

*Syrian Arab Republic*  
Ministry of Local Administration  
and Environment

**National Action Plan for Protection of  
the Mediterranean Marine  
Environment from Land-Based  
Activities in the Syrian Arab Republic**

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## 1. EXECUTIVE SUMMARY

At the conclusion of the United Nations' Conference on the Human Environment held in Stockholm in 1972, the Mediterranean Sea was declared as among the "particularly threatened bodies of water". Consequently, the Mediterranean states requested the United Nations Environment Programme to set up an activity framework for environmental co-operation in the Mediterranean region. In 1975, the "Mediterranean Action Plan" was created. One year later, the Convention for the Protection of the Mediterranean Sea against Pollution, known as the Barcelona Convention was adopted. In order to translate the Barcelona Convention into a legally binding Action Plan, the Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources (LBS Protocol), was ratified, and later modified in 1996. In 1997, the Strategic Action Programme (SAP) was conceived as the operational and technical mechanism for the implementation of the LBS Protocol. The SAP requires that the Contracting Parties shall elaborate and implement, individually or jointly, national and regional action plans and programmes. The SAP is set out to have National Action Plans by 2005 to help countries fulfill their pollution clean-up objectives. The Action Plan presented in this document fulfills this requirement for the Syrian Arab Republic. It covers the geographical area constituting the "Coastal Region and Coastal Mountains", which coincides with the administrative borders of the governorates of Tartous to the south and Lattakia to the north. The length of the coastline is 183 km, and the land surface area is approximately 4000 km<sup>2</sup>, which constitutes about 2 percent of the surface land area of Syria.

### 1.1 Identification and Nature of Problems

The updated report for the priority pollution hot spots identified four areas on the Syrian coastline that negatively affect human health, ecosystems, biodiversity, and economy in a significant manner. These are Baniyas, Lattakia, Tartous and Jableh. The National Diagnostic Analysis states that common environmental problems in the Syrian coastal region originate from the urban environment; industrial development; and physical alterations and destruction of habitats. Concerning the urban environment, urban activities affect the marine environment in two aspects: municipal sewage and municipal solid waste. Regarding industrial development, impacts result from major industrial complexes such as the Baniyas oil refinery, the Tartous cement plant, the phosphate loading dock at the Port of Tartous, the two oil terminals of Baniyas and Tartous, and the thermal power generation station in Baniyas. Small-scale industries also affect the marine environment including steel rolling mills, food processing, beverage, olive oil mills, cattle and sheep slaughter houses, textiles, and various agricultural related activities such as confined animal facilities and green houses.

### 1.2 Environmental Priorities

The Strategic Action Programme identified specific contaminants with significant adverse impacts on the marine environment. These consist of nutrients from urban and industrial sources, persistent organic pollutants (POPs), heavy metals,

organohalogenes, and other hazardous wastes. Based on the baseline budget of pollutants study, it was concluded that these contaminants are associated in some form or other with the major land-based activities in the Syrian coastal region. In fact, these activities were confirmed by stakeholders as being the cause of the most significant environmental aspects that need to be addressed in the coastal region. For Lattakia, the identified priority environmental issues were:

1. Municipal solid waste dumps; lack of management of hazardous wastes, construction debris and garbage dumping on side of roads, and the non-segregation of medical wastes;
2. Municipal sewage from the City of Lattakia and surrounding tourists' areas;
3. Air emissions from diesel-operated vehicles on roadways and in the cities; and
4. Aqueous effluents from olive oil mills and slaughterhouses.

For Tartous, the identified priority environmental issues were:

1. Aqueous effluents from the Baniyas refinery
2. Municipal sewage from the Cities of Tartous and Baniyas in addition to sewage from small coastal and non-coastal cities and areas;
3. The problem of the "unlicensed" municipal waste dumps in Tartous governorate;
4. Air emissions from combustion of fuel oil in Baniyas refinery, cement plant; thermal power generation plant, and the phosphate loading docks;
5. Aqueous effluents from olive oil mills; and
6. Surface water runoff from petroleum facilities due to leakage and spills, and from agricultural lands due to the extensive use of fertilizers and pesticides.

### **1.3 The SAP Targets and the National Action Plan**

The priority issues identified by the stakeholders were used to formulate a comprehensive national plan of action for reducing the discharge of pollutants from land-based sources and activities to the Mediterranean Sea. The plan, which is included in Annex 'C', incorporates measures that take into account the SAP targets. These measures are divided into three categories:

1. Specific measures for promoting sustainable use of coastal and marine resources such as BAT, BEP, and clean technologies;
2. Requirements and incentives to induce action to comply with measures including economic instruments, regulatory measures, capacity building, and public awareness; and
3. Institutional arrangements with the relevant authorities and resources necessary for carrying out management tasks associated with the strategies and programme.

Measures included in the action plan are divided into five sectors based on the sectoral plans for Syria:

1. Municipal sewage;
2. Municipal solid waste;
3. Industrial solid wastes and aqueous effluents;
4. Hazardous wastes of particular interest to the Strategic Action Programme; and

## 5. Air emissions from urban and industrial sources.

Given that it is highly unlikely that financial resources will be available to accomplish *all* actions outlined in Annex 'C' within the required timeframe of 2010, specific projects requiring substantial investments were identified and prioritized by stakeholders within the context of a realistic and politically acceptable *financial strategy*, as shown in the following table. The investment portfolios of these projects are included in Annex 'D'.

| Project (in order of priority)  | Approximate cost |              |
|---|------------------|--------------|
|   | Million SYP      | Million USD* |
| The rehabilitation of the Baniyas refinery IWWTP, including the construction of a landfill for industrial hazardous waste                         | 300              | 5.7          |
| The construction of the Tartous municipal WWTP  | 300              | 5.7          |
| The construction of the Lattakia municipal WWTP   | 1367             | 25.8         |
| The exchange of fuel with natural gas for two power generation units at the Baniyas thermal power plant   | 2800             | 53.0         |
| The development of the municipal landfill of Tartous  | 125              | 2.4          |
| The construction of a WWTP in Jableh and a sewerage network for the industrial area of Al Fawar Spring  | 220              | 4.2          |
| The construction of the Baniyas WWTP and sanitary sewers network  | 567              | 10.7         |
| The installation of fabric filters on the production line for the Tartous Cement Factory  | 65               | 1.2          |
| The rehabilitation of the Old Jableh City sewerage network  | 50               | 1.0          |
| Pretreatment of wastewater from food manufacturers at Fawar Spring area and Ugarit Beverages Company prior to discharge to public sanitary sewers | NA               | NA           |

These projects will enable Syria to achieve the targets of the Strategic Action Programme for the year 2010<sup>†</sup>. Nevertheless, the national action plan included in Annex 'C' contains additional activities that do not require substantial investments such as segregation, recycling, or reuse of industrial wastes, in addition to incentives and institutional arrangements, which will also contribute to pollution reduction from land-based sources and activities in Syria by 2010.

### 1.4 Plan Support Elements

The responsibility for dealing with the main environmental issues in Syria lies within a number of ministries, in addition to the Ministry of Local Administration and Environment. These ministries bear a direct responsibility for providing the legislative framework or the institutional support necessary for environmental work.

Applicable economic instruments for the implementation of the investment projects are limited to taxes that may be applied for rendered environmental services

\* Based on a conversion rate of 53 SYP for 1 USD

† Refer to Table 4.3

(wastewater treatment or landfilling) or added to the costs of generated products (electricity, or petroleum products).

Monitoring and environmental-quality reporting system is based on the monitoring agreement signed between MEDPOL and the Syrian government. Other monitoring programmes may be also used for tracking progress in pollution reduction. Environmental indicators for tracking progress on the sectoral level are also presented.

The sustainability of the action plan is ensured through public participation in identifying environmental and economic priorities. These were reflected in the specific measures included in the action plan.

Presently, environmental NGO's cannot be counted on for effective support in the implementation of this action plan. They are few in number and limited to one NGO in the coastal region. Nevertheless, non-governmental organizations in Syria are gaining experience, as they get more and more involved in environmental programmes; hence, their ability should be assessed on a regular basis.

## 2. INTRODUCTION

### 2.1 Background

At the conclusion of the United Nations' Conference on the Human Environment held in Stockholm in 1972, the Mediterranean Sea was declared as among the "particularly threatened bodies of water". Consequently, the Mediterranean states requested the United Nations Environment Programme (UNEP) to set up an activity framework for environmental co-operation in the Mediterranean region.

In 1975, an action plan for protection and development of the Mediterranean basin was adopted. It was referred to as the "Mediterranean Action Plan" (MAP). One year after the legal framework for this cooperation was formed, three legal instruments were simultaneously adopted: the Convention for the Protection of the Mediterranean Sea against Pollution, known as the Barcelona Convention; the Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft; and the Protocol concerning Cooperation in Combating Pollution of the Mediterranean Sea by Oil and Other Harmful Substances in Cases of Emergency.

In order to translate the Barcelona Convention into a legally binding Action Plan, the Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources (LBS Protocol), was adopted. It came into force in 1983.

Both the Barcelona Convention and its LBS Protocol were amended in 1996, following the 1992 Earth Summit in Rio (UN Conference on Environment and Development) and the requirements of the Rio Declaration on Environment and Development (Agenda 21). In 1997, the Strategic Action Programme (SAP) was conceived as the operational and technical mechanism for the implementation of the LBS Protocol. The SAP requires that the Contracting Parties shall:

- Elaborate and implement, individually or jointly, national and regional action plans and programmes;
- Adopt priorities and timetables according to Annex 1 of the LBS Protocol;
- Consider the Best Available Techniques (BAT) and the Best Environmental Practices (BEP), including clean production technologies (CP); and
- Undertake relevant preventive measures to reduce the risk of accidental pollution.

The SAP is set out to have National Action Plans by 2005 to help countries fulfill their pollution clean-up objectives. The Action Plan presented in this document fulfills this requirement for the Syrian Arab Republic. Syria ratified the original LBS Protocol in 1993, and is expected to ratify the 1996 amendments by 2005.

### 2.2 Purpose of the Plan

A national programme of action is a dynamic short, medium, and long-term agenda for marine protection involving strategic planning; the implementation of concrete targeted and costed projects; and periodic evaluation to improve performance.

The fundamental purpose for implementing a national plan of action for the protection of the Mediterranean Sea along the Syrian coastline is to ensure the health and



sustainable use of coastal and marine resources for present and future generations. This is achieved by responding in a strategic and feasible manner, using targeted, integrated, and adequately resourced measures, to overcome both sustained and short-term pressures caused by human activities on land.

### 2.3 Geographic Extent and Scope of the Plan

According to Article [3, b] of the 1996 LBS Protocol, the Protocol area includes the entire watershed zone within the territories of the Contracting Parties which drains into the Mediterranean Sea. In Syria, this area constitutes the “Coastal Region and Coastal Mountains”. It coincides with the administrative borders of the governorates of Tartous to the south and Lattakia to the north as shown on Figure 2.1. The area is situated between Lebanon from the south; Aleskandaron region from the north; and the fault of Al Ghab and Al Omq basins, and the Orontes River, from the East. It is the only western outlet for Syria on the Mediterranean Sea. The length of the coastline is 183 km, and the land surface area is approximately 4000 km<sup>2</sup>, which constitutes about 2 percent of the surface land area of Syria.

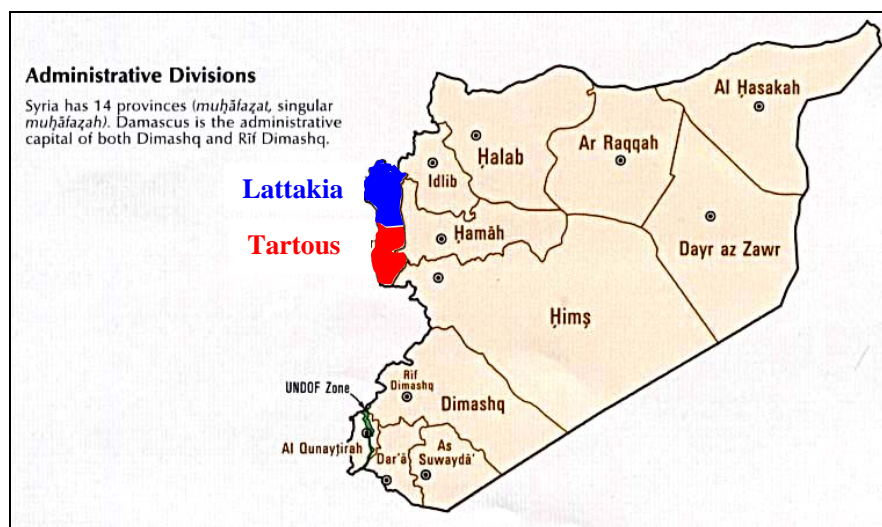


Figure 2.1: Administrative Divisions in Syria

The scope of the national action plan includes land-based sources and activities requiring actions and targets in line with those stipulated in the Strategic Action Programme. The actions and targets of the SAP are based on the preliminary findings of a regionally prepared transboundary diagnostic analysis (TDA), and are prioritized in accordance with the requirements of the Global Programme of Action (Washington 1995). Table 2.1 presents the list of SAP activities of relevance to Syria, which are targeted for 2010 and 2025. These activities are grouped into two areas:

1. Urban environment, including municipal sewage; urban solid waste; and air pollution.
2. Industrial development including i) toxic, persistent organic pollutants and heavy metals; ii) other heavy metals; iii) organohalogen compounds; iv)

nutrients and suspended solids; v) hazardous wastes; and vii) atmospheric emissions.

**Table 2.1: Short and long-term SAP targets and activities**

| Issue                  | SAP Targets for 2010   | SAP Targets for 2025   |
|------------------------|--|--|
| Urban Environment      | Dispose sewage for cities over 100,000 in population in WWTP   | Dispose all sewage in conformity with the LBS Protocol               |
|                        | Manage solid waste for cities over 100,000 in population   | Solid waste management for all urban agglomerations                  |
|                        | Ensure that cities over 100,000 in population conform to ambient air quality standards                     | All cities conform to ambient air quality standards                  |
| Industrial Development | Collect and dispose of all PCBs  | Phase out inputs of POPs   |
|                        | Reduce 25% of PAH inputs   | Phase out input of PAH   |
|                        | Reduce 50% of heavy metals inputs  | Phase out discharges and emissions                                   |
|                        | Reduce discharges of organohalogenes   | Eliminate discharges of organohalogenes                              |
|                        | Reduce 50% of industrial BOD and nutrients discharges  | Dispose all industrial nutrients in conformity with the LBS Protocol |
|                        | No target for reduction of nutrients from agricultural activities  | Reduce nutrients from agricultural activities                        |
|                        | Reduce by 20% hazardous waste generation, and dispose 50% of waste in a safe environmental manner          | Dispose all hazardous waste in a safe environmental manner           |
|                        | Collect 50% of lubricating oil and dispose in a safe environmental manner                                  | No further targets   |
|                        | Reduce by 20% batteries' generation, and dispose 50% of generated batteries in a safe environmental manner | Dispose all batteries in a safe environmental manner                 |

### 3. IDENTIFICATION AND ASSESSMENT OF PROBLEMS

#### 3.1 General

The Syrian coastline extends for about 183 km along the Mediterranean Sea. The region is characterized by its sandy mountainous terrains, and flat lowlands. The coastal strip includes wetlands, river estuaries, coastal cliffs and other diverse habitats. Sandy beaches are encountered near the City of Lattakia and do not exceed 40 km in length. The sea is generally deep and the continental shelf is narrow (less than 1 km in some locations; the widest point is 16 km to the south of the City of Tartous). The shoreline is poor with gulfs and bays, and does not support nursing and reproduction for biological species. Freshwater input into the sea is very low due to damming of coastal rivers. This results in higher pollution concentration in the coastal rivers and in their estuaries. Consequently, the seawater along the Syrian coastline (as is the case along other parts of the eastern Mediterranean) is oligotrophic and characterized by high salinity, low primary productivity, slow water currents, and low tidal waves. This slows the dispersion rate of pollutants and increases the impact of pollution on marine life.

#### 3.2 Identification and Nature of Problems

The updated report for the priority pollution hot spots<sup>1</sup> identified four areas on the Syrian coastline that negatively affect human health, ecosystems, biodiversity, and economy in a significant manner. The most critical hot spot is Baniyas, followed by Lattakia, then Tartous, and finally Jableh. The report concluded that remedial measures are needed in Baniyas to deal with actual risks resulting from the lack of a domestic wastewater treatment plant for the City of Baniyas; and to rehabilitate the Baniyas refinery and oil terminal. For the Lattakia hot spot, wastewater treatment plants are required to treat domestic and industrial wastewater effluents. In Tartous, risks on drinking water quality and recreational uses mandate the construction of a domestic wastewater treatment plant for the City of Tartous; treatment of industrial effluents; in addition to rehabilitation of the Tartous cement factory; the port; and the oil terminal. Finally, for Jableh, the most pressing issue is the construction of the domestic wastewater treatment plant for the City of Jableh.

The National Diagnostic Analysis (NDA) report<sup>2</sup> states that common environmental problems in the Syrian coastal region originate from the urban environment; industrial development; and physical alterations and destruction of habitats. The report further indicates that the impacts on the coastal environment are generally similar in the two governorates of Tartous and Lattakia, although they exhibit differing characteristics in several aspects, as noted in Table 3.1.

Concerning the urban environment, the NDA indicates that urban activities affect the marine environment along the Syrian coastline in two aspects: municipal sewage and municipal solid waste. Regarding industrial development, the NDA distinguishes between the impacts of major industrial complexes and small-scale industrial

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<sup>1</sup> Mohamad Kayyal. "Revision of Pollution Hot Spots- Country Report for Syria". UNEP/MAP, Athens 2002.

<sup>2</sup> Amir Ibrahim. "National Diagnostic Analysis of Syria". UNEP/MAP, Athens 2003.

facilities. Major industrial complexes include the Banias oil refinery, the Tartous cement plant, the phosphate loading dock at the Port of Tartous, the two oil terminals of Banias and Tartous, and the thermal power generation station in Banias. Small-scale industries include steel rolling mills, food processing, beverage, olive oil mills, cattle and sheep slaughter houses, textiles, and various agricultural related activities such as confined animal facilities and green houses. Details on the nature and severity of problems caused by both the urban environment and industrial development are provided in Annex A and Annex B, respectively.

**Table 3.1: Pollution Aspects in the Coastal Region of Syria**

| Aspect              | Lattakia           | Tartous            |
|---------------------|--------------------|--------------------|
| Source of pollution | Various industrial | Petroleum industry |
| Population density  | High               | Low                |
| Human activity      | High               | Low                |
| Coastal plain       | Narrow             | Wide               |
| Industrial areas    | Widespread         | Concentrated       |

### 3.3 Nature of Contaminants

The Strategic Action Programme identified specific contaminants with significant adverse impacts on the marine environment. These contaminants are based on those provided in the Global Programme of Action (Washington 1995). They consist of nutrients from urban and industrial sources, persistent organic pollutants (POPs), heavy metals, organohalogens, and other hazardous wastes. Following, we present a characterization of the contaminants and description of the sectors responsible for their discharge or emission in the Syrian coastal region.

#### 3.3.1 BOD and Nutrients

Nutrients of concern for the marine environment are total phosphorus and nitrogen. In the Syrian coastal region, biological oxygen demand (BOD) and nutrients originate from municipal sewage, agricultural-related activities including slaughterhouses and animal farming, and olive oil mills. Table 3.2 presents details on emissions of BOD and nutrients in the coastal region including their main sources, loads and percentage, source type and effluent, and sector. This information was provided in the National Baseline Budget of Pollutants for Syria<sup>3</sup>, specified for the year 2003.

In that respect, it should be noted, that there are no exact figures on the amounts of phosphorus and nitrates discharged to the environment because of the extensive use of organic fertilizers in agriculture. Hence, percentages quoted in Table 3.2 do not reflect this aspect. It is estimated that the amount of fertilizers utilized in the region exceeded 16,000 tons in 2001<sup>4</sup>. This factor is particularly important when considering the presence of over 70,000 plastic green houses concentrated over only 3000 hectares of land.

<sup>3</sup> Kayyal and Azmeh. "National Baseline Budget of Pollutants for the Syrian Arab Republic". UNEP/MAP, Athens 2003.

<sup>4</sup> Ministry of Agriculture and Agrarian Reform, Agricultural Statistical Abstract. The Syrian Arab Republic 2001.

**Table 3.2: Details of emissions of BOD and Nutrients from the Coastal Region**

| Indicator        | Main Sources                               | Load (tons/year) | Percentage discharges | Source Type and Effluent     | Sector     |
|------------------|--|------------------|-----------------------|------------------------------|------------|
| BOD              | Municipal sewage                           | 17,760           | 38%                   | Point Aqueous                | Municipal  |
|                  | Animal farming activities                  | 20,779           | 45%                   | Diffuse <sup>5</sup> Aqueous | Industrial |
|                  | Olive oil mills                            | 5167             | 11%                   | Diffuse Aqueous              | Industrial |
| Total Phosphorus | Municipal sewage                           | 325              | 15%                   | Point Aqueous                | Municipal  |
|                  | Animal farming activities                  | 1850             | 84%                   | Diffuse Aqueous              | Industrial |
|                  | Agricultural fertilizing                   | NA               | NA                    | Diffuse Aqueous              | Industrial |
|                  | Phosphate loading docks in Port of Tartous | 21               | 1%                    | Point Air emissions          | Industrial |
| Total Nitrogen   | Municipal sewage                           | 2920             | 47%                   | Point Aqueous                | Municipal  |
|                  | Animal farming activities                  | 3352             | 53%                   | Diffuse Aqueous              | Industrial |
|                  | Agricultural fertilizing                   | NA               | NA                    | Diffuse Aqueous              | Industrial |

### 3.3.2 Toxic, Persistent and Liable to Bioaccumulate Substances (TPBs)

TPB substances encountered in the Syrian coastal region include persistent organic pollutants (POPs) such as PCBs, polycyclic aromatic hydrocarbons (PAH), and heavy metals.

**Polychlorinated biphenyls (PCB)** are highly toxic persistent organic chemicals. In Syria, PCBs are most commonly found in old electrical power transformers. In 2002, the Syrian Arab Republic ratified the Stockholm Convention on Persistent Organic Pollutants banning the use of PCBs. An inventory list of industrial transformers containing or suspected of containing PCBs was subsequently prepared. According to this list, it was determined that the coastal region possesses five transformers four of which are located in the Tartous and Baniyas power transformers stations, and one in the old Jableh textile weaving plant. These transformers contain over 50 tons of PCB oil. In addition, the survey concluded that over 110 transformers of various sizes contain oils with undetermined amounts of PCB. The reason for the uncertainty is that during maintenance operations, oils free of PCB were often mixed with the original transformers' oil that contained PCB. These transformers are found in most

<sup>5</sup> BOD sources from animal farming activities are in their majority diffuse with the exception of the municipal slaughterhouse in Lattakia (point source) which produces approximately 25 percent of total BOD load (1500 tons/year) from all slaughterhouses in the coastal region.

major urban power transforming stations in addition to the Baniyas refinery, Baniyas thermal power generation plant, and the sea ports of Tartous and Lattakia.

**Polycyclic aromatic hydrocarbons** (PAHs) are a group of over 100 different chemicals that are formed as byproducts of combustion of oil, gas, and other organic substances. Benzo[a]pyrene (BaP) is the most toxic of the PAHs. In the coastal region, PAHs are emitted from the combustion of heating oil, which is common among the three major industrial complexes: the Baniyas refinery; the Baniyas power generation plant; and the Tartous cement plant. Average yearly consumption of fuel oil by the three major industrial complexes in the coastal region exceeds one million tons. This quantity is in turn responsible for over 60 percent of total gaseous emissions in the coastal region. PAH are also generated from the petroleum storage tanks at the oil terminals of Tartous and Baniyas, and from a large number of small industrial facilities dispersed over the entire coastal region.

PAHs can be also found in smoke and soot generated by urban road transport particularly in the cities of Lattakia and Tartous, and their two commercial ports. PAHs can attach to other particles, including dust. These particles can be carried in air, water and soil ultimately precipitating into the sea. Due to their diffuse sources, we do not have exact figures of the total emissions of PAHs in the coastal region.

Insignificant amounts of aqueous effluents of PAHs are also encountered in the coastal region. These take place as part of the discharges of domestic sewage to the sea. According to the 2003 NBB analysis, small amounts of PAH that do not exceed 44 kg are discharged yearly to the sea. These constitute about 85 percent of total aqueous PAH emissions to the marine environment.

Finally, and with the exception of the Baniyas refinery, there are no large-scale industrial point sources of **heavy metals** in the coastal region. Heavy metals were detected in the aqueous effluent of the refinery based on laboratory tests conducted on wastewater samples. Aqueous effluents of lead and cadmium were also detected in the municipal sewage discharged to the sea. These were estimated in the NBB analysis at 40 and 400 kg per year, respectively. Trace amounts of chromium were also predicted by the NBB analysis for activities related to recycling of lubricating oils.

Particulate emissions of heavy metals consist of mercury from the Tartous cement plant. NBB analysis estimates mercury emissions at about 190 kg of per year. Combustion and heating oils from various industrial facilities are also responsible for the emission of heavy metals including Arsenic, Cadmium, Chromium, Copper, and Nickel. However, due to their diffuse sources, it is not possible to obtain an exact estimate of these emissions and the consequent atmospheric depositions in the sea.

### 3.3.3 Organohalogen Compounds

Organohalogen compounds encountered in the Syrian coastal region include the nine organohalogen pesticides<sup>6</sup>, which are classified as persistent organic pollutants, and particulates of the chlorobenzene compound from the Tartous cement plant.

The nine **organohalogen** pesticides are not permitted to be imported or utilized in Syria. However, it is anticipated that unknown quantities of these compounds are leaching from the ground to the marine environment due to past accumulations of the

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<sup>6</sup> The nine pesticides are: DDT (Dichloro Diphenyl Trichloro Ethane), Aldrin, Dieldrin, Endrin, Chlordane, Heptachlor, Mirex, Toxaphane and Hexachlorobenzene.

organohalogen pesticides in the soil. This problem occurs as seeping chemicals get mixed with surface water run-off pursuant to sustained periods of rainfall and precipitation.

Concerning the **chlorobenzene** compound emitted by the Tartous cement plant, the 2003 baseline budget of pollutants estimated that the total quantity of chlorobenzene discharged with the air emissions of the Tartous cement plant do not exceed 14 kg per year. This number was estimated based on a total manufacturing capacity of 1.7 million tons of cement per year.

#### 3.3.4 Hazardous Wastes

Hazardous wastes targeted by the Strategic Action Programme consist of mineral hydrocarbons, particularly lubricating oils, and batteries.

**Mineral hydrocarbons** are discharged by petroleum-related facilities such as the Baniyas refinery and the oil transport terminals of Tartous and Baniyas. However, due to the fact that most discharges are due to spills and other incidents, it is not possible to estimate accurately discharged quantities reaching the Mediterranean Sea.

On the other hand, mineral oils are primarily used as lubricant base oils to produce further refined oil products. The major hydrocarbon constituents of lubricant base oils and derived products occur naturally in crude petroleum. These products include engine oils, automotive and industrial gear oils, hydraulic fluids, bearing oils, textile machine oils, metalworking oils, rust preventative oils, heat-treating oils, transformer oils, greases, and processing oils. In the coastal region, these oils are primarily used by the iron rolling mills and in automotive workshops. According to the NBB, large amounts of mineral hydrocarbons are discharged by the iron rolling mills. However this percentage does not take into account the proportion of discharges from spills at the petroleum refining and transport facilities. In contrast, **lubricating oils** are generally recycled in licensed or unlicensed private recycling facilities. Recycling is performed to produce second grade oil. According to official figures, there is one recycling facility in Lattakia with a recycling capacity of 100 tons per year. Used lubricating oil is sometimes mixed in small industrial facilities with combustion fuel in boilers and generators, as a cheap alternative for recycling and disposal.

Finally, and concerning used leaded **batteries**, these are sold to recycling workshops which disassemble them to their constitutive components. Lead is then melted down and reformed for use in new batteries. According to official figures in 2003, there are 11 workshops in the coastal region licensed to produce leaded batteries, with a total production capacity of 39,900 batteries per year.

## 4. PRIORITY ISSUES AND ACTIONS

### 4.1 Environmental Priority Issues

According to the hot spots report, and to the NDA and NBB studies, the Syrian coastal region is exposed to pressure factors that have given rise to a number of environmental problems. These were specified by concerned stakeholders in the Syrian coastal region based on the participatory approach. In total, 29 issues were identified in Lattakia, and 32 in Tartous. Issues were prioritized by means of an impact matrix that scales and scores each environmental problem according to the following four criteria:

1. Human health
2. Marine environment
3. Socio-economic factors
4. Global environment

For each criterion, weighing factors were assigned, and four types of impacts were considered: high, medium, low and no impact. These were utilized to rank the environmental issues in a priority order that reflects the perceived importance by the involved stakeholders.

For Lattakia, the identified priority environmental issues were:

1. Municipal solid waste dumps; lack of management of hazardous wastes, construction debris and garbage dumping on side of roads, and the non-segregation of medical wastes;
2. Municipal sewage from the City of Lattakia and surrounding tourists' areas;
3. Air emissions from diesel-operated vehicles on roadways and in the cities; and
4. Aqueous effluents from olive oil mills and slaughterhouses.

For Tartous, the identified priority environmental issues were:

1. Aqueous effluents from the Baniyas refinery
2. Municipal sewage from the Cities of Tartous and Baniyas in addition to sewage from small coastal and non-coastal cities and areas;
3. The problem of the "unlicensed" municipal solid waste dumps in Tartous governorate;
4. Air emissions from combustion of fuel oil in Baniyas refinery, cement plant; thermal power generation plant, and the phosphate loading docks;
5. Aqueous effluents from olive oil mills; and
6. Surface water runoff from petroleum facilities due to leakage and spills, and from agricultural lands due to the extensive use of fertilizers and pesticides.

Table 4.1 illustrates the relationship between the environmental issues identified by the stakeholders and the SAP short-term targets. All three SAP targets in the area of urban environment, and six out of nine SAP targets in the area of industrial development were identified by the stakeholders.



**Table 4.1: Relationship between SAP targets and perceived priority issues by stakeholders**

| Area                   | SAP Targets for 2010   | Perceived Priorities by Stakeholders  |
|------------------------|--|---|
| Urban Environment      | Dispose sewage for cities over 100,000 in population in WWTP   | Lack of WWTP in Lattakia, Tartous, Baniyas, and Jableh  |
|                        | Manage solid waste for cities over 100,000 in population   | Lack of landfills in Tartous, Bassa (Lattakia), Jableh  |
|                        | Ensure that cities over 100,000 in population conform to ambient air quality standards                     | Emissions from diesel operated urban transport vehicles in Lattakia   |
| Industrial Development | Collect and dispose of all PCBs  | Not mentioned by stakeholders   |
|                        | Reduce 25% of PAH inputs   | Emissions from combustion and heating of oils used in industrial facilities   |
|                        | Reduce 50% of heavy metals inputs  | Emissions from combustion and heating of oils used in industrial facilities; and emissions from Tartous cement plant    |
|                        | Reduce discharges of organohalogens  | Agricultural runoff of pesticides and emissions from Tartous cement plant   |
|                        | Reduce 50% of industrial BOD and nutrients discharges  | Untreated wastewater from slaughter houses; and air emissions from the phosphate loading dock                           |
|                        | No targets to reduce nutrients in agricultural runoff  | Polluted agricultural runoff with nutrients from fertilizers  |
|                        | Reduce by 20% hazardous waste generation, and dispose 50% of waste in a safe environmental manner          | Contaminated effluents from olive oil mills; the Baniyas refinery; and surface runoff from petroleum-related facilities |
|                        | Collect 50% of lubricating oil and dispose in a safe environmental manner                                  | Not mentioned by stakeholders   |
|                        | Reduce by 20% batteries' generation, and dispose 50% of generated batteries in a safe environmental manner | Not mentioned by stakeholders   |

## 4.2 Environmental Priority Actions and Measures

The priority issues identified by the stakeholders, and presented in Table 4.1, offer a road map for selecting priority actions for effectively achieving the 2010 SAP targets. A comprehensive national plan of action for reducing the discharge of pollutants from land-based sources and activities to the Mediterranean Sea is presented in Annex 'C'. Actions included in this plan consist of:

- Specific measures for:
  - Promoting sustainable use of coastal and marine resources and prevention of degradation of the marine environment including the implementation of BAT, BEP, and clean technologies;
  - Modifying contaminants or other forms of degradation after generation such as waste recovery, recycling and effluent reuse, and waste treatment; and
  - Preventing, reducing, or ameliorating degradation of affected areas such as environmental quality criteria, land use planning requirements, and rehabilitation of degraded habitats.
- Requirements and incentives to induce action to comply with measures including economic instruments, regulatory measures, capacity building, and public awareness; and
- Identification/designation of the institutional arrangement with the relevant authorities and resources necessary for carrying out management tasks associated with the strategies and programme, including implementation of compliance provisions.

The national action plan is divided into the following five sectors based on the national sectoral plans for Syria<sup>7</sup>:

1. Municipal sewage
2. Municipal solid waste
3. Industrial solid wastes and aqueous effluents
4. Hazardous wastes of particular interest to the Strategic Action Programme
5. Air emissions from urban and industrial sources

### 4.3 National List of Priority Actions for 2010

Given that it is highly unlikely that financial resources will be available to accomplish *all* actions outlined in Annex 'C' within the required timeframe of 2010, specific actions requiring substantial investments were prioritized within the context of a realistic and politically acceptable *financial strategy*.

As a first step in this process, specific investment projects to reduce effectively the release of pollutants to the Mediterranean Sea were selected. Table 4.2 presents synopsis of these projects, which constitute the national list of priority actions, including targeted pollutants; expected percentage reduction; baseline and expected final loads, and relevant stakeholders. It should be noted that there are no exact information as to when these projects will be initiated or completed within the period between 2006 and 2010.

As can be inferred from this list, these investment projects should enable Syria to meet the SAP targets for 2010. However, additional activities not requiring substantial investments, such as segregation, recycling, or reuse of industrial wastes, incentives, and institutional arrangements, are also planned as tabulated in Annex C.

<sup>7</sup> Hosni Al Azmeh, "Sectoral Plans for the Reduction of Pollutants from Land Based Source in the Syrian Coastal Region". Ministry of Local Administration and Environment. The Syrian Arab Republic, 2005.

These specific measures should also contribute to reducing pollution from land-based sources and activities in Syria by the year 2010.

Table 4.2: National priority action List to address SAP targets by 2010

| Sector            | Priority actions  | Admin. Region      | Pollutant             | Expected Reduction   | Baseline Load  | Expected Final Load | Relevant Stakeholder                     |
|-------------------|---|--------------------|-----------------------|--|----------------|---------------------|--|
| BOD and Nutrients | Construct wastewater treatment plants in Lattakia, Tartous, Baniyas and Jableh (with sewerage networks for the industrial area of Fawar Spring in Jableh and the old Jableh city) | Lattakia & Tartous | BOD and nutrients     | Wastewater treatment plants built for all cities with population in excess of 100,000 people             |                |                     | Ministry of housing and construction     |
|                   | Manage solid waste and construct landfill in Tartous. Rehabilitate Bassa landfill (Lattakia and Jableh)   | Lattakia & Tartous | BOD and nutrients     | Solid waste managed and landfills constructed for all cities with population in excess of 100,000 people |                |                     | Ministry of Local Admin. and Environment |
| PAH               | Reduce gaseous emissions from the Baniyas thermal power generation plant by converting from fuel to gas   | Tartous            | PAH                   | NA   | 600 kg/year    | NA                  | Ministry of electricity                  |
| Organo halogen    | Reduce emissions from Tartous cement plant by means of fabric filters   | Tartous            | Chloro-benzene        | NA   | 14 kg/year     | NA                  | Ministry of Industry                     |
| Industrial BOD    | Pre-treat wastewater from food manufacturers at Fawar Spring area prior to discharge to sewers  | Lattakia           | Industrial BOD        | 50%  | 2600 tons/year | 20 tons/year        | Ministry of Industry                     |
|                   | Pre-treat wastewater from for the Ugarit beverages company  | Lattakia           | Industrial BOD        |  |                | 220 tons/year       | Ministry of Industry                     |
| Hazardous Wastes  | Construct an industrial wastewater treatment plant for the Baniyas refinery and build a disposal site for hazardous wastes  | Tartous            | Hydro-carbon minerals | NA   | 30 tons/year   | NA                  | Ministry of petroleum and minerals       |

#### 4.4 Investment Portfolios

Based on the selected projects requiring substantial investments and outlined in Table 4.2, the investment portfolios were established. The purpose of the investment portfolios is to identify and communicate investment priorities for mobilizing donor and domestic resources; justifying choices; and raising public awareness and commitment.

The investment projects were identified in the national sectoral development plans prepared by the relevant line ministries, and the National Environmental Action Plan (NEAP), taking into consideration the SAP targets. Following the preparation of the investment portfolios, projects' details and financial data were subjected to the views and comments of stakeholders who were previously involved in the environmental issues' prioritization process. Based on a specific set of criteria, stakeholders were asked to prioritize the investment projects in order of importance. The adopted criteria were:

- The capital and running costs of a project;
- The benefits expected to accrue from a project;
- The contribution of a project to the productivity of the local/national economy;
- The feasibility for project implementation within the existing legal, administrative, and institutional frameworks; and
- The financial sustainability or capacity of the project to generate or mobilize future revenue sources for cost recovery.

The prioritized investment projects and their costs are presented in Table 4.3. The corresponding investment portfolios<sup>8</sup> are included in Annex 'D'<sup>9</sup>.

This participatory process enabled the selection of projects with scopes in line with the perceived priorities expressed by the stakeholders as shown in Table 4.1. Rehabilitation of Al Bassa municipal landfill in Lattakia was excluded from the list of investment projects since landfill closure is expected by 2010, and the landfill is currently undergoing expansion works to accept additional quantities of solid waste.

Applicable economic instruments for the implementation of the selected projects are briefly explained in the investment portfolios presented in Annex 'D'. However, it should be stated that economic incentives are limited to taxes that may be applied for rendered environmental services (wastewater treatment or landfilling) or added to the costs of generated products (electricity, or petroleum products), as explained in the following section<sup>10</sup>.

Finally, tracking of percentage reductions after implementation can be accomplished by means of monitoring indicators and environmental-quality reporting system as described in the following section.

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<sup>8</sup> With the exception of projects consisting of preliminary treatment by privately-owned factories

<sup>9</sup> Riad Abrash. "Merging Economic Instruments with the National Action Plan for the Implementation of the Strategic Action Programme". UNEP/MAP, Athens 2005.

<sup>10</sup> Riad Abrash. "Proposals for adaptation and preparation of economic instruments for protection of the marine environment from pollutants originating from based sources in Syria". PAP/RAC, 2005

**Table 4.3: The national investment projects' priority list for 2010**

| Project (in order of priority)  | Approximate cost |              |
|---|------------------|--------------|
|   | Million SYP      | Million USD* |
| The rehabilitation of the Banias refinery IWWTP, including the construction of a landfill for industrial hazardous waste                          | 300              | 5.7          |
| The construction of the Tartous municipal WWTP  | 300              | 5.7          |
| The construction of the Lattakia municipal WWTP   | 1367             | 25.8         |
| The exchange of fuel with natural gas for two power generation units at the Banias thermal power plant  | 2800             | 53.0         |
| The development of the municipal landfill of Tartous  | 125              | 2.4          |
| The construction of a WWTP in Jableh and a sewerage network for the industrial area of Al Fawar Spring  | 220              | 4.2          |
| The construction of the Banias WWTP and sanitary sewers network   | 567              | 10.7         |
| The installation of fabric filters on the production line for the Tartous Cement Factory  | 65               | 1.2          |
| The rehabilitation of the Old Jableh City sewerage network  | 50               | 1.0          |
| Pretreatment of wastewater from food manufacturers at Fawar Spring area and Ugarit Beverages Company prior to discharge to public sanitary sewers | NA               | NA           |

\* Based on a conversion rate of 53 SYP for 1 USD

## 5. PLAN SUPPORT ELEMENTS

### 5.1 Institutional and Legislative Framework of the Environment

The responsibility for dealing with the main environmental issues in Syria lies within a number of ministries, in addition to the Ministry of Local Administration and Environment. These ministries bear a direct responsibility for providing the legislative framework or the institutional support necessary for environmental work.

#### *5.1.1 Institutional Framework*

The environmental institutional framework in Syria comprises three levels. The first level is the Council for Environmental Safety and Sustainable Development chaired by the Prime Minister. It consists of 17 ministries in addition to the State Planning Commission and a number of grass-root organizations and chambers of commerce and industry. The Council for Environmental Safety and Sustainable Development is considered the highest body responsible for setting environmental policies in Syria. The second level is the Ministry of Local Administration and Environment. Its main role is supervision and follow-up of environmental concerns. The ministry is also the final authority for all correspondence and communications with the national and international organizations concerned with the environment. The Ministry has two arms; the first is technical, which is the General Commission for Environmental Affairs (GCEA), and the second is scientific, which is the Scientific and Environmental Research Centre (SERC). The Organization Chart of General Commission for Environmental Affairs is depicted in Figure 5.1.

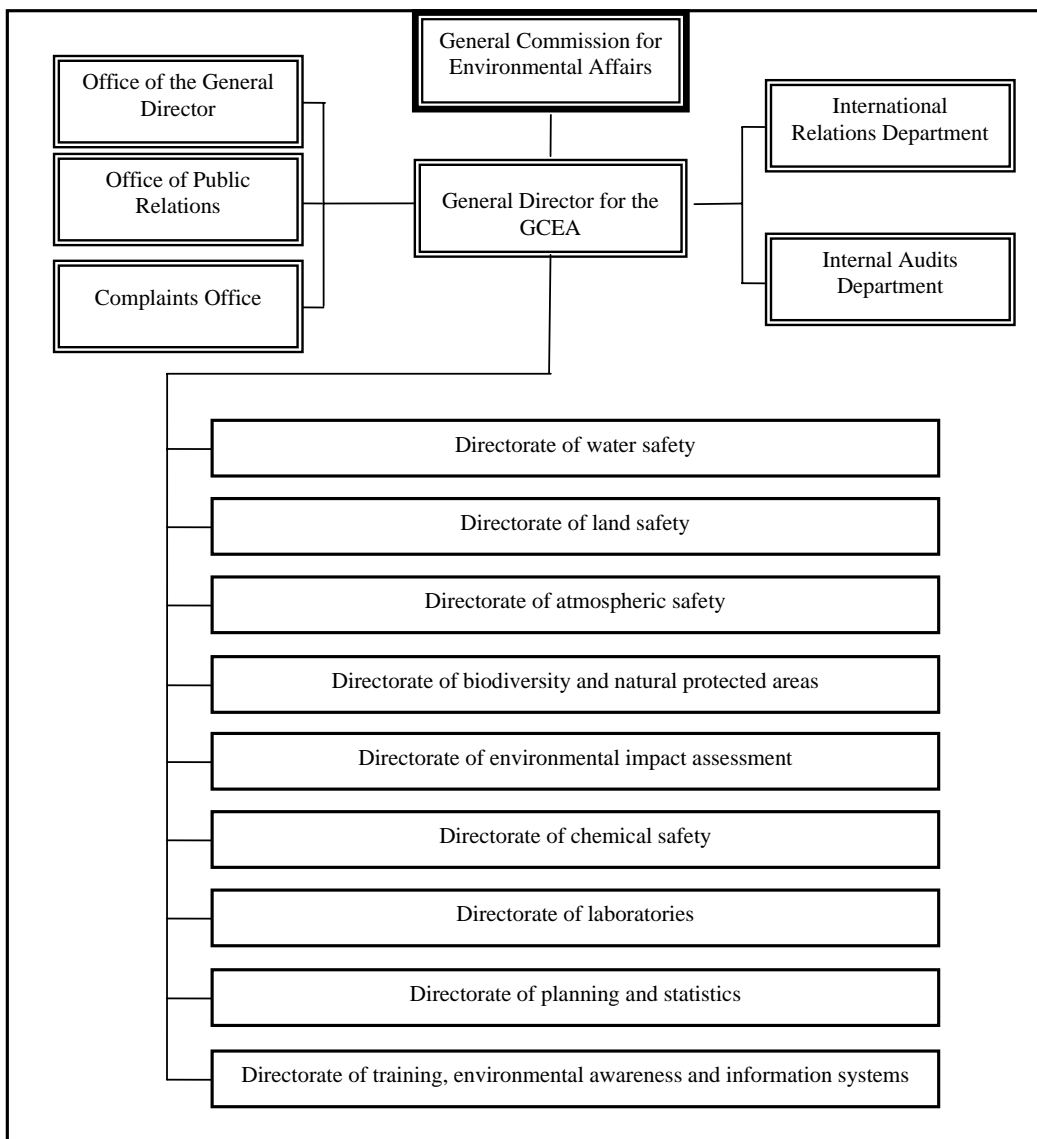
At the third level of the hierarchy stands the Environmental Directorates. These are established at the administrative regions level (i.e. fourteen environmental directorates). Their task is to implement and enforce the adopted environmental policies and law on the local level.

Secondary environmental committees were also established in each governorate<sup>11</sup>, and delegated with the following responsibilities:

- Follow-up on the implementation of the decisions of the Council for Environmental Safety and Sustainable Development, on the governorate level, and within the framework of the general government policy.
- Follow-up on the implementation of the environmental specifications and pollution standards adopted by Council for Environmental Safety and Sustainable Development.
- Follow-up on the conformance of industrial establishments and others with negative impacts on the environment, to the licensing requirements under which they were permitted to operate.
- Assisting in the establishment and implementation of emergency plans to deal with environmental disasters on the governorate level.
- Submitting to the Ministry of Local Administration and Environment a yearly report on the state of the environment, which describes the environmental problems in the governorate and adopted remedial measures.

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<sup>11</sup> Local environmental committees were legislated under ministerial decision number 856, dated 6/11/2002 issued by the Ministry of State for Environmental Affairs



**Figure 5.1: The organizational chart of the General Commission for Environmental Affairs**

*5.1.2 Legislative Framework*

The environmental law was passed by parliament in its session that convened on 26/6/2002, and ratified by the president of the republic on 8/7/2002. It was issued as Law Number 50 for the year 2002. The law specified the responsibilities and authorities of the Ministry of Local Administration and Environment, which includes signifying responsibilities for damages and compensation in cooperation with the Ministry of Justice and other relevant agencies. In addition, in 2002, the Council for Environmental Safety approved pollution standards that set the limits for discharge to the environment. Work is currently underway by the Ministry for completion of the legislative requirements for the Environmental Law in the form of decisions, plans and guidelines, and for establishing a list of approved laboratories for the purpose of environmental analyses. The laboratories will be accredited based on a process of



conformance to a system of procedures for quality control and assurance, prepared specifically for analytical laboratories.

### *5.1.3 Weaknesses and Gaps in the Institutional and Legislative Frameworks*

Even though most national institutions with environmental mandates have been established in Syria, however, they still lack the capacity to function effectively. In principle, there is little available environmental expertise in the Ministry of Local Administration and Environment or in the public and private sectors. Nationally, work is underway to assist governmental agencies develop and strengthen their environmental capacities, and to introduce environmental aspects into development strategies during the planning phase. The following summarizes areas where capacity building is required:

- Increasing the level of coordination and its effectiveness between the various agencies in the planning, use and preservation of environmental resources (in particular water, land and biodiversity);
- Soliciting additional resources for financing environmental projects, and for providing the necessary environmental services;
- Rectifying the problem of lack of qualified specialists with skills and competencies in the fields of environmental economy, planning, impact assessment, law, and environmental health;
- Increasing the environmental awareness of personnel employed by various organizations; and
- Strengthening the concept for protection of cultural heritage as a major aspect in environmental protection.

## **5.2 Sources of Finance and Funding**

In the period between 1999 and 2004, Syria received 8 million USD in the form of loans and grants for supporting projects in the fields of drinking water supply and wastewater treatment. This amount is rather insignificant when compared to the amount of one billion USD obtained for funding other types of development projects<sup>12</sup>.

Considering the environmental nature of projects envisaged by the SAP, following is a list of potential donors that may be approached for financing the investment projects. These consist of international and bi-lateral donors; each of which has its own agenda, objectives and specific conditions for spending development aid in Syria. Nevertheless, all donors insist that funded projects should include an element of sustainability in terms of projected outcomes and potential benefits.

**Arab and International Funds:** Historically, Arab and international funds have provided large loans for development projects in Syria. Major donors under this category include Abu Dhabi Fund for Arab Economic Development (ADFAED), Arab Fund for Economic and Social Development (AFESD), Arab Monetary Fund (AMF) and, Islamic Development Bank (ISDB). The average interest rate charged by these funds is about 4.5 percent, with a grace period of 10 years, and repayment period of up to 40 years. These funds have focused in the past on infrastructure type of projects. They are considered most appropriate for funding projects in excess of 100 million

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<sup>12</sup> Directorate of International Cooperation, State Planning Commission, the Syrian Arab Republic.

USD. In addition, they are known for their flexibility in implementing projects jointly with government funds.

**European Investment Bank:** In recent years, the EIB has become one of the main development and financial partners with Syria. The bank is capable of funding large projects, similar to the international funds, however with higher interest rates. Lower interest rates are nevertheless applied to projects of environmental nature or pertaining to the water sector. The bank also provides grants and technical assistance programmes. The EIB typically requires government participation in at least 50 percent of project's investment capital, and supports the participation of other donors. The bank has recently shown a preference to providing loans in the field of environment.

**European Union:** With the ensuing Syrian European partnership agreement, the European Union (EU) is fast becoming the major development partner for Syria. The European Union provides mainly technical assistance and financial aid with amounts exceeding 3 to 5 million Euros for each project. The EU gives primary support to projects of environmental nature. The water sector has been identified as one of the main areas of the EU's interventions.

**European Countries:** Bi-lateral cooperation agreements exist between a number of European countries and Syria. These include Germany, France, Italy, Spain, etc. Bi-lateral financing agreements are typically independent of support provided by the EU or EIB. However, the volume of assistance is relatively smaller and often includes soft loans with low interest rates (0.75 percent), and repayment periods of up to 40 years.

**The United Nations' Organizations:** The United Nations' Organizations are considered the main supporters of environmental projects in Syria. Support is typically provided in the form of grants, and technical assistance programmes. Such programmes generally include a substantial capacity building, particularly in the field of environment.

#### 5.2.1 Sources of Funding for the Investment Projects

Following in Table 5.1 is a list of potential sources and types of funding for meeting SAP targets for 2010. The list is limited to projects for which investment portfolios were prepared, as presented in Annex 'D'.

#### 5.2.2 Mechanism of Funding the Investment Projects

Funding mechanism for projects required to meet SAP targets should follow the same routine procedure typically applied for other projects in need of external funding in Syria. Specifically, the following steps should be implemented:

1. Project proposals are submitted by the executing agency to their related ministry.
2. The ministry submits the project proposal to the State Planning Commission accompanied by economic and technical feasibility studies (and the investment portfolio), and reasons for funding.
3. The State planning commission (SPC) assesses the project proposal and evaluates its importance to national development.

**Table 5.1: Funding sources for the national investment projects' priority list for 2010**

| <b>Project (in order of priority)</b>   | <b>Type of funding</b> | <b>Potential Funding Source</b>                        |
|---|------------------------|--|
| The rehabilitation of the Baniyas refinery IWWTP, including the construction of a landfill for industrial hazardous waste                         | Grant and public funds | GEF and Syrian Government                              |
| The construction of the Tartous municipal WWTP  | Loan                   | France   |
| The construction of the Lattakia municipal WWTP   | Loan                   | France   |
| The exchange of fuel with natural gas for two power generation units at the Baniyas thermal power plant   | Public funds           | Syrian Government                                      |
| The development of the municipal landfill of Tartous  | NA                     | International Funds                                    |
| The construction of a WWTP in Jableh and a sewerage network for the industrial area of Al Fawar Spring  | NA                     | International Funds and Syrian Government              |
| The construction of the Baniyas WWTP and sanitary sewers network  | Grant and public funds | GEF and Syrian Government                              |
| The installation of fabric filters on the production line for the Tartous Cement Factory  | Public funds           | Syrian Government                                      |
| The rehabilitation of the Old Jableh City sewerage network  | NA                     | Funds, bi-lateral donors, or EIB and Syrian Government |
| Pretreatment of wastewater from food manufacturers at Fawar Spring area and Ugarit Beverages Company prior to discharge to public sanitary sewers | Economic Incentives    | Private Sector (factories owners)                      |

4. If the project assessment is positive, and the project is not included in the five-year plan for Syria, then consideration is given to adding it to the list of approved of projects.
5. The proposal is raised by SPC to the economic committee at the prime ministry in order to seek approval for external funding.
6. Upon approval, SPC determines the most suitable donor based on project data, and donors' requirements.
7. If the donor shows interest in the project proposal, a finance agreement is drafted and signed, and project appraisal is conducted. This is followed by detailed studies and project implementation.

### 5.3 Economic Instruments

Since the early 1960's, Syria has based its development policy on centralized planning. As a result, the government has always focused its development programmes on economic projects with quick social returns, leaving those with non-tangible environmental benefits to circumstances. The economic expert Mr. Riad Abrash<sup>13</sup> states that an in-depth analysis of the Environmental Law No. 50 dated 2002, shows that economic instruments and incentives which would enable entrepreneurs to reduce environmental pollution are absent. Mr. Abrash adds that several economic instruments may be considered to reduce the contamination of the marine environment from land-based sources in Syria. These include:

- Allowing public sector companies to keep their liquid assets in order to prepare their environmental policies and implement the necessary mitigation measures to reduce pollution stemming from their activities;
- Allowing public sector companies to include their expenditures on environmental projects, whether related to development of industrial processes, or products, or work environment, in the production costs;
- Creation of an “environmental tax” to be applied to all products which pollute the environment, whether at the production, usage, or disposal levels. This tax may be based on the cost of environmental degradation resulting from this product. Products that may be considered include petroleum products (handled and stored), cement, phosphate, olive oil, public transport vehicles operating on petroleum products, etc.;
- Utilization of the financial resources resulting from the implementation of the environmental tax to support companies investing in “clean technologies”. This includes reduction of environmental taxes, or reduction of customs related to the import of tools and equipment classified as “clean technologies”; and
- Applying environmental taxes on public services such as wastewater treatment and disposal of solid wastes. Taxes may be based on the actual costs of these services and the cost of degradation of the coastal environment.

The investment portfolios listed in Annex “D” incorporate economic incentives derived from those above listed proposals, which may be applied to recover the costs of these projects.

### 5.4 Public Participation

#### *5.4.1 Participatory Approach in the Preparation of the NAP*

Public participation is a key issue for the successful implementation of the measures and activities proposed in this plan. For that purpose, specific environmental issues of concern to stakeholders in the Syrian coastal region were identified based on the participatory approach. Participating stakeholders included government authorities, industries, associations, NGO's and members of parliament. Serious attempts were made through two public consultation meetings to demonstrate to stakeholders that the real needs and concerns of the people are reflected in the SAP's targets and activities. Ultimately, the environmental and economic priorities raised by the stakeholders were

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<sup>13</sup> Riad Abrash. “Proposals for adaptation and preparation of economic instruments for protection of the marine environment from pollutants originating from based sources in Syria”. PAP/RAC, 2005.

adopted in the NAP. It is thought that this process ensures the sustainable implementation of this plan, at least up to the year 2010.

#### *5.4.2 Non-Governmental Organizations*

Environmental non-governmental organizations (NGO) are developing into key players on the national environmental scene in Syria. However, their number is relatively small when compared the total number of charitable organizations (around 600), and hence their contribution in the implementation of the NAP is rather limited at the current time. According to latest statistics<sup>14</sup>, the number of environmental NGO's does not exceed 11, and only one environmental NGO is registered in the coastal region. Some of these NGOs address a much-focused area such as wild life, birds, or thoroughbred Arab horses and the environment. Some specify "environmental protection" as their purpose, while others take a very broad sense of environment, embracing not only the physical environment but also its human and socio-economic aspects in relation to sustainable development. Their activities include sensitizing the general population (as well as sub-groups such as students and schoolchildren) as to the importance of protecting the environment, through information, education and communication, as well as organizing campaigns to clean up areas where pollution is particularly bad.

Nevertheless, non-governmental organizations in Syria are gaining experience, as they get more and more involved in public participatory processes, and obtain funds from programmes such as the small grants fund managed by the UNDP, and other foreign sources. Public organizations and unions (such as the engineers' syndicate, the syndicate of agricultural engineers, women's union, farmers' union, and youths' union) have also adopted a number of environmental issues in their agenda. Nevertheless, there is still plenty of space for other NGO's in Syria, and these are still required to build their capacities in the field of environment.

### **5.5 Monitoring and Environmental Quality Reporting System**

Monitoring of outputs and impacts of implemented SAP actions can be achieved through the existing monitoring activities carried out in the framework of the MEDPOL Phase III Programme. Specifically, Syria had finalized a national monitoring agreement with MEDPOL in 2003, and monitoring data will soon be generated. In this agreement, the Syrian coastline was divided into two areas (Lattakia and Tartous Governorates), with 84 monitoring points, consisting of:

- 55 compliance monitoring points for assessing health-related conditions (e.g. sanitary quality of bathing waters);
- 7 compliance monitoring points of effluents to determine whether the adopted common measures concerning concentrations of contaminants in effluents are complied with;
- 7 coastal zone trend monitoring points to assess trends and the overall quality status of the Mediterranean Sea;
- 4 trend monitoring in the four "hot spots" areas;
- 9 trend monitoring of loads from land based sources of pollution transported by coastal rivers for assessment of loads originating from diffuse sources; and

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<sup>14</sup> Ministry of Social Affairs and Labor

- 2 biological effects monitoring points to provide information on the direct impact of pollutants on marine flora and fauna.

Monitoring data may be organized and placed in the MEDPOL database that includes all monitoring data collected by the Mediterranean countries. The objective of this database is to provide frequently updated information on monitoring activities and a data inventory to be published in the internet.

Monitoring agencies participating in the monitoring activities include the Ministry of Local Administration and Environment, the Higher Institute for Marine Research, the Scientific Research Center, the Ministry of Irrigation (Coastal Basin Directorate), and the Atomic Agency Commission.

As part of the monitoring agreement, MEDPOL is committed to providing participating laboratories with the following:

- Training courses on analysis of inorganic and organic contaminants. Every year, the IAEA laboratory in Monaco provides training for two persons from Syria. Capacity building include the provision of analytical instrumentation, together with chemicals and general laboratory tools and chemicals;
- Inter-calibration exercises which are set-up mainly for trend monitoring. In principle, samples with known pollutants' concentrations are sent to various laboratories for analysis;
- Equipment (Gas Chromatography) and materials (i.e. chemical reagents, etc.);
- Preparation of guidelines, manuals, documents and reference publications relevant to the implementation of the MEDPOL Programme; and
- Management of a data Quality Assurance Programme for chemical analysis. This programme has been in place since the outset of the monitoring programme. Its objective is to ensure accurate analytical data for pollutant concentrations in the various environmental compartments by validating the analytical methods used by the laboratories.

Another mechanism for monitoring SAP related activities may be undertaken through the "Pollutants Release & Transfer Registers" (PRTR) project. The project aims at the establishment of records of emissions of pollutants from industrial sources; training of personnel; and capacity building of local authorities. A PRTR unit was set-up in the Ministry of Local Administration and Environment. The PRTR has been initiated in 2005 in Syria. Monitoring of data is being carried out in ten industrial facilities including the Baniyas refinery, the Baniyas and Tartous oil terminals, the Baniyas Thermal Power Plant, and the Tartous Cement Plant. The collected data can be utilized to verify percentage reduction against the baseline budget data and to document pollution reduction as SAP activities are being implemented.

## 5.6 Environmental Indicators

Environmental indicators should cover the five sectors included in the national action plan. These include municipal and industrial wastewaters, municipal and industrial solid wastes (including hazardous wastes), and air emissions.

In the case of the wastewater, the following indicators may be considered:

- Number of municipal wastewater treatment plants
- Number of industrial wastewater treatment plants

- Number of population served by wastewater connections
- Quality of sea water effluents
- Quality of water in lakes
- Quality of coastal river waters
- Drinking water quality
- Bathing water quality

In the case of the municipal solid waste, the following indicators may be considered:

- Number of municipal landfills in the coastal area
- Amount of municipal waste generated per inhabitant
- Ratio of recovered and recycled waste per inhabitant
- Number of illegal waste dump sites

In the case of the hazardous waste, the following indicators may be considered:

- Percentage recycled batteries
- Percentage recycled lubricating oils
- Number of reports of illegal dumping of hazardous wastes
- Number of transformers with possible PCB in the transformers' oil
- Number of reports documenting the use of banned pesticides in agriculture
- Concentration of POPs in run-off water
- Concentration of organohalogens in run-off water
- Concentration of heavy metals in fish

In the case of the air emissions, the following indicators may be considered:

- Sulfur dioxide emissions
- Nitrogen oxide emissions
- Frequency of exceeding the limit values of Sulfur dioxide concentrations
- Frequency of exceeding the limit values of ozone concentrations
- Carbon dioxide emissions in urban centers
- Number of vehicles with emissions standards not conforming to national legislation

## ANNEX A

### URBAN ENVIRONMENT

#### NATURE AND SEVERITY OF PROBLEMS

##### A.1 Municipal Sewage

Based on the reported information in the NDA, there are three sources of municipal sewage in the coastal region:

1. The four major population centers of Lattakia, Tartous, Jableh and Banias;
2. The small coastal municipalities which discharge directly to the sea; and
3. The non-coastal towns which discharge their municipal effluents to the rivers ending into the sea (such as Safita, Dreikish, Sheikh Badar, Qurdaha, Haffeh and other small towns situated along Al Kabir Al Shimaly and Al Sakia outfalls in Lattakia, and Al-Kabir Al-Janoubiy and Al-Husseini outfalls in Tartous).

The following aspects characterize the municipal sewage problem in the Syrian coastal region:

- The majority of direct discharge points of raw sewage to the sea (from the four major cities) are concentrated along a length not exceeding 8 percent of the 183 km long coastline;
- Fresh water input into the mixed storm-sanitary sewers has decreased dramatically due to damming and irrigation;
- The sewage network in most cities is old and deteriorating;
- The capacity of the sewage network is very low and cannot deal with the joint storm water discharges;
- Sewage networks can carry untreated industrial wastewater and suspended solids which precipitate on the ground and get mixed with sewage water during rainwater precipitation; and
- About one-third of the population that lives in non-coastal centers is not connected to a sewage network and uses cesspits, or is connected to networks which discharge into rivers and lakes.

The populations of the four major urban centers in the Syrian coastal region are tabulated in Table A.1.

The severity of the municipal sewage problem is manifested by the drifting of raw sewage along the shoreline, and the eutrophication and bacteriological contamination of the coastal seawater at the points of discharge of raw untreated sewage water. The problem becomes particularly acute during summer seasons.

Eutrophication is the process by which waters enriched with nutrients; primarily nitrogen and phosphorus, under favorable physico-chemical conditions stimulate aquatic primary production. Its most serious consequences are algal blooms (red tides), algal scum, enhanced benthic algal growth and, at times, a massive growth of submerged and floating macrophytes. The decaying excessive organic material, deriving from vegetal biomass, consumes or even depletes oxygen, causing a series of secondary problems such as fish mortality, formation of corrosive and other



undesirable substances such as CH<sub>4</sub>, H<sub>2</sub>S, and NH<sub>3</sub>; taste and odor-producing substances; organic acids; mucilage; and toxins (among others).

**Table A.1: Populations of the major urban centers in the Syrian coastal region**

| City                       | Population |
|----------------------------|------------|
| Lattakia                   | 506,600    |
| Tartous                    | 154,400    |
| Jableh                     | 100,000    |
| Banias                     | 50,000     |
| Total (four urban centers) | 811,000    |

Eutrophication has also negative impacts on human health due to the sticking algal material and high pH which can cause dermatitis and conjunctivitis, whereas ingestion of toxic algae can cause diarrhea in sensitive individuals. Blooms of toxin-producing algae when accumulated in fish, particularly in shellfish, could lead to a threat to human health.

Microbiological contamination is manifested by the entry into the marine environment of pathogenic and other micro-organisms (principally bacteria, viruses and fungi) through raw and untreated municipal wastewater discharges which are discharged into the immediate coastal zone. Rivers may add also a considerable amount of microbiological pollution, mainly from upstream wastewater discharges.

Micro-organisms contained in sewage are dispersed by the mixing of effluent and marine waters where they discharge into the sea. On discharge into seawater, they are rapidly adsorbed on to particles of various kinds that float in the water (plankton, mineral particles, and assorted organic debris). These particles are diluted, dispersed, flocculated, and sedimented or carried back to the coast. The coarse particulate matter contained in sewage has a tendency to settle rapidly in seawater, fixing micro-organisms which are adsorbed onto it. Natural turbulence and marine currents can become plausible mechanisms by which the contaminated sediments can be re-suspended, with the consequent impairment of the microbiological quality of the overlying seawater. Uptake of viruses by shellfish is also possible. Shellfish can concentrate viruses in their tissues at densities much greater than those in the surrounding waters.

## A.2 Urban Solid Waste

Urban Solid Waste generated in the coastal region was estimated at 355,000 tons per year. According to the NDA, this amount originates from two sources:

1. Solid waste generated by the coastal municipalities of Lattakia, Tartous, Banias and Jableh; and
2. Solid waste discarded by tourists on the beaches and other recreational areas.

The municipal urban solid waste problem in the Syrian coastal region is characterized by the following aspects:

- High population density (380 persons/km<sup>2</sup>) constituting over 9 percent of the Syrian population (1.92 million inhabitants) living in an area consisting of 2.5

- percent of land, which constitutes four times the national average population density (97 persons/km<sup>2</sup>);
- Growth of tourism which averages about 20 percent of permanent population in summer seasons, mainly domestic, with a lacking infrastructure;
  - Lack of licensed landfill sites some of which are only few meters away from the sea;
  - The pollution of the coastal waters with non-biodegradable matter (e.g. plastic bags, bottles, cans, etc.) which were carried from open waste dumps by wind action or discarded by tourists and sunbathers<sup>15</sup>;
  - Lack of properly designed and constructed landfills which results in percolation of leachate (often contaminated with pathogenic and toxic agents) to the groundwater; washing of contaminants with surface water run-off to rivers and ultimately the sea; noxious odors; spread of waste objects carried by wind action; and open air burning practices;
  - Lack of proper practices to segregate hazardous waste from the municipal waste (health care wastes, industrial wastes, etc.), which is typically undertaken by poor people with no due consideration to health impacts; and
  - Illegal dumping of construction waste along highway shoulders, side roads, and in open lands.

One of the largest waste dump sites in the coastal region is Al Bassa landfill site which is located 12 km south of the City of Lattakia, and occupies 100 hectares in a potentially tourists area. The landfill receives about 400 tons of waste daily. Seawater near the site was found to be contaminated with heavy metals. The landfill is due to be closed in 2010 when an alternative site will be selected. The site culminates many of the aspects described above, and is characteristic of other unlicensed waste dumpsites in the coastal region.

The direct impact of the **solid waste disposal** problem is the contamination of groundwater by leachate; pollution of the coastline and seawater by solid waste carried from open dump sites by wind action; and the occurrence of noxious odors. Human health is negatively impacted due to contamination of groundwater and pollution of bathing water. Negative impacts on marine life such as sea turtles are also common. There is evidence to show that the number of turtles in the Syrian coastal waters has decreased in number due to pollution by plastic bags that cause the turtles to choke when they mistake them for jellyfish. As a result, the jellyfish population has increased markedly along the Syrian coastline. This in turn has resulted in loss of revenue when beaches become no longer attractive for tourists under such conditions.

The severity of the municipal urban solid waste problem is manifested by the spread of illegal open dumping sites and construction debris across the region; and the drifting of non-biodegradable waste along the shoreline, particularly during summer seasons. As a result, negative socio-economic impacts ensue. These are manifested by the reduction of tourism, decrease in economic revenues due to loss of recreational areas, and possible decrease in real-estates values due to odors; polluted water; and presence of solid wastes on beaches and bathing waters.

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<sup>15</sup> UNEP/MAP, Guidelines on Management of Coastal Litter for the Mediterranean Region, MAP Technical Reports Series No. 148, Athens 2004

## ANNEX B

### INDUSTRIAL DEVELOPMENT

#### NATURE AND SEVERITY OF PROBLEMS

##### **B.1 Nature of Problems Caused by Major Industrial Complexes**

**The Banias oil refinery** is one of the major polluters in the coastal region. The refinery currently handles 7.2 million cubic meters of crude oil, half of which is exported as petroleum products. The Banias refinery discharges its aqueous effluent through a joint pipeline with the Banias oil terminal directly to the sea. Effluents originate from the industrial processes, segregation of water from petroleum crude in the storage tanks, and surface water run-off contaminated with spills that typically overflows the retention basins during heavy rainfall periods. Industrial wastewater effluent is treated in physical, chemical and biological processes. However, the treatment processes are currently under review and major improvements will need to be incorporated to increase capacity and improve treatment efficiency and effectiveness.

**The oil terminals of Banias and Tartous** handle approximately 37 million cubic meters of crude oil every year. Aqueous effluents consist of hydrocarbon contaminated surface water run-off that originates from two sources: segregated water from the petroleum products in the storage tanks, and oil spills around the petroleum tanks. During heavy rainfall periods, surface water run-off floods the basins containing the segregated water that overflows and ultimately discharges to the sea. No wastewater treatment is undertaken for the effluent at the Banias oil terminal, whereas partial treatment is performed for the effluents to the Hussein River at the Tartous oil terminal that ultimately ends to the Mediterranean Sea.

**The Banias thermal power station** consists of four power generation units. Two old units that are currently being converted to operate on fuel or natural gas, and two new units which operate on fuel. The power plant consumes 800,000 tons of fuel per year when all four units are operational. Wastewater originates from four sources: regeneration water of the softeners, industrial process water, boilers' blow down, and hydrocarbon-contaminated surface water runoff from spills around the fuel tanks. Wastewater is treated in the two new units, but little treatment is carried out in the older units. Under normal operating conditions, combined domestic and industrial wastewater effluents estimated to be 50 m<sup>3</sup>/hour are discharged; the majority of which are domestic in nature. In addition, large amounts of heated water (5 to 6 degrees above average sea temperature) are discharged from the cooling system of the station.

**The Tartous cement factory** is surrounded by agricultural lands cultivated with olive trees. The plant is located at a distance of 1.5 km from the Mediterranean Sea. Production capacity is 1.8 million tons of cement per year. Cement dust in the form of suspended particulates is emitted from the manufacturing process, and may be carried to distances exceeding 10 km, eventually precipitating on land and sea. Electrostatic precipitators have been installed to retain particulates prior to discharge to the atmosphere. However, these units continue to face numerous problems resulting in reduced efficiency. According to figures reported in the National Environmental Action Plan (NEAP 2003), average concentrations of total suspended

particulates in the proximity of the Tartous cement factory vary from 115 to 486  $\mu\text{g}/\text{m}^3$  that exceeds WHO allowable limits of 150  $\mu\text{g}/\text{m}^3$ .

**The phosphate loading dock** at the Port of Tartous is also an important source of suspended particulates. The port handles over one million tons of phosphate per year (wet and dry types). Emissions result from the processes of phosphate mineral handling, storage, and loading onto ships. Concentrations of particulates exceed allowable WHO limits. According to estimates made in the National Baseline Budget analysis, total phosphorus emissions is around 20 tons of phosphate dust per year.

## **B.2 Severity of Problems Caused by Major Industrial Complexes**

Heavy metals discharged in aqueous effluents or emitted in particulate form can get adsorbed to lungs' surfaces, especially lead. Uptake by shellfish is also common. Shellfish can concentrate heavy metals in their tissues at densities much greater than those in the surrounding waters. Health risks ensue when these life forms enter the food chain.

Long-term exposure to PAH releases from the combustion of heating oil in major industrial facilities and from urban transport may result in skin rashes, sensitivity to sunlight, eye irritation and cataracts, and in some circumstance lung cancer. According to information published in the National Environmental Action Plan, about 51 percent of patients reporting to the Baniyas health clinic were living near Baniyas refinery and the power plant. Medical diagnosis indicated that patients suffered from respiratory diseases.

Gaseous emissions from major industrial facilities include SO<sub>x</sub> and NO<sub>x</sub> in addition to carbon monoxide and other volatile organic chemicals (VOCs). Volatile organic compounds in the coastal region were estimated by the NBB at over 12,000 tons per year. Nitrogen and sulfur oxides play an important role in the formation of smog, which is the product of the reaction of nitrogen oxides with oxygen in the presence of hydrocarbons under the effect of ultraviolet radiation. The result of these photochemical reactions is the formation of secondary pollutants which exceed in their health risk those chemicals from which they were originally formed. These compounds cause the congestion of the respiratory mucus membranes, eye irritation, in addition to asthma, bronchitis and coughing. These compounds also impact construction materials, and historic buildings. The occurrence of smog is quite common in the City of Baniyas.

Hydrocarbon contaminated effluents from petroleum refining and transport facilities impacts the marine environment due to the presence of mineral oils, PAH, and heavy metals in their effluents. These in turn impact marine organisms depending on their exposure to each of these constituents. Specifically, mineral oils and hydrocarbons form an impermeable layer over the water surface preventing oxygen from reaching marine life forms, and affecting their biological and chemical processes. Furthermore, hydrocarbons bioaccumulate in marine species resulting in negative impacts on human health when these species enter the food chain.

Dust resulting from the manufacture of cement near Tartous affects plant life and the soil reducing their productivity. It also causes serious diseases in the respiratory system for persons living near the plant, including asthma, coughing, emphysema, lung sclerosis, which end-up in lung and heart failures. The marine environment is also impacted by the precipitating cement dust. The coarse particulate matter settles

in the seawater, with the consequent impairment of the microbiological quality of the overlying seawater. According to information published in the National Environmental Action Plan (2003), approximately 76 percent of patients visiting the Tartous health clinic were living near the Tartous Cement Factory.

Phosphate dust at the Port of Tartous has serious health impacts manifested in respiratory diseases. It causes chemical and radioactive contamination when precipitating in the sea. This has serious ecologic impacts on aquatic life and economic impacts on the value of real estate in areas adjacent to the Port of Tartous.

### **B.3 Olive Oil Mills**

The Olive oil mills in the coastal region exceed 330 in number, with a total capacity of about 54,000 tons per year. The problem with the olive oil presses is that they are dispersed over two main regions (north of Lattakia and Safita). Thus emissions are diffuse, and discharges occur mainly only during the months of October and November from each year.

Olive oil waste constitutes a serious environmental and social problem due to the high pollutant load, seasonal discharge, type and quality of the pollutants and difficulties to find technical and economical favorable solutions. When olive oil waste reaches enclosed bodies of water, it results in the death of aquatic life forms, and particularly fish. This is caused by the formation of an impermeable layer of oil over the water surface which prevents oxygen from reaching life forms; thus impacting their biological and chemical processes. Olive oil waste is highly acidic, with high biological oxygen demand (BOD), and contains polyphenols that can foul a city's sewage treatment plant. As a result, polluted water with olive oil waste is not suitable for drinking purposes and irrigation. The NDA has identified Al Kabir Al Shimali River and Al Hussein River as two ecosystems adversely impacted by olive oil waste effluents.

### **B.4 Steel Rolling Mills**

The Steel rolling mills are encountered in Lattakia, Jableh, Haffeh, and Tartous (five in the Lattakia governorate and one in Tartous). Total yearly production capacity, when all mills are operational, exceeds 780,000 tons. Pollutants in the effluent wastewater include hydrocarbon mineral oil resulting from adding emulsified rolling oils directly to the water sprayed on the metal as it is being rolled. Effluent water also contains fine scale and metal chips droppings, which settle very slowly in water. Wastewater is typically recycled and reused in the industrial process. Settled solids with mineral oil adhering to the solids' surface are disposed of without further treatment to the receiving environment.

### **B.5 Slaughterhouses**

The Slaughterhouses in the coastal region lack the character of proper industrial facilities. They are influenced in their operational and control methods largely by the cultural habits of the local inhabitants. As a result, these facilities are encountered wherever local communities are found. The amount of slaughtered product they handle is typically small, on an individual basis, with the exception of the municipal slaughterhouse of the city of Lattakia that is responsible for about one-half of the quantity produced in the governorate of Lattakia. It is estimated that the governorate

of Lattakia produces 6000 tons of cattle meat per year in comparison with 1500 tons in the Tartous Governorate. Poultry slaughterhouses produce 4500 tons in Lattakia and 2000 tons in Tartous. Effluent wastewaters are characterized by their high BOD load that amounts to about one-half of the total BOD load produced in both governorates. However, due to their widespread location, discharges from the slaughterhouses are mainly diffuse or non-point sources, that typically end-up in the local sewers discharging directly or indirectly to the sea.

## **B.6 Agricultural and Animal Related Activities**

Agricultural and animal related activities include the use of confined animal facilities, grazing, plowing, pesticide spraying, irrigation, fertilizing, planting, and harvesting of agricultural products. The intensive agricultural activities in the coastal region, including the 70,000 plastic green houses, result in excessive and uncontrolled use of fertilizers and pesticides. Emissions from these activities constitute in their majority non-point or diffuse sources of pollution, which cause soil degradation and groundwater contamination, ultimately reaching the Mediterranean Sea. Chemicals generated from pesticides include POPs and organohalogenes. Fertilizers and manure from the raising of cattle, sheep and poultry also result in the leaching of nutrients that are carried with surface run-off to the sea. It is estimated that the total yearly quantity of bred cattle and sheep in both governorates is around 5000 tons; the corresponding quantity for poultry exceeds 11,000 tons.

Nutrients from agricultural and animal-related activities can damage habitat and water streams. This situation is typical of Al Kabir Al Shimaly and Al Sakia outfalls in Lattakia, and Al-Kabir Al-Janouby and Al-Hussein outfalls in Tartous.

## ANNEX C

### NATIONAL ACTION PLAN

### MEASURES AND STRATEGIES

Following is a list of measures and strategies for reducing the discharge of pollutants from land-based sources and activities to the Mediterranean Sea environment. These are divided into the following five sectors:

1. Municipal sewage
2. Municipal solid waste
3. Industrial solid wastes and aqueous effluents
4. Hazardous wastes of particular interest to the Strategic Action Programme, including: heavy metals; used batteries; organo-halogens; PCBs; and lubricating oils
5. Air emissions from urban and industrial sources

Measures are divided into three categories:

1. Specific measures for promoting sustainable use of coastal and marine resources such as BAT, BEP, CT; modifying contaminants or other forms of degradation after generation such as recovery, recycling reuse and treatment of wastes; and preventing, reducing or ameliorating degradation of affected areas by implementing environmental quality criteria, land use planning, or rehabilitation of degraded habitats;
2. Requirements and incentives to induce action to comply with measures including economic instruments, regulatory measures, capacity building, and public awareness; and
3. Institutional arrangements and resources necessary for carrying out the management tasks associated with the strategies and programmes by the governmental authorities.

Following we present the national action plan for each of the above five sectors. Measures and strategies are presented separately for target dates of 2010 and 2025.

## National Action Plan for the Municipal Sewage Sector for 2010

| Specific Measures   | Responsibility* |
|---|-----------------|
| Construction of WWTP for Lattakia   | MOH&C           |
| Construction of WWTP for Tartous  | MOH&C           |
| Construction of WWTP for Jableh and the sewage network for Al Fawar Springs industrial area | MOH&C           |
| Construction of WWTP for Baniyas and the sewage network                                     | MOH&C           |
| Rehabilitation of the sewage network for the old City of Jableh                             | MOH&C           |

| Requirements and Incentives   | Responsibility  |
|---|-----------------|
| Introducing an appropriate tariff system for recovery of cost of operation and maintenance of wastewater treatment plants | MOH&C<br>MOFin  |
| Introducing incentives for the implementation of clean technologies   | MOLA&E<br>MOFin |
| Introducing incentives for the private sector to enter into joint ventures to build, own, and operate WWTP                | MOH&C<br>MOFin  |

| Institutional Arrangements   | Responsibility   |
|--|------------------|
| Coordinating responsibilities and authorities in the municipal sewage sector                   | MOH&C            |
| Monitoring of seawater quality in effluent points and coastal rivers                           | MOLA&E           |
| Capacity building for monitoring and analysis of effluent quality of wastewater                | MOH&C<br>MOLA&E  |
| Incorporating EIA studies in the execution of sewers' networks and wastewater treatment plants | MOLA&E           |
| Awareness raising among farmers for means and ways for reuse of treated wastewater             | MOLA&E<br>MOA&AR |
| Capacity building for operators and managers of WWTP   | MOH&C            |

\* LEGEND FOR RESPONSIBLE STAKEHOLDERS: MOH&C: Ministry of Housing and Construction. MOLA&E: Ministry of Local Administration and Environment. MOA&AR: Ministry of Agriculture and Agrarian Reform. MOE: Ministry of Electricity. MOP&M: Ministry of Petroleum and Minerals. MOInd: Ministry of Industry. MOFin: Ministry of Finance. MOH: Ministry of Health. MOT: Ministry of Transport.



## National Action Plan for the Municipal Sewage Sector for 2025

| Specific Measures   | Responsibility*                   |
|---|-----------------------------------|
| Extending sewers networks to all rural population areas   | MOH&C                             |
| Treatment of wastewater in Arwad Island   | MOH&C                             |
| Introducing WWTP for small coastal communities and tourists' centers  | MOH&C                             |
| Introducing WWTP for small non-coastal communities  | MOH&C                             |
| Segregating storm water sewers networks from municipal sewage networks  | MOH&C                             |
| Segregation and pre-treatment of industrial wastewater with effluent to municipal sewers  | MOInd<br>Private Sector           |
| Requirements and Incentives   | Responsibility                    |
| Introducing incentives for recycling and reuse of substances in waste streams originating from industrial facilities prior to discharge to sewers' networks     | MOInd<br>MOLA&E<br>Private sector |
| Promoting water demand management as an alternative to expanding WWTP due to high population growth rates   | MOH&C                             |
| Introducing the subsidiarity principle and autonomy in decision making for companies dealing with the management and treatment of wastewater                    | MOH&C                             |
| Assessing evolving risks posed by existing WWTP on the environment  | MOLA&E                            |
| Introducing government decrees that promote the polluters' pay principle  | MOH&C<br>MOLA&E                   |
| Institutional Arrangements  | Responsibility                    |
| Developing systematic training programmes for technical operators and managers of municipal WWTP  | MOH&C                             |
| Developing centralized laboratory(ies) and monitoring programmes for sewage water and sludge  | MOH&C                             |
| Promoting coordination between the Ministry of Housing and Construction and the Ministry of Irrigation for integrated water and wastewater resources management | MOH&C<br>MOIrr                    |
| Promoting factual decision making based on socio-economic analysis for projects dealing with wastewater management  | MOH&C                             |
| Implementing the participatory approach in the selection of WWTP sites, and treatment technologies  | MOH&C                             |

\* LEGEND FOR RESPONSIBLE STAKEHOLDERS: MOH&C: Ministry of Housing and Construction. MOLA&E: Ministry of Local Administration and Environment. MOA&AR: Ministry of Agriculture and Agrarian Reform. MOE: Ministry of Electricity. MOP&M: Ministry of Petroleum and Minerals. MOInd: Ministry of Industry. MOFin: Ministry of Finance. MOH: Ministry of Health. MOT: Ministry of Transport.

## National Action Plan for the Municipal Solid Waste Sector for 2010

| Specific Measures   | Responsibility* |
|---|-----------------|
| Development of municipal solid waste collection system in Lattakia  | MOLA&E          |
| Development of municipal solid waste collection system in Tartous   | MOLA&E          |
| Development of municipal solid waste collection system in Jableh  | MOLA&E          |
| Construction of waste segregation plant and landfill in Heddah valley (Tartous)   | MOLA&E          |
| Rehabilitation of Al Bassa solid waste landfill (Lattakia)  | MOLA&E          |
| Requirements and Incentives   | Responsibility  |
| Introducing an appropriate tariff system for recovery of cost of operation and maintenance of the municipal solid waste collection system       | MOLA&E<br>MOFin |
| Introducing incentives for the private sector to enter into joint ventures with public sector to collect, segregate and dispose of solid wastes | MOLA&E<br>MOFin |
| Introducing incentives for industries to segregate, reuse, and recycle solid waste at source  | MOLA&E<br>MOInd |
| Introducing national legislation for segregation and safe disposal of medical waste   | MOLA&E<br>MOH   |
| Institutional Arrangements  | Responsibility  |
| Monitoring of dumping activities of solid waste along the Mediterranean shoreline   | MOLA&E          |
| Awareness raising among citizens on the dangers posed on human health and the environment from uncontrolled solid waste dumping                 | MOLA&E          |
| Encouraging community-based groups and NGO's to participate in campaigns for cleaning beaches and shorelines and ridding of solid wastes        | MOLA&E<br>NGO's |
| Specifying the requirements for establishing landfills and waste treatment plants   | MOLA&E          |

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## National Action Plan for the Municipal Solid Waste Sector for 2025

| Specific Measures  | Responsibility* |
|--|-----------------|
| Construction of solid waste segregation plant and landfill in Kassieh (Lattakia)             | MOLA&E          |
| Development of solid waste collection systems in rural population centers                    | MOLA&E          |
| Closure of Al Bassa landfill site south of Lattakia  | MOLA&E          |
| Elimination of all unauthorized dump sites for municipal solid waste and construction debris | MOLA&E          |

| Requirements and Incentives   | Responsibility  |
|---|-----------------|
| Introducing incentives for segregation of municipal solid wastes by citizens of the coastal region                              | MOLA&E<br>MOFin |
| Introducing the subsidiarity principle and autonomy in decision making for companies dealing with the management of solid waste | MOLA&E          |
| Assessing evolving risks posed by existing landfill sites on the environment  | MOLA&E          |
| Introducing government decrees that promote the polluters' pay principle  | MOLA&E          |

| Institutional Arrangements  | Responsibility |
|---|----------------|
| Developing systematic training programmes for technical operators and managers of municipal landfill sites                              | MOLA&E         |
| Promoting factual decision making based on socio-economic analysis for projects dealing with the management and disposal of solid waste | MOLA&E         |
| Implementing the participatory approach in the development and implementation of solid waste management systems                         | MOLA&E         |

\* LEGEND FOR RESPONSIBLE STAKEHOLDERS: MOH&C: Ministry of Housing and Construction. MOLA&E: Ministry of Local Administration and Environment. MOA&AR: Ministry of Agriculture and Agrarian Reform. MOE: Ministry of Electricity. MOP&M: Ministry of Petroleum and Minerals. MOInd: Ministry of Industry. MOFin: Ministry of Finance. MOH: Ministry of Health. MOT: Ministry of Transport.

## National Action Plan for the Industrial Solid Wastes & Aqueous Effluents Sector for 2010

| Specific Measures   | Responsibility*                  |
|---|----------------------------------|
| Rehabilitation of the Baniyas Oil Refinery industrial wastewater treatment plant including the construction of a landfill for disposal of hazardous waste and completion of the underwater discharge line | MOP&M<br>MOLA&E                  |
| Separation of storm water runoff from industrial effluent discharge line at the Tartous oil terminal and rehabilitation of existing separation tank   | MOP&M<br>MOLA&E                  |
| Completion of works related to the separation of storm water runoff from industrial effluent discharge line at the Baniyas oil terminal and construction of a new separation tank                         | MOP&M<br>MOLA&E                  |
| Rehabilitation of existing IWWTP and construction of new treatment plant at the Baniyas thermal power station   | MOE<br>MOLA&E                    |
| Separation of storm water runoff from industrial effluents for the discharge line at the tank farm of the Baniyas thermal power station   | MOE<br>MOLA&E                    |
| Recycling and recovery of segregated petroleum and mineral oil wastes at the Baniyas thermal power station  | MOE<br>MOLA&E                    |
| Pre-treatment of aqueous effluents from food industries in the industrial area of Fawar Springs in Jableh and from Ugarit Beverages Company prior to discharge to the sewers                              | Private sector, MOInd,<br>MOLA&E |

| Requirements and Incentives   | Responsibility        |
|---|-----------------------|
| Introducing incentives for recovery and reuse of wastes generated from industrial facilities  | MOLA&E MOInd<br>MOFin |
| Providing economic incentives to olive oil manufacturers to employ the two-phase decanter centrifuge method (which does not require water) in the extraction of olive oil | MOLA&E MOInd<br>MOFin |
| Enforcing the legislation which prevents the uncontrolled discharge of aqueous effluents from olive oil extraction processes  | MOLA&E                |
| Providing incentives for the proper application of fertilizers and pesticides   | MOA&AR<br>MOLA&E      |
| Providing economic incentives for the development of organic agriculture  | MOA&AR<br>MOLA&E      |
| Introducing standards for the control of wastes generated by animal farms and slaughterhouses   | MOA&AR<br>MOLA&E      |
| Providing incentives for the recycling of process water in steel rolling mills  | MOInd<br>MOLA&E       |

\* LEGEND FOR RESPONSIBLE STAKEHOLDERS: MOH&C: Ministry of Housing and Construction. MOLA&E: Ministry of Local Administration and Environment. MOA&AR: Ministry of Agriculture and Agrarian Reform. MOE: Ministry of Electricity. MOP&M: Ministry of Petroleum and Minerals. MOInd: Ministry of Industry. MOFin: Ministry of Finance. MOH: Ministry of Health. MOT: Ministry of Transport.

## National Action Plan for the Industrial Solid Wastes & Aqueous Effluents Sector for 2010 (Continued)

| Institutional Arrangements  | Responsibility           |
|---|--------------------------|
| Developing monitoring programmes of industrial effluents at petroleum-related facilities  | MOP&M<br>MOLA&E          |
| Developing emergency plans for containing oil spills at petroleum-related facilities  | MOP&M<br>MOLA&E          |
| Implementing environmental management tools to reduce the generation of solid wastes and aqueous effluents from industrial facilities   | MOP&M<br>MOLA&E          |
| Investigating the possibility for reuse of crude olive cake that remains after the first pressing of the olives through traditional and continuous machines in heating, animal feed supplement, or as mulch in olive groves | MOA&AR<br>MOLA&E         |
| Implementing environmental management tools to control the negative impacts of green houses on soil degradation and contamination of surface water runoff   | MOA&AR<br>MOLA&E         |
| Developing monitoring programmes of surface water run-off originating from agricultural activities  | MOA&AR<br>MOLA&E         |
| Conducting a comprehensive survey and developing a strategy for the safe disposal of hazardous wastes generated in the coastal region, particularly for wastes that may be disposed by incineration                         | MOLA&E<br>MOInd<br>MOHea |

## National Action Plan for the Industrial Solid Wastes & Aqueous Effluents Sector for 2025

| Specific Measures  | Responsibility*                   |
|--|-----------------------------------|
| Construction of a centralized incinerator for disposal of hazardous wastes in the coastal area   | MOLA&E                            |
| Development of integrated wastewater treatment systems for dealing with aqueous effluents from olive oil mills   | MOA&AR<br>MOLA&E                  |
| Requirements and Incentives  | Responsibility                    |
| Introducing incentives for recycling and reuse of substances in waste streams originating from industrial facilities prior to discharge to sewers' networks                      | MOInd<br>MOLA&E<br>Private sector |
| Developing national legislation for the proper management of chemicals, and particularly in the handling of hazardous chemicals including transport, storage, and disposal       | MOLA&E<br>MOInd                   |
| Prohibiting the illegal trade in hazardous chemicals and wastes, and coordinate between relevant authorities to avoid conflicting regulations                                    | MOLA&E<br>MOInd                   |
| Establishing a chemical decontamination unit, and an intensive care unit (ICU), specialized in the treatment of poison-exposure cases  | MOLA&E                            |
| Introducing government decrees that promote the polluters' pay principle   | MOH&C<br>MOLA&E                   |
| Institutional Arrangements   | Responsibility                    |
| Developing industrial facilities and agricultural activities as part of the integrated coastal zone management   | MOInd.<br>MOA&AR<br>MOLA&E        |
| Developing laboratories capable of analyzing environmental parameters for industrial effluents   | MOLA&E                            |
| Establishing a national information database on chemicals, and a network for information and data exchange between relevant agencies in the coastal region                       | MOLA&E                            |
| Organizing public awareness campaigns on chemical safety by means of various information channels and schools, and encourage the participation of non-governmental organizations | MOLA&E                            |
| Raising the competency level of workers and inspectors in the management of chemicals including the safe disposal  | MOLA&E                            |

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## National Action Plan for Hazardous Wastes of Particular Interest to the SAP for 2010

| Specific Measures  | Responsibility*  |
|--|------------------|
| Reduction of heavy metals in municipal wastewater streams (treatment of municipal wastewater)  | MOH&C            |
| Reduction of heavy metal particulate emissions from the combustion process of the Baniyas Thermal Power Plant (substitution of fuel oil by natural gas in the 3 <sup>rd</sup> and 4 <sup>th</sup> generator units) | MOE              |
| Reduction of lead particulate emissions from transport vehicles (substitution of leaded gasoline by unleaded gasoline)   | MOT              |
| Reduction of heavy metal particulate emissions and organo-halogens from the Tartous cement plant (installation of fabric filters)  | MOInd            |
| Substitution of PCB oil in five transformers (two in the Tartous and two in the Baniyas electric transformers' stations and one in the old Jableh Weaving Company)   | MOE<br>MOLA&E    |
| Requirements and Incentives  | Responsibility   |
| Providing incentives to car repair shops to recycle leaded car batteries and lubricating oils  | MOT              |
| Licensing of recycling facilities for leaded batteries and lubricating oils  | MOInd<br>MOLA&E  |
| Enforcing the recycling of leaded batteries and lubricating oils in licensed workshops only, and prohibition of dumping into municipal sewers networks   | MOLA&E           |
| Enforcing the plowing of surface slopes in a direction parallel to slope profile lines (which reduces soil erosion and hence the concentration of organo-halogen pesticides in surface water runoff)               | MOA&AR<br>MOLA&E |
| Enforcing the implementation of strict standards for the application of organic pesticides in green houses and open lands  | MOA&AR<br>MOLA&E |

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**National Action Plan for Hazardous Wastes of  
Particular Interest to the SAP for 2010  
(continued)**

| <b>Institutional Arrangements</b>   | <b>Responsibility</b> |
|---|-----------------------|
| Creation of a register of recycled leaded batteries and lubricating oils in the coastal region  | MOT<br>MOLA&E         |
| Monitoring of recycling activities for impacts on human health and the environment  | MOLA&E<br>MOH         |
| Investigating the levels of PCB in the oil found in all electric transformers in the coastal region and formulation of a strategy to substitute with oil free of PCBs | MOE                   |
| Developing and updating a register of all transformers in the coastal region and levels of PCB in the transformers oil.   | MOE<br>MOLA&E         |



## National Action Plan for Hazardous Wastes of Particular Interest to the SAP for 2025

| Specific Measures  | Responsibility*           |
|--|---------------------------|
| Phasing out all activities discharging PCB's and organo-halogens from industrial sectors   | MOInd<br>MOE<br>MOLA&E    |
| Reducing inputs of organo-halogens from agriculture  | MOA&AR<br>MOLA&E          |
| Requirements and Incentives  | Responsibility            |
| Enforcing all sectors discharging heavy metals to limit their concentrations in conformance with the requirements LBS Protocol                         | MOLA&E                    |
| Enforcing all sectors discharging persistent organic pollutants (POPs) to limit their concentrations in conformance with the requirements LBS Protocol | MOLA&E                    |
| Dispose of all batteries in an environmental manner  | MOLA&E                    |
| Institutional Arrangements   | Responsibility            |
| Apply BAT and BEP in environmental management of all industries discharging POP's organohalogens, and other hazardous wastes                           | MOLA&E<br>MOInd<br>MOA&AR |
| Promote good house keeping practices for industrial facilities   | MOLA&E                    |
| Promote the environmental management of sludge   | MOLA&E                    |

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## National Action Plan for the Air Emissions from Urban & Industrial Sector for 2010

| Specific Measures   | Responsibility*        |
|---|------------------------|
| Transforming the 3 <sup>rd</sup> and 4 <sup>th</sup> generation units at the Baniyas Thermal power generation plant from fuel oil to natural gas  | MOE                    |
| Developing the public transport sector in Lattakia, Tartous and Jableh  | MOT                    |
| Phasing out leaded gasoline from use by vehicular traffic   | MOP&M<br>MOT<br>MOLA&E |
| Installing fabric filters at the Tartous cement plant   | MOInd                  |
| Requirements and Incentives   | Responsibility         |
| Providing incentives for citizens to convert to solar energy for house and water heating  | MOH&C<br>MOFin         |
| Providing incentives to citizens for incorporating thermal insulation in their houses   | MOH&C<br>MOFin         |
| Providing incentives to mini-buses encountered in Tartous and Lattakia and Jableh to operate in rural areas   | MOT<br>MOFin.          |
| Enforcing the implementation of proper controls on the emissions of phosphate dust particles at the Tartous phosphate loading docks   | MOP&M<br>MOLA&E        |
| Enforcing vehicular emissions standards and controls  | MOT<br>MOLA&E          |
| Institutional Arrangements  | Responsibility         |
| Increasing the combustion efficiency of boilers and generators in industrial facilities   | MOInd<br>MOLA&E        |
| Assessment of available technologies for reducing particulates emissions at the Tartous phosphate loading docks   | MOP&M                  |
| Monitoring of ambient air quality in the coastal region on a regular basis  | MOLA&E                 |
| Assessment of available technologies to reduce air emissions due to the combustion of oil from major industrial complexes (Baniyas refinery, Tartous cement plant, and Baniyas thermal power plant) | MOLA&E                 |

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## National Action Plan for the Air Emissions from Urban & Industrial Sector for 2025

| Specific Measures  | Responsibility* |
|--|-----------------|
| Improve the environmental standards in the extraction and refining of petroleum products   | MOP&M           |
| Reduce the gaseous emissions, dust and other particulates to allowable limits  | MOInd           |
| Reduce demand on vehicular transport; adjust peak periods; and substitute the individual vehicular traffic with an integrated public transport system  | MOT             |
| Raise the efficiency of energy utilization in industry   | MOInd           |
| Requirements and Incentives  | Responsibility  |
| Control technical performance of vehicles, and develop appropriate rules and regulations in accordance with international standards for imports with the aim of preventing pollution         | MOT             |
| Providing incentives to citizens for central heating on the neighborhood level   | MOH&C           |
| Adhere to a regular and annual vehicles inspection system for monitoring exhaust gas emissions, and provide the necessary equipment for this task  | MOT             |
| Institutional Arrangements   | Responsibility  |
| Adopt policies and projects which contribute to the decrease of green house gases, and to the reduction of pressures on natural resources, particularly for the major industrial complexes   | MOInd           |
| Establish enforcement patrols to control illegal emissions from vehicles' exhausts, within and outside city limits   | MOLA&E<br>MOT   |
| Develop urban master plans for cities and municipalities in accordance with international standards, which account for population growth and traffic movement, and provide car parking areas | MOH&C           |

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## ANNEX D

### INVESTMENT PORTFOLIOS

The purpose of the investment portfolios is to identify and communicate investment priorities to donors and interested groups for mobilizing domestic resources and development aid; justifying choices; and raising public awareness and commitment. Following are the investment portfolios for specific projects requiring substantial investments, which are critical for achieving SAP targets for 2010. These projects form part of the specific measures proposed in the national action plan for reduction of pollution from land-based sources (Annex 'C'). The investment projects were selected by stakeholders in their meeting of July 2005. The stakeholders were involved previously in the prioritization of environmental issues reflected in the national action plan in June 2004. The nature of selected projects is based on the national sectoral development plans prepared by the relevant line ministries. The investment projects are prioritized based on a specific set of criteria. For each criterion, weighing factors were assigned, and a scoring system (ranging from 1 to 5), which reflects the level of impact resulting from the implementation of the project, was devised. These scores were utilized to prioritize the investment projects taking into account the wider national policy context as voiced by the stakeholders. The criteria and their weighing factors are presented below:

| Criterion  | Weighing Factor |
|--|-----------------|
| The benefits expected to accrue from a project   | 5               |
| The contribution of a project to the productivity of the local/national economy  | 4               |
| The financial sustainability or capacity of the project to generate or mobilize future revenue sources for cost recovery | 3               |
| The feasibility for project implementation within the existing legal, administrative, and institutional frameworks       | 2               |
| The capital and running costs of a project   | 1               |

Following are the investment portfolios presented consecutively in decreasing order of importance. Information included in these portfolios is obtained from a study commissioned by MAP<sup>16</sup>.

<sup>16</sup> Riad Abrash. "Merging Economic Instruments with the National Action Plan for the Implementation of the Strategic Action Programme". UNEP/MAP, Athens 2005.

| <b>INVESTMENT PORTFOLIO</b>    |  |                                 |
|--------------------------------|--|---------------------------------|
| Project Name:                  | Rehabilitation of the industrial wastewater treatment plant and construction of the hazardous waste landfill at the Baniyas Oil Refinery   | <b>Priority:<br/>1</b>          |
| Location:                      | Baniyas, Governorate of Tartous  | <b>Overall<br/>Score<br/>73</b> |
| Executing Agency               | Ministry of Petroleum and Minerals   |                                 |
| Sector                         | Industrial solid wastes and aqueous effluents sector   |                                 |
| Duration                       | 24 months  |                                 |
| Main Purpose                   | Improving the treatment efficiency of the industrial wastewater treatment plant at the Baniyas Oil Refinery in order to reduce discharge of petroleum contaminated effluents to the Mediterranean Sea  |                                 |
| <b>Criteria</b>                | <b>Description</b>   | <b>Score</b>                    |
| Benefits                       | Reduction of pollution by 95% of lubricants and mineral hydrocarbons, and consequently the increase in the amount of nutrients available for improving the marine environment and fish stocks  | 5                               |
| Economic Development           | Indirect benefits, including the improvement of tourism and opportunities for recreation. Project will create 23 additional employment opportunities   | 5                               |
| Financial Sustainability       | Cost recovery may be achieved by increasing fees of refinery products, and by applying environment taxes on sectors benefiting from improved environment   | 5                               |
| Feasibility for implementation | There are no administrative or legislative obstacles to prevent implementation   | 5                               |
| Cost                           | Total project cost 300 million Syrian pounds (5.7 million USD), that may be funded in part by a grant from GEF (20% to 40%) to be complemented by Syrian government funds. Operational costs 13 SYP (0.24 USD) per cubic meter of treated wastewater | 3                               |

| <b>INVESTMENT PORTFOLIO</b>    |  |                            |
|--------------------------------|--|----------------------------|
| Project Name:                  | Tartous Municipal wastewater treatment plant   | <b>Priority:</b><br>2      |
| Location:                      | Tartous, Governorate of Tartous  | <b>Overall Score</b><br>73 |
| Executing Agency               | Ministry of Housing and Construction   |                            |
| Sector                         | Municipal wastewater sector  |                            |
| Duration                       | 25 months  |                            |
| Main Purpose                   | Treatment of effluent wastewater originating from domestic sources at the City of Tartous prior to discharge to the Mediterranean Sea  |                            |
| <b>Criteria</b>                | <b>Description</b>   | <b>Score</b>               |
| Benefits                       | Reduction of BOD and nutrients loads discharged to the Mediterranean Sea, with the consequent improvement of the marine environment  | 5                          |
| Economic Development           | Indirect benefits, such as the improvement of the natural environment, which promotes tourism and recreational activities. Project will create 71 employment opportunities                                   | 5                          |
| Financial Sustainability       | Cost recovery may be achieved by increasing the water bill fees with a wastewater component that reflects wastewater treatment costs   | 5                          |
| Feasibility for implementation | There are no administrative or legislative obstacles to prevent implementation   | 5                          |
| Cost                           | Total project cost 300 million Syrian pounds (5.7 million USD), that may be funded in part by a loan from France and/or Syrian government funds. Operational costs 70 million SYP (1.3 million USD) per year | 3                          |

| <b>INVESTMENT PORTFOLIO</b>    |  |                            |
|--------------------------------|--|----------------------------|
| Project Name:                  | Lattakia Municipal wastewater treatment plant  | <b>Priority:</b><br>3      |
| Location:                      | Lattakia, Governorate of Lattakia  | <b>Overall Score</b><br>71 |
| Executing Agency               | Ministry of Housing and Construction   |                            |
| Sector                         | Municipal wastewater sector  |                            |
| Duration                       | 25 months  |                            |
| Main Purpose                   | Treatment of effluent wastewater originating from domestic sources at the City of Lattakia prior to discharge to the Mediterranean Sea   |                            |
| <b>Criteria</b>                | <b>Description</b>   | <b>Score</b>               |
| Benefits                       | Reduction of BOD and nutrients loads discharged to the Mediterranean Sea, with the consequent improvement of the marine environment  | 5                          |
| Economic Development           | Indirect benefits, such as the improvement of the natural environment, which promotes tourism and recreational activities. Project will create 50 employment opportunities                                     | 5                          |
| Financial Sustainability       | Cost recovery may be achieved by increasing the water bill fees with a wastewater component that reflects wastewater treatment costs   | 5                          |
| Feasibility for implementation | There are no administrative or legislative obstacles to prevent implementation   | 5                          |
| Cost                           | Total project cost 1367 million Syrian pounds (25.8 million USD), that may be funded in part by a loan from France and/or Syrian government funds. Operational costs 70 million SYP (1.3 million USD) per year | 1                          |

| <b>INVESTMENT PORTFOLIO</b>    |  |                                   |
|--------------------------------|--|-----------------------------------|
| Project Name:                  | The exchange of fuel with natural gas for two power generation units at the Baniyas thermal power plant  | <b>Priority:</b><br>4             |
| Location:                      | Baniyas, Governorate of Tartous  | <b>Overall Score</b><br><b>71</b> |
| Executing Agency               | Ministry of Electricity  |                                   |
| Sector                         | Air emissions from urban and industrial sector   |                                   |
| Duration                       | 7 months   |                                   |
| Main Purpose                   | Conversion of the oil-fired thermal power generation units 3 & 4 to natural gas in order to reduce the consumption of oil in Syria                     |                                   |
| <b>Criteria</b>                | <b>Description</b>   | <b>Score</b>                      |
| Benefits                       | Reduction of emissions of sulfur and nitrogen oxides in addition to carbon dioxide in the flue gas. Suspended particles emissions will also be reduced | 5                                 |
| Economic Development           | Indirect benefits, such as the improvement of the natural environment, which promotes tourism and recreational activities.                             | 5                                 |
| Financial Sustainability       | Cost recovery may be achieved by increasing the electricity fees such as to absorb the conversion costs  | 5                                 |
| Feasibility for implementation | Insufficient natural gas resources may slightly delay the implementation of the project  | 5                                 |
| Cost                           | Total project cost 2800 million Syrian pounds (53 million USD), that may be funded by Syrian government funds  | 1                                 |



| <b>INVESTMENT PORTFOLIO</b>    |   |                            |
|--------------------------------|---|----------------------------|
| Project Name:                  | The development of the municipal landfill of Tartous in the Heddah valley   | <b>Priority:</b><br>5      |
| Location:                      | Tartous, Governorate of Tartous   | <b>Overall Score</b><br>67 |
| Executing Agency               | Ministry of Local Administration and Environment  |                            |
| Sector                         | Municipal solid waste sector  |                            |
| Duration                       | NA  |                            |
| Main Purpose                   | Segregation, recycling, and disposal of municipal solid waste generated in the City of Tartous  |                            |
| <b>Criteria</b>                | <b>Description</b>  | <b>Score</b>               |
| Benefits                       | Reduction of pollution caused by the unsafe disposal of solid municipal waste in informal dumping grounds including construction debris   | 5                          |
| Economic Development           | Indirect benefits, such as the improvement of the natural environment, which promotes tourism and recreational activities. Project will create 20 employment opportunities  | 5                          |
| Financial Sustainability       | Cost recovery may be achieved by increasing the municipal tax fees that reflect costs of collection and disposal. There is an opportunity for reducing incurred costs from the sale of recovered and recycled waste items | 3                          |
| Feasibility for implementation | There are no administrative or legislative obstacles to prevent implementation  | 5                          |
| Cost                           | Total project cost 125 million Syrian pounds (2.4 million USD), that may be funded in part by a loan from international funds and/or Syrian government funds. Operational costs 4 million SYP (75,000 USD) per year       | 3                          |

| <b>INVESTMENT PORTFOLIO</b>    |   |                                 |
|--------------------------------|---|---------------------------------|
| Project Name:                  | The construction of a municipal wastewater treatment plant in Jableh and a sewerage network for the industrial area of Al Fawar Spring  | <b>Priority:<br/>6</b>          |
| Location:                      | Jableh, Governorate of Latakia  | <b>Overall<br/>Score<br/>67</b> |
| Executing Agency               | Ministry of Housing and Construction  |                                 |
| Sector                         | Municipal wastewater sector   |                                 |
| Duration                       | NA  |                                 |
| Main Purpose                   | Treatment of effluent wastewater originating from domestic sources at the City of Jableh and collection and treatment of pre-treated waste from industries located in Al Fawwar spring area |                                 |
| <b>Criteria</b>                | <b>Description</b>  | <b>Score</b>                    |
| Benefits                       | Reduction of BOD and nutrients loads discharged to the Mediterranean Sea, with the consequent improvement of the marine environment   | 5                               |
| Economic Development           | Indirect benefits, such as the improvement of the natural environment, which promotes tourism and recreational activities   | 5                               |
| Financial Sustainability       | Cost recovery may be achieved by increasing the water bill fees with a wastewater component that reflects wastewater treatment costs  | 3                               |
| Feasibility for implementation | There are no administrative or legislative obstacles to prevent implementation  | 5                               |
| Cost                           | Total project cost 220 million Syrian pounds (4.2 million USD), that may be funded in part by a loan from international funds and/or Syrian government funds                                | 3                               |

| <b>INVESTMENT PORTFOLIO</b>    |  |                                   |
|--------------------------------|--|-----------------------------------|
| Project Name:                  | The construction of the Baniyas municipal WWTP   | <b>Priority:</b><br>7             |
| Location:                      | Baniyas, Governorate of Tartous  | <b>Overall Score</b><br><b>61</b> |
| Executing Agency               | Ministry of Housing and Construction   |                                   |
| Sector                         | Municipal wastewater sector  |                                   |
| Duration                       | 24 months  |                                   |
| Main Purpose                   | Construction of a new sewer network and treatment of effluent wastewater originating from domestic sources at the City Baniyas   |                                   |
| <b>Criteria</b>                | <b>Description</b>   | <b>Score</b>                      |
| Benefits                       | Reduction of BOD and nutrients loads discharged to the Mediterranean Sea, with the consequent improvement of the marine environment  | 5                                 |
| Economic Development           | Indirect benefits, such as the improvement of the natural environment, which promotes tourism and recreational activities. Project will create 71 employment opportunities                           | 5                                 |
| Financial Sustainability       | Cost recovery may be achieved by increasing the water bill fees with a wastewater component that reflects wastewater treatment costs   | 1                                 |
| Feasibility for implementation | There are no administrative or legislative obstacles to prevent implementation   | 5                                 |
| Cost                           | Total project cost 567 million Syrian pounds (10.7 million USD), that may be funded in part by a grant from GEF and Syrian government funds. Operational costs 21 million SYP (400,000 USD) per year | 3                                 |

| <b>INVESTMENT PORTFOLIO</b>    |   |                                 |
|--------------------------------|---|---------------------------------|
| Project Name:                  | The installation of fabric filters on the production line for the Tartous Cement Factory  | <b>Priority:<br/>8</b>          |
| Location:                      | Tartous, Governorate of Tartous   | <b>Overall<br/>Score<br/>59</b> |
| Executing Agency               | Ministry of Industry  |                                 |
| Sector                         | Air emissions from urban and industrial sector  |                                 |
| Duration                       | NA  |                                 |
| Main Purpose                   | Installation of filter fabric inside the factory in order to collect cement dust generated from the operational processes   |                                 |
| <b>Criteria</b>                | <b>Description</b>  | <b>Score</b>                    |
| Benefits                       | Reduction of particulate emissions to the atmosphere, which ultimately precipitates on adjacent agricultural lands  | 5                               |
| Economic Development           | Indirect benefits, such as the improvement of the natural environment, which promotes tourism and recreational activities. Project will create 4 employment opportunities | 3                               |
| Financial Sustainability       | Cost recovery may be achieved from the value of recovered dust which constitutes raw materials  | 3                               |
| Feasibility for implementation | There are no administrative or legislative obstacles to prevent implementation  | 5                               |
| Cost                           | Total project cost 65 million Syrian pounds (1.2 million USD), that may be funded by Syrian government funds  | 3                               |

| <b>INVESTMENT PORTFOLIO</b>    |   |                            |
|--------------------------------|---|----------------------------|
| Project Name:                  | The rehabilitation of the Old Jableh City sewerage network  | <b>Priority:</b><br>9      |
| Location:                      | Jableh, Governorate of Latakia  | <b>Overall Score</b><br>57 |
| Executing Agency               | Ministry of Housing and Construction  |                            |
| Sector                         | Municipal wastewater sector   |                            |
| Duration                       | NA  |                            |
| Main Purpose                   | Treatment of effluent wastewater originating from domestic sources in the old City of Jableh prior to discharge to the Mediterranean Sea                  |                            |
| Criteria                       | Description   | Score                      |
| Benefits                       | Reduction of BOD and nutrients loads discharged to the Mediterranean Sea, with the consequent improvement of the marine environment                       | 5                          |
| Economic Development           | Indirect benefits, such as the improvement of the natural environment, which promotes tourism and recreational activities                                 | 3                          |
| Financial Sustainability       | Cost recovery may be achieved by increasing the water bill fees with a wastewater component that reflects sewer network maintenance                       | 3                          |
| Feasibility for implementation | Presence of archaeological sites within the city may cause some delays in implementation  | 3                          |
| Cost                           | Total project cost 50 million Syrian pounds (1 million USD), that may be funded in part by a loan from international funds and/or Syrian government funds | 5                          |