at regional level. This has led to the non-integration of solid waste treatment sector within the Master Plans for integrated Urban Utilities.

Whereas most Coastal cities has not developed any Master plans for solid waste management, this has led to deterioration efficiency in this sector, in particular with regard to solid waste disposal program activity in building increasing urban construction, renovation and maintenance, has resulted in great volumes of demolition and construction waste, comparable to same garbage volume. Absence of plans and control operations contributed to widespread dumpsites, covering extensive areas on the seashore, occasionally as fill-in to the shore. In spite of local administration commitments to provide financial support for the procurement of solid waste collection and removal equipments and trucks, it did not manage to allocate any special site for solid waste disposal, as per accepted environmental standards and considerations, which are known as “sanitary Land fields”.

Random disposal of solid waste in some shore areas caused pollution and damage to local landscape and ecosystems, some parts of it reaching the Sea through wind and floods in the rainy season. Volume of solid waste produced by the main population settlements on the coast may be estimated

by presuming that garbage production rate is 1kg / capital per day. Table 2-4 shows daily rates on the basis of these estimates figure (2.1) shows average percentage of Household garbage content for coastal areas.

Table 2-4 the estimated daily rates of urban solid waste

City name	Estimated solid waste ton/d	City name	Estimated solid waste ton/d
Abu Kamash	20	Khums	100
Zilten	12	Souk Alkamis	6
Zuwarah	130	Zliten	80
Reqdalin	15	Misratah	400
Al Jamayl	15	Tawargha	25
Al Ajaylat	15	Sirt	132
Sabrata	20	Ras-Lanuf	75
Surman	40	Brega	80
Azzawiya	150	Ajdabiya	90
Janzur	250	Benghazi	815
Tripoli	750	El-Marje	110
Tajura	250	Al-Bida	115
Al Qarabulli	25	Shahat	25
Gasr Alkyar	5	Susa	15
Masallatah	25	Derna	125
		Tobruk	95

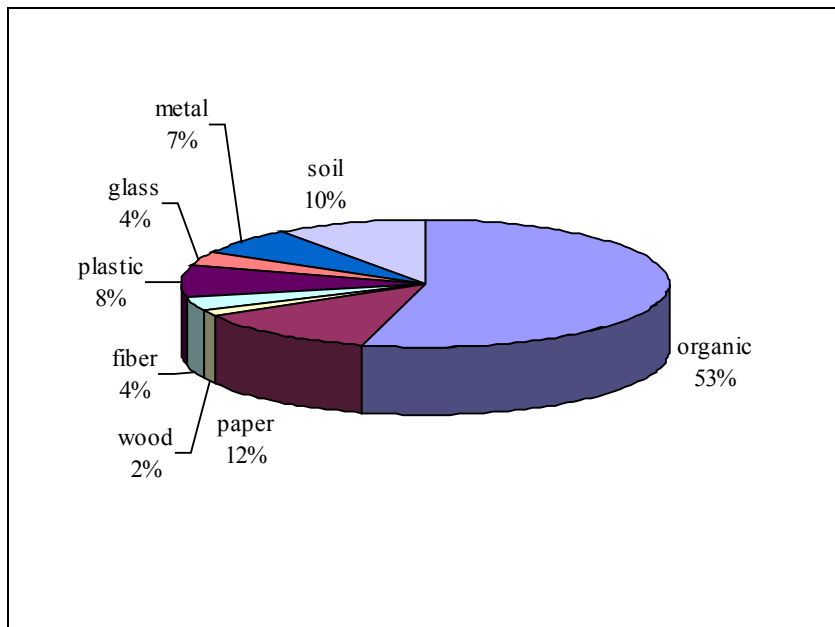


figure (2.1) Average percentage of Household garbage content for coastal areas.

#### 4.2.2 Indicator (4) : Hazardous Wastes

Hazardous waste has been a general environmental problem across Libyan regions. This is due to low environmental awareness of the damage such substances could inflict on people and environment; in addition to inactivation of legislation and controls on hazardous material, whether medical or industrial. Moreover, the lack of documentation for all Liquid or solid wastes – save at limited level – has lead to the spread of numerous hazardous substances, specially in garbage dumps, mixed with other solid waste.

- **Medical Wastes**

Medical wastes from hospitals and medical clinics are main sources of hazardous wastes, which are usually disposed of by special incinerator. However, there is no coordination between such centers to receive medical wastes in the event of breakdown to respective incendiary faculty, dumping medical waste with other wastes. *Table (2.5)* shows quantities of medical waste from hospitals and clinics in certain coastal region.

Table 2-5 Estimation of Hospital Waste

City	Hospital Waste ton/day
Sirt	16.10
Ras Lanuf and Brega	24.50
Ajdabiya	13.30
Benghazi	207
Al-Marj	23.80
Al-Bida	35
Dernah	29.70
Tobruk	11.50

- **Motor-Vehicle Batteries**

There is an existing battering factory at Tajurah, which do not meet local market demand. Shortages are compensated by imports from abroad. The factory do not undertake to replace used batteries, hence, it find its way to waste dumps, in one way or another. Also, there are private workshops equipped with blast furnaces, which collect and smelt used-up batteries to obtain lead, often in an unauthorized manner.

- **Persistent Organic Pollutants (POP)**

Libya is non-producer of any persistent organic pollutants indicated in Annexes 'A' 'B' and 'C' in Stockholm Agreement on Persistent Organic Pollutants (May 2001). However, such compounds come in the form of manufactured material (solvent or insecticide). In the event of application of such material, it will unlikely reach marine environment through sewage or runoff. In all events, available current data are insufficient for making any comments.

- **Heavy Metal Compounds**

Heavy metals enter in production of many compounds, in addition to its use in industrial processes, some studies suggest its presence in urban wastewater in various level, depending on city size, and intensity of industrial activity. Lead pipes are still used in household sewage networks, raising lead concentrations in sewage water, which is estimated for Tripoli wastewater at 0.088 ppm, and at 0.038 ppm in chromium. Run-off collected from streets and car parking areas contains lead compounds produced from petrol fuel combustion. However, EL BREGA, the company in charge of Petrol fuel processing and distribution, has completely moved to the production of lead-free petrol, since 2003, considerably reducing lead concentrations in run-off ditches. Mercury is used in Abu KAMASH Chemical Industries Plant during chlorine production process. This subject requires control and monitoring measures to maintain mercury concentration in plant wastewater within acceptable limits.

- **Radioactive Substances**

Radioactive substance applications are restricted to specific medical treatment or scientific research centers, under strict control, due to its hazardous nature. Handling of Radioactive substances is covered by Law No. (2) of 1982 concerning ionized Radiation application and protection. Radioactive substances are used for medical purposes in certain hospitals, where a closed radiation source (Cobalt **60**) in Tripoli Medical Center.

Suppliers undertake to return radioactive substances to original exporter, after consumption. In Zahra Hospital, liquid radioactive substances are used, and discharged to a special tank, after its use, leaving it in the tank to drop to acceptable radiation level (Decay System).

### **2.2.5 Indicator (5): Air Pollution**

- **Cement Industry**

There are 6 existing Cement Factories in study area, Cement Industry is a main contributor to gases and dust air pollution, in particular with the absence of special equipments to filter and reduce emission levels of such pollutants. Conditions have deteriorated to a considerable extent, as in the case of HAWARI Cement Factory in Benghazi. As for other regions, complaints are still coming from surrounding areas. Gaseous and dust pollutants contribute to environmental pollution to surrounding marine environments, resulting from direct fall-out of such pollutants, in case of availability of transport means (air currents), or rainfall.

- **Electric Power Generating Plants**

The Libyan coast contains 12 Power Generating Plants, supplying population settlement and industrial compounds with the necessary electric Power. Gaseous Pollutants resulting from combustion of fuel used in generating electrical contribute a large share to gaseous pollutants emissions from land-based sources on the Libyan Coast. The General Electrical Company has long been concerned with developing its industrial facilities. One of the most important adopted plans is to using natural gas fuel instead of heavy fuel oil, which will greatly contribute to reduce quantity and quality of pollutants produced by Power Generating Plants.

### **2.2.6 Indicator( 6) : Petroleum Operations**

The Libyan Economy and National Income depend on Petroleum Production and Exportation. The oil seaport existing on the Libyan Coast are

the only outlets for export operations. The Coast contains three main oil refineries, in AZAWIA, RAS LANUF, and TOBROUK – Petrochemical industries has been concentrated at El Brega and RAS LANUF Complex. The national Oil Corporation, and other oil Companies, has been greatly concerned with reducing pollution levels from the above-mentioned activities. This does not mean pollution absence; additionally, oil exploration, production, transport, export, and processing, constitute a threat to the Coastal environment in the event of defects or uncontrollable accidents or incidences. Therefore, efforts made by Environmental Protection Units in oil Companies are relatively great, compared to other industrial activities, due to the volume of damage that may result from accidents.

#### **2.2.7 Indicator (7) : Pollutant Cumulative Time**

The life span of pollutant accumulated on the Libyan Coast is short in length, compared to other regions, considering that industrial activities in its present form, has only commenced since 30 years ago.

#### **2.2.8 Indicator( 8) : Factors Contributing to Environmental Problems**

Environmental issues are a daily concern to local Administrators, who often fail to treat or intervene to solve environmental problems, until such problem augment to become National problems. This may be due to many factors, such as:

- Low environmental awareness among local population
- Lack of legal and moral consciousness among perpetrator of environmental problem.
- Lax rules to control and punish environmental polluters.
- Lack of centers specialized in environmental monitoring and control, making permanent assessment to environmental conditions.
- Lack of the necessary technical ability to maintain liquid, gaseous or solid pollutant treatment units, in addition to non-allocation of sufficient financial budgets.
- Pollution perpetrators tend to conceal their acts, abandoning their responsibility for environmental protection.

- Environmental projects are not considered as priority projects, accordingly directing expenditure to other areas.
- Lack of environmental danger awareness, reduced pressure factor on local authorities in the Shabeyat, in taking effective environmental protection measures, like constructing Sanitary land field, wastewater treatment units, etc.

### **2.3 Defining Priority Issues**

Defining environmental priority issues process – is a main step to be taken before the development of any National Environmental Plan; mainly for:

- Determining pollution related activities.
- Defining most significant issues, from man point of view.
- Concentration of financial efforts and expenses.
- Defining Plan time schedule and executive Programme

In order to determine environmental issues priority, at National level, with regard to Mediterranean Strategic Action Plan, the following sources have been tapped:

- National Environmental Diagnosis and Assessment (NDA)

Report conclusions;

- Industrial Pollutants Assessment Report Conclusions;
- Decision – making (stakeholder) meetings held at Sectoral Plan preparation Phase;

- Planning and Development Programmes at National level, affecting environment.

Results of this assessment process show that wastewater management sector should take the first priority, followed by urban solid waste management; the third priority is taken by air pollution, other Sectors considered as of equal Status.

#### **2.3.1 Urban Wastewater Management**

Discharge of sewage to the Seashore is a major environmental problem in Coastal Cities. This is due to defects in pumping or wastewater treatment



plants, or to improper connection with run-off ditches and open channels. This problem has augmented by the natural flow of urban sewage along natural land ingredient, towards the Sea, making sewage networks terminus closer to the shore or natural valley channels. Given that wastewater treatment plants often to the south sewage is pumped to treatment plants through Coastal Plants. In both cases of waste treatment or pumping failure, wastewater finds its way to Sea. As for areas lacking sewage network, wastewater is disposed of through septic tanks, which are drained by sewage trucks, which in turn, pour it in valley courses, open land areas or Seashore.

Industrial wastewater discharge to public sewage network in urban areas, constitutes an additional increase to the volume of pollutants transported with wastewater, whether reaching the Sea or Sewage treatment Plants, which necessary to take legislative and technical procedures to regulate industrial discharge.

Large amounts of run-off from urban areas find its way to Sea through special outlets, as in Tripoli, or through natural valleys and watercourses, as in Khums, Al Qarabulli, Tajura, and Sirt Cities. Such run-off water is extremely contaminated by pollutants carried along the road, and by washout from open lands. The improper connection of household wastewater with run-off drainage line, made such outlet sewage drains, all the year round.

People's Congresses in Libya has adopted the National Water and Sewage Programme Project, for which large financial amounts are allocated, to rehabilitate, maintain and erect sewage treatment Plants, within a time period of 5 years, starting from 2004. This Project emphasizes priority of wastewater management in environmental safety context.

### **2.3.2 Urban Solid Waste**

Solid Waste collection and disposal occupy the second priority, in the National Plan for the Coastal Areas. Although this waste sector does not pose direct significant threat to marine water, except for direct dumping of solid waste, however the lack of Sanitary Land Field, and efficiency of waste collection, has assisted in solid waste transport. This solid waste transport may be indirect through valley courses after rainfall or directly by solid waste removal trucks, to vacant lots on the Seashore.

Due to the large investments required to establish sanitary dump places and to increase waste collection efficiency, to covering all living areas even those outside the Urban area, this sector lost its budget priority place to other more important sectors like health and education. Recently, current problems facing the cleaning sector in Libya has become an urgent issue at local Administrative level, with recent policies to attract Foreign Investment, and Tourism Promotion; in addition to common awareness of the importance of cleaning sector.

At Strategic Action Programme (SAP) level, controlling and preventing solid waste from reaching the Mediterranean Sea have priority over gaseous pollutants control. This should put the Sector among National Action Plan for protecting the Mediterranean Sea from land-based pollution sources priorities.

### **2.3.3 Air Pollution**

There has been clear correlation in the first National Report on the Environment (General Authority for Environment) between fuel consumption and atmospheric air pollution, whether such fuel is consumed for Electric Power Production or Transport or Plant Operation purposes. Due to the absence of complete studies on atmospheric air pollution at coastal areas, the above activities can hardly be responsible for pollution, the National Plan deals with such fuel consuming activities at equal level, providing specific recommendations to reduce gaseous emissions level in general, in a bid to attain target reduction rate by 2010, in accordance with Mediterranean Strategic Action Programme.

Activities causing atmospheric air pollution can be divided into three main activities, in accordance to local data on Coastal Regions in Libya, as follows:

- Electric Power Generating Plant;
- Cement Production Plans;
- Road transport traffic (motor-vehicles).

There are environmental plans for such parties in charge of these activities, presented in Meetings with the concerned Parties, in sectoral planning phase.

#### **2.3.4 Pollution from Heavy Metal (Mercury-Cadmium-Lead)**

Non-availability of sufficient data on the use of heavy metals (except for mercury uses in Abu – Kamash Plant), has created difficulties in assessing environmental conditions resulting from such substances. In addition, these substances come from various sources, spreading in small quantities, over extensive areas in the natural environment, as in the case of dry battery ingredients and household sewage lead pipes.

Also, Public awareness of the hazardous nature of these substances is limited; hence, it has not been among environmental issues priority. However, the National plan will deal with this aspect from various sides, including legislation, public awareness, monitoring and Control; in addition to its being target for reduction in industrial immersions, waste water, and in solid waste forms.

#### **2.3.5. Insecticide and Herbicide Control and Management**

Control and count of pesticide imports, has greatly improved in the recent year, due to strict control and collaboration between Customs Authorities and the Environment General Authority, with regard to importation and local use permissions. However, the main problem lies with stored and invalid quantities, especially those imported in the past, and are no longer valid for use, which have to be disposed of in a safe way.

The lack of reliable data about the annual required quantities, has confirmed concerns to maintain additional stores of pesticide, the validity of which may expire before use,

#### **2.3.6 PCBs**

PCBs chemicals has been banned in Libya since more than 15 years ago, having been Confirmed as dangerous to the environment and public health. These substances are used in electrical equipments as heat resistant and antiburn insulators, entering in electric transformers and capacitors, and other equipments.

The general Electrical Company has taken preventive measures in this regard, where most equipment using PCBs oils has been replaced, and collected on special sites, pending Contracting with specialist companies to safely dispose of such oils.

### **2.3.7 Industrial Solid and liquid waste**

Disposal of industrial solid and liquid waste is still a major, environmental problem in Libya. In spite of the in apparent danger of such waste , being immediately disposed of through waste water networks and solid waste dumps, Environmental awareness among people has increased in the last few years. Controls and legislations to manage this problem has become an urgent demand, specially after groundwater contamination cases. Environmental diagnosis analysis and plans for certain major industries, such as oil Refineries, and Iron and steel factory, revealed that such industries has established Control systems and treatment Units, to reuse and recycle industrial liquid waste. However, the problem lay with a large number of small industries, within Urban city plans, or adjacent to cities, in industrial Zones, lacking Special facilities for liquid waste collection and treatment , and for safe disposal of solid waste.

## **Chapter Three: National Sectoral Plan for Attaining 2010 Target**

This chapter deals with detailed national plan for protecting The Med. Sea from land based sources in Libya coast regions. The plan has been structured and produced to separately deal with each class of pollutants, renewing legal administrative and organizational aspects of the concerned facilities, describing existing, or exposed action plans at the national level. Finally, the national plan will be developed, to confirm with:

- Economic and Environmental local conditions
- National strategy, and policies and plans adopted by State planning bodies.
- Results of the environmental National Diagnosis Analysis (NDA) Report on the coastal zone.
- Baseline Budget for pollutants resulting from industrial activity in Libyan coastal zone.
- Achievement of Med. Strategic Action Programme objectives to reduce solid, liquid, and gaseous pollutant emissions to (%). in accordance to the type of pollutant, by 2010.

### **3. 1. National Plan for Urban Waste Water Management**

#### **3.1.1. Administrative and Legislative Framework**

Waste water collection, conveyance, and treatment operations are among main urban infrastructures. The objective is to secure public safety, to protect the environment and other natural resources from pollution. Urban wastewater directly discharged to the sea, without treatment, main land-based source of marine pollution. For sewerage do not only contain used water, but also carried along large quantities of oils, detergents, and suspended solid

particles, in addition to the industrial waste discharge to urban waste water networks.

It shall not be necessary for the seawater to change color at sewerage discharge outlets to indicate pollution presence. For the seawater may be extremely contaminated by high concentrations of heavy metals, affecting public health, through fish consumption, or by chemical pollution resulting from damage to marine species.

Law N<sup>o</sup>. (15) of 2003 concerning environment has addressed the discharge of untreated waste water to the sea, considering such practice as prohibited, in accordance to Article 34 “It shall be prohibited to directly discharge contaminated water to the sea, or through drainage pipes, to/from the coast, or channels and courses, including internal flow sewerage, before undergoing treatment in accordance to applicable laws, and Executive Regulations thereof”.

### **3.1.2. Liquid Waste Management Strategies and Plans**

Water resources strategy considers urban waste water as secondary water sources that must be utilized after treatment. Article (43) of law N<sup>o</sup>. (15) has provided for environmental protection as follows: “Household and industrial waste water shall be deemed as a water source that shall not be disposed of after treatment, unless it shall be proven that its use will not be feasible, in such case it shall be disposed of in accordance to applicable provisions and regulations, without resulting in any pollution to environment.

Accordingly, Libya started to build waste water treatment plants, in order to recycle these waste waters for irrigation purposes. The first group of such plants started operation since early 1970, covering the four coastal cities of Tripoli, Misratah, Benghazi and Tobruk. New plants were erected to cover additional number of cities, amounting to 40 treatment plants, by 2002. Plans for this sector has currently concentrated on:

- Supporting water and waste water companies in the Shabeyat, to enable it to manage and operate water and waste water network in

a highly efficient manner, by training and habituating local sector's staff.

- Maintaining extensive investment in this area, and repairing damage incurred during the economic embargo imposed on Libya during 1993 – 2000.
- Complete implementation of the five-year plan for the sector, to which 100 million Libyan dinars has been allocated, for urgent maintenance to waste water pumping and treatment plants.
- Starting, execution of national water and waste water program, by performing full assessment to Town and Villages infrastructures systems, allocating necessary funds for maintenance, completion of suspended projects, and implementation of new projects.

### **3.1.3. National Plan Programs for Waste Water Sector in the Coastal Zone up to 2010**

Strategic Action Programme, at Mediterranean States level, aims to provide each coastal city with over 100, 000 population (one hundred thousand peoples) with a waste water treatment plant, for secondary treatment before discharge to sea shore. The National Diagnosis Analysis (NDA) report revealed that a number of wastewater treatment plants are non-functioning, for various resources. The volume of pollutants that may reach the sea, without treatment, in the event of breakdown and direct discharge of wastewater to sea, may be high in rates, as per Baseline Budget accounts. Additionally, conclusions to the discussions in the sectoral meetings held in Tripoli and Benghazi cities, has stressed priority of wastewater management sector, for its significant influence in reducing pollution levels, and in processing public health safety.

The Libyan State has confirmed its great concern with water and sewerage water problem, taking major decisions in this regard, aimed to rehabilitate, maintain, and construct water and waste water networks in all Libyan cities. This will be implemented within the framework of the national program for urban water and wastewater, extending for 5 years duration, as of 2004. Expenditure on this program is expected to be around 5000 million

dinars. This project conforms with SAP objectives. Considering that the National water and wastewater program covers all cities and villages in Libya, including water supply, and sewerage, the National Action Plan will concentrate on maintaining existing waste water treatment plants, and connecting urban waste water networks to treatment plants, which may lead to significant reduction to waste water reaching the sea thereafter at the end of plan implementation, there will remain small discharges resulting from inter-mixing of run-off drains with waste water networks, in emergency cases, due to maintenance operations to coastal pumping stations.

Table 3-1 waste water treatment plants which must be operated or maintained for proper waste water treatment in some density populated coastal cities

Table 3-1- Maintenance projects for certain waste water treatment plants

WTP name	The operation status	The Actions needed
<i>Zuwarah</i>	<i>Ready but not working ( no contract )</i>	<i>Maintenance of civil and mechanical work, connection of sewage pumping station in the city.</i>
<i>Sabrata</i>	<i>Under over all maintenance</i>	<i>Complete the restoration works</i>
<i>Azzawiya</i>	<i>Ready but not working ( tendering stage )</i>	<i>Maintenance of civil and mechanical work, connection of sewage pumping station in the city.</i>
<i>Janzur</i>	<i>small part of swage is pumped to the WTP ( the contract was signed for expansions)</i>	<i>Complete the restoration works complete the pumping stations in the city , expansion of sewer network.</i>
<i>Tripoli</i>	<i>Second stage ( elhdba elkadera)</i>	<i>Maintenance of civil and mechanical works in progress it will finished by year 2007</i>
<i>Tripoli</i>	<i>aen zara ( No contract )</i>	<i>Restarts the construction</i>
<i>Khums</i>	<i>Not ready ( No contract )</i>	<i>Maintenance of civil and mechanical work, connection of sewage pumping</i>



		<i>satiation in the city.</i>
<i>Zliten</i>	<i>Working</i>	<i>Needs some maintenance, extended of the capacity</i>
<i>Misratah</i>	<i>Working</i>	<i>Needs some maintenance, extended of the capacity</i>
<i>Sirt</i>	<i>Ready (start up phase)</i>	<i>Connection of pumping station in the city with STP</i>
<i>Ajdabiya</i>	<i>Working</i>	<i>Maintenance work is finish</i>
<i>Benghazi</i>	<i>Second phase</i>	<i>Under over all maintenance</i>
<i>Dernah</i>	<i>Not working</i>	<i>Under over all maintenance</i>
<i>Tobruk</i>	<i>Not working</i>	<i>Under over all maintenance</i>

### **3.2 National Plan for Urban Solid Waste Management**

#### **3.2.1 Administrative and Legislative Framework**

Solid waste collection, transport and disposal are under responsibility of the Secretariats of the General People’s Committees for Utilities, Housing and Environment, managed by the Authority for Environmental Protection in respective Shabeyat.

The Shabeyat allocates annual budgets to cover solid waste collection, treatment and disposal, cleaning such budgets, also cover personnel salaries, operation of machinery, and the supply of the necessary mechanical equipment for such works.

In 1984, law N°. (13) covering public cleaning, provisions and executive regulations thereof. The Law contains (18) an Article defining urban cleaning responsibilities, and violation penalty value. The executive regulation thereof has provided for various sector organization procedures.

Certain Sector Regulation in this executive regulation contain legislations, closely connected with the national action plan, which shall be reviewed as follows:

- Article (1) in chapter one (general provisions) prohibits, individuals, or organizations, corporations, companies, establishments and institutions, whether public or private, national or international, from disposing of household waste and garbage, building waste materials, chemicals and scrap metal on non-authorized places.
- Chapter Two dealt with collection and preservation and garbage, and responsibilities of each party, including household members responsibility for preserving waste in special containers, until collection or removal to assembly containers.
- Obligations of industrial and chemical establishments, hospitals, Research Centers, and like Institutions, to dispose, to dispose of it hazardous waste by the technical means by approval by competent authorities. Such waste shall not be dumped or disposed of among household waste and garbage (Article 11)
- Chapter Three defined collection use, in terms of quality and operation.
- Chapter Four defined waste
- Chapter Five defined procedures related to street, square and vacant lot cleaning
- ◆ Chapter Six dealt with necessary procedures for buildings, cleaning, maintenance and painting
- ◆ Chapter seven dealt with Markets, and agricultural and animal production market square cleaning
- ◆ Chapter Eight is concerned with waste disposal under the terms required for dump areas (Article 43)
- ◆ Article (44) provided for strict compliance to dumping terms, in the event of its use as a method for disposal of solid waste
- ◆ Article (45) defend the possibility of transforming waste into organic metal, plastic, and glass material, to be

deposited for town inhabited by more than 50 000 population

- ◆ Article (46) limited waste booming to emergency cases, to be effected under prior permission from competent authorities .

It has been observed that this law requires amendments to be in line with social – economic changes and development in Libya. The main issues to be addressed by this, if amendment shall be as follows:

- Regulation of solid waste collection by private companies
- Recycling waste process and techniques
- Breach and road cleaning in rural areas
- Value of fines against law violators
- Define the type of hazard waster and it is disposal safety

### **3.2.2 National Strategy of Solid Waste, Policies and Plans**

At the National Strategy for Solid Management Policies and Plans Level, the first national reports on the, Environment reviewed in detail their aspect. The report defined procedures with respect to the National Action Plan for the Protection of the Med. Sea from Pollution emanating from land-based sources.

The main solid waste management strategy objective may be summarized as follows:

- Limits on the production of wastes and promotion of clean production
- Limitation of production wastes, through the development of production specifications
- Encouraging private sector to invest in solid waste activities
- Preparation of Master Plans for Urban Solid Waste Management
- Adopting Selective waste collection, and waste recycling

- Adopting material recovery system (application of product-recovery principle), by making waste producers pay prescribed fee for each production unit.
- Environment awareness and education
- Establishment of a trust fund supports and promote private Sector in Solid Waste Management.

In order to achieve solid waste management objectives, a national plan, considering of two phases, has been developed as follows:

**Phase One:**

The first phase in the plan is concerned with the necessary immediate action to be taken to manage pollution resulting from wastes, including the following measures:

- Establishment of Sanitary land fields, under the technical and environmental terms set by the Shabeyat
- Establishment of Intermediate collection stations and Centers to sort out waste
- Closing unauthorized dumping sites currently used

**Phase Two:**

The second phase covers investment in recycling and reuse of solid waste, as follows:

- Application of solid waste separation principle (starting from house level)
- Encouraging private sector's participation in waste recycling programs
- Expansion in the establishment of organic fertilizers production plants from solid waste organic.

concerning the hazardous wastes, the national strategy has adopted a number of Action Plans and projects to deal with this type of waste in a safe manner, including

- Establishment of local listing of hazardous waste

- Establishment of a special unit for hazardous waste treatment, at national level
- Exportation of hazardous waste which could not be treated locally to foreign treatment Centers, in compliance with relevant international conventions.

### **3.2.3 National Action Plan for the Solid waste Management in the Coastal Zone (up to 2010)**

The National Strategy for solid waste numerous environmental measures and plans, developed to attain the above mentioned objectives. As a result of the apparent objective similarities between the National Strategic Action Plan for Libya, and Strategic Action Programme, at the Mediterranean States level, the strategy will concentrate on supporting the proposed national programs, to attain its target by 2010, if properly executed, such programs include:

#### **Sanitary Land Fields Program**

It shall be necessary to start on the construction and equipment of sanitary dumps, closing existing authorized dumps, and control of the coast, and water courses reaching the coast, being main sources of transport of solid waste to marine environment, after rainfall.

Table 2-3 contains a list of coastal cities proposed for Sanitary dump sites, to serve the city and surrounding shall population settlement .The necessary areas has been estimated on the basis of population number, at 20- year span of time, at average height of 10 layer (one layer per year).

**Note:** There exist major difficulties in selecting suitable sites for hygienic dumps in certain areas, resulting in cost rise, due to high compensation rates to land owners in some cases.

Table 2-3 list of coastal cities proposed for Sanitary land field

	<b>Shabeya</b>	<b>The service zone</b>	<b>The <sup>2</sup>SLF area in hectares</b>	<b>Estimated cost in L.D</b>
1	Al Nigat Al Khams	Zuwarah, <i>AbuKamash Zilten</i> and Al Ajaylat	20	3,000,000
2	Surman and Sabrata	Surman and Sabrata	6	900,000
3	Azzawiya	Azzawiya	25	3,750,000
4	Jifarah	Janzur	25	3,750,000
5	Tripoli	Tripoli	60	9,000,000
6	Tajura	Tajura	25	3,750,000
7	Tarhunah , Masallatah	Al Qarabulli and Masallatah	6	900,000
8	Al Mergib	Al Khums , Zliten	25	3,750,000
9	Misratah	Misratah	50	7,500,000
10	Sirt 1	Sirt ,Ben-Jowad, Al-Hisha, buhadei	25	3,750,000
	Sirt 2	Ras Lanuf, Brega	20	3,000,000
11	Ajdabiya	Ajdabiya , Azwetina	20	3,000,000
12	Al-Hizam Al-Akhdar	Gemines- Deriana	6	900,000
13	Benghazi	Benghazi	60	9,000,000
14	AL-Marj	AL-Marj ,Tulmetha-Aguria -Batta	8	1,200,000
15	AL-Bieda	AL-Bieda, Shhat, Susa	25	3,750,000
16	AL-Ghobba	AL-Ghobba,Ras AL-Hilal	5	750,000
17	Dernah	Dernah	20	3,000,000
18	EL-Batnan	Tobruk	20	3,000,000

<sup>2</sup> SLF = Sanitary Land field حقل الرديم الصحي

### **Solid Waste Recycling Program**

Solid waste clean and reuse process contribute to the recovery of part of the economic value of solid wastes, which also, will contribute to the provision of work opportunities and financial revenue for the community.

Preliminary estimates for 16 Libyan cities, shows that the value of (LD 121) could be obtained per day for every ton of recycle household wastes, (First National Environment Report). Considering that this figure is theoretical, assuming sorting-out and recycling of all waste contents. If we take these figures in more scientific terms, like extracting organic fertilizers from organic waste content, the value of 20 Libyan dinars can be recovered per ton. On this basis, about 50% of household solid waste can be recycled.

In accordance to the First National Report on Environment, a number of organic fertilizer plant depending on urban household waste for cities with more than 90 000 in habitants. These proposed sites will include the coastal cities listed in table 3-3, beside Benghazi and Tripoli sites.

Table 3-3 location of proposed compost plants

	<b>Location</b>	<b>The capacity of compost plant ton / day</b>
1	Al Nigat Al Khams	100
2	Azzawiya	200
3	Al Mergib	100
4	Sirt	100
5	Ras Lanuf, Brega	200
6	Ajdabiya	100
7	AL-Marj	200
8	Tobruk	100

### **Public Participation Program**

The success of solid waste management plans always depend on public participation level in terms of individual environmental behavior. Urban solid

waste management programs and plans success opportunity will be enhanced with high environmental awareness . This is mainly due to the fact that the individual sense of responsibility towards his household cleanser will considerably contribute to solid waste production, and easy and speedy collection, removal, and sorting-out. Therefore, environmental plans give special attention to environmental education programs. Considering this plan is concerned with protecting the Med. Sea from pollution from land base sources, environmental education may concentrate on:

- Cleaning swimming beaches all the year round
- Banning shore fill-in with building materials waste and refuse
- Avoiding throwing solid waste like scrap metal, household equipment etc, in water course
- Educating people about the importance of sea water and shores as a rich natural resource.
- Enhancement of such culture and behavior may be secured-through mass media, summer youth camps, etc; which shall extend over a longer period of time in addition to participation by influential personalities in local communities, like religious men, intellectuals, and dignitaries.

### **3.3 Air Pollution**

#### **3.3.1 Electric Power Plants**

The General Electric Company has introduced technical procedure at electric power generation plants to transform such plant to the use of natural gas instead of heavy fuel. This entails replacing outdated steam turbines with new gas turbines, which has already been used in extension works on existing plants.

Table 3-4 contains a list of Electric Power Generation Plants on the coastal zone, and power generation process.



Table 3-4 list of electrical power station in costal area

<b>No</b>	<b>Power Plant location</b>	<b>Type of the plant</b>	<b>The max. design capacity Mega watt /hr</b>
1	<i>Abu Kamash</i>	Gas Turbines	325
2	Azzawiya -west	Gas Turbines	300
3	Tripoli – west	Steam Turbines	560
4	Tripoli – south	Gas Turbines	500
5	Al Khums	Gas Turbines Steam Turbines	600 480
6	Misratah steel plant	Steam Turbines	500
7	Misratah city	Gas Turbines	60
8	Sirt	Gas Turbines	30
9	Azwetina	Gas Turbines	200
10	Benghazi – north	Steam Turbines	160
11	Dernah	Steam Turbines	130
12	Tobruk	Steam Turbines	130

The above table indicates that the General Electric Company has adopted using Gaseous unites at Electric Power Generation Plants, as at the recently build west Azzawiya, plant;

In addition to new extensions to El Khums Plant, and the replacement of existing West Tripoli, North Benghazi, Derna, and Tobruk Plant Stations, after expiry of its operation life, with gas systems.

Due to the high replacement costs, the national action plan has been practiced in allowing the General Electric Company to implement its plans in accordance to its own time schedule, which is expected to extend to 2015, and in not insisting on immediate change, before 2010.

### 3.3.2 Cement Plants

Most cement plants established in 1970s, has passed over all maintenance and up-grading phase for original dust separation system. Acceptable emission rates at production commencement were 300 mg/m<sup>3</sup>, applying mechanical precipitators to separate dust. In a later phase, cloth filter unit has been added. However, such filters require maintenance or replacement from time to time, Malfunction in Benghazi Hawari Cement Plant has led to significant rise in dust emission.

The company in charge of cement plants operation, intends to introduce Electrostatic Precipator Units, which act to reduce dust emission to international acceptable level, which is 50 mg/m<sup>3</sup>. Electrostatic precipitators total cost for the six existing cement plants is estimated at 72 million Libyan dinars, i.e. 12 million dinars per plant. The Libyan Cement Company, which owns ALFATIEH, HAWARI, and BENGHAZI Cement Factories, is expected to contact with foreign company to equip its three factories with Electrostatic Precipator Units in addition to maintenance of existing filters. This measure is expected to reduce cement gas emission, to a large extend.

### 3.3.3 Motor – Vehicles

Gaseous pollution from motor-vehicle traffic constitutes a major pollutant to urban environment, which partially extend to marine water in the coastal cities. The People's Committee for Communications and Transport at Sectoral plan meeting held at Tripoli submitted a study on the gaseous pollution reduction rate upon implementation of public metro project. Table 3-5 shows reduction rates of pollution emission resulting from private vehicle and medium size transport vehicles.

Table 3-5 the reduction in Gases pollutants

Pollutants	% of reduction in pollutants emissions
Carbon monoxide CO	18.4
Hydrocarbons	17.8
Nitrogen oxides	21.2

The figures in the table revealed that 750 000 vehicle daily pass through Tripoli, which are nearly half the number of motor-vehicle in whole coastal zone.

### **3.4 Solid and Liquid Industrial Waste**

Environmental condition improvement, with regard to solid and liquid industrial waste disposal, will require additional efforts at National and Shabeyat level. The absence of environmental specifications for industrial activities, and the omission of industrial impact analysis, has caused confusion and delayed progress in this scope.

Industrial activity, in Libya may be divided into two classes:

- **Major Industries:** Including iron, steel, Petrochemicals, Cement Textile, etc. These industries are located away from cities, and equipped with special solid and liquid waste treatment and disposal systems. Most environmental problems associated with such industries result from breakdown in waste treatment systems, or efficiency reducing pollution to acceptable levels.

**Small Industries:** Including Food, diary, garment, metallic paints detergent, and soap and other industries. These industries are usually located inside or outside cities. Factories laying within the city tend to discharge its liquid waste through urban waste water system, if any, otherwise liquid waste is collected in collection tanks, to be transported and discharged on uncontrolled areas.

This may also occur without of town factories, if its own waste treatment systems upgrading existing legislation, and issuing new laws, defining in detail provisions to control solid and liquid industrial waste, shall be a priority item.

For, only through such legislation, whether in the form of law, or environmental specification, the concerned Shabeyat authorities could enforce control measures requiring factories to up-grade its waste treatment

systems in accordance to specifications defining acceptable pollution emission concentration levels.

### **3.5 Insecticide and Herbicide Management**

Management and control of insecticides and herbicides process objective is to reduce damage resulting from misuse or mishandling of hazardous chemical substances, severe damage from these compounds may lead to death of living species, including man, if subjected to lethal dose, with side effects extending to future generations, for such substances, may remain effective for long period of time.

For time being, insecticides and herbicides are still needed to combat at agricultural pests and harmful insects, for lack of alternative remedy, having similar effect and efficiency .

To reduce risks from such chemicals, many countries, including Libya has taken special measures to control entry and use of substances, supported by WHO information of banned pesticides, which has lethal effects on human health, from direct exposure, or entering the human body through the food chain.

#### **3.5.1 Administrative and Legislative Framework**

On 19/7/1987, the Secretariat of the General People's Committee issued its circular letter N°. (5004) banning importation or manufacturing of chemical pesticides, save by prior permission from the Technical Environmental Protection Center (presently General Authority for Environment), such permission procedure entails registration of pesticides not internationally banned, conducting analysis on selected samples from imported goods, to ensure its conformity with manufacturer certificate and relevant documents.

### **3.5.2 National Plan Program for Pesticide Control in the Coastal Zone up to 20 10**

Although the procedure followed to register imported pesticides before Customs clearance, provide sufficient guarantee to prevent entry of banned articles, hazardous from these chemicals will remain however, for many reasons, mainly:

- Failure to follow-up imported quantities, in order to control storage, handling, and use of such substances
- Lack of environmental awareness among users, especially in the agricultural sector
- Omission to report leakage incidences as a result of improper storage or accidents.
- Non-availability of data about stock balance and validity
- Lack of administrative or legislative framework providing for disposal of expired validity items
- Lack of the necessary information Center to monitor and document pesticide quantities, qualities and application, upon the information of which a National Program may be drawn.

In conclusion, control and management procedures shall be up-to date in order to avoid weaknesses in the present program, stressing individual responsibility, beginning from supplier, and through, through to user. Also, developing environmental specifications on pesticides, and guidelines for safety uses, will considerably contribute to reduce such levels.

## Chapter Four: National Plan Implementation And Success Means

### 4.1 Expenses amount and Fund Saving

Amount of the required budget could not be determined in the present phase; for this will necessitate the definition of implementation and funding means to be provided for the establishment of new environmental schemes, and for supplying the industrial sector with the necessary requirements to reduce pollution emission levels.

Table 4-1 shows the estimation of total budget required for some items of National action plan implementation .

Table 4-1 the NAP estimated Budget

Item No	The project	Location	Cost estimation Million L. D	Finical sources
1	Sewage treatment plants maintenances and constructions	as shown in table 3-1	<b>150</b>	The national program of water and wastewater projects
2	Sanitary land fields	as shown in table 3-2	<b>67.65</b>	Shabeyat local budget
3	Cement industries	6 plants	<b>72</b>	Different sources
4	Regional site for treatment and disposal Hazard chemicals waste	----	<b>20</b>	Government budget
5	Central environmental Laboratories	Tripoli Sirt Benghazi	<b>20</b>	Government budget
6	Environment education and awareness	-----	<b>0.750</b>	Government budget
7	Building capacity program	-----	<b>0.75</b>	Government budget
Total		<b>331,150,000 L. D</b>		Around <b>206 million Euro</b>

## **4.2 Environmental Protection, Legislation from Work Finalization**

Environmental legislation are considered as main environmental protection tools, applied to guard against environmental violation, penalize violators and to define the technical terms and conditions to be observed by various development, service, and economic activities, public or private. Also, integration of legislative instruments will considerably contribute to facilitate day today work of the departments concerned with environmental protection programs in the General Authority for Environment, and other institutions, and to legal and technical transparency Environmental assessment, inspection, and permissions for activities that may constitute environmental pollution sources.

Law N<sup>o</sup>. (7) of 1982, ad Executive Regulation thereof, is the first law decided to environmental protection in general. This law has been substituted by law N<sup>o</sup>. (15) of 2003, which is the main legislative framework for environmental protection in Libya, all aspects; in addition to other legislation conforming with environmental protection law, regulating urban, industrial and agriculture activities, which include:

- Law N<sup>o</sup>. (5) of 1969 concerning town and village planning amended by law N<sup>o</sup>. (3) of 2002. This law, in certain paragraphs, is concerned with on-shore land uses.
- Libyan marine law N<sup>o</sup>. (105) of 1958, concerning various issue, including marine vessels collision
- Law N<sup>o</sup>. (62) of 1976, containing certain amendments to marine law and Captain's responsibility with regard to oil log
- Law N<sup>o</sup>. (81) of 1971 concerning Seaports, with regard to hazardous substance transport and discharge
- Fisheries law N<sup>o</sup>. (14) of 1989 regulating fishery operations and aquiculture
- Law N<sup>o</sup>. (13) of 1984 concerning public cleanness and urban and rural solid waste collection and disposal, and Executive Regulation thereof.

- Law N<sup>o</sup>. 38/39 of 1975, concerning Municipalities and Municipality Ministry organizing actions, defining in details concerned with environmental protection.
- Decision of the Minister of Municipalities N<sup>o</sup>. (24) for the year , 1976 concerning Model Public Cleansines Regulation
- Decision of the Minister of Municipalities v N<sup>o</sup>. (81) for 1976 concerning model water Facility Organizing Regulation
- Decision of the Minister of Municipalities N<sup>o</sup>. (142) for 1976 concerning waste disposal
- Law N<sup>o</sup>. (2) of 1982, concerning regulations, and protection from rays and ionized materials.

In order for environmental laws to be enforced, such laws must be integrated with the necessary technical law codes that may be applied to environmental protection scope, must be in the following sequence:

### **Environmental Protection Law**

Law N<sup>o</sup>. (15) of 1371 (2003) is the ultimate reference on which all other environmental protection legislation, such as Executive Environmental Decisions, specifications, standards and guidelines, Law N<sup>o</sup>. (15) contains 97 articles, divided into the following chapters:

**Chapter One:** General Provisions.

**Chapter Two:** Atmospheric Air protection / including controlling pollutant emissions to the atmospheric air from factories, motor vehicles, and other sources, defining rules and standards thereto.

**Chapter Three :** Marine and marine wealth protection / including protection of fish stocks, ban on discharge of oils and other pollutants from vessels and other sources on discharge of untreated waste water to sea, and on disposal of hazardous radioactive material, toxic gases, and explosives, or storage in regional waters.

**Chapter Four:** Protection of water sources / including household and drinking water, industrial water, and agricultural water, from surface or underground sources, The law provided for water quality insurance.

**Chapter Five:** Food staff production / pesticide and quality Control.



**Chapter Six.** Environmental Health / this chapter is concerned with environmental aesthetic aspects and Community health.

**Chapter Seven:** Protection from Common Diseases / Concerned with the necessary measures to protect native animals from contagious diseases.

**Chapter Eight /** Plant and Soil Protection / refers to agricultural Soil protection and Sustenance.

**Chapter Nine: Wild life protection :** concerned with protecting wild life and birds from extinction, and regulation of hunting. Practices.

**Chapter Ten:** Bio-safety / This chapter is concerned with seeds, stocks, and genetics. Articles 66 to 76 defined penalties for violators of this law provisions.

**Chapter Eleven :** final Provisions with regard to the Executive Regulation of the law, and annulment of law No.(7) of 1982.

#### **Executive Regulation to Environmental Protection law.**

Law No (15) has superceded previous law No. (7) and Executive Regulation thereof. However, law No. (15) has not explicitly stipulate that the general Authority for Environment is the concerned party. This law Articles stipulate that ( the implicitly concerned party shall be responsible for Environmental affairs management, protection and improvement ).

As a result of this legislative status, the environmental legislation structure will not be complete, unless supported by Executive Regulation for law No. (15).

#### **Executive Decisions .**

Executive Decisions are issued by the Higher Executive body of the General Authority for Environment, in accordance to recommendation from the said Authority, or legal memos from parties concerned with environmental pollution Control. These Decision are deemed as executive Regulation Articles, filling potential legislative gaps. The legal framework must be up – graded, if necessary. To deal with new environmental issues.

#### **Environmental Specifications:**

Environmental Specifications will constitute the executive and control aspect in the law.

Environment law cannot be enforced without defining unacceptable pollution Figures and levels, and potential risks.

Development and approval of Libyan specifications are assigned to the National Specifications and standards Center.

Specification are developed on the basis of a scientific environmental data base.

This shall require the general Authority for Environment to be the party responsible for developing such specification, while the National specification Center will issue the specification in accordance to its specific publication system.

This has constituted a cross-ring between the two authorities, which should require coordination.

The General Authority for Environment appointed a special Committee for environmental specification, in 2002. However, this Committee has suspended it work one year after formation, for administrative reasons.

The legislative void resulting from non- availability of national environmental specifications, has forced local institutions to adopt environmental guide lines or specifications issued by other countries, and which may not conform with local conditions.

To make a success of National Action Plans it shall be very important of Environmental specifications at national level, covering, as an initial stage, the following items.

- Urban waste water
- Industrial waste water.
- Industrial atmospheric air Pollution
- Atmospheric air Pollution resulting from feul combustion at Power Plants and factories.
- Organic Hallogin Compounds
- Hazardous Compounds register and handling.

### **Environmental Guide – lines**

Environment Guide – lines are considered as integral technical documents to the legislative framework, giving technical description of technical practices and engineering techniques, to be employed to define environmental solutions and specifications.

The above instruments has been listed in accordance to pyramidal sequence, and are considered as technically and legally integral part thereof.

In summary assessment of Current efforts, we can say that the first item, be Environmental Protection law, has be fulfilled the executive Regulation for the above law must be issued, at nearest possible time, to assist in law, Control, and protection measures enforcement.

As for Executive Decisions , it usually deal with cases not provided for in the law or law executive Regulation.

Environmental specifications are considered as an advanced stage that could only be attained through the development of technical standards and guide- lines for each specification. Specification constitutes a legal paper, summarizing environmental technical standards; while the guide lines giving detailed description thereto, and optimal methods to verify specification conformity.

Therefore to commence the development of environmental evidence and technical standard and sheets for various environmental activities.

### **4.3 Economic Instruments Implementation**

Economic Instrument method is applied in many Mediterranean Countries as a means for the provision of part of the necessary environmental projects funds, and to support Joint work between the parties Concerned with environment Pollution ( Industrial activities, as well as being a channel for the utilization of the revenue from Violation fine payments.

Economic instrument vary with different countries, in accordance to state political and economic systems. Volume of private economic activity contribution to Gross National Income. Economic instrument has

not been applied to environmental protection, so far. However, due to financial expresses requirements for improving environmental Conditions in small private sector industries in addition to high financial needs for Cement and Electric power plants, Economic Instruments shall be adopted for the above reasons.

Whereas the National Plan is not concerned with. Presenting detailed programs for the economic instruments to be applied, but it presents a set of concepts, which may be adopted by economists and economic institutions in Libyan, defining application ways and means, if adopted. Which includes.

### **Establishment of National Environment Fund**

This Fund will be managed by the Banking Sector, to be funded by environmental violation fines, Chemicals importation fees, Public Exchequer, annual fees from Industry sector, in accordance to individual industry type, and other sources, Fund revenues may be employed in granting facility loans to finance public and private environmental projects.

### **Packing tax. (polluted principles )**

This tax is a small fee imposed on every product introduced to the market in the form of metal or plastic packs ( tins or bottles ), whether locally produced or imported from abroad. Such fees will be allocated to collection and recycling costs of such forms of solid waste.

### **Customs Facilities**

Customs facilities should be granted for equipments tools, and material used in environment protection aspects of any project. Such easements may include total exemption of certain and liquid waste treatment and recycling.

### **Support to existing environmental equipments and change to clean production in private sector.**

It is recommended to support the emerging private sector by additional technical equipment to reduce emissions from its plants to acceptable levels; or change to its clean production, by replacing its industrial process system. This support may be in the form of free of interest loan, or tax exemption for a limited time, or other support forms, that encouraging the private sector to adopt clean production method.

#### **4.4 Human Capacity Building and Research tools**

Environmental Inspection, monitoring, and Control will, require specialist technical capabilities, and stationary and mobile laboratory equipments.

In addition to continued to personnel training in order to be in line with technological advancements.

Libya lacks advanced and specialized central laboratories for chemical analysis of pollutants, except for water and food analysis lab in certain research centers. Accordingly, the Plan proposes the establishment of 3 central labs for environmental pollution at the cities of Tripoli, Sirt , and Benghazi, Each lab will include four main sections as follows:

- Liquid analysis section.
- Solid pollutant
- Gaseous Pollutant section.
- Environmental Training, education and Awareness

The Libyan Universities and Higher institutes are graduating engineers and technicians with Sufficient skills to join capacity building programs.

This will require specialized centers equipped with labs, educational means, and expert instruction in this field. Depending upon provision of the above proposed central laboratories.

There is a Higher institute specialized in Environmental technologies at university study level. Post – graduate studies mostly

concentrate on theoretical studies, especially in environmental management area.

#### **4.5 Environmental Control, monitoring and Documentation systems**

Environment plans success depends on the results obtained during plan implementation for phase, considering that the objective of the National action plan is to protect the med. Sea from pollutant from land based – sources, it should be necessary to establish environmental Control, monitoring and documentation, to assess coastal and marine conditions, and to determine the necessary themes for plan success, and location requiring additional environmental improvement procedures.

Environmental control, monitoring and Documentation include an action program concerned with defining fixed locations for taking sea water samples on a regular basis, and for conduction periodical analysis to waste water discharged to sea, in addition to control and documentation of gaseous immersion rates from centralized site, like electric power and cement plants, and others.

Monitoring stations may be established to assess urban air quality conditions.

These stations should be connected to connection centers to receive information by telecommunication means. The Control, monitoring and documentation system will depend on the means provided by the proposed three central labs, as indicated in previous para. 4.4. with each central lab covering an allocated geographical area on the coast, in addition to other assignments.

#### **4.6. Environmental education and Awareness.**

Public participation in environmental protection programs, is a main and reliable tool for launching of new environmental project, contributing to environmental protection . This objective may be achieved by improved environmental individual and collective community behavior.

Raising public environment awareness will be a great incentive for local authorities to impose strict measures to protect and preserve the

environment such programs will require an integrated plan, developed by the competent parties, including secretariats of Education. Health and information in the Shabeyat, in addition to private sector participation, through Environmental societies.

The Environment General Authority should take a leading role in environmental education and awareness programs, through providing such programs with environmental information, publications, video tapes. Local Radio services can help in this regard by interviewing people's reporting their views and comments, and incite them to participation in environmental work, in general.

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## 5. The References

1. The first National Report on the state of the Environment 2002, EGA, Libya
2. National Diagnostic Analysis of the Libyan Coastal Area, M. ELALLAH, F. EL-DURSSI, Libya 2004, SAP, MAP
3. Baseline Budget for the Libyan Coastal Area < M. ELALLAH, F. EL-DURSSI, Libya 2005, SAP, MAP.
4. Guidelines for the preparation of national action plans for reduction of pollution of the Mediterranean from land base sources, UNEP(DEC)/MED WG.212/inf.3, 2002
5. Working document for the training course on the preparation of national action plans as part of the SAP UNEP(DEC)/MED/GEF WG.245/4, 2004
6. Guidelines for the preparation of investment portfolio for the implementation of the SAP/NAP, UNEP(DEC) / MED/GEF WG.245/5, 2004
7. Guidelines for economic instruments for the preparation of the SAP/NAP, UNEP(DEC)/MED/GEF WG.245/6, 2004
8. Public participation in the NAP for the SAP, UNEP(DEC)/MED/GEF WG.245/7, 2004
9. The Master plan for Tourist developments in Libya ( 1999-2018) UNDP Tripoli – Libya, 2000
10. The National Atlas – secretary of planning and survey.
11. Environment Policy and Management in Libya ( Report prepared for United Nations Centre for Human Settlement, Tripoli) -1991, Arabic & English.
12. The natural physical plan (1981-2000) Centre for Human Settlement, Tripoli
13. Management of Libyan coastal area , A. huniy & H. mftah 2002 , Marine research center ,Libya.
14. The environment situation report – industrial sector- TCEP 1994
15. Stockholm convention on POPs, A. maheshe, Elbea Magazine. Issue NO 17, Libya .
16. Law NO7 & for year 1982 concerning the Environment protection .
17. Law NO15 & for year 2003 concerning the Environment protection
18. The official magazine for legislations NO .4 year 37 Libya.
19. Law No.(5) for 1969 with regard to planning and organization of towns and villages.
20. Department of Nature conservation EGA Libya
21. Protocol concerning specially protected areas and Biological diversity in the Mediterranean. MAP, UNEP,
22. Report on pollution coastal Hot spots in the Libyan Arab Jamahiriya, Dr. Boargob , Technical center for Environment Protection , Tripoli, Libya.
23. Hot spots in Libya, Dr. Ayed gallal & Dr. Mohamed M. Amer. EGA , Libya.
24. Identification Of Priority Pollution Hot Spots and sensitive areas in the Mediterranean, UNEP (OCA) WG.136/inf, 29 /9 /1997, Athens.
25. Level of Heavy Metals Along the Libyan Coastline *Marine Pollution Bulletin*, Hamouda .M.S& Wilson. J.G. Volume 20, No. 12. p.p 621-624, 1989.
26. "Libyan Coastline Pollution Study Hamouda *et.al* Scientific Research Beru-Libya-2000.
27. " *Hydrocarbons pollution along the Libyan Coast*. Tumi.F.F *et.al* Published by Garyounis University –Libya 1992
28. " Situation of Solid Waste Management in Benghazi City" **EI-Mabrouk.F** Paper presented in the Symposium on Management of Recycle and Reuse of Solid Waste, Benghazi-Libya- December, 2003 .
29. The sectoral meeting in Tripoli and Benghazi for the preparation of sectoral plans, Libya Marsh 2005.