NATIONAL ACTION PLANS FOR THE IMPLEMENTATION OF THE LBS PROTOCOL AND ITS REGIONAL PLANS IN THE FRAMEWORK OF SAP MED TO ACHIEVE GOOD ENVIRONMENTAL STATUS FOR POLLUTION RELATED ECAP ECOLOGICAL OBJECTIVES

– REPUBLIC OF LEBANON –

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LIST OF ACRONYMS

BML	Beirut and Mount Lebanon
CDR	Council of development and reconstruction
COED	Cost of environmental degradation
CoM	Council of Ministers
ECAP	Ecological Approach
EIs	Economic instruments
EO	Ecological Objective
GES	Good Environmental Status
ISWM	Integrated solid waste management
LBS	Land Based Sources
LoM	List of Measures
MoE	Ministry of Environment
MoEW	Ministry of Energy and Water
MoIM	Ministry of Interior and Municipalities
MoTPW	Ministry of Transport and Public Works
MSWM	Municipal solid waste management
MCA	Multi-criteria Analysis
NAP	National Action Plan
NCMS	National center for marine science
NL	North Lebanon
NSC	National Steering Committee
NSL	Nabatiyeh and South of Lebanon
OBBA	Operation Big Blue Association
O&M	Operation and Maintenance
PE	Population Equivalent
PoM	Programme of Measures
RWEs	Regional water establishments
SAP MED	Strategic Action Program
STP	Sewage treatment plant
TC	Technical Committee
TGs	Thematic groups

WTE	Waste to Energy
WWTP	Wastewater treatment plant

CHAPTER 1: PREFACE

Prepared within the framework of the project "Sustainable Water Integrated Management (SWIM) - Support Mechanism" funded by the **European Commission**, this report presents the updated "National Action Plans for the implementation of the LBS Protocol and its Regional Plans in the framework of SAP MED to achieve Good Environmental Status for pollution related ECAP ecological objectives". It is the result of several months of diligent work involving various governmental agencies, consulting experts, and international partners.

Over the past years, the state of the Lebanese coastal region and more generally the state of the environment in Lebanon has continued to come under increasing strain. As the Lebanese Government remains committed to the protection of the marine environment in its Mediterranean waters, the preparation of this report gains particular importance as it aims to provide a set of tangible and implementable measures that can help achieve this objective. In preparing this report, significant emphasis has been placed on learning from previous experiences in order to maximize the chances of implementation of the recommendations.

I would like to extend my thanks to all those who have contributed to preparing this report, and trust that the implementation phase will witness the same level of commitment, cooperation, enthusiasm, and professionalism.

CHAPTER 2: EXECUTIVE SUMMARY

1. Introduction

This report is the second National Action Plan (NAP) prepared in Lebanon in response to the Barcelona Convention and the related Protocol for the protection of the Mediterranean Sea from land-based pollution. The objective of this report is to present an updated assessment of Lebanon's commitment to the latter Convention (and all related protocols, regional plans, and ECAP ecological objectives) and chart the roadmap for enhancing compliance.

2. NAP update process

The NAP update process adopted a participatory approach and was conducted following the UNEP-MAP "Guidelines for updating National Action Plans for the implementation of the LBS Protocol and its Regional Plans in the framework of SAP MED to achieve Good Environmental Status for pollution related ECAP ecological objectives".

3. Midterm baseline assessment

Drafting of the first NAP, back in the year 2005, shed the light on a number of activities considered as a source of pressure on the marine environment in Lebanon. A decade after, some issues remain unresolved while the list of pressure sources kept on expanding. Analysis of these pressure sources called for a fragmentation of the Lebanese territory into three different zones as shown in Figure A, including:

1- Zone A covered the governorate of North Lebanon (NL) and Akkar;

2- Zone B covered the governorates of Beirut and Mount Lebanon (BML);

3- Zone C covered governorates hosting the lower Litani river basin namely the Nabatiyeh and South of Lebanon governorates as well as part of the Bekaa governorate.

The range of economic and human activities within the study area is wide. Major human settlements are concentrated in major cities along the coastline or along river banks, attracting thus infrastructural development (solid waste management, wastewater management and transport related infrastructure) as well as investment opportunities in the energy, industrial, tourism and agricultural sectors. The influx of Syrian refugees to the country, for the past couples of years, also exerted significant pressure on the existing infrastructure and natural resources.

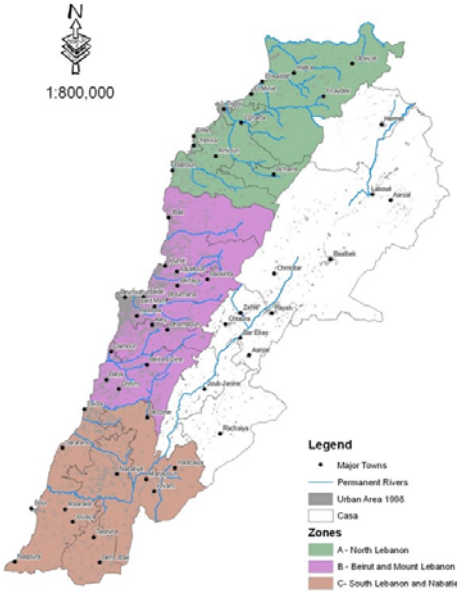

Figure A: Study area

The updated list of hotspots shed the light on the unsuccessful efforts, especially in the field of wastewater and industrial discharges management, to eliminate important sources of environmental pressure previously identified by the NAP endorsed in 2005. According to the current report, eight areas are considered today as priority hot spots as compared to fourteen hot spots and one potential hotspot with uneven distribution of these sites along the study area.

Despite the remarkable progress made during the past few year with respect to the development of the Lebanese environmental legal framework, further progress in this field is still required. Additional efforts to strengthen the environmental governance system are also recommended to overcome the unclear definition of boundaries of jurisdiction between different governmental agencies, thus creating overtime a leadership vacuum. Improvement has also been witnessed on the strategic planning front, however the inability to devise a management system allowing financial sustainability – through introduction of fees, tariffs, and eco-taxes among other economic instruments – inhibited the successful implementation of the numerous strategies developed so far.

A number of environmental projects aimed, directly or indirectly, at controlling and/or reducing input of priority contaminants into the marine environment were launched as a result of the NAP endorsed in 2005, and some are still in progress till the date.

4. Identification of gaps

The fundamentals for environmental management and preservation of natural resources were only introduced in 2002 to the Lebanese legal framework, through Law 444/2002. Prior to that period, scattered legal texts remained the only tools for management of environmental resources in the country. Nevertheless, few gaps related to regional plans mandatory obligations & SAP-MED commitments were identified within the Lebanese legal framework.

With respect to the environmental governance, gaps were identified based on the sector under consideration, whereas at the technical level, serious commitment by the Lebanese government is required to meet the regional plans' mandatory obligations and the SAP-MED Commitments.

Public participation in the decision making process is weakly practiced in Lebanon, especially in the field of environmental resources management. As a result, information produced by public institutions isn't often shared nor made accessible to the public mainly for political reasons. In the field of monitoring, three main requirements were dictated all of which were partially met at the national level.

Tracking progress made in the field of protection of the Mediterranean Environment is poorly developed. The main problems can be summarized by 1) lack of a well-defined reporting mechanism/program at the MoE; 2) progress reporting is usually based on donor's request or specific projects' requirements; and 3) scattered data and lack of a database.

5. NAP Operational targets

The final list of operational targets developed with associated legal requirements and EO addressed is presented in Table below.

Ecological objective	Legal requirement	Operational Target
EO5: Eutrophication	Industrial Food Plants outlined in Appendix I which discharge more than 4000 PE into water bodies shall meet the following requirements: COD 160 mg/l or TOC 55 mg/l and BOD 30 mg/l [deadline 2014]	Ensure that all Industrial Food Plants outlined in Appendix I discharging more than 4000 PE into water bodies comply with the discharge requirement of a maximum COD 160 mg/l and BOD 30 mg/l by year 2020
	In case the food sector installation discharges into the sewerage system, the competent authorities shall establish ELV and an authorization compatible with the operation and the emission discharge values of the urban waste water treatment plant [deadline 2014]	Update ELVs for effluent discharged by food sector installations directly in the sewerage system and develop a discharge authorization system compatible with the operation and the emission discharge values of the urban waste water treatment plant by 2020
	Ensure that all agglomerations of more than 2000 inhabitants collect and treat their urban wastewater before discharging them into the environment [deadline 2019]	Reach 100% urban wastewater network and treatment coverage for agglomerations of more than 2000 inhabitants by 2019
EO9: Contaminants	Phase out discharges and emissions and losses of mercury, cadmium and lead [deadline 2025]	Reach 50% reduction in discharges, emissions and losses of mercury, cadmium and lead originating from the cement industry by year 2020 and 100% by year 2025
	Eliminate to the fullest possible extent pollution of the Mediterranean Sea caused by discharges, emissions and losses of zinc, copper and chrome [deadline 2025]	Reach 50% reduction in discharges, emissions and losses of zinc, copper and chrome originating from the cement industry by year 2020 and 70% by year 2025
	Dispose all hazardous wastes in a safe and environmentally sound manner [deadline 2025]	Ensure safe and environmentally sound disposal of e-waste produced by 2025
	Take appropriate measures to isolate and contain mercury containing wastes [deadline 2025]	Ensure safe storage and containment of mercury waste produced by healthcare sector by 2025
EO10: Marine Litter	Urban solid waste management is based on reduction at source with the following waste hierarchy: prevention, re-use, recycling, recovery, and environmentally sound disposal [deadline 2025]	Reach 15% recyclables recovery from the general municipal waste stream by 2020 and 20% recovery by 2025
	Close to the extent possible existing illegal solid waste dump sites [deadline 2020]	Close 10% and 30% of illegal municipal solid waste dump sites identified as top 20 priorities (by the master plan for closure and rehabilitation of uncontrolled dumps) by 2020 and 2025 respectively
	Explore and implement National Marine Litter Clean-up Campaigns; participate in International Coastal Clean-up Campaigns and Programmes; apply "Adopt-a-Beach" or similar practices; and apply "Fishing for Litter" practices [Deadline 2019]	Strengthen existing national programs for Marine Litter Clean-up to reach a 50% reduction in marine litter deposition on the beaches by 2019
	Implement adequate waste reducing/reusing/ recycling measures in order to reduce the fraction of plastic packaging waste that goes to landfill or incineration without energy recovery [deadline 2019]	Implement adequate waste reducing/reusing/ recycling measures in order to reach 3% plastic recovery from the general MSW stream by 2019

6. Program of measures for Pollution Prevention and Control

The final program of measures (PoM) developed for the purpose of the current report is summarized in Table below.

Operational target	Proposed measures
Reach 15% recyclables recovery from the general municipal waste stream by 2020 and 20% recovery by 2025 **And** Implement adequate waste reducing/reusing/ recycling measures in order to reach 3% plastic recovery from the general MSW stream by 2019	Legal & institutional • Review and enactment of the solid waste management law • Drafting related application decrees and texts • Strengthen the role of Municipalities and Municipal Unions through update of the Municipal law to improve the sector's governance by local authorities in the fields of collection and final disposal of MSW and marine litter management Economic • Provide funding sources for solid waste management projects implemented by local authorities (loans, etc.) • Develop economic instruments (tax breaks on recycled material and recycling industries …) Technical • Development of national awareness material (by MoE) on integrated solid waste management approaches (including waste minimization, reuse, recycling and options for final disposal) applicable in Lebanon and facilitate dissemination to public through municipalities and local NGOs • Provide technical assistance to local authorities to develop and manage SW projects through development of technical guide including info such as (legal, technical & financial tools and awareness material)

Operational target	Proposed measures
Reach at least 80% urban wastewater network coverage and provide treatment coverage for 50% of the population residing within study area by 2019 **AND** Update ELVs for effluent discharged by food sector installations directly in the sewerage system and develop a discharge authorization system compatible with the operation and the emission discharge values of the urban waste water treatment plant by 2020	Institutional • Restructuring MoEW's organization in line with the requirements of laws 221 and 247 to reflect more its water governance role, with main focus on policy making, planning and regulatory roles: 1) Development of revised organization structures for MoEW; 2) Drafting a revised organization law, supporting in the approval process and following up on its enactment; 3) Implementation of the restructuring of MoEW • Develop the process for the performance monitoring and evaluation of RWEs including: 1) Monitoring body; 2) Performance indicators; 3) Tools and procedures • Clarify the distribution of responsibilities between municipalities and RWEs through update of Decree 8735/1974 regarding construction or upgrade of sewer lines Economic • Ensure financial sustainability of the RWEs through: 1) update of water tariffs; 2) update of taxes/fees for collection of wastewater; 3) development of wastewater discharge fees Technical • Rehabilitation and expansion of the sewer network covered by the Tripoli STP (including Mina area, Tripoli, Zgharta…) • Upgrade and expansion of sewer network and STP in Saida
Close 10% and 30% of illegal municipal solid waste dump sites identified as top 20 priorities (by the master plan for closure and rehabilitation of uncontrolled dumps) by 2020 and 2025 respectively	Technical • Closure and rehabilitation of Adweh open MSW dump • Closure and rehabilitation of Tripoli controlled MSW dump • Closure and rehabilitation of Hbeline controlled MSW dump • Closure and rehabilitation of Nabatiyeh open MSW dump • Closure and rehabilitation of Ras El Ain open MSW dump • Rehabilitation of Bourj Hammoud open MSW dump
Reach 50% reduction in discharges, emissions and losses of mercury, cadmium and lead originating from the cement industry by year 2020 and 100% by year 2025 **AND** Reach 50% reduction in discharges, emissions and losses of zinc, copper and chrome originating from the cement industry by year 2020 and 70% by year 2025	Technical • Provide technical assistance to improve reduction and monitoring of emissions from cement industries • Develop a databank for industrial sector (including info about EIA, permit details and requirements, discharges loads, self-reporting data, GIS mapping, pollution modeling, …)

Ensure that all Industrial Food Plants outlined in Appendix I discharging more than 4000 PE into water bodies comply with the discharge requirement of a maximum COD 160 mg/l and BOD 30 mg/l by year 2020	<u>Institutional</u> • Issuing voluntary agreements and implementation of environmental performance certificates • Developing discharge permits for food sector industries. • Developing a self-monitoring program with concerned industries for sustainable monitoring of compliance <u>Economic</u> • Implement water pollution (water consumption and WW discharges into water bodies) charges on Food sector industry • Provide financial incentives for reducing pollution loads in food sector industry <u>Technical</u> • Provision of technical assistance to food sector industries adopting CP will be accomplished through 1) conducting a survey identifying Industrial Food Plants (outlined in Appendix I) discharging more than 4000 PE into water bodies; 2) imposing the preparation of internal auditing reports on the concerned facilities; 3) recommendation by MoE for CP technologies based on the audit reports review • Create a pilot industrial zone in Ghadir area through 1) conducting a baseline assessment for the industrial zone including info about the zone's neighborhood environment characteristics (i.e.: landuse and baseline environmental conditions), types of industries (production type and capacity, class and coordinates), available environmental infrastructure, industrial discharges, etc…2) development of an industrial pollution abatement program in the Al-Ghadir drainage area including a set of interventions to address pollution problems highlighted by the baseline

Strengthen existing national programs for Marine Litter Clean-up to reach a 50% reduction in marine litter deposition on the beaches by 2019	Legal • Strengthen the role of Municipalities and Municipal Unions in the field of marine litter management through update of the Draft Integrated solid waste management law Institutional • Strengthen the monitoring and enforcement mechanisms for control of marine litter through1) strengthen cooperation between MoE, MoTPW, Municipalities and local NGO named OBBA (through the design of a joint monitoring program with well-defined performance indicators) and information exchange (through clear definition of communication/data portal, accessibility to data, and development of a Databank for marine litter management) • Provision of necessary training targeting MoTPW for management and operation of beach cleaning and litter fishing equipment Economic • Provision of funding sources for procurement of beach cleaning and litter fishing equipment and provision of necessary training for operation and maintenance of equipment • Provide funding sources for marine litter management projects implemented by local authorities (loans, etc.) and NGOs Technical • Conduct a needs assessment study to identify 1) technological needs for beach cleaning and litter fishing equipment, 2) develop a national and sustainable marine litter clean-up program in close coordination with concerned stakeholders

7. Monitoring plan for NAP implementation

A number of factors have impeded the implementation of an effective monitoring program for environmental quality assurance at the national level. Ongoing monitoring programs are far from being considered as comprehensive programs and mostly lack financial sustainability. For this purpose, development of NAP monitoring plan is considered as an important measure to strengthen existing programs and enhance the country's potential for tracking NAP implementation progress and evaluate the efficiency of interventions adopted in this respect. A main objective to be achieved is acquisition and centralization of data necessary to continuously record baseline state. This requirement actually falls under the country's obligations to follow up and report to the Secretariat – through the MEDPOL program - status of compliance to Barcelona Convention and the associated protocols.

The recommendation is to create a NAP update independent unit within MoE responsible of 1) coordinating with concerned stakeholders; 2) defining and setting up the monitoring program and develop the performance indicators; 3) developing and managing an information sharing program or platform (including continuous feed of the system, quality control of the data feed, data analysis and report preparation among other activities). The unit's responsibilities can be further expanded at later stages to provide technical support to MoE in the field of inspection and site visits. The unit will be responsible of submitting periodical reports to the MEDPOL focal point at MoE and yearly reports to the MEDPOL Secretariat. A sustainable source of financing can be provided through international agencies.

8. Capacity building, Awareness and Public participation for NAP implementation

The capacity building plan was developed based on institutional strengthening measures identified within the program of measures prepared under the scope of the current NAP update process. Soft interventions aim at complementing structural ones or any other intervention relying on behavioral changes for successful implementation.

Without public support only limited progress is foreseen in the field of naturel resources preservation and marine environment protection more specifically. The international experience proved that by educating and involving the public in the decision making processes it has been possible to promote the project ownership culture among the communities hence enhancing adherence and compliance to environmental projects and regulation. Proposed public participation activities aimed at improving implementation of the updated NAP include 1) Produce of informational publications offering essential data on the updated NAP and the developed program of measures; 2) Strengthen public consultation processes and stakeholders involvement during project inception and development processes; 3) Promote watchdog concept especially among local communities and media should be involved in preparation and monitoring of the work progress, and informed on all details regarding the undertaken environmental protection measures; and 4) Regularly inform general public about implementation progress of projects and effectiveness of corrective actions taken when applicable.

CHAPTER 3: INTRODUCTION

1. Background

Over the past decades, significant efforts were made by Mediterranean countries for the preservation of the marine resources. A fast growing population and a high level of tourism activities along main coastal cities coupled with the significant growth of the energy and industrial sectors were considered as main challenges for the sustainable management of resources within the Mediterranean Basin. The first initiative witnessed in this domain was translated by the adoption of the Mediterranean Action Plan (MAP) by 21 Mediterranean countries. The plan aimed at providing concerned parties with adequate tools to evaluate, control and eliminate sources of marine pollution. It was consequently considered the corner stone for the adoption of Barcelona Convention (in 1976) and the subsequent Protocols ratified by Lebanon since the year 1977.

Two decades later, the Strategic Action Program (SAP MED) was adopted by the Contracting Parties to the Barcelona Convention thus facilitating the identification of regional and national activities for land-based pollution control. The program clearly identified priority pollutants to be addressed and sat the relative timetable for control and/or phase out ending in 2025. The preparation of National Action Plans (NAPs) in 2005 represented the complementary step through which all Mediterranean Countries – including Lebanon – each described, through a participatory approach, the different frameworks and actions adopted to preserve the quality of the marine environment, in line with SAP targets. Decision IG 17/8 adopted by the Contracting Parties in 2008 stressed on the obligation to implement the NAPs endorsed in 2005 and mandated the plans' revision in 2011.

To this end, UNEP-MAP developed, in 2015, the "Guidelines for updating National Action Plans for the implementation of the LBS Protocol and its Regional Plans in the framework of SAP MED to achieve Good Environmental Status for pollution related ECAP ecological objectives". The Guidelines were developed while building on the methodology followed in 2005 and the lessons learned since with the main objective of ensuring alignment of all updated NAPs produced by Mediterranean countries with the new defined set of requirements.

Today, Lebanon is updating its NAP for the Protection of the Mediterranean Sea during a period characterized by a number of challenges including internal political turmoil and regional geopolitical and security instability. The influx of around 1.13 million Syrian refugees has taxed the country's infrastructure and natural resources. Despite these challenges, the Lebanese Government recognizes the importance of protecting the Mediterranean Sea and remains committed to improve the level of compliance to Barcelona Convention, the related ratified protocols, the Regional Plans, and the Ecological Approach.

While the NAP updating process is a necessary and important undertaking for the Lebanese Government, it is however essential to clarify there has been a number of challenges in the implementation of the previously endorsed NAP. Review has found that the adopted associated strategies and plans have generally been well studied and detailed, so the lack of implementation cannot be attributed to faults in design. Rather, deficiencies in implementation can be attributed to a variety of factors including:

- The absence of a unified implementing authority
- Overlap and confusion in institutional responsibilities
- Superseding and changing priorities among successive governments and concerned officials (lack of continuity)
- Financing shortage considerations in some cases
- General lack of political will to undertake tough (unpopular) decisions and measures necessary for implementation
- Etc.

In light of this recent unsatisfactory track record in implementation – as considered by MoE – diligent and sustained international assistance and accompaniment is therefore required to support and push through the implementation and follow up of the program of measures developed through the NAP update process. In the opinion of this author, it is a pre-requisite for success.

2. Scope

This report is the second National Action Plan prepared in Lebanon in response to the Barcelona Protocol for the protection of the Mediterranean Sea from land-based pollution and its related program (MEDPOL). The objective of this report is to present an updated assessment of Lebanon's commitment to Barcelona Convention (and all related protocols, regional plans, and ecological approach) through evaluating progress made since the endorsement of the first National Action Plan prepared in 2005, and chart the roadmap for enhancing compliance.

3. Limitations

A number of limitations were encountered throughout the NAP update process, several are noteworthy:

1. Faulty public and stakeholder participation process: the methodology recommended for the preparation of the updated NAP suggests a public and stakeholder participatory approach to create a certain level of project ownership and thus facilitating priority setting and plan implementation. Originally planned to be launched in October 2014, the NAP update process was initiated in Lebanon in February 2015. With a limited timeframe, implementation of the participatory approach was compromised to some extent.
2. Lack of a quantitative data: collection of quantitative data pertinent to the SAP/MED and regional plans requirements was a challenging process in the absence of a database and the lack of clear coordination and information exchange mechanisms among line ministries and institutions.
3. Pollutant reduction percentages set by operational targets lack scientific validation: due to the lack of baseline data, percent reduction values for priority substances defined in the present report were computed based on the experts judgement and experience in the relative sectors.
4. Inability to identify effective solutions for the municipal solid waste management (MSWM) sector: in view of the current MSWM crisis faced by the Lebanese government (especially for the Beirut and Mount Lebanon Governorates) gap analysis was considered

a challenge due to the unexpected change in baseline data and lack of updated quantitative data regarding this topic.

Despite the aforementioned challenges, the update NAP is considered an effective tool for strengthening compliance to Barcelona Convention and reduction of pollution of the Mediterranean Sea from land based sources.

4. Report structure

The updated NAP consists of nine chapters designed for a clear presentation of the study area and local context, the main gaps hindering compliance to Barcelona convention and related requirements, the recommended priority interventions and the estimated cost for implementation.

The introduction of the current report in terms of background information, scope of report as well as report limitations is presented in Chapter 3.

Chapter 4 describes the NAP update process especially in terms of institutional arrangements, involved stakeholders and public consultation processes and the work methodology used throughout the process.

Chapter 5 provides an overview of the study area in terms of baseline data relevant to the SAP/MED, regional plans requirements and ecological approach requirements. This chapter also includes an updated list of the hotspots with direct impact on the Mediterranean marine environment.

Chapter 6 presents a general description of the identified gaps hindering effective compliance to Barcelona convention and the related requirements. This is evaluated based on a comparison between midterm baseline and existing requirements.

Chapter 7 summarizes the set of operational targets developed under the scope of this report to enhance compliance and provide a solid ground for future NAP implementation progress evaluation.

Chapter 8 identifies the program of measures required for successfully achieving the developed operational targets and includes project fiches for ten priority interventions. Prioritization of the suggested interventions was based on two subsequent processes, one of which consisted of a qualitative evaluation based on a well-defined set of criteria while the second method consisted of conducting a multi-criteria economic evaluation.

Chapter 9 presents the monitoring plan for NAP implementation developed based on selected monitoring indicators for achievement of the selected operational targets. The chapter also include suggested institutional arrangements and resources required to undertake the monitoring process.

Chapter 10 provides a capacity building plan for the NAP implementation. Details such as assignment of responsibilities, resources and budgets for capacity-building for the tasks to be undertaken for implementation of the NAP will be included in this chapter.

Chapter 11 is the last chapter of this NAP and consists of the set of arrangements to be adopted by the country in order to improve information dissemination, awareness raising and education at the national level.

CHAPTER 4: NAP UPDATE PROCESS

1. Institutional arrangement

Three different meeting organized at the early stages of the process constituted the corner stone for stakeholders' engagement in the NAP update. The first meeting was held on the 24th of March, 2015 and was considered as the First National Coordination Workshop for the NAP update. A total of 49 participants attended the workshop mainly representing public agencies, international and local NGOs, academic and the private sectors. Active participation throughout the event encouraged valuable input from different stakeholders and successful attainment of expected outputs which included briefly:

- Defining and validating the institutional stratification governing the NAP updating process through dividing concerned stakeholders into three different categories namely 1) the Thematic Groups (TG); 2) the Technical Committee (TC); and 3) the National Steering Committee (NSC). It's worth noting that members of the first two categories were agreed on during the workshop.
- Identification of main obstacles hindering the full implementation of the NAP endorsed by the Lebanese government in 2005 after reviewing and validating/updating preliminary information on the status of activities implemented in relation to this plan.
- Review and validation/update of the midterm baseline data as presented by previously prepared reports and country fact sheet with special focus on the legal, policy and technical aspects.

It is worth noting that representation of local NGOs was very limited during the workshop. To overcome this issue and to optimize involvement of concerned parties during the update process, a recap meeting targeting NGOs currently involved in projects and activities associated with the protection of the Mediterranean Sea was organized in 15 April, 2015. A total of 10 participants attended the meeting mainly representing 6 different local NGOs. This meeting shed the light on the weak interaction between governmental and non-governmental agencies and was considered as a first step toward establishing a sustainable and transparent coordination/consultation mechanism between the Ministry of Environment and active local NGOs.

The last meeting was held on the 17th of June, 2015 at the Ministry of Environment (MoE) and it aimed at nominating the National Environmental Council as the NSC for the NAP update process and obtaining commitment of the committee members to the NAP update process. The meeting was headed by the Minister of Environment in the presence of six member of the National Environmental Council.

Active participation of stakeholders was maintained throughout the NAP update process through one to one meetings, phone interviews and email correspondences especially for outputs review as the restricted time frame of the current project as well as other unanticipated events didn't allow the organization of additional group consultation events. Stakeholders involved during the NAP update process consisted of:

- Representatives from line Ministries such as Ministry of Transport and Public Works (Directorate General of Land and Maritime Transport), Ministry of Industry, Office of Minister of State for Administrative Reform (OMSAR), Ministry of Agriculture and Ministry of Water and Energy.
- Head of departments at Ministry of Environment (MoE) and managers UNDP project being implemented at the latter Ministry;
- Syndicate of professional divers;
- Association of Lebanese Industrialists;
- International and local NGOs;
- Academic institutions namely American University of Beirut and University of Balamand;
- Research institutes such as National Center for Marine Research;
- Heads of major Municipalities in Lebanon;
- Regional water establishments such as the North and Litani water establishment;
- Electricity of Lebanon; and
- Council of development and reconstruction.

2. Work methodology

2.1 Study area

Management of environmental challenges occurring within the Mediterranean hydrological basin requires adoption of a cooperative approach among concerned nations - Lebanon is no exception. One of the few middle-eastern countries blessed with its hydrological resources, Lebanon is divided into two hydrologic regions (the Mediterranean and the inland region) consisting of a system of tributaries flowing into 16 perennial (including 14 rivers draining into the Mediterranean) and 23 seasonal rivers. The combined length of these perennial rivers is approximately 730 km and their total annual flow averages 3,900 Mm^3 (Refer to Figure 1).

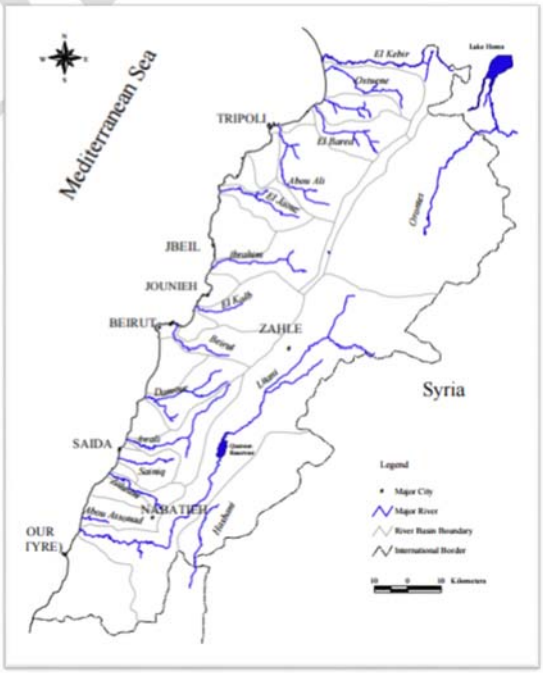

Figure 1: permanent Rivers of Lebanon (MoE/LEDO/ECODIT, 2001)

However, this abundance in water resources is not considered anymore as an asset but instead as an environmental liability as pollutants reaching waterways - due to poor environmental services and inadequate infrastructure – are carried along the streams and discharged directly in the Mediterranean Sea. Underground water supplies aren't exempt from quality deterioration. Geologically Lebanon is dominated by limestone formation, the complex network of underground fissures that makes up the main aquifers accelerates rapid and unpredictable infiltration of pollutants leading to the contamination of the underground supplies.

Drafting of the first NAP, back in the year 2005, shed the light on a number of activities considered as a source of pressure on the marine environment in Lebanon. A decade after, some issues remain unresolved while the list of pressure sources kept on expanding as it will be discussed in this report. Analysis of these pressure sources called for a fragmentation of the Lebanese territory into three different zones as shown in Figure 1. The methodology adopted for this purpose wasn't based on the river basin approach as proposed by the NAP update guidelines. Adaptation of the guidelines to the local context entailed the adoption of a different zoning criteria, whereby owing to the lack of quantitative and qualitative data at the river basin level (most data published in the country is reported at the administrative level), zoning was performed taking into consideration administrative divisions. However, to facilitate evaluation and tracking of pollution loads along each perennial river under consideration - discharged into the Mediterranean Sea - administrative areas sharing a common river were merged into one main zone (Refer to Figure 2). Accordingly, the study area was divided into the following zones:

1- Zone A covered the governorate of North Lebanon (NL) and Akkar;

2- Zone B covered the governorates of Beirut and Mount Lebanon (BML);

3- Zone C covered governorates hosting the lower Litani river basin namely the Nabatiyeh and South of Lebanon governorates as well as part of the Bekaa governorate.

The Litani River is the largest river in Lebanon and runs through three governorates (namely Bekaa, Nabatiyeh and South Governorates) and covers a surface area of 2000 km^2 (which constitutes 20% of the Lebanese territory). Water flowing in the Litani River represent about 30% of the total water running in all Lebanese rivers. Since 1960s, water resources of the Basin were harnessed for development purposes through the construction of Qaraoun Dam. Practically, Lake Qaraoun divides the river basin into two separate entities, Upper and Lower Litani River Basins. Since releases from the reservoir downstream are rare - and restricted to overflows during the wet season or to limited releases for irrigational purposes, during the dry season - water quality varies significantly upstream and downstream the dam. For the purpose of understanding the level of contamination occurring at the point of confluence with the Mediterranean Sea, only the Lower Litani Basin was considered in the current report as covered in Zone C.

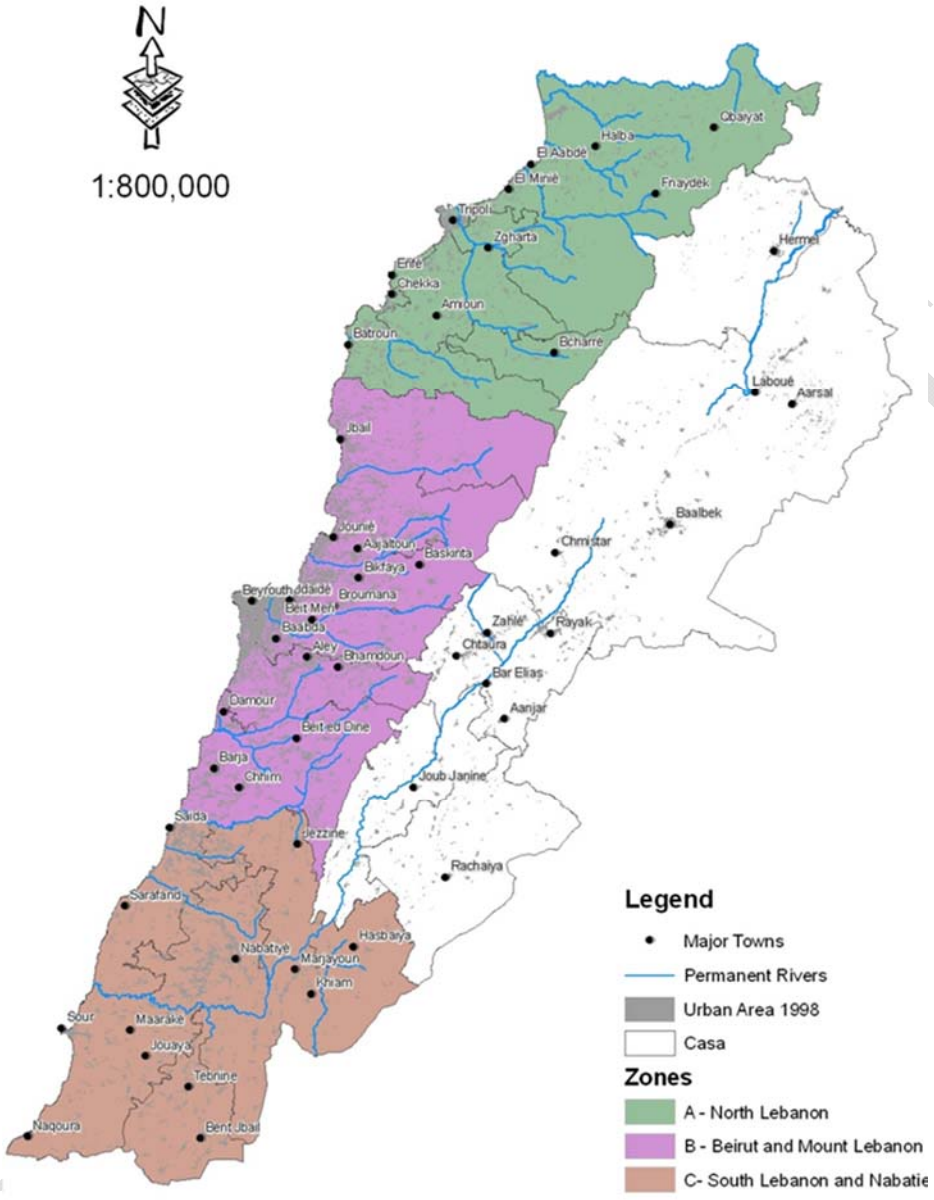

Figure 2: Study area

2.2 NAP updating process

The NAP updating process was conducted following the UNEP-MAP "Guidelines for updating National Action Plans for the implementation of the LBS Protocol and its Regional Plans in the framework of SAP MED to achieve Good Environmental Status for pollution related ECAP ecological objectives", to the extend possible. Figure 3 summarizes the different steps adopted throughout the update process.

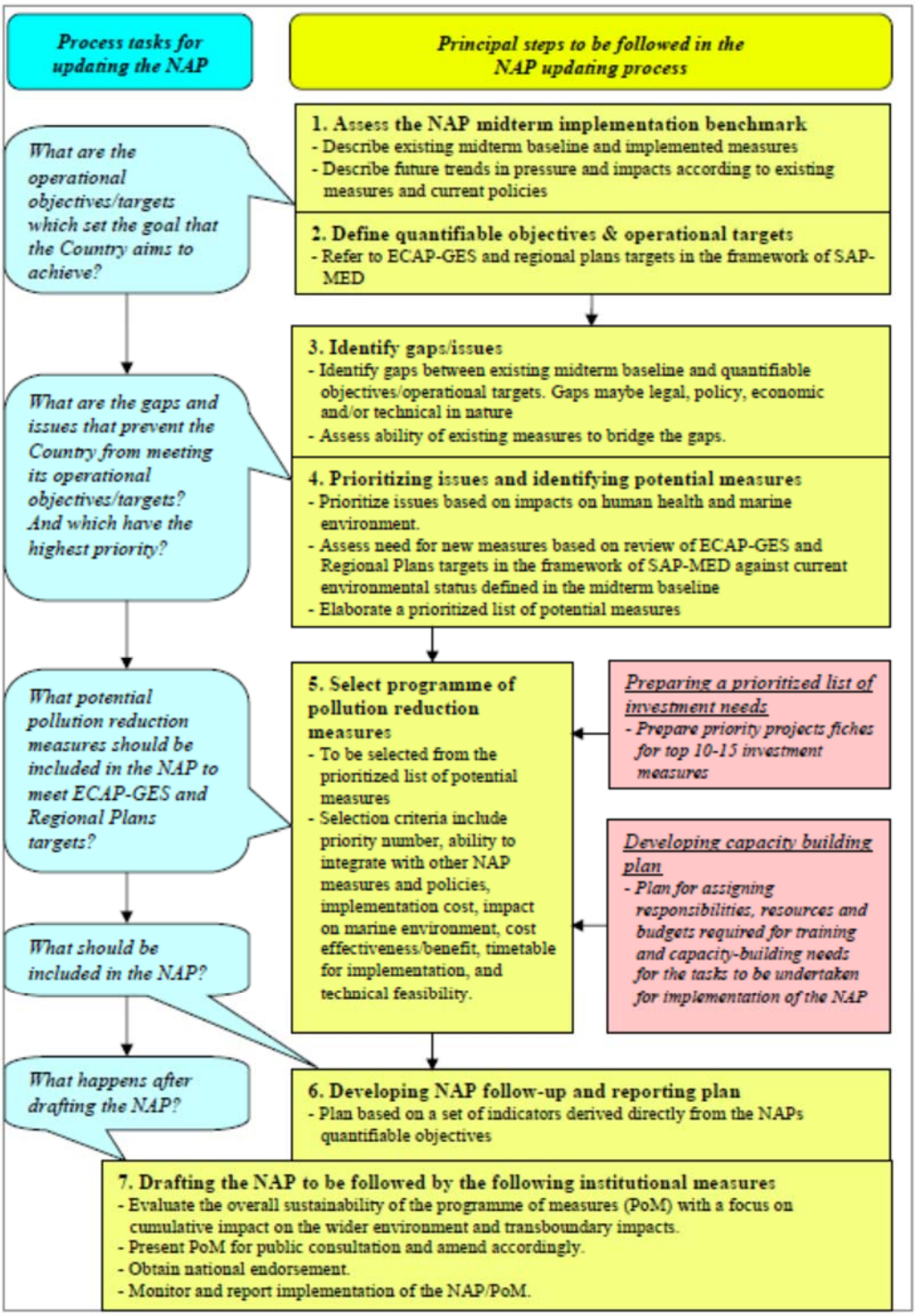

Figure 3: Steps adopted during the NAP update process

2.2.1 Assessing the NAP Midterm Implementation Benchmark

The aim of drafting the midterm baseline is to capture the outcomes of the actions implemented by the Lebanese government under the framework of the SAP-MED through the NAP implementation since its endorsement in 2005. The effectiveness of the adopted measures during the past decade was measured based on the country's compliance to the long-term provisions of the SAP-MED, the legally binding provisions of the 10 Regional Plans and their timetables for implementation standards, and the GES targets of ECAP Ecological Objective 5 on eutrophication, Objective 9 on contaminants and Objective 10 on marine litter.

Since the main effort for assessing the midterm baseline is the responsibility of the thematic groups (TGs), the first coordination workshop was designed in a way to divide the participants into different working groups each representing one specialized TG. The NAP update guidelines suggested the formation of eight TG to cover two main sources of pressure namely urban and industrial sources and three different types of pressures each including wastewater, solid waste and air pollution in addition to one TG on agricultural pollution and another on monitoring. However, to ensure effective and efficient use of expertise, adaptation to the local context was necessary and TGs were divided into the following working groups:

- Working Group 2: Solid Waste Management in Urban and Industrial Environments
- Working Group 3: Wastewater Management in Urban and Industrial Environments
- Working Group 4: Air pollution and Marine Environment Monitoring

The outputs from each working group consisted of the majority of the baseline data used during the preparation of the midterm baseline assessment, especially in terms of 1) main challenges affecting successful implementation of the NAP endorsed in 2005 and proposed solutions; 2) different legal and policy instruments developed to control different pressure types; and 3) the different depollution activities implemented and currently operational by type of pressure. Subsequent to the first national coordination workshop, the compiled information was screened and reorganized to fit the purpose of the report. As additional information relevant to the legal, institutional and technical framework for regulating and controlling emission of priority substances - as set by the SAP-MED, the legally binding provisions of the 10 Regional Plans and their timetables for implementation standards, and the GES targets of ECAP Ecological Objectives – was still needed, a questionnaire was prepared and sent to the TGs by email. The latter exercise was complemented by one on one and phone interviews for effective results. Compiled information consisted of the body of the midterm baseline assessment report. Update of the hotspots' list, on the other hand, was performed by the Technical committee (TC) based on the updated criteria included in Appendix C of the NAP update Guidelines.

2.2.2 Defining Quantifiable Objectives, and as appropriate, Operational Targets

The process of defining operational targets - aimed at improving adherence to SAP-MED provisions, Regional Plans commitments and EcAp-GES targets - was entirely based on the conducted baseline assessment. Legal, institutional, economic and technical obstacles hindering compliance to specific Ecological Objectives (EO) were highlighted accordingly, thus facilitating the identification potential opportunities to improve performance at the national level.

Focusing the scope of work, however, necessitated adoption of a set of prioritization criteria based on which EO specific operational targets were developed, these included:

- Urgency of the requirement (based on the predefined timetable set by the SAP-MED provisions, Regional Plans commitments and EcAp-GES targets);
- Governmental priorities;
- Availability of basic infrastructure to build on (namely in terms of baseline data, implemented or ongoing projects…);
- Attainability of target within the set timeframe.

A first screening of the SAP-MED provisions, Regional Plans commitments and EcAp-GES targets was conducted by the NAP update Technical Committee (TC) to identify potential areas of intervention. As a result, a first draft of operational targets was developed addressing requirements for EO related to eutrophication, contaminants, and marine litter. A second round of consultation with the TC and concerned stakeholders (mainly representing MoE, MoTPW, MoEW, CDR and NGOs) was conducted, at a later stage, to validate the list of operational targets either based on existing data or sector specific experience. It's worth noting that the process of setting specific operational targets, especially in terms of percent reduction, was considered a challenging process due the unavailability of quantitative data, in specific fields, at the national.

2.2.3 Identifying Gaps/Issues

A gap analysis was performed to define the gaps between the existing baseline and the well-defined operational targets set for the purpose of the NAP update. Gaps identification was partially completed during the first national coordination workshop whereby TGs identified the main issues that hindered the implementation of the NAP endorsed in 2005. These issues represented the main gaps identified at the policy, legal, regulatory and monitoring/reporting levels. Further analysis was conducted to prepare a comprehensive list of gaps.

2.2.4 Prioritizing Issues and Identifying Potential Measures

The gaps' identification activity facilitated the development of the list of potential measures needed to meet the operational targets and hence improve compliance to Barcelona Convention and the associated protocols. Different types of measures were developed at the level of each Zone under consideration and at the national level. These measures were divided into different categories including legal, institutional, economic and technical measures. Around 130 measures were identified at this level. A first level of screen of the list of measure was necessary in order to short list priority intervention. As recommended by the NAP update Guidelines, identified technical measures were evaluated based on the set of criteria presented in Table 1 below.

Table 1: Prioritization criteria used for scoring technical measures

Prioritization categories	Scoring criteria			
	4	3	2	1
Achievement of pollution-related GES targets	Measure contributes more than 50% pressure reduction and substantial decreasing trends in GES targets	Measure contributes to 30% to 50% pressure reduction and decreasing trends in GES targets	Measure contributes to 10% to 30% pressure reduction or in maintaining the existing trends of GES targets	Measure contributes less than 10% to pressure reduction or no impact on GES target
Elimination of hotspots/ sensitive areas	The measure directly and significantly contributes to the elimination of hotspots/ sensitive areas of Category A[1]	The measure moderately contributes to the elimination of hotspots/ sensitive areas of Category B	The measure has weak and indirect contribution to the elimination of potential hotspots/sensitive areas (Category C)	The measure has no contribution to the elimination of hotspots or sensitive areas
Contribution to other pollution-related ecological objectives	Contributes directly to ecological objective EO1 on biodiversity	Contributes to other pollution-related ecological objectives/ GES targets	Contributes to other non-pollution-related ecological objectives *(other than EO1)*	No contribution
Technical feasibility	Technology is mature and capacity to implement the measure is sufficient (BAT, BEP and SCP)	Technology is mature but capacity to implement the measure is moderate	Technology is not mature or in trial phase	Technology is not available
Geographical scope	National with transboundary impacts	Within national boundaries	Within regional boundaries	Local level
Implementation timetable/ urgency in line with the agreed national operational targets [2]	Deadline has passed	Deadline earlier than 2017	Deadline is 2020	Deadline is 2025

The TC was mainly responsible of conducting the scoring exercise. Accordingly, technical measures were ranked based on the prioritization score obtained. The top seventeen technical measures were selected. All legal, institutional and economic measures – initially identified within the list of potential measures - needed to allow implementation of the selected technical measures were then compiled with the latter ones. The result of this exercise consisted of a final list of

[1] Categories of hotspots are included in Appendix C of the NAP Update Guidelines included in the Draft Report of the Second MED POL Focal Points meeting on NAP update [UNEP(DEPI)/MED WG.404/7]

[2] These deadlines are provided for indicative purposes based on regional targets. However, the countries may adjust them based on their national operational targets

measures including around 65 proposed interventions. The final list of measures was reviewed and validated by a number of stakeholders.

2.2.5 Selecting the Programme of Measures for Pollution Prevention and Control

Transition from the final list of measures to the final program of measure for pollution prevention and control necessitated the implementation of an economic evaluation to further screen out or prioritize the proposed interventions.

The economic analysis was conducted at the level of all technical measures that were selected for prioritization by the technical committee and were assigned a score.

Due to data and time limitations, and the inability of assessing the economic benefits of all the list of measures proposed by the country team, Multi-Criteria Analysis (MCA) was adopted to evaluate the list of measures as it applies cost-benefit thinking to cases where it is necessary to deal with impacts that are a mixture of qualitative, quantitative and monetary data and where there are varying degrees of certainty (UNEP MAP, 2015).

Some advantages of MCA include its ability to take into account a diverse set of different criteria that are important for the evaluation problem at hand; and to take into account both quantitative and qualitative aspects, even of a fuzzy nature. MCA aims to identify the most plausible ranking of measures out of a set of distinct choice possibilities (Stratigea & Grammatikogiannis, 2012).

A variety of MCA methods have been developed during the last decade, differentiating in terms of: the nature of the data handled (quantitative, qualitative or mixed data); the formal relationship between policy objectives and choice attributes; the nature of weights attached to the evaluation criteria (quantitative or qualitative); the treatment of outcomes of alternatives in an impact matrix (e.g. pairwise comparison); the specification of decision rules; the type of standardization used for the criteria outcomes; etc.

The main steps of MCA are:

- Step 1: Establish the aims of the MCA, the decision makers and other stakeholders

  The MCA aims to identify the most plausible ranking of measures identified by the technical committee in consultation with the national stakeholders.

- Step 2: Identify measures

  Lists of measures were identified by the technical committee in consultation with the national stakeholders for each operational target.

- Step 3: Define the criteria

  Criteria used for the analysis included the type of measure and economic, environmental and socio-political aspects as follows:

- Economic aspects:
  - Cost of implementing the measure: The capital and operation costs of facilities, insurance, internal transport cost, etc.;
  - Economic changes affecting job opportunities, business viability and potential to enhance incomes
  - Marketability of the recovered materials and energy.
- Social-political impacts
  - Social equity: A change in the distribution of internal and external costs borne by different income groups.
  - Ease of administration/implementation: including monitoring, enforcement, preparation, siting and publicity.
- Benefits:
  - Benefits (economic benefits)
  - Health risks

- Step 4: Describe the performance of each alternative against the criteria in the performance matrix and determine the score matrix (scoring)

The measures were evaluated with regards to the selected criteria based on the scoring matrices summarized in Table 2 below.

Table 2: Scoring matrices

Criteria	Scoring
Type of measure	1- Awareness raising, monitoring 2- Projects, plans, policies 3- Capacity building, enforcement, incentives 4- Technical, bans, phase-outs
Cost	The estimated cost for the implementation of the measure was used as is in USD
Social equity	1- Major change in the distribution of internal and external costs borne by different income groups. 2- Minor change in the distribution of internal and external costs borne by different income groups. 3- No change in the distribution of internal and external costs borne by different income groups.
Ease of administration/implementation	1- Very Difficult 2- Difficult 3- Medium 4- Easy
Economic changes affecting job opportunities, business viability and potential to enhance incomes	1- Large: Local businesses close due to loss of income or are transferred to other locations. Significant job losses and loss of livelihoods in communities (>30% of jobs or livelihoods) with no local alternative opportunities in near medium term (within 1 year from job losses) other than out-migration. 2- Medium: Job losses and adverse effects on livelihoods in a community able to adapt and provide alternative job opportunities and reverse adverse livelihood changes in near – medium term (within 1 year of job losses) 3- Small: Temporary (<1 year) or intermittent negative changes to some aspects of the livelihoods and life chances/options for improvement of a limited number of individuals/households/businesses (including job opportunities, and income, access to markets for produce sales), but to which most individuals/households are expected to be able to adapt relatively easily. Some owners of businesses experience short-term (<1 year) financial loss, but recovery is likely in near future. Temporary decrease in household/individual incomes resulting from reduction of jobs or hours worked, but recovery is likely in near future 4- No economic changes - Beneficial: Increased ability of individuals, households, businesses or communities to maintain or improve livelihoods through enhanced 1) Financial and physical assets (such as savings and buildings); 2) Natural assets (such as land, water sources, and forests); 3) Human and social assets (such as skills, knowledge, community support networks); 4) Job opportunities, job security and enhanced per capita incomes; 5) Economic diversification; and 6) Local business viability/opportunities.
Benefits	1- Low 2- Medium 3- High 4- Very high
Health risk	1- Very high 2- High 3- Medium 4- Low 5- No health risk 6- Improvement of public health

For the cost lower values are better while for the other criteria, higher values are better.

- Step 5: Assign weights to each of the criteria to reflect their relative importance (weighting).

  Equal weights were given to the cost of implementation of the measures and to their effects. The weighing system used is as follows:

- Step 6: Combine the weights and scores for each of the options to derive overall values

  The system used for the MCA is SANNA (System for Analysis of Alternatives), a standard MS Excel add-in application. The measures were scored according to the different criteria and the system analyzes the data based on the scoring and the weights set as described above to derive overall values. The TOPSIS method was selected for analysis. It is based on the computation of global utilities of alternatives according to their closeness to the ideal criteria values and distance from the nadir criteria values. The TOPSIS method provides complete ranking of alternatives according to their global utilities.

CHAPTER 5: MIDTERM BASELINE ASSESSMENT

1. Land based sources of pollution

The range of economic and human activities within the boundaries of the considered zones is wide. Major human settlements are concentrated in major cities along the coastline or along river banks, attracting thus infrastructural development (solid waste management, wastewater management and transport related infrastructure) as well as investment opportunities in the energy, industrial, tourism and agricultural sectors as represented in Annex I. The influx of Syrian refugees to the country, for the past couples of years, also exerted significant pressure on the existing infrastructure and natural resources, namely marine environment, as Syrian communities were mainly hosted in coastal cities. Unfortunately, till today this unexpected increase in population number was not accounted for during implementation of infrastructural projects.

1.1 Population

Population growth is hard to define in Lebanon due to the high emigration history, thus different growth rates were estimated for the country ranging between 0.92 and 1.75 per annum (MoE/UNDP/ECODIT, 2011). Zone A covers a surface area of 2,024.8 km^2 and hosts a total population of 763,712 with the city of Tripoli alone accommodating more than 40% of the zone's total population (MoE/UNDP/ECODIT, 2011). Zone B covers a relatively small surface area of around 4,954 km^2 but is characterized with the highest population density (1,845,840) with half of the country's urban population is settled within the Greater Beirut Area (GBA) which represents the city of Beirut and its southern and northern coastal suburbs (MoE/UNDP/ECODIT, 2011). Zone C has a surface area around 1,987 km^2 - including South (929.6 km^2) and Nabatiyeh (1,058 km^2) governorates - and a total population of about 800,000 mainly concentrated in the towns of Saida, Tyre, Nabatiyeh and Jezzine (OCHA, 2014). Population density in this zone is low reaching 18% of the total Lebanese population (MoE/UNDP/ECODIT, 2011).

The above listed figures didn't account for Syrian refugees' influx to the country. Recent statistics published by the UNHCR reported an uneven distribution of registered refugees across the country with Zone A hosting around 282,593 registered refugee, while Zones B and C host around 345,999 and 131,000 refugees respectively (UNHCR, 2015).

1.2 Agricultural Activities

The agricultural sector, mainly concentrated in Zones A and C, represents 60% of the total coastal agriculture. Along the coastline, 37% of the land is used in agriculture and the natural space represents 26%. Agricultural workers make up an estimated 7.5% of the active population (Plan Bleu/SES, 2015).

Zone A is one of the largest agricultural zones in the country located in Aakkar and Abou Ali valley. Cultivations in this zone include a variety of irrigated crops and vegetables (MoE/UNDP/ECODIT, 2011). Due to the rapid urban expansion in Zone B, agricultural activities are considered insignificant (MoE/UNDP/ECODIT, 2011). Development of human activities is limited in Zone C due to the constant armed conflict with Israel. Agricultural areas still account

for the largest part of the land stretching from Saida to Naquoura on the coastal line and even deep inland (UNEP-ROWA, 2012). Main crops produced along the coastal strip include citrus fruits, bananas, horticulture products and vegetables while those produced at higher altitudes include olives, grains, tobacco and almonds (MoE/UNDP/ECODIT, 2011). The uncontrolled uses of pesticides and fertilizers, as well as over cropping practices are main sources of environmental stresses. Estimation of the intensity of adverse impacts, however, in this field is complex owing to the lack of national data. Expected outcomes associated with runoffs from agricultural lands mainly in Zone A and C might include:

- Water and bathing water quality deterioration due to 1) increased concentration of Total Nitrogen and Total Phosphorus in water column leading to accelerated eutrophication; 2) high concentrations of contaminants in fresh and sea water;
- Soil and land degradation due to over-cropping and intensive livestock activities thus increasing runoff intensity; and
- Increased demand on natural resources (i.e. irrigation from coastal aquifers).

1.3 Industrial activity

The industrial sector in Lebanon witnessed a significant growth since the year 1950 with the number of registered industrial establishments rising from 82 to 4,033 in 2007, as reported by the Ministry of Industry (MoI/UNIDO/ALI, 2010). Despite the availability of around 72 industrial zones in the country, it should be highlighted that none of these is currently equipped with the adequate infrastructure to comply with environmental management requirements.

The industrial sector's workforce in the study area (including zones A, B & C) was estimated around 69,694 people in the year 2007 (MoI/UNIDO/ALI, 2010). Zone A accounts for the second highest density of industrial establishments nationwide hosting around 560 different types of industrial establishments with varying sizes and associated environmental impacts (MoI/ALI, 2013). Three of the highest environmental impact industries (ISIC Class 1 establishments) in Lebanon are located within the coastal areas of Chekka (2 cement factories) and Selaata (1 fertilizer production establishment). This zone also hosts one third of the food industries in Lebanon. Registered industrial establishments are unevenly distributed across Zone A, with the city of Tripoli reporting the highest density of industrial establishments. Zone B hosts the highest number of industrial facilities reported in the country estimated around 2,280 facilities (with 1930 facilities in ML and 350 in Beirut governorate) (MoI/ALI, 2013). Around 489 industrial facilities are established in Zone C, 40% of which are food industries.

Most industrial facilities are located within the coastal stretch for proximity to the main roads' network including five cement industries (Namely in Zones A and B). Existing cement plants are those of the dry process type. The production rate of the cement industries amounts to 5,309,000 tons in the year 2012 (BankMed, 2013). Main coastal quarries are located in Chekka and serving the cement industry (UNEP/MOE, 2013).

1.4 Power Generation and fuel import ports

The Lebanese energy and electric power generation sector is almost uniquely composed of thermal energy production, with fuel oil, diesel oil and natural gas being used as fuel sources. There are

six thermal power generation plants located on the coastal zone. All these plants are using seawater for cooling purposes. Other energy sources are hydropower which accounts for only 4.5% the total generation capacity in the country. The use of water for power generation is compromised by the requirement for domestic water and irrigation which frequently takes priority over hydropower (CEDRO, 2013).

Two thermal power plants are located in Zone A mainly in Deir Aamar and Hreichi areas providing electric supply for the whole zone. Zone B benefits from two power plants located in Jiyeh and in Zouk areas. Based on a PCBs inventory prepared in 2011, in and out of service Askarel transformers were identified at both power plants. Significant levels of PCB contamination were reported at Zouk power plant, however contamination was confined to a limited surface area. On the other hand, high levels of PCB contamination were reported at a workshop, located in Bauchrieh, used by Electricity du Liban (EDL) for storage and repair of out of service Askarel transformers. Two power plants are identified in Zone C namely in Zahrani and Tyre towns in addition to Seventeen PCB transformers still in service at the Jiyeh power plant (WorldBank/ECODIT, 2011).

Although total traded quantities via maritime transport are marginal, 38.1% of the country's total imports of petroleum products are done through maritime transport which remarks the importance of such services to maintain the country's fuel and petroleum needs (Plan Bleu/SES, 2015).

Fuel import ports are distributed all over the study area, with three ports located in Zone A (mainly in Amshit, Chekka and Selaata), three located in Zone B namely in Jieh, Dora and Zouk and the last one located in Zahrani area of Zone C. The frequency of accidental oil spills occurring in these ports is not well documented on the national level.

1.5 Maritime transport and fishing activities

Four main commercial ports are located in the major coastal cities namely Beirut (Zone B), Tripoli (Zone A) and Saida and Tyre (Zone C). The Port of Beirut accounted for 91% of total seaborne imports in 2013, while the Port of Tripoli accounted for only 6% and the Port of Sidon constituted a 3% share. On the exports side, the Port of Beirut is also dominant with an 84% share of total seaborne exports in 2013, compared to 10% and 6% shares of Port of Tripoli and Port of Sidon, respectively (BankMed, 2014). In 2014, the total revenues for the Beirut port were of approximately of 210.89 million USD (Credit Libanais, 2015). There is no complete information on the social aspect of maritime transport but data shows that Beirut Container Terminal Consortium employs 600 Lebanese individuals; the only terminal in the Middle East and North Africa region that employs 100% local staff (BCTC, 2014). As for cruising and pleasure boating activities, in 2014, the country counted with 28 public ports, 13 private marinas and 5741 yachts. Furthermore, cruising and pleasure boating are likely to provide services for tourism related activities which play a key role for the country's economy (Plan Bleu/SES, 2015).

Fishing and marine aquaculture, along the coastal region, remain marginal, accounting for only 0.06 % of the country's GDP in 2011. Marine aquaculture is almost absent with only one shrimp farm being present (Plan Bleu/SES, 2015). The total marine capture fisheries production in Lebanon for the year 2011 was estimated at 4.9 thousand tons of seafood corresponding to an overall turn-over of approximately $27 million (Plan Bleu/SES, 2015). Domestic production

accounts only for about 22% of the sea food products consumed in the country, depending largely on imports to cover the 78% left (Plan Bleu, SES, 2015). In 2006, it was estimated that fishing supported about 30,000 fishermen and their families (Plan Bleu/SES, 2015). Fifteen fishing ports are commonly found in Zone A (accounting for 35% of both national number of ports and vessels). The city of Tripoli host one of the busiest fishing ports in the country.

1.6 Tourism and marine leisure activities

Tourism is a main driver in the Lebanese economy; in 2013 the direct contribution of travel and tourism accounted for 6.9% of the country's GDP and the total contribution (taking wider effects into account) represented 19.2% of the GDP (WTTC, 2014). Tourism is considered one of the most important activities in the coastal zone. The total number of hotels and resorts on the Lebanese territory has reached 486, of which 71% are located on the coastal zone. Beirut and Jounieh (both coastal cities) host the highest percentages of touristic institutions in the country (UNEP/MOE 2013). Travel and tourism activities directly generated 92,500 jobs in 2013 or 6.7% of total employment (WTTC, 2014). This includes employment by hotels travel agents, airlines and other passenger transportation services; it also includes the activities of restaurants and leisure industries directly supported by tourists (Plan Bleu/ SES, 2015).

Zone A is the center for 37 hotels and resorts, most of which are located in coastal cities such as Chekka (15), Tripoli (10) and Batroun (9). The Palm island nature reserve located in Tripoli is considered one of the main attractions for locals as well as foreigners in addition to several recreational beaches identified in this zone. During the summer season, this Zone witnesses an increase in the number of beach goers and tourist, especially in the coastal towns of Batroun, Enfeh and Tripoli, whereas a significant number of locals relocate to their summer residences in the Mountains especially in the District of Bcharre. These seasonal population redistribution events are expected to cause significant pressure on the solid waste and wastewater management infrastructure considering the uneven distribution of services across the country. Zone B is the center for 271 hotels and resorts, and around 42% and 28% of these are located in Beirut and Jounieh respectively (UNEP/MOE, 2013). Several recreational beaches are identified in this zone attracting a number of local beach goers and tourists. A recent study classified Zone B a "natural and spiritual sanctuary" attracting tourists for its religious and natural sites, historical attractions, ruins and religious landmarks (Plan Bleu/SES, 2015).

Although Zone C "has adopted the tagline on ancient Coastal Land" (Plan Bleu/SES, 2015) only six hotels and beach resorts are established in this zone two of which are in Saida and the remaining four are located in Tyre (UNEP/MOE, 2013), probably due to the unstable security situation historically witnessed in this area.

2. Environmental Services

2.1. Wastewater management

Wastewater management is considered a national priority. On one hand, disparities in sewer network coverage are observed throughout the country with main cities such as Beirut, Tripoli and Saida benefiting from the highest coverage due to population density in these areas. However, most of these cities' networks are old and require immediate rehabilitation works, with the

exception of the city of Beirut. On another hand, wastewater treatment efficiency at the national level is still below acceptable levels with estimates indicating around 8% average treatment rate prior to discharge through sea outfalls (MoE/UNDP/ECODIT, 2011) (MOE/EU/UNDP, 2014).

Zone A benefits from an average wastewater network coverage reaching 67.4% (up to 91% in city of Tripoli). Three WWTPs were constructed in this zone. Tripoli treatment plant started operation in 2013 and consists of a secondary treatment facility. The project is supposed to cover Tripoli coastal area, Al Qalamoun, some parts of Koura and Zgharta districts, the coastal areas of Beddawi, Deir Amar and El Minyeh (hence serving the equivalent of 1,000,000 inhabitants). Tripoli treatment plant is currently operational at 20% of design capacity owing to incomplete of network connection works. Two other primary treatment facilities are constructed in Batroun and Chekka but still not yet operational. Sea outfalls are commonly identified along the coastal zone and consist of around 16 domestic sewage and 14 industrial outfalls. Most outfalls extend only a couple of meters or terminate near the coastline; thus not allowing effective dilution of wastewater (MoE/LEDO/ECODIT, 2001). Towns not connected to the sewer system still rely on septic tanks (27.3%) or on direct discharge into the environment. Recent publications reported the generation of 40.5 MCM/year of domestic wastewater (for the year 2010) in Zone A, the equivalent of 24,247 tons/year BOD5 load (MOE/EU/UNDP, 2014). The latter estimate did not take into consideration the impact of Syrian refugees on the wastewater sector, whereby an additional load of BOD5 equivalent to 9,467 tons/year is calculated for this zone A. Zone specific qualitative and quantitative data related to industrial liquid discharges is not available in the country, except for Selaata plant. The latter facility is expected to discharge directly in the sea, in the form of slurry, the equivalent of 950 tones/day of photogypsum, 0.7 tones/year of cadmium, 2 tones/year of lead and 2 tones/year of nickel (Darine Geara, 2010).

Zone B has the highest wastewater network connection coverage reaching around 79% (MOE/EU/UNDP, 2014). Beirut alone benefits from 96% network coverage (MoE/UNDP/ECODIT, 2011). Two WWTPs are constructed to serve the area namely Al Ghadir (pre-treatment facility currently operational at 50% of design capacity) and Al Jiyeh (Bio-filtration facility) stations with a design capacity to serve 250,000 and 80,000 PE respectively. Sea outfalls are commonly identified along the coastal zone and consist of around 39 domestic sewage and 9 industrial outfalls. Four sea outfalls are located in the Capital Beirut (namely in Ramlet el Baida, Carlton Hotel, Ras Beirut and Ain Mreiseh) near popular tourist attractions and beach resorts (Plan Bleu/SES, 2015). Unfortunately, wastewater generated in Mount Lebanon is discharged directly into the sea through coastal outfalls without any form of pretreatment specifically in areas such as the historic valley of Nahr Ibrahim, Zouk and Dora coastal areas (Plan Bleu/SES, 2015). Most outfalls are not properly designed to allow effective dilution (MoE/LEDO/ECODIT, 2001). Some inland towns are not yet connected to the sewer system and around 21% of households rely on septic tanks (MOE/EU/UNDP, 2014). According to World Bank, the annual load of BOD5 generated by local communities' amounts to 58,603 tons. Additional BOD5 loads generated by registered refugees is equivalent to 13,321 tones/year (MOE/EU/UNDP, 2014).

Sewer network coverage in Zone C is around 50% (MOE/EU/UNDP, 2014). Three WWTP were constructed in this zone, namely in the cities of Saida, Tyre and Nabatiyeh. Only Saida primary treatment and Nabatiyeh secondary treatment facilities are currently operational with the former working only at 50% of design capacity. According to World Bank, the annual load of BOD5 produced by local communities is equivalent to 20,945 tons while around 25,786 tones as

generated by Syrian refugees. Discharges from industrial zone in Ghazieh (where tanneries, chemical companies and slaughter house are located) and Bourj el Chemali are discharged in the Mediterranean directly without prior treatment.

2.2.Municipal solid waste management

Similarly to the wastewater management sector, the existing solid waste management infrastructure is not adequate to cope with unexpected increase in municipal waste volumes. The daily generation rate of MSW for zone A was estimated at 900 tones, the equivalent of 18% of the national rate. MSW collection coverage is generally high reaching up to 99% of the population in both rural and urban settings (SWEEPNET, 2012) (World Bank, 2011) (MoE/UNDP/ECODIT, 2011). The city of Tripoli alone generates 350 tones/day of MSW all of which are disposed of at the coastal rehabilitated semi-landfill located in the city (that lacks adequate bottom isolation or lining material) despite the availability of a sorting facility on site (SWEEPNET, 2012). The lack of proper infrastructure for waste treatment and disposal in most towns (with the exception of the cities of Tripoli and Minieh) encouraged open dumping/burning as a final disposal method. In fact, more than 80 municipal waste open dumps are identified within the study zone, seven of which are considered of high priority on the national level due to the associated adverse environmental impacts, thus requiring immediate intervention (ELARD, 2011). In view of this situation, a number of consequences are anticipating including overuse of the Tripoli coastal semi-sanitary landfill and the town of Srar's open dump as these two towns currently accommodate the highest rates of refugees. The increasing trend of illegal dumping of solid wastes is also one of the expected outcomes.

MSW generation rate in zone B was estimated at around 60% of the national waste load for the past five years. Recent estimate suggests an annual waste generation rate around 1,040,250 tones (produced by locals) and an added quantity of 117,165 tones/year produced by registered refugees in Zone B (MOE/EU/UNDP, 2014). The solid waste management developed for this area (excluding Jbeil District) is relatively advanced compared to the systems adopted in the rest of the country. This system has been operated by the same private company since 1997 under the supervision of CDR with a waste collection rate reaching 100%. In terms of treatment, the system comprised of different components including manual and mechanical sorting systems, baling and wrapping, followed by composting and landfilling (MoE/UNDP/ECODIT, 2011) (World Bank, 2011) (MOE/EU/UNDP, 2014). Recently, a total collapse of the waste management system adopted in Zone B was caused by closure of the main sanitary landfill due to public pressure. As a result, waste generated since mid-June 2015 has been mismanaged by local authorities through street accumulation and open dumping. This situation is alarming considering that more than 100 municipal waste open dumps already exist within the Zone B - out of which three are considered of high priority on the national level due to the associated adverse environmental impacts - excluding the closed but non rehabilitated Bourj Hammoud coastal dump (ELARD, 2011). Recent estimate suggests an annual local MSW generation rate around 365,000 tones as opposed to 41,610 tones/year produced by registered refugees in Zone C (MOE/EU/UNDP, 2014). Despite the availability of a number of MSW treatment facilities in this zone (with design capacities varying between 7 and 300 tones/day), increase waste generation rates witness during the past of couple of years weakened the existing infrastructure. Most of these quantities will probably be disposed of in open dumps, similarly to previous practices, whereby more than 160 municipal waste open

dumps were identified in Zone C - two of which are considered of highest priority on the national level due to the associated adverse environmental impacts (ELARD, 2011).

Associated adverse impacts will be translated into 1) increased amount of marine litter deposited on the coastline and accumulating on the seafloor; and 2) decreased bathing water quality; 3) increased chemical contamination.

Table 3 below summarizes the different sources of pressure identified in each selected zone as discussed in the previous section. A general list of environmental impacts associated with the different human activities conducted within the three zones under consideration is included summarized in Table 4 below.

Table 3: Different sources of pressure identified per Zone

Zone	Surface area (km^2)	Population	Number of Registered Syrian Refugees (UNHCR, 2015)	Description of Human Activities
A	2,024.8	763,712	282,593	• Large agricultural areas (in Aakkar & Abou Ali valleys) • Recreational beaches • The Palm island natural reserve (in Tripoli) • 37 hotels and resorts (mostly in Chekka, Tripoli & Batroun) • 560 industrial establishments (mainly located in Tripoli) including 3 ISIC Class I facilities (2 cement factories in Chekka and a fertilizer production establishment in Selaata) • 3 ports for oil & fuel storage and distribution (in Amshit, Chekka and Selaata) • A commercial port (in Tripoli) • 15 fishing ports (the busiest located in Tripoli) • 2 thermal power plants (in Deir Amar & Hreichi) • Wastewater management: Sewer network coverage around 67.4%; treatment rates do not exceed 8% at the national level. • Municipal waste management: 99% collection rate; 80 open dumps
B	4,954	1,845,840	345,999	• Recreational beaches • 271 hotels and resorts (mostly in Beirut & Jounieh) • 2,280 industrial establishments including 2 ISIC Class I facilities (in Bourj Hammoud & Dekwaneh) • 3 ports for oil & fuel storage and distribution (in Jieh, Dora & Zouk) • 2 commercial ports (in Beirut & Jounieh) • 2 thermal power plants (in Jiyeh & Zouk) • Wastewater management: Sewer network coverage around 79%; treatment rates do not exceed 8% at the national level. • Municipal waste management: 100% collection rate; 100 open dumps
C	1,987	800,000	131,000	• Large agricultural areas • Recreational beaches • 6 hotels and resorts (in Saida & Tyre) • 489 industrial establishments including 1 ISIC Class I facility (in Nabatiyeh) • 1 port for oil & fuel storage and distribution (in Zahrani) • 2 commercial ports (in Saida & Tyre) • 2 thermal power plants (in Zahrani & Tyre) • Wastewater management: Sewer network coverage around 50%; treatment rates do not exceed 8% at the national level. • Municipal waste management: 160 open dumps

Table 4: Environmental impacts associated with different sources of pressures

Source of Pressure	Associated environmental impacts
Urban development	
Population increase	• Soil and land degradation • Waste water generation • Solid waste generation • Noise and air pollution • Increased demand on natural resources (i.e.: water extraction…)
Economic development	
Agricultural sector	• Water quality deterioration due to uncontrolled use of pesticides & fertilizers • Soil and land degradation due to over-cropping and intensive livestock activities • Increased demand on natural resources (i.e.: irrigation from coastal aquifers…)
Tourism sector	• Soil and land degradation • Waste water generation • Solid waste generation • Noise and air pollution • Increased demand on natural resources (i.e.: water, seafood…) • Water quality degradation • Loss of the natural landscape
Industrial sector	• Soil and land degradation • Waste water generation • Solid waste generation • Noise and air pollution • Increased demand on natural resources (i.e.: water extraction…) • Water quality degradation
Energy sector	• Oil spills • PCB contamination • Waste water generation • Noise and air pollution • Water quality degradation
Fishing sector	• Decrease in biomass due to mass fishing and illegal practices (i.e.: dynamite use, electric fishing, poisoning and trawling) • Increased marine litter • Water quality deterioration due to vessels maintenance through release of contaminants (i.e.: paints, heavy metals, oil spills…)
Transport sector (ports)	• Waste water generation • Solid waste generation • Noise and air pollution • Landscape degradation • Water quality deterioration due to release of maintenance related contaminants (i.e.: paints, heavy metals…) or oil spills • Marine ecosystem disturbance

The cost of environmental degradation in Lebanon has been estimated at 3.4% of GDP with water pollution accounting for the highest component of the cost - 1.07% of GDP (Sarraf, Cost of Environmental Degradation - The case of Lebanon and Tunisia, 2004). As part of the cost of environmental degradation (COED) study for Lebanon conducted by the World Bank in 2003, the recreational cost of coastal degradation was estimated using the travel cost method. The survey addressed beach recreation in eight beach areas from Tripoli North Lebanon to Tyre South Lebanon. The cost of recreation related to coastal degradation was estimated at USD 9-12 million per year or 0.05-0.07% of GDP (Sarraf, 2003) (Sarraf, Cost of Environmental Degradation - The case of Lebanon and Tunisia, 2004).

Moreover, under the cost of environmental degradation study another survey was undertaken to assess the losses in ecological and non-use values of the coastal zone associated with degradation. The study aimed at estimating the value Lebanese place on the restoration of Jounieh beach to save sea turtles facing extinction. The contingent valuation method (CVM) was used to ask respondents their willingness to pay (WTP) for the restoration of Jounieh beach through payments made yearly for a period of 10 years. The estimated value is USD 27-40 million per year corresponding to about 0.2% of GDP (Sarraf, 2003).

The COED for Lebanon in 2005 was updated in the Country Environmental Analysis study undertaken by the World Bank in 2011 and reached US$ 800 million (or US$ 969 million in 2008 prices) equivalent to 3.7 percent of GDP including the global environment with the following damage costs namely: water pollution (1.08% of GDP), air pollution (0.7% of GDP), coastal zones and cultural heritage (0.69% of GDP), soil pollution and wildlife (0.61%), Global environment (0.53%) and solid waste (0.09%). When compared to the COED of 2000, the updated COED 2005 shows a slight reduction in relative terms when compared to the GDP, a growth in absolute terms and the same ranking by category. The reduction is due to two factors: the 2002 ban of leaded gasoline has produced important environmental benefits in urban areas with a reduction of the cost of environmental degradation from 1.02% of GDP 0.7% of GDP to in terms of less cardio-pulmonary cases and loss of IQ; and the GDP (+20.7 percent) grew at a faster pace than environmental degradation (+13.2 percent) over the period in constant terms (World Bank, 2011).

In 2007, a study was undertaken by the University of Balamand with the funding from the European Commission under SMAP III on the economic valuation of the coastal zone of the Mohafaza of North Lebanon. “The annual willingness to pay (WTP) derived through the survey for the entire population to preserve the Coastal Zone reached a mean USD 41 per household per annum in 2005 prices. The WTP to preserve the direct consumptive (e.g., extraction such as fisheries), direct non-consumptive (e.g., recreational, transport/trade, etc.), indirect (ecosystem services) and environmental health (ill-health attributed to externalities and behavior) values ranged between USD 10 to 11 per household per annum for each category. The WTP represents 0.5 percent of household income on average. The WTP also helped derive the direct-indirect resource use conservation value, which reached an average of USD 5.9 million (equivalent to PPP$ 6.9 million and € 4.4 million) per annum. This figure could equally be divided between direct consumptive, direct-consumptive and indirect use as well as environmental health to reach just about USD 1.5 million per annum” (Doumani F. , 2007).

In the socio-economic evaluation of maritime activities in Lebanon report, the cost of degradation due to pollution of Ramlet-el-Bayda public beach (Zone B) was estimated at 343,200 USD per year based on the cost of illness approach (Plan Bleu/SES, 2015).

The cost of environmental degradation due to municipal waste in Beirut and Mount Lebanon (Zone B) was estimated in 2014 based on two distinct categories: the Cost Assessment of Solid Waste Degradation (CASWD) and the opportunity loss from interventions that could reap some benefits and improve the management of the waste sector in the future. The CASWD of Zone B reaches US$ 66.5 million (LP 100 billion) in 2012 with a variation between US$ 48 and 127 million equivalent on average to 0.3% of GDP in Zone B and 0.2% of the current national GDP of Lebanon in 2012. Conversely, the opportunity loss from interventions that could improve the waste sector management amounts to US$ 74 million (LP 112 billion) almost equivalent to the same GDP figures (Doumani F. , 2014).

3. Pollution trends

In general, studies confirmed bacteriological contamination in a number of samples collected from riverine and coastal environments. Parameters used for bacteriological water quality evaluation were based on coliform bacteria despite GES targets and "bathing water quality COP decision" requirements for adoption of intestinal enterococci as ab indicator if bacteriological contamination. In terms of chemical quality evaluation, a number of publications reported varying types and levels of contamination in Lebanese rivers. Chemical parameters tested included NO_3, SO_3, TDS, DO, mercury, cadmium, lead, chromium, Nickel and PO_4 depending on the objective of the conducted study. Summary of findings compiled from different reports is presented in Table 5. It's worth noting that the below table is not exhaustive due to the lack of quantitative published data.

Table 5: Compilation of Bacteriological and chemical contamination published results in riverine and coastal environments ((MoE/UNDP/ECODIT, 2011); (Kouyoumjian, 2012); (Plan Bleu/SES, 2015); (National Center for Marine Science, 2015))

Zone	Type of sample	Location	Type of contamination		Source of Contamination
			Bacteriological	Chemical	
A	River	Kabir	x	x	Wastewater, Agricultural
		El Bared	x	x	Wastewater, Industrial
		Abou Ali	x		Wastewater
	Sea	Tripoli	x	x	Wastewater, Industrial
		Batroun	x	x	Wastewater
		Selaata	x	x	Wastewater, Industrial
		Enfeh	x		Wastewater
B	River	Ibrahim	x	x	Wastewater
		Antelias	x	x	Wastewater
		Beirut	x	x	Industrial
	Sea	Dora		x	Industrial
		Zouk		x	Industrial
C	River	Zahrani	x		Wastewater
		Lower Litani (Qasmieh)	x		Wastewater
	Sea	Saida	x	x	Wastewater, Industrial
		Sarafand	x		Wastewater
		Tyre		x	Industrial

Estimates published in 2010 of yearly generated volumes of domestic sewage water - expressed in terms of BOD loads – amounted to around 103,795 tons in the three zones under consideration. The incremental increase in pollution loads, calculated in 2014, associated with the Syrian influx affecting these zones was estimated around 28,000 tons of BOD5.

An inventory of pollutants' discharge was published by the UNEP and the Ministry of Environment in 2015 (under the scope of the National Baseline Budget report) to evaluate trends in industrial emissions of fifty priority contaminants (whether liquid or gaseous). Total annual discharges computed are included in Annex II. The inventory also attempted to compare discharges across three different years (namely 2003, 2008 and 2013). Unfortunately inconsistency of data reporting during this time interval only allowed comparative evaluation

for 8 different pollutants. Despite the numerous study limitations, results were relatively indicative reflecting a cumulative increase in pollutants' emission as compared to the baseline year of 2003, except for gaseous mercury (showing a 50% decrease in emissions) and VOCs (showing undetectable change in trends) as summarized in Table 6 below.

Table 6: Cumulative emission trends for the year 2013 compared to year 2003 baseline

Pollutant	Human activities source of pollutant release	Cumulative emission trend in 2013 (%)
BOD5	• Wastewater treatment plants • Tanning sector • Textile manufacturing • Manufacturing of Paper and pulp • Animal farming • Processing of sugar beet • Manufacturing of olive oil and other vegetable oils • Manufacturing of wine and spirits • Manufacturing of beer • Manufacturing of non-alcoholic beverages	+ 34
Cadmium (gas)	• Energy Production • Cement Manufacturing	+ 52
Chromium (gas)	• Energy Production • Cement Manufacturing	+ 5
Chromium (liq)	• Manufacture of Phosphate Fertilizers and Phosphoric Acid • Textile manufacturing	+ 28
Mercury (gas)	• Energy Production • Cement Manufacturing	- 49
PCDD / PCDF (gas)	• Energy production • Manufacturing of paper and pulp • Cement Manufacturing • Manufacturing of lime and plastic • Casting of iron and steel • Second stage aluminum, copper and lead smelting • Manufacturing of textile • Manufacturing of glass and glass products • Incineration of industrial waste • Urban road transport • Residential fuel burning	+ 3
Total nitrogen	• Tanning sector • Animal farming	+ 80
Total phosphorus	• Animal farming	+ 69
VOC	• Transport and manufacturing of petroleum products • Manufacturing of textile • Paint manufacturing • Processing of sugar beet	0

4. Updated hotspots

Update of the list of hotspots identified in the NAP published in 2005 was performed based on the methodology provided by UNEP/MEDPOL program. Details of the hotspot evaluation criteria and evaluation used relevant to each zone are included in Annex III. Results shed the

light on the unsuccessful efforts, especially in the field of wastewater and industrial discharges management, to eliminate important sources of environmental pressure during the last decade as previously identified hotspots persisted while new hotspots emerged as listed in Table 7.

Based on the UNEP/MEDPOL updated methodology for the hotspots evaluation, priority hotspots are considered as cities/towns suffering from high outflow of pollutants into the coastal environment. Immediate intervention to eliminate the sources of pressure emanating in these areas are of high priority. Eight priority hotspots were identified across the country, all of which are located within the coastal stretch. The cities of Beirut, Saida and Tripoli are included in the priority hotspots list.

Hotspots are cities/towns suffering from environmental degradation however their adverse impact on the Mediterranean is not as pronounced as that of priority hotspots. Fourteen hotspots were identified in total in Lebanon.

Potential hotspots are areas witnessing a certain level of human activities and environmental degradation that can develop in the future into a high impact on the marine environment. Those sites are to be monitored and managed carefully to avoid situation worsening. The city of Sour was the only city classified under this category.

Table 7: Updated list of hotspots

Zone	City/Town	Hot spot category		
		Priority hot spot	Hot spot	Potential hot spot
A	Batroun/Selaata		X	
	Chekka		X	
	Enfeh		X	
	Tripoli	X		
	Deir Amar		X	
	Minieh		X	
	Adweh		X	
	Arida		X	
	Aabdeh		X	
B	Jiyeh		X	
	Beirut	X		
	Bourj Hammoud/Dora	X		
	Antelias	X		
	Bauchrieh	X		
	Zouk	X		
	Jounieh		X	
	Hbeline		X	
	Byblos		X	
C	Saida	X		
	Ghazieh	X		
	Sarafand		X	
	Sour			X
	Ras el Ain		X	

5. Legal framework

The legal framework addressing municipal solid waste management (MSWM) is incomplete and only few existing legal texts directly tackle the subject. Recent attempt of the Ministry of Environment (MoE) to resolve the incompleteness and fragmentation issue was translated by

submission to the Council of Ministers, in 2012, a draft law on integrated solid waste management (ISWM). Unfortunately, enactment of this law is still pending the approval of the parliament. A draft decree for hazardous waste management is currently being prepared by MoE.

The situation in the field of municipal wastewater management is not different. Existing legislation contains few laws which are the directly related to wastewater management. In fact, the only legal texts addressing the SAPMED and regional plans requirements consist of two Ministerial decisions issued by MoE that sets guidelines and standards for pollution control in general, including wastewater related provisions.

The legal framework addressing industrial discharges in Lebanon is general and weakly structured. Most legislation issued by the government is general texts mainly addressing classification of industrial establishments based on ISIC code (Decree 5243/2001) and environmental compliance (Decree 8471/2012). Economic instruments were introduced through law 444/2002 to promote such compliance. Decision 52/1 of 1996 (and its amendment Decision 8/1 of 2001), is considered the only specific regulation, setting ELVs for specific pollutants released by the industrial sector, specifically treated effluents' discharges into municipal sewers and surface waters. These ELVs are currently being revised by MoE. It's worth noting, that MoE is also working on finalizing the draft decree for classification and management of hazardous waste while a Clean Air Act was drafted and submitted to the CoM, but the latter law has still not been approved by the parliament.

Table 8 below lists the SAPMED and regional plans requirements and the associated national provision. Requirements relevant to the releases of mercury from chlor alkali plants were not included in this table since such industrial activity is not developed in Lebanon.

Table 8: List of SAPMED, ECAP and regional requirements and associated national requirements

Requirements (SAPMED, ECAP, Regional plans)	**National Provision**
Limit concentrations of key nutrients in the marine environment to levels which are not conducive to eutrophication	Existing requirements for water quality promoting natural development of aquatic life including limit values for nitrogen and phosphorus (Decision 52/1 of 1996 - Annex 3)
In case the food sector installation discharges into the sewerage system, the competent authorities shall establish ELV and an authorization compatible with the operation and the emission discharge values of the urban waste water treatment plant	ELVs for discharges in sewer, not specific to food sector installations, set at 125 mg/l for BOD5 and at 500 mg/l for COD (Decision 8/1 of 2001 - Annex 5) without taking into consideration compatibility with the operation and the emission discharge values of the urban waste water treatment plant. Instead, the decision hinted to an agreement that has to be reached between the owner of the installation and operator of wastewater treatment facility to determine ELV compatible with operation and the emission discharge values of the urban waste water treatment plant
Adopt emission limit values (ELV) for BOD5 in urban wastewater after treatment in accordance with the requirements of the "regional guideline on the reduction of BOD5 from urban waste water"	Decision 8/1 of 2001 - Annex 5: sets limit values for sea water discharge in case of primary treatment at <200 mg/l BOD5 and in case of secondary treatment at <50 mg/l which is in compliance with the "regional guideline on the reduction of BOD5 from urban waste water"
Adopt the criteria and standards for bathing waters in the Mediterranean region based on Intestinal enterococci	Bathing water quality standards are still based on coliform counts instead of intestinal enterococci (Decision 52/1 of 1996 - Annex 4)

Requirements (SAPMED, ECAP, Regional plans)	National Provision
Adopt National ELVs for mercury emissions based on values included in the "regional plan on the reduction of inputs of mercury" from other than Chlor Alkali industry	Decision 8/1 of 2001 - Annex 2.8 sets ELVs for mercury generated from MSW incinerators at 0.05 mg/m^3 which is compliant to the regional plans requirement. Annex 3 sets limit values for Total Hg in sea discharges from other establishments at 0.05 mg/l. Annex 5 sets the limit value for Total Hg discharged in sewer system at 0.05 mg/l.
Prohibit and/or take legal and administrative measures necessary to eliminate the production and use, import and export of POPs and their wastes	Beside the ratification of Stockholm Convention by the GoL, associated local legislation are still lacking

6. Institutional framework

The approach adopted so far by Government of Lebanon was based on increasing investments with a relative disregard to 1) prioritization of investments; 2) reallocation of the O&M costs; and 3) devising a management system allowing financial sustainability, such as introducing fees, tariffs, and eco-taxes among other economic instruments.

In the field of solid waste management, three main strategies were endorsed and issued by CoM in the last decade. The first strategy endorsed by CoM in 2006 proposed adoption of recycling and composting methods, to the greatest extent possible, for waste recovery and landfilling for final disposal of rejects (Decision No.1 dated 28/6/2006). The main challenges for successful implementation of this strategy consisted of:

- High cost of investments projected; and
- Prevalence of the NYMBY Syndrome which prevented the government from identifying landfilling sites.

In 2010, a new strategy was endorsed by the CoM (Decision 55 of 1/9/2010) introducing the concept of waste to energy (WTE), mainly in large cities, while building on the 2006 strategy for the remaining parts of the country. The latter strategy basically fulfilled the requirement of the regional plans, especially in terms of "*Urban solid waste management is based on reduction at source with the following waste hierarchy: prevention, re-use, recycling, recovery, and environmentally sound disposal*". For this purpose, a set of legal, institutional, economical and technical measures were also developed by the strategy to ensure successful implementation. Few years after endorsement of the 2010 strategy, limited progress was achieved in the field of solid waste treatment and final disposal due to the public controversy created by the strategy and lack of political will to adequately address this issue.

It's worth noting that a master plan for the closure and rehabilitation of uncontrolled dumps all around the country was published in 2011. The plan included an inventory of uncontrolled dumps identified in the country and amounting to almost 700 sites as well a list of priority interventions to be adopted to fulfill the regional plans requirement regarding *"Control of impacts of litter on marine life to the maximum extent practicable"*.

The country environmental analysis report published by MoE, in 2011, conducted a comprehensive assessment of the strategies adopted in the field of solid waste management.

The report resulted to a list of new mitigation options aimed at optimizing investments in terms of both economic and environment benefits.

As a result of closure of the main sanitary landfill in the country and the inability of the government to find an alternative site or to implement the 2010 strategy, the CoM issued in 2014 an emergency plan for solid waste management, under Decision 46, pushing forward the concept of waste to energy as a national solution coupled with recycling and waste recovery approach. The latter plan followed the same path of its sister strategies. A major solid waste management crisis is currently creating a big wave of chaos and controversy in the country.

Development of national plans and strategies for wastewater management in Lebanon did follow for the past decade the same fate as that of MSWM. Even after the endorsement of national wastewater management plan in 1994 - focusing on rehabilitation and expansion of the existing infrastructure - only few of the proposed sewage treatment facilities were constructed and operated while the remaining facilities are still either under construction or waiting for funding.

In 2012, the Council of Ministers endorsed the national water sector strategy prepared by the Ministry of Energy and Water (MoEW). The strategy addressed the wastewater sector with short to long-term targets covering a period of ten years and revolved around four main axes - all of which were aimed at fulfilling the regional requirements - namely:

- Improving wastewater collection and treatment efficiency on the national level to reach 80 percent in 2015 and 95 percent in 2020 as compared to a current services efficiency estimated around 60 percent for collection and 8 percent for treatment;
- Reaching 100 percent efficiency in pretreatment of industrial wastewater by 2020;
- Reaching 20 and 50 percent efficiency in terms of treated wastewater reuse by 2015 and 2020 respectively; and
- Achieving full recovery of all operation and maintenance cost in this sector by 2020.

Unfortunately, the strategy was not fully implemented and most targets set to be achieved by 2015 are still pending execution. In fact, water cost recovery is only achieved today in BML despite low tariffs, whereas treatment and disposal waste cost recovery is quasi-inexistent because the very low municipal fee is barely collected for waste collection and drainage (Arsifa wa Majarir) by municipalities. Water sector's O&M costs are subsidized by GOL transfers through the MOEW.

Moreover, the country environmental analysis report published by MoE, in 2011, conducted a comprehensive assessment of the management strategies adopted so far by the Lebanese government with respect to the wastewater sector and proposed mitigation options aimed at optimizing investments in terms of both economic and environment benefits. Proposed options targeted a reduction in the municipal amount of BOD5 generated in 2010 - estimated at around 165,563 tons - to 8,000 tons in 2030. However, progress in this regard was not achieved since the latest NBB report indicates a cumulative increase in BOD5 discharges of 34% as compared to the year 2005.

A strategic environmental assessment (SEA) for the aforementioned water sector Strategy was recently published resulting of a set of recommendations to evaluate and improve implementation of the Strategy (ECODIT, 2015). However, till the date, the MoEW didn't endorse this SEA.

With respect to management of the industrial sector, the lack of strategies or plans addressing industrial solid waste management is considered a clear indication of the unpreparedness of the concerned public agencies to manage this portfolio, whether in terms of existing infrastructure or financial and human capabilities. Recently, an action plan addressing management of industrial effluents was prepared by MoE (and published in 2013) in consultation with different stakeholders. The main objective of the action plan was to draw the road map for strengthening environmental compliance of the industrial sector and hence ensure sustainability of environmental resources. Execution of this plan was initiated by the MoE through implementation of a number of activities that comply with the general spirit of the action plan.

7. Monitoring mechanisms

Different governmental agencies are currently involved in the field of MSWM with no clear definition of the boundaries of jurisdiction of each, thus creating a leadership vacuum. In fact, Although Law 64/1988 condemned littering in the general contexts and set penalties for violators, the party responsible of enforcing this law is not explicitly defined as preservation of natural resources is considered the responsibility of MoE (Law 216/1993), while municipalities are responsible of ensuring cleanliness of the public domain (Decree 8735/1974). It's worth noting that the enforcement role of municipalities is not well practiced in Lebanon, due to the lack, in most cases, of human and financial resources, competencies, equipment (material resources) and lack of follow up from the central government. Furthermore, Law 444/2002 made reference to the environmental police responsible of controlling environmental violations, however, application decree for the creation of this body is not yet approved by CoM.

Additional monitoring requirements are relatively fulfilled as presented below:

- Requirement 1: Appointment of lead agency that will be responsible of "seeking direct cooperation with other Contracting Parties, with assistance of the MEDPOL or competent international and regional organizations, to address trans-boundary marine litter cases".

This role is currently being played by MoE although an official appointment in this regard was never made by the Lebanese Government.

- Requirement 2: Identification of potential parties responsible of "controlling impacts of litter on marine life to the maximum extent practicable".

Different local NGOs are currently involved in reducing the adverse impact of marine litter. For instance, Operation Big Blue Association (OBBA) is the NGO responsible of organizing and managing marine litter clean-up campaigns. It's is worth noting that despite all the efforts invested by OBBA to organize beach clean-up activities, mobilize communities in this respect and collect quantitative data during campaigns, a well-developed National Monitoring Program coupled with a scientific database on Marine Litter is not yet developed, due to the lack of technical expertise and financial resources.

Other NGOs specialized in biodiversity preservation are directly involved in the management of marine nature reserves (namely the Palm Islands Nature Reserve committee and the Tyre Coast Nature Reserve team) under direct supervision of the MoE. Although this system is not comprehensive, however it compensates to some extend the lack of human and technical resources at the MoE.

The institutional framework governing the wastewater sector is also considered incomplete and ineffective. Different players are involved often with overlapping functions and inadequate resources. To be more specific, although Law 221/2000 promoted decentralization of the wastewater management sector through transfer of executive responsibilities to Regional Water Establishments (RWEs), the latter law weakened the oversight responsibility of the Ministry over the RWEs. Furthermore, despite the important responsibilities assigned to RWEs through the latter law - all of which cover the requirements set by the SAPMED, ECAP and regional plans regarding the creation of a national body responsible for *1) "Enforcing the adopted ELVs by monitoring discharges from municipal wastewater treatment plants into the environment", 2) "Monitoring discharges from municipal wastewater treatment plants and take necessary measures to enforce national regulations" and 3) "Report on the implementation of the measures on the reduction of BOD5 from urban waste water and on their effectiveness"* – poor human and financial resources allocated to these establishments were the main barriers to effective management of the sector. In response to this situation, CDR continue to play, since 1977 (through Legislative Decree 5), a major role in this field, through participating in preparation of national sector plans in close coordination with the different line ministries, seeking international funding for these plans and managing their execution. In principle, CDR's intervention in this sector was expected to end after handing over the ownership of facilities and assets built to the respective line ministries or establishments, namely RWEs, for management and operation. Unfortunately, due to the management difficulties faced by the RWEs, CDR is still taking the lead in this field.

Law 221/2000 was also ambiguous regarding the responsibility of maintaining sewerage networks as this responsibility was considered under the mandate of Municipalities as per Decree 8735/1974. Accordingly, municipalities continue today to build or upgrade sewer lines separately from MOEW, RWE and CDR although they are considered inadequately equipped for this task.

Despite being the main authority responsible for controlling pollution and regulating all activities that impact the environment, MoE's jurisdictions with respect to wastewater management are limited to reviewing and approving EIA studies for construction and operation of STPs, setting ELVs for discharges from STPs and monitoring compliance. Unfortunately, effective implementation of the latter activity is frequently hindered by the lack of human, technical and financial resources at the Ministry. Nevertheless, paving the way towards an enhanced governance of the sector is translated by the draft Decree regulating environmental permits for wastewater discharges from classified establishments currently being prepared by MoE.

A number of non-governmental institutions are involved in the field monitoring marine environment. The National Center for Marine Sciences (NCMS) – a scientific institutions affiliated to the National Council for Scientific Research (NCSR) – is an example of establishments active in this domain. The center developed over the past decades a water quality monitoring program through which bacteriological and chemical parameters are periodically analyzed. Program activities include 1) monitoring coastal and bathing water quality; 2) preparing bathing water profiles or beach profiles; and 3) information dissemination to the public. However, the center's program was developed to service pure research and scientific purposes. Mechanisms for data exchange and management with the public agencies, namely MoE, is still not fully practiced despite the Memorandum of Understanding signed with NCSR. The main outcomes of such weak coordination can be summarized by ineffective interventions in case of bathing water contamination and inaccessibility of data by the public.

8. Economic and financial tools

Economic instruments (EIs) are rarely used in Lebanon to ensure adherence to environmental requirements. In fact, the few existing EIs proved ineffective when it comes to promoting behavioral changes at the consumer's level, ensuring compliance at the polluter's level, covering the O&M cost for service provision or even depollution costs.

Main inhibiting factors can be summarized by 1) insufficient legal provisions; 2) poor design of the instrument; 3) lack of monitoring data/ metering equipment to establish the base; and 4) lack of enforcement.

For example, in the water sector, finances for the water sector typically have come from taxes, bonds, donor contributions which do not send signals to the water sector on water shortages or scarcity, or to encourage rational water-use and water conservation, demand reduction, reuse and recycling. There is a total disconnect between cost of supply and demand on one side and tariffs on the other (USAID, 2011). So far, the Regional Water Establishments (RWEs) have not introduced wastewater tariffs as the water tariff ranges across regions between US$ 118 and US$ 157 with an average of US$ 138 per household per year for one m3 per day, although water provision lacks pressure, regularity, and continuity in most regions. Moreover, this tariff remains subsidized and does not cover O&M, even though the new MOEW water sector strategy calls for an increase of the water tariff to US$ 142 per household per year by 2011 and US$ 164 per household per year in 2015 (based on 1 m^3 water consumption per household per day) (World Bank, 2011).

As for the solid waste, the legal and institutional framework is antiquated and gives the wrong signals as a regulatory and even an economic instrument to municipalities, the private sector, and households. There is no tax levied on solid waste generation or on waste landfilled, which means that a share of the Independent Municipal Fund (IMFU) municipality scarce resources have been relocated towards the cost of treatment and disposal of solid waste. The IMFU is, however, in deficit, as payments made exceeded revenues collected on behalf of the municipalities. In other words, the municipalities could be said to be indebted to the Treasury. Therefore, the sector is not financially sustainable and is increasingly burdening public (Treasury advances) and municipal (forgone opportunity to use the funds for investment alternatives) finances. Municipalities perceive a fee for solid waste collection and sweeping that represents a fraction of the real cost incurred for SWM O&M. Given the municipalities' scarce resources and their inability to increase waste fees, most costs are covered by indirect taxes (resources transferred through the IMFU) that could have been put towards better use. As for treatment and disposal, the GOL is considering it as a public good and no fee is levied on treatment and disposal. Since solid waste treatment and disposal responsibility is not clear-cut, O&M and land expropriation have usually been covered by both municipalities through IMFU and the GOL through budget appropriation, whereas most capital investments in terms of loans and grants have been directly or indirectly (through CDR or third parties) provided by development partners (World Bank, 2011). Table 9 below provides a summarized description of the nationally adopted EIs per sector.

Table 9: Summary of applied economic instruments

Name of the instrument	Tax/ charge base	Tax/ charge rate	Use of revenues (recipients)
Irrigation charges	• Area Charges (lump sums periodic charges based on area irrigated)	• Varies between $140 and $650 /ha/yr	Operation and maintenance cost (Regional water establishments)
	• Volumetric Charges (used in case of pressurized networks, where hydrants are equipped with water meters)	• Varies between $0.10 and $0.15/$m^3$	
Water tariff	• A flat water tariff per household per year for one m3 per day regardless of consumption rate	• US$ 118 to US$ 157 (with an average of US$ 138)	Operation and maintenance of treatment stations and network (Regional water establishments)
solid waste collection and sweeping tariff	• The housing unit lease assessment	• 1.5 % of the housing unit lease assessment	Drainage sewerage network O&M and solid waste collection (Municipalities)
Economic incentives for municipalities hosting landfills or MBT facilities	• Tone of landfilled waste • Tone of sorted and composted waste	• 6 $/tone of landfilled waste • 4 $/tone of sorted/composted waste	O&M for solid waste management (municipality)
Loans (0% interest) for pollution abatement technologies adopted by industrial establishments			

9. Implemented measures for pollution prevention and control

A number of interventions were proposed by the NAP 2005 to combat marine pollution. In the field of MSWM, few of these were implemented, as summarized in Table 10. In fact, Lebanon is faced with major challenges when it comes to addressing the municipal solid waste management:

- Legal and institutional reforms are needed to support policy implementation: update legislative texts, assign clear institutional responsibilities and improve governance in terms of accountability, regulation, O&M cost recovery, safeguarding, and compliance (carbon funding).
- SWM Plans endorsed by the COM should be coherent with the NPMPLT that was endorsed by the COM early 2009 and should be consistent with the ongoing investments that were driven by development partners of a number of newly implemented segregation and recycling facilities.
- Capital investment needs are substantial, which will require leveraging from both development partners and the private sector.
- Cost recovery through tariff/fee/tax increases remains an afterthought in SWM Plans, which preclude that a larger share of IMFU monies as well as the GOL Treasury advances will be needed to achieve the full cost recovery.
- Engaging the public at all levels (policy formulation to implementation) to reach a consensus and avoid repeating previous mistakes. Awareness campaigns should be designed to reflect a coherent policy and avoid public resistance (World Bank, 2011).

It is also worth noting that efficiency of MSW treatment varies from one facility to another, depending on the efficiency of operations. A number of factors were reported to impede treatment operations, these included 1) lack of technical expertise at the level of facility operators; 2) lack of a solid monitoring and follow up mechanism at the level of local authorities due to the deficiency in technical and human resources; 3) lack of financial resource to maintain and upgrade the MSW facilities; 4) lack of monitoring and enforcement from the regulator, namely MoE. Operational targets set at the design stage for these MSW facilities, based on data related to waste composition in the country, projected a 10% recovery of recyclable material and 60% of organic waste. Unfortunately, these targets were not achieved at most of the facilities and more than 35% of the treated waste ended up either in controlled or uncontrolled open dumps.

In terms of domestic wastewater management, Table 11 summarizes progress made since 2005. The CDR wastewater implementation plan, including network and plants, was estimated at US$ 3.5 billion until 2030 in current prices, targeting a 6.5 million population equivalent and leaving a 1.2 million population equivalent gap by 2030. Nevertheless, the plan is behind schedule and lacks coordination as (World Bank, 2011):

- Most large-scale municipalities have either 1) wastewater networks without wastewater treatment plants and/or pumping station or 2) wastewater plants without the related networks. While the former phenomenon is directly associated with the lack of political will translated into the inability of the government to locate and expropriate a land for the construction of the treatment plant/pumping station, the second is directly related to the

unclear distribution of responsibilities between concerned municipalities and RWE and the associated lack of financial resources;

- Inland communities have neither sewerage networks nor treatment plants, which increase the risk of groundwater contamination;
- The communities in rural areas usually use on-site sanitation (septic tanks) where the authorities do not control any of them; and
- Few communities treat their effluents in small treatment plants that often are not properly operated and maintained.

Table 10: List of implemented measures for pollution prevention and control in the field of MSWM

Zone	Location	Project Type	Population served	Project Status
A	Minieh	MSW Sorting and Composting plant	130,000	Operational and expansion in process
	Tripoli	MSW sorting Facility	500,000	Constructed and soon to become operational
		MSW Composting facility		Under preparation
		RDF preparation		Under preparation
		Rehabilitation of the controlled dump (as proposed by NAP 2005)		Not achieved
		Infectious waste treatment (Haykal Hospital)	NA	Operational
	Zgharta	Infectious waste treatment (Local NGO)	NA	Operational
	Srar	Rehabilitation of the dumpsite	550,000	Under preparation
		MSW Sorting, composting and landfilling facilities		
	Michmich	Michmich Sorting and composting facilities	17,000	Constructed but not operational
	Koura	MSW sorting, composting and landfilling facilities	80,000	Under preparation
	Zgharta	MSW sorting and composting facilities	100,000	Under preparation
	Daniyeh	MSW sorting and composting facilities	173,000	Under preparation
B	Beirut	Rehabilitation of Normandy Dumpsite	NA	Completed
	Bourj Hammoud	Rehabilitation of Dumpsite	NA	No information
C	Tyr	Rehabilitation of Ras el Ain Dumpsite	NA	Planned (Funding approved)
	Saida	Rehabilitation of Dumpsite	NA	Ongoing

Table 11: Status of wastewater management interventions proposed in NAP 2005

Zone	Location	Project Title	Linked Hot Spot	Population to be served (PE)	Project Status in 2015
A	Chekka	Chekka WWTP	No info	24,000	Facility and network under construction
	Batroun	Batroun WWTP	Batroun	30,000	Facility constructed and sewer network almost completed. Full operation of STP depends on siting and installing pumping station
	Tripoli	Tripoli WWTP	Tripoli	1,000,000	Operational since 2011 at 20% of its design capacity due to poor or absence of proper sewer network within coverage area
	Koura	Koura WWTP	No info	68,000	No WWTP will be constructed in this area, but instead koura will be connected to Tripoli WWTP. The construction of the sewer network is currently under preparation with secured source of funding
B	Beirut	Rehabilitation of wastewater sewer networks	Greater Beirut	N/A	Completed
		Carlton-Ghadir coastal collector	Greater Beirut	N/A	Completed
		Ghadir WWTP	Greater Beirut	250,000	Operational & Extension/Upgrade planned
		WW collectors in North and South Beirut	Greater Beirut	N/A	Completed
	Jbeil	BiofiltrationWWTP	Jbeil	50,000	STP and network under construction
	Jiyeh	BiofiltrationWWTP	No info	88,000	Completed but non-operational pending completion of network works
	Tabarja	BiofiltrationWWTP	Greater Beirut	505,000	Planned and funding secured
	Bourj Hammoud	Pre-treatment WWTP	Greater Beirut	2,200,000	Still in planning phase and funding secured. Unforeseen implementation due to facility siting problems
C	Saida	WWTP & wastewater collectors	Saida	630,000	Operational but problems of rainwater infiltration into the sewer network
	Nabatieh	WWTP (secondary treatment)	No info	100,000	STP and network completed and operational
	Tyr	WWTP	Sour	200,000	STP completed but non-operational pending completion of the network works

10. Implemented and ongoing projects since year 2005

A number of environmental projects aimed, directly or indirectly, at controlling and/or reducing priority contaminants into the marine environment were initiating after the preparation of the NAP in 2005, and some are still in progress till the date. Table 12 below lists and gives a brief description of these projects.

Table 12: List of Implemented environmental projects since year 2005

Project name (Implementation period)	**Project description**
Lebanese Cleaner Production Center (LCPC) (2002-till date)	The center was created to promote sustainable and continuous application of cleaner production (CP) by the industrial sector. It provides a platform for demonstrating CP methods and providing technical assistance in pollution abatement field. During the first 5 years of the project, target industrial sectors included: agro-food and canning, dairy, paper & cardboard, plastic production & recycling sectors
Demonstrating and Promoting Best Techniques and Practices for Reducing Health-Care Waste to Avoid Environmental Releases of Dioxins and Mercury (2009-2013)	The Project aimed at demonstrating the effectiveness of non-burn health-care waste treatment technologies, waste management practices and other techniques to avoid environmental releases of dioxins and mercury
State and Trends of the Lebanese Environment (SOER) (2010)	A ten chapters report diagnosing the state of the environment in Lebanon and providing substantial information for decision makers.
Shared Environment Information System (SEIS) (2010-2014)	The project aims to improve environmental monitoring and data and information sharing by gradually extending the SEIS principles to the European neighborhood
Lebanon's second national communication to the UNFCC (2011)	A national inventory of Lebanon's anthropogenic emissions by sources and removals by sinks for the year 2000 of all GHGs covered by the Kyoto Protocol as well as indirect GHGs (CO, NOx, SO2, and NMVOCs)
Environmental Resources monitoring in Lebanon (2011 – 2013)	The project aims at improving environmental monitoring in key sectors, namely on coastal and marine resources, through provision of policy guidance and implementation of management programs consistent with environmental priorities defined by the Ministry of Environment.
Technology needs assessment for climate change (2012)	Identification & analysis of priority technology needs to mitigate GHG emissions and reduce the vulnerability of sectors and livelihoods to the adverse impacts of climate change
Regional – Governance and Knowledge Generation (REGOKO) (2012 - 2015)	A regional project aimed at enhancing the process of integrating environmental issues into sectoral and development policies.
PRTR (2013)	The project consisted of developing an environmental database or inventory of potentially harmful releases and transfer to air, water, and soil from both diffused and point sources
IDF (2013)	The project aimed at improving the governance of the Ministry of Environment over the industrial sector
Industrial Statistics (2013)	The project developed a system & a database to record industrial permits taking into consideration information such as the type and owner of industry, classification of industrial activity, location (administrative region) and contact details.
Lebanon Environmental Pollution Abatement Project (LEPAP) (2014 – still ongoing)	The project promotes environmental compliance of the industrial sector by supporting the financing of pollution abatement interventions, through near zero percent interest loans supported by Bank du Liban

Project name (Implementation period)	Project description
SWEEP-NET country report on the solid waste management in Lebanon (2014)	The project produced a report containing updated information on the SWM sector in Lebanon
Support to Reforms - Environmental Governance" Program (STREG) (2014 – still ongoing)	The project's overall objective is to improve environmental performance of the Lebanese public sector through performing environmental governance, and with the purpose of: 1) Creating effective capacity, specifically at the Ministry of Environment, to plan, execute and enforce environmental policy; and 2) Mainstreaming environmental policy through coordinating with key line Ministries.
PCB Management in the Power Sector Project (2015 – still ongoing)	The project development objective is to dispose of high risk PCBs and improve the inventory management of transformers in the power sector in an environmentally sound manner
Update of the National Implementation Plan for management of POPs (2015 – still ongoing)	The project consist of updating the NIP taking into consideration the newly added POPs through update of the POPs inventory and POPs contaminated sites.
Sustainable Consumption and Production Action Plan for the Industrial Sector in Lebanon (2015 – still ongoing)	The project aims at developing a Sustainable Consumption and Production (SCP) Action Plan for the Industrial Sector in Lebanon through adoption of a consultative approach for mainstreaming SCP in the industrial sector's policies and plans
Switch-Med-Med TEST-II project (2015 – still ongoing)	The Switch-Med/Med TEST II project aims at increasing the supply and demand of sustainable production services to industry by 1) Demonstrating to industry the business case for more sustainable production through the identification and application of integrated environmental management approaches; 2)Strengthening the local market of industrial service providers in the field of resource efficiency and cleaner production; 3) Providing recommendations for harmonizing and reinforcing policies to support the introduction of resource efficient and clean technologies in industry

CHAPTER 6: IDENTIFICATION OF GAPS

1. Introduction

Lebanon, like a number of neighboring Mediterranean countries, is facing numerous environmental challenges, more specifically with respect to coastal environment degradation, mainly as a result of a history of political turmoil and associated heavy economic burdens. During the past two decades, efforts to alleviate the prevailing situation culminated with the ratification of a number of international environmental agreements by the Lebanese government, one of which was Barcelona Convention for the protection of the Mediterranean Sea against pollution and some related protocols. Unfortunately, a number of factors have been impeding effective implementation of the latter convention and development of environmental issues continued to be reported nationwide. This chapter aims at highlighting the main obstacles – or gaps – to achieve the ECAP–GES and Regional Plans targets requirements in the framework of the SAP-MED whether at the policy, legal, institutional or technical levels. Baseline benchmarking was the main starting point for conducting the current gap analysis.

2. Legal framework

In the general context, the fundamentals for environmental management and preservation of natural resources were only introduced in 2002 to the Lebanese legal framework, through Law 444/2002. Prior to that period, scattered legal texts remained the only tools for management of environmental resources in the country. Major gaps identified within the legal framework include the following (refer to Table 13):

- ELVs issued under Decision 52/1 of 1996 and its amendment Decision 8/1 of 2001 require minor amendments to address specific issues; and
- Strengthen the existing legal and administrative framework needed to eliminate the production and use, import and export of POPs and their wastes to comply with the requirements of the ratified Stockholm Convention (Law 432/2002) and existing Ministerial Decisions banning import of some POPs waste (MoE Decision 71/1 of 1997) and import and use of POPs pesticides (MoA Decision 94/1 of 1998).

Table 13: Legal Gaps

Ecological Objective	RP Mandatory Obligations & SAP-MED Commitments	Gap Analysis
EO5	In case the food sector installation discharges into the sewerage system, the competent authorities shall establish ELV and an authorization compatible with the operation and the emission discharge values of the urban waste water treatment plant [deadline 2014]	Update Decision 8/1 of 2001 - Annex 5 to specifically address food sector installations in terms of ELVs for discharges in sewer explicitly taking into consideration compatibility of discharges with the operation and the emission discharge values of the urban waste water treatment plant
EO5	Adopt the criteria and standards for bathing waters in the Mediterranean region based on Intestinal enterococci	Update Decision 52/1 of 1996 - Annex 4 to consider Bathing water quality standards in terms of intestinal enterococci instead of coliform counts
EO9	Prohibit and/or take legal and administrative measures necessary to eliminate the production and use, import and export of POPs and their wastes [deadline passed]	Develop and strengthen implementation of existing legislation regulating controlled production, use, import and export of POPs and their wastes and accelerate endorsement process for decree regarding total phase-out of PCB use currently being drafted at MoE

3. Institutional framework

The institutional framework governing the wastewater sector is considered incomplete and ineffective. Different players are involved often with overlapping functions and inadequate resources. These include the Ministry of Energy and Water (MoEW), Regional Water Establishments (RWEs), CDR, Municipalities and MoE.

In terms of meeting the EO5 requirements as indicated in Table 14, two main authorities are concerned namely RWEs – mandated under the tutelage of MoEW – and CDR. While the former authority is lagging behind in terms of monitoring discharges from municipal wastewater treatment plants to ensure compliance to the national ELVs due to the lack of human, financial and technical resources, the latter authority is fully assuming its responsibility when it comes to reporting effectiveness of BOD5 reduction from urban waste water. However, the mechanism of data sharing between CDR and other concerned authorities is not well established.

Institutional gaps associated with EO9 requirements, the responsibilities of different stakeholders are well defined, however, the lack of human, technical and financial resources remain the most common inhibitors to effective programs' implementation (as summarized in Table 14).

In terms of meeting the EO10 requirements, different governmental agencies are involved with no clear definition of the boundaries of jurisdiction which created a leadership vacuum. Table 14 summarizes the main gaps identified after reviewing the institutional framework.

Table 14: Institutional gaps

Ecological Objective	RP Mandatory Obligations & SAP-MED Commitments	Gap Analysis
EO5	Enforce the adopted ELVs by monitoring discharges from municipal wastewater treatment plants into the environment [deadline 2019]	Enforcement and monitoring responsibilities are under the mandates of RWEs. However due to the lack of human, financial and technical resources at RWEs enforcement mechanism are inexistant
EO5	Monitor discharges from municipal wastewater treatment plants and take necessary measures to enforce national regulations [Deadline 2019]	
EO5	Report on the implementation of the measures on the reduction of BOD5 from urban waste water and on their effectiveness [On a biannual basis]	CDR is the main authority overseeing the operation of wastewater treatment facilities and evaluating the effectiveness of treatment, however such data is not shared with other concerned authorities such as MoE, MoEW, Municipalities or RWEs
EO9	Support, promotion and facilitation of programmes of assistance in pollution control and reduction in the area of scientific, technical and human resources	The LCPC center was created to promote sustainable and continuous application of cleaner production (CP) by the industrial sector, however the center can benefit from additional human and financial resources to expand the scope of its activities at the national level. Additional support is provided through a number of donor funded projects such as LEPAP and MEDTEST II, however these are time limited projects.
EO9	Support, promotion and facilitation of capacities to apply, develop and manage access of cleaner production technologies as well as Best Available Techniques (BAT) and Best Environmental Practices (BEP)	
EO9	Provision of information to the public about bathing water quality and implemented management measures [Deadline 2016]	Bathing quality assessment reports are shared with the media through the NCMS. However, since the role of MoE is not clearly legislated in this domain, except with regard to setting limit values for bathing water quality, the scope of information dissemination is limited and the intervention in case of significant pollution levels are not coordinated
EO9	Monitor releases of mercury into water, air and soil in order to verify compliance with the requirements [Deadline 2015]	Lack of comprehensive monitoring program for mercury. Published data is based on scattered reports produced for research purposes
EO9	Monitor bathing water quality *[Deadline 2016]*	NCMS has developed a beach profiling program mainly based on bacteriological assessment (based on coliform counts) with only few chemical parameters tested
EO9	Prepare bathing water profiles or beach profiles [Deadline 2016]	
EO10	Enforce measures to combat illegal dumping including littering on beaches and illegal sewage disposal in coastal zones and rivers [deadline 2020]	The party responsible of enforcing measures to combat illegal dumping of MSW including littering on beaches is not well defined by the legal framework. Update of the Municipal law might be required to assign this responsibility to local authorities and municipalities Control of illegal sewage disposal is the role of RWEs, however due to the lack of human, technical and financial resources at these agencies the associated enforcement mechanisms are very weak.

Ecological Objective	RP Mandatory Obligations & SAP-MED Commitments	Gap Analysis
EO10	Seek direct cooperation with other Contracting Parties, with assistance of the MEDPOL or competent international and regional organizations, to address trans-boundary marine litter cases *[As appropriate]*	No gap, the MoE is currently responsible of this task
EO10	Control of impacts of litter on marine life to the maximum extent practicable [deadline 2015]	A local NGO in coordination with municipalities and local community has established a marine litter clean-up program. However, this NGO suffers from limited human, financial and technical resources and can benefit significantly from additional support from MoE
EO10	Report on the implementation of the National Marine Litter Monitoring Programme [On a biannual basis]	The NGO responsible of the National Marine Litter management Programme lacks the adequate technical and human resources to develop specific monitoring indicators, report and analyse such data
EO10	Urban solid waste management is based on reduction at source with the following waste hierarchy: prevention, re-use, recycling, recovery, and environmentally sound disposal [deadline 2025]	Urban solid waste management was purely based on end-of pipe interventions so far. Limited MoE intervention in the fields of prevention, re-use, recycling and recovery activities
EO10	By the year 2025 at latest, to base urban solid waste management on reduction at source, separate collection, recycling, composting and environmentally sound disposal	• Lack of waste reduction initiatives • Current collection and management crisis in Zone A • Recycling and composting programs need strengthening • Current crisis related to lack of environmentally sound final disposal solutions
EO10	Design National Monitoring Programme on Marine Litter [Deadline 2017]	• Lack of National Monitoring Programme on Marine Litter
EO10	Establish Regional Data Bank on Marine Litter *[Deadline 2016]*	• Scattered and inconsistent quantitative data on marine litter • Lack of a databank on marine litter

4. Requirements for pollution prevention and control measures

Serious commitment by the Lebanese government is required at the technical level to meet the regional plans' mandatory obligations and the SAP-MED Commitments. Lack of structural interventions was observed for the three different ecological objectives as summarized in Table 15.

Table 15: Technical gaps

tory Obligations & SAP-MED Commitments	Gap
of separate collection of rain waters and municipal s [deadline not specified]	Construction of rainwater collection network
of reuse of treated effluents for the conservation of rces [deadline not specified]	Upgrade wastewater treatment facility to allow reuse of treated effluent for the conservation of water resources
es and urban agglomerations of more than 100,000 are connected to a sewer system [deadline passed]	• Provide quantitative data regarding agglomerations' coverage with a sewer system (which requires Update of Population data last conducted in 1997) • Upgrade Ghadir WWTP and ensure full capacity operation • Construct Bourj Hammoud WWTP • Upgrade Saida sewer network and WWTP • Upgrade Tripoli sewer network • Complete the construction of sewer network needed for full operation of Tripoli WWTP • Construct pumping station in Batroun • Complete sewer network for Byblos area • Complete sewer network needed for full operation of Nabatiyeh WWTP • Closure of 58 sea outfalls for municipal wastewater
sary measures to establish adequate urban sewer and treatment plants that prevent run-off and riverine ter [deadline 2020]	
all agglomerations of more than 2000 inhabitants treat their urban wastewater before discharging them vironment [deadline 2019]	
of direct and indirect effects of nutrient over- in the marine environment *[Deadline 2015]*	• Adopt Best Agricultural practices to control nutrients runoffs into water streams and sea water especially in coastal zones • Control direct discharge of municipal sewer into water bodies through improvement of wastewater collection and treatment at the national level
trient inputs, from agriculture and aquaculture nto areas where these inputs are likely to cause eadline 2025]	
Food Plants outlined in Appendix I which discharge 4000 PE into water bodies shall meet the following ts: COD 160 mg/l or TOC 55 mg/l and BOD 30 mg/l 014]	Treatment of industrial wastewater rich in BOD, COD, nutrients and SS prior to discharge into water bodies
wastewater from industrial installations which are BOD, nutrients and suspended solids [deadline 2025]	
of BAT and BEPs for environmentally sound nt of POPs [deadline passed]	• Update database related to the use of POPs (currently in progress at MoE) • Implementation of national projects promoting BAT and BEPs for environmentally sound management of POPs
on of priority contaminants in biota, sediment or	• Development and implementation of a national monitoring program for

Ecological objective	RP Mandatory Obligations & SAP-MED Commitments	Gap
		• Provision of financial sustainability of such programs • Promote accreditation of Laboratories • Technical training and capacity building on standard methods of sampling and analytical procedures • Development of a databank
EO9	Phase out discharges and emissions and losses of mercury, cadmium and lead [deadline 2025]	• Implement BAT for control of discharges and emissions and losses of mercury, cadmium and lead mainly from power plants and industrial sector • Development of a databank for sources and quantities of discharges and emissions and losses of mercury, cadmium and lead
EO9	Eliminate to the fullest possible extent pollution of the Mediterranean Sea caused by discharges, emissions and losses of zinc, copper and chrome [deadline 2025]	
EO9	Phase out to the fullest possible extent discharges, emissions and losses of organomercuric compounds and reduce those of organolead and organotin compounds [deadline passed]	• Conduct an inventory to identify sources and quantities of discharges, emissions and losses of organomercuric compounds and reduce those of organolead and organotin compounds • Implement projects promoting phase out to the extent possible of organomercuric, organolead and organotin compounds
EO9	Phase out inputs of PAHs [deadline 2025]	• Conduct an inventory to identify sources of PAHs emissions • Implement projects promoting phase out of PAHs
EO9	Eliminate to the fullest possible extent pollution caused by discharges, emissions and losses of organohalogen compounds [deadline 2025]	• Conduct an inventory to identify sources of organohalogen compounds' emissions • Implement projects promoting phase out of organohalogen compounds
EO9	Eliminate to the fullest possible extent inputs of radioactive substances [deadline 2025]	• Conduct an inventory to identify sources of Radioactive waste (with the exception of radioactive medical waste which is currently being managed) • Implement projects promoting elimination to the fullest possible of radioactive substances
EO9	Dispose all hazardous wastes in a safe and environmentally sound manner [deadline 2025]	Provide the proper infrastructure for management of industrial hazardous waste, e-waste, hazardous medical waste…
EO9	Safeguard of the ecosystem function and maintenance of the integrity and biological diversity of species and habitats [deadline not specified]	• Creation of natural reserves • Implement projects aimed at organizing hunting activities
EO9	Restore marine and coastal habitats that have been adversely affected by anthropogenic activities [deadline not specified]	• Conduct a national assessment to evaluate the extend of environmental damage caused by anthropogenic activities to marine and coastal habitats and identify hotpots • Implementation of projects aimed at restoring and preserving marine and coastal habitats
EO9	Identify existing sites which have been historically contaminated with mercury [deadline passed]	Conduct a national inventory for historic use of mercury and potential contaminated sites

Ecological objective	RP Mandatory Obligations & SAP-MED Commitments	Gap
EO9	Apply environmentally sound management measures to sites which have been historically contaminated with mercury [deadline 2015]	Identify sites historically contaminated with mercury and implement relevant restoration projects
EO9	Achieve environmentally sound management of metallic mercury from the decommissioned plants [To be achieved following decommission]	Not applicable since chloralkali industry is not available in Lebanon
EO9	Progressively reduce total releases of mercury (to air, water and to products) from existing Chlor alkali plants until their final cessation [deadline 2020]	
EO9	Take appropriate measures to isolate and contain mercury containing wastes [deadline 2025]	Implement projects aimed at restoring sites historically contaminated with mercury
EO9	Identify stock piles consisting of or containing POPs [deadline passed]	Update previously conducted inventories
EO9	Phase out inputs of the 9 pesticides and PCBs and reduce inputs of unwanted contaminants: hexachlorobenzene, dioxins and furans [deadline passed]	• Conduct an inventory on the national use of regulated and non-regulated pesticides at the national level • Update inventory on PCBs use at national level (currently in progress at MoE) • Implement projects aimed at phasing out the 9 pesticides reducing inputs of unwanted contaminants • Institutionalize and provide sustainability of previous and existing projects aimed at reducing inputs of unwanted contaminants such as hexachlorobenzene, dioxins and furans
EO9	Ensuring that water quality in bathing waters and other recreational areas does not undermine human health *[Deadline 2015]*	• Develop and implement a bathing water quality assessment/monitoring program • Provision of financial sustainability of such programs • Technical training and capacity building on standard methods of sampling and analytical procedures (namely for intestinal enterococcus bacteria) • Development of a databank for bathing water quality • Develop and implement a bathing quality deterioration warning system to preserve public health • Implement depollution projects to improve quality of bathing and recreational waters • Treatment of industrial water prior to discharge • Expand sewer network coverage and Upgrade of WWT plants • Implement projects aiming at the control of agricultural runoffs into bathing and recreational water
EO9	Minimization of effects of released contaminants to the marine environment such as not to give rise to acute pollution events *[Deadline 2015]*	
EO9	Prevention of acute pollution events and minimization of their impacts *[Deadline 2015]*	

Ecological objective	RP Mandatory Obligations & SAP-MED Commitments	Gap
		• Implement projects for control of marine litter reaching recreational water. • Rehabilitation of MSW dumps located on the coastal stretch or at proximity of river streams
EO10	By the year 2005 at latest, to base urban solid waste management on reduction at source, separate collection, recycling, composting and environmentally sound disposal in all cities and urban agglomerations exceeding 100.000 inhabitants and areas of concern	Implement projects aimed at promoting waste minimization, sorting at the source and recycling
EO10	Reduction of fraction of plastic packaging waste that goes to landfill or incineration [deadline 2019]	• Implement projects aimed at enhancing minimized production of plastic waste and plastic recycling
EO10	Ensuring adequate urban sewer systems, WWTP and waste management systems to prevent run-off and riverine inputs of Marine Litter [deadline 2020]	• Rehabilitation of MSW dumps located on the coastal stretch or at proximity of river streams • Expand sewer network coverage and treatment of wastewater prior to discharge in water bodies and streams
EO10	Application of cost effective measures to prevent any marine littering from dredging activities [deadline not specified]	Implement cost effective measures to prevent any marine littering from dredging activities
EO10	Adopt preventive measures to minimize inputs of plastic in the marine environment [deadline 2017]	• Implement projects for plastic waste minimization and recycling • Rehabilitation of MSW dumps located on the coastal stretch or at proximity of river streams
EO10	Implement programmes on regular removal and sound disposal of accumulations/hotspots of marine litter [deadline 2019]	• Conduct study to determine technological marine litter clean-up equipment (waste skimmers and sand filtering mobile machinery) to support existing marine litter clean-up programs • Provision of marine litter clean-up equipment (waste skimmers and sand filtering mobile machinery) to Ministry of transport and public work to support existing marine litter clean-up activities carried on by local NGOs and local authorities
EO10	Implement adequate waste reducing/reusing/ recycling measures in order to reduce the fraction of plastic packaging waste that goes to landfill or incineration without energy recovery [deadline 2019]	Implement plastic packaging waste minimization and recycling projects targeting public and big commercial institutions
EO10	Close to the extent possible existing illegal solid waste dump sites [deadline 2020]	Closure and rehabilitation of the open dumps identified by the master plan for closure and rehabilitation of open dumps in Lebanon (around 700 open dumps)
EO10	Remove existing accumulated litter from Specially Protected Areas of Mediterranean Importance (SPAMI) and litter impacting endangered species [deadline 2019]	Implement periodic marine litter clean-up activities in Specially Protected Areas of Mediterranean Importance (SPAMI) and areas populated with endangered species

Ecological objective	RP Mandatory Obligations & SAP-MED Commitments	Gap
EO10	Explore and implement National Marine Litter Cleanup Campaigns; participate in International Coastal Cleanup Campaigns and Programmes; apply "Adopt-a-Beach" or similar practices; and apply "Fishing for Litter" practices [Deadline 2019]	• Institutionalized existing National Marine Litter Cleanup Campaigns through partnership between MoE and NGO active in this field • Provision of technical support to NGO active in this field (i.e.: equipment, capacity building…) • Development of a databank for marine litter

5. Public participation, awareness and information access

Public participation in the decision making process is not a common practice in Lebanon, especially in the field of environmental resources management. As a result, information produced by public institutions are usually not shared nor made accessible to the public mainly for political reasons. Gaps were highlighted for all requirements related to this issue as summarized in Table 16.

Table 16: Gaps related to Public participation, awareness and information access

RP Mandatory Obligations & SAP-MED Commitments	Gap
Facilitation of public access to scientific knowledge and activities for protection and management of the environment	• Lack of educational programs accessible for the public in the field of environmental management • Scientific publications are not made accessible for free to public
Mobilization, participation and involvement of major actors concerned in protection and management of the environment (local and provincial communities, economic and social groups, consumers, etc.)	• Weak participation of major actors concerned in the protection and management of the environment in the decision making process • Public participation and public consultation processes are not well established • Lack of trust between NGOs and governmental agencies
Enhancement of public awareness and education of pollution, and involvement of various stakeholders with regard to marine litter management including activities related to prevention and promotion of sustainable consumption and production [Deadline 2015]	Environmental awareness material mostly developed by NGOs is not unified in its content nor validated or disseminated by the MoE
Provide to the public access to information available on the state of the environment of the Mediterranean and its evolution, and of the measures taken to improve it	• Minimal effort made by MoE to disseminate information • Public is mostly unaware of the information available either at the premises of MoE or on the website • Most Ministries' websites (namely MoE) are not user friendly and the process of continuous update of the content is weak • Quantitative information collected by Ministries is not shared/published
Collect information on the state of treatment and disposal of liquid and solid wastes	

6. Monitoring

In the field of monitoring, three main requirements were dictated all of which were not fully met at the national level. The main gaps are listed under each requirement as follows:

1. Gaps related to the requirement "Establish a monitoring programme of the inputs of priority pollutants identified in the SAP- MED and of the quality of the marine environment" included:
    - The monitoring program developed by NCMS does not cover most of priority substances and is not a continuous program. This is due to lack of adequate laboratory equipment and the financial resources to carry on a comprehensive monitoring program.
    - Data collected by the NCMS is not shared with MoE nor with other public agencies.

2. Gaps related to the requirement "Establish systems of inspection to ensure compliance with conditions laid down in the authorizations and regulations" included:
    - The monitoring program developed by NCMS does not cover most of priority substances and is not a continuous program. This is due to lack of adequate laboratory equipment and the financial resources to carry on a comprehensive monitoring program.
    - Data collected by the NCMS is not shared with MoE nor with other public agencies.

3. Gaps related to the requirement "Establish systems of inspection to ensure compliance with conditions laid down in the authorizations and regulations" included:
    - Very weak inspection, monitoring and enforcement by the MoE. Inspections are carried on based on public complaints submitted to the Ministry. Strengthening this mechanism would require additional human and technical resources as well as financial sustainability.

4. Gaps related to the requirement "Establish a permanent river water quality/quantity register" included:
    - Relevant data is collected by different parties (NCMS, RWEs, MoE, MoEW) and is not centralized nor shared.

7. Reporting

Reporting progress made in terms of protection of the Mediterranean Environment is not well developed in Lebanon. Both defined requirements were not met, including:

- Publish a report on the State and Evolution of the Mediterranean Environment; and
- Application of a unified reporting system for implementing the provisions of the Barcelona Convention, the Protocols, the SAP- MED, the Regional Plans and ECAP objectives.

The main problems can be summarized by 1) lack of a well-defined reporting mechanism/program at the MoE; 2) progress reports are usually prepared based on the donor's request or specific projects' requirements; and 3) the need for the creation of a unit at the MoE for coordination with stakeholders, data collection and centralization, data analysis and reporting under the provisions of the Barcelona Convention, the Protocols, the SAP- MED, the Regional Plans and ECAP objectives.

CHAPTER 7: NAP OPRATIONAL TARGETS

1. Rational and methodology adopted for selection of targets

The process of defining operational targets - aimed at improving adherence to SAP-MED provisions, Regional Plans commitments and EcAp-GES targets - was entirely based on the baseline assessment and gap analysis conducted under the scope of the NAP update process. Legal, institutional, economic and technical obstacles hindering compliance to specific Ecological Objectives (EO) were highlighted accordingly, thus facilitating the identification potential opportunities to improve performance at the national level.

Focusing the scope of work, however, necessitated adoption of a set of prioritization criteria based on which EO specific operational targets were developed, these included:

- Urgency of the requirement (based on the predefined timetable set by the SAP-MED provisions, Regional Plans commitments and EcAp-GES targets);
- Governmental priorities;
- Availability of basic infrastructure to build on (namely in terms of baseline data, implemented or ongoing projects…);
- Attainability of target within the set timeframe.

A first screening of the SAP-MED provisions, Regional Plans commitments and EcAp-GES targets was conducted by the NAP update Technical Committee (TC) to identify potential areas of intervention. As a result, a first draft of operational targets was developed addressing requirements for EO related to eutrophication, contaminants, and marine litter. A second round of consultation with the TC and concerned stakeholders (mainly representing MoE, MoTPW, MoEW, CDR and NGOs) was conducted, at a later stage, to validate the list of operational targets either based on existing data or sector specific experience. It's worth noting that the process of setting specific operational targets, especially in terms of percent reduction, was considered a challenging process due the unavailability of quantitative data, in specific fields, at the national.

2. Presentation of selected operational targets

Table 17 below represents the final list of operational targets developed with associated legal requirements and EO addressed.

Table 17: Operational targets set for each legal requirement

Ecological objective	Legal requirement	Operational Target
EO5: Eutrophication	Industrial Food Plants outlined in Appendix I which discharge more than 4000 PE into water bodies shall meet the following requirements: COD 160 mg/l or TOC 55 mg/l and BOD 30 mg/l [deadline 2014]	Ensure that all Industrial Food Plants outlined in Appendix I discharging more than 4000 PE into water bodies comply with the discharge requirement of a maximum COD 160 mg/l and BOD 30 mg/l by year 2020
	In case the food sector installation discharges into the sewerage system, the competent authorities shall establish ELV and an authorization compatible with the operation and the emission discharge values of the urban waste water treatment plant [deadline 2014]	Update ELVs for effluent discharged by food sector installations directly in the sewerage system and develop a discharge authorization system compatible with the operation and the emission discharge values of the urban waste water treatment plant by 2020
	Ensure that all agglomerations of more than 2000 inhabitants collect and treat their urban wastewater before discharging them into the environment [deadline 2019]	Reach 100% urban wastewater network and treatment coverage for agglomerations of more than 2000 inhabitants by 2019
EO9: Contaminants	Phase out discharges and emissions and losses of mercury, cadmium and lead [deadline 2025]	Reach 50% reduction in discharges, emissions and losses of mercury, cadmium and lead originating from the cement industry by year 2020 and 100% by year 2025
	Eliminate to the fullest possible extent pollution of the Mediterranean Sea caused by discharges, emissions and losses of zinc, copper and chrome [deadline 2025]	Reach 50% reduction in discharges, emissions and losses of zinc, copper and chrome originating from the cement industry by year 2020 and 70% by year 2025
	Dispose all hazardous wastes in a safe and environmentally sound manner [deadline 2025]	Ensure safe and environmentally sound disposal of e-waste produced by 2025
	Take appropriate measures to isolate and contain mercury containing wastes [deadline 2025]	Ensure safe storage and containment of mercury waste produced by healthcare sector by 2025
EO10: Marine Litter	Urban solid waste management is based on reduction at source with the following waste hierarchy: prevention, re-use, recycling, recovery, and environmentally sound disposal [deadline 2025]	Reach 15% recyclables recovery from the general municipal waste stream by 2020 and 20% recovery by 2025
	Close to the extent possible existing illegal solid waste dump sites [deadline 2020]	Close 10% and 30% of illegal municipal solid waste dump sites identified as top 20 priorities (by the master plan for closure and rehabilitation of uncontrolled dumps) by 2020 and 2025 respectively
	Explore and implement National Marine Litter Clean-up Campaigns; participate in International Coastal Clean-up Campaigns and Programmes; apply "Adopt-a-Beach" or similar practices; and apply "Fishing for Litter" practices [Deadline 2019]	Strengthen existing national programs for Marine Litter Clean-up to reach a 50% reduction in marine litter deposition on the beaches by 2019
	Implement adequate waste reducing/reusing/ recycling measures in order to reduce the fraction of plastic packaging waste that goes to landfill or incineration without energy recovery [deadline 2019]	Implement adequate waste reducing/reusing/ recycling measures in order to reach 3% plastic recovery from the general MSW stream by 2019

CHAPTER 8: PROGRAM OF MEASURES FOR POLLUTION PREVENTION AND CONTROL

1. Prioritizing Issues and Identifying Potential Measures

A full list of measures (LoM) was developed to bridge the existing gap between the Regional plans and SAP/MED related requirements to achieve Good Environmental Status and the set of operational targets to be achieved as summarized in Annex IV. For the purpose of setting the priorities, proposed technical interventions were ranked - based on the criteria set by the NAP update Guidelines – and the top seventeen interventions were shortlisted accordingly. The output from this exercise is summarized in Annex V.

2. Selecting the Program of Measures for Pollution Prevention and Control

Second level prioritization was conducted whereby technical measures were evaluated first based on economic and social criteria and ranked accordingly. Then the measures were evaluated based on the economic and social criteria added to them the total score set by the technical committee for the evaluation of the measures. The prioritization list remained the same during the 2 evaluations, only the scores differed slightly (Refer to Annex VI).

The final program of measures (PoM), hence was developed by combining shortlisted technical measures with their relevant legal, institutional and economic measures initially included in the LoM - and with high potential for implementation - as summarized in **Error! Reference source not found.**. Project fiches relevant to the PoM are included in Annex VII.

Table 18: Program of measures

Operational target	Proposed measures
Reach 15% recyclables recovery from the general municipal waste stream by 2020 and 20% recovery by 2025 **And** Implement adequate waste reducing/reusing/ recycling measures in order to reach 3% plastic recovery from the general MSW stream by 2019	Legal & institutional • Review and enactment of the solid waste management law • Drafting related application decrees and texts • Strengthen the role of Municipalities and Municipal Unions through update of the Municipal law to improve the sector's governance by local authorities in the fields of collection and final disposal of MSW and marine litter management Economic • Provide funding sources for solid waste management projects implemented by local authorities (loans, etc.) • Develop economic instruments (tax breaks on recycled material and recycling industries …) Technical • Development of national awareness material (by MoE) on integrated solid waste management approaches (including waste minimization, reuse, recycling and options for final disposal) applicable in Lebanon and facilitate dissemination to public through municipalities and local NGOs • Provide technical assistance to local authorities to develop and manage SW projects through development of technical guide including info such as (legal, technical & financial tools and awareness material)
Reach at least 80% urban wastewater network coverage and provide treatment coverage for 50% of the population residing within study area by 2019 **AND** Update ELVs for effluent discharged by food sector installations directly in the sewerage system and develop a discharge authorization system compatible with the operation and the emission discharge values of the urban waste water treatment plant by 2020	Institutional • Restructuring MoEW's organization in line with the requirements of laws 221 and 247 to reflect more its water governance role, with main focus on policy making, planning and regulatory roles: 1) Development of revised organization structures for MoEW; 2) Drafting a revised organization law, supporting in the approval process and following up on its enactment; 3) Implementation of the restructuring of MoEW • Develop the process for the performance monitoring and evaluation of RWEs including: 1) Monitoring body; 2) Performance indicators; 3) Tools and procedures • Clarify the distribution of responsibilities between municipalities and RWEs through update of Decree 8735/1974 regarding construction or upgrade of sewer lines Economic • Ensure financial sustainability of the RWEs through: 1) update of water tariffs; 2) update of taxes/fees for collection of wastewater; 3) development of wastewater discharge fees Technical • Rehabilitation and expansion of the sewer network covered by the Tripoli STP (including Mina area, Tripoli, Zgharta…) • Upgrade and expansion of sewer network and STP in Saida
Close 10% and 30% of illegal municipal solid waste dump sites identified as top 20 priorities (by the master plan for closure and rehabilitation of uncontrolled dumps) by 2020 and 2025 respectively	Technical • Closure and rehabilitation of Adweh open MSW dump • Closure and rehabilitation of Tripoli controlled MSW dump • Closure and rehabilitation of Hbeline controlled MSW dump • Closure and rehabilitation of Nabatiyeh open MSW dump • Closure and rehabilitation of Ras El Ain open MSW dump • Rehabilitation of Bourj Hammoud open MSW dump

Reach 50% reduction in discharges, emissions and losses of mercury, cadmium and lead originating from the cement industry by year 2020 and 100% by year 2025 **AND** Reach 50% reduction in discharges, emissions and losses of zinc, copper and chrome originating from the cement industry by year 2020 and 70% by year 2025	<u>Technical</u> • Provide technical assistance to improve reduction and monitoring of emissions from cement industries • Develop a databank for industrial sector (including info about EIA, permit details and requirements, discharges loads, self-reporting data, GIS mapping, pollution modeling, …)
Ensure that all Industrial Food Plants outlined in Appendix I discharging more than 4000 PE into water bodies comply with the discharge requirement of a maximum COD 160 mg/l and BOD 30 mg/l by year 2020	<u>Institutional</u> • Issuing voluntary agreements and implementation of environmental performance certificates • Developing discharge permits for food sector industries. • Developing a self-monitoring program with concerned industries for sustainable monitoring of compliance <u>Economic</u> • Implement water pollution (water consumption and WW discharges into water bodies) charges on Food sector industry • Provide financial incentives for reducing pollution loads in food sector industry <u>Technical</u> • Provision of technical assistance to food sector industries adopting CP will be accomplished through 1) conducting a survey identifying Industrial Food Plants (outlined in Appendix I) discharging more than 4000 PE into water bodies; 2) imposing the preparation of internal auditing reports on the concerned facilities; 3) recommendation by MoE for CP technologies based on the audit reports review • Create a pilot industrial zone in Ghadir area through 1) conducting a baseline assessment for the industrial zone including info about the zone's neighborhood environment characteristics (i.e.: landuse and baseline environmental conditions), types of industries (production type and capacity, class and coordinates), available environmental infrastructure, industrial discharges, etc…2) development of an industrial pollution abatement program in the Al-Ghadir drainage area including a set of interventions to address pollution problems highlighted by the baseline

Strengthen existing national programs for Marine Litter Clean-up to reach a 50% reduction in marine litter deposition on the beaches by 2019	Legal • Strengthen the role of Municipalities and Municipal Unions in the field of marine litter management through update of the Draft Integrated solid waste management law Institutional • Strengthen the monitoring and enforcement mechanisms for control of marine litter through1) strengthen cooperation between MoE, MoTPW, Municipalities and local NGO named OBBA (through the design of a joint monitoring program with well-defined performance indicators) and information exchange (through clear definition of communication/data portal, accessibility to data, and development of a Databank for marine litter management) • Provision of necessary training targeting MoTPW for management and operation of beach cleaning and litter fishing equipment Economic • Provision of funding sources for procurement of beach cleaning and litter fishing equipment and provision of necessary training for operation and maintenance of equipment • Provide funding sources for marine litter management projects implemented by local authorities (loans, etc.) and NGOs Technical • Conduct a needs assessment study to identify 1) technological needs for beach cleaning and litter fishing equipment, 2) develop a national and sustainable marine litter clean-up program in close coordination with concerned stakeholders

3. Limitations

MCA techniques are designed to help overcome the limitations of subjective interpretation by imposing a disciplined structure which directs attention to criteria in proportion to the weight which they deserve. The development of a performance matrix is an important step in this direction, but it is limited because a subjective interpretation of the matrix is still prone to many of these well documented distortions of human judgment.

CHAPTER 9: MONITORING PLAN FOR NAP IMPLEMENTATION

1. Rational

A number of factors have impeded the implementation of an effective monitoring program for environmental quality at the national level. Ongoing monitoring programs are far from being considered as comprehensive programs and mostly lack financial sustainability. For this purpose, development of NAP monitoring plan is considered as an important measure to strengthen existing programs and enhance the country's potential for tracking progress of the NAP implementation and evaluate the efficiency of interventions adopted in this respect. A main objective to be achieved is acquisition and centralization of data necessary to continuously record baseline state which falls under the country's obligations to follow up and report to the Secretariat – through the MEDPOL program - status of compliance to Barcelona Convention and the associated protocols.

2. Monitoring program

The first step in the process of developing a solid monitoring program is to identify monitoring parameters needed for tracking implementation progress. A List of indicators to assess the LBS, Dumping, Hazardous waste Protocols, NAP and Regional Plans implementation was provided for this purpose by the Guidelines for the NAP update. Table 19 enumerates the different performance indicators developed based on the operational targets previously discussed. Table 19 also specifies the monitoring responsibilities and frequency per identified indicator. The MoE is responsible for data collection, data analysis and reporting of NAP implementation progress to the MEDPOL program on yearly basis with a midterm evaluation in 2020 and final evaluation in 2025.

3. Institutional arrangements

Although development of a separate monitoring mechanism for coastal environment can be considered as an optimal solution, the proposed method is to build up on existing national mechanisms to optimize use of resources and avoid additional financial burdens. Data is mostly available with different stakeholders but rarely centralized or shared with the MoE. It's thus the responsibility of MoE to take necessary measures in coordination with concerned authorities to facilitate data acquisition, storing and analysis, especially data relevant to the set operational target. However, MoE has a long-term vision and is thinking one step ahead. In this respect, improving the monitoring and reporting mechanism, especially for priority substances, is one of the main priorities, however a number of challenges are anticipated. The first challenge lies in the inability of MoE to dedicate human resources for this activity while the second challenge consists of providing financial sustainability should MoE decides on contracting a third party for this task. The recommended solution is hence to create a NAP update independent unit within MoE responsible of coordination with concerned stakeholders, Define and set up the monitoring program and develop the performance indicators, develop an information sharing program or platform, ensure continuous feed of the system, quality control of the data feed, data analysis and report preparation among other activities. The unit's responsibilities can be further expanded at later stages to provide technical support to MoE in the field of inspection and site visits. The unit will be responsible of submitting periodical reports to the MEDPOL focal point at MoE and yearly

reports to the MEDPOL Secretariat. A sustainable source of financing can be provided through international agencies.

Table 19: Monitoring indicators and reporting frequency and responsibilities

Operational Target	Program of measures	Monitoring Indicator	Frequency	Responsibility
Ensure that all Industrial Food Plants outlined in Appendix I discharging more than 4000 PE into water bodies comply with the discharge requirement of a maximum COD 160 mg/l and BOD 30 mg/l by year 2020	<u>Institutional</u> • Issuing voluntary agreements and implementation of environmental performance certificates • Developing discharge permits for food sector industries. • Developing a self-monitoring program with concerned industries for sustainable monitoring of compliance <u>Economic</u> • Implement water pollution (water consumption and WW discharges into water bodies) charges on Food sector industry • Provide financial incentives for reducing pollution loads in food sector industry <u>Technical</u> • Provision of technical assistance to food sector industries adopting CP will be accomplished through 1) conducting a survey identifying Industrial Food Plants (outlined in Appendix I) discharging more than 4000 PE into water bodies; 2) imposing the preparation of internal auditing reports on the concerned facilities; 3) recommendation by MoE for CP technologies based on the audit reports review • Create a pilot industrial zone in Ghadir area through 1) conducting a baseline assessment for the industrial zone including info about the zone's neighborhood environment	• Total loads of BOD5 and COD loads prior to discharge into water bodies from Industrial Food Plants outlined in Appendix I discharging more than 4000 PE • Share of companies within Annex I of the LBS Protocol applying cleaner production, BAT and/or BEP	Quarterly	MoE, MoI/ALI

Operational Target	Program of measures	Monitoring Indicator	Frequency	Responsibility
	characteristics (i.e.: landuse and baseline environmental conditions), types of industries (production type and capacity, class and coordinates), available environmental infrastructure, industrial discharges, etc…2) development of an industrial pollution abatement program in the Al-Ghadir drainage area including a set of interventions to address pollution problems highlighted by the baseline			
Reach 100% urban wastewater network and treatment coverage for agglomerations of more than 2000 inhabitants by 2019 AND Update ELVs for effluent discharged by food sector installations directly in the sewerage system and develop a discharge authorization system compatible with the operation and the emission discharge values of the urban waste water treatment plant by 2020	<u>Institutional</u> • Restructuring MoEW's organization in line with the requirements of laws 221 and 247 to reflect more its water governance role, with main focus on policy making, planning and regulatory roles: 1) Development of revised organization structures for MoEW; 2) Drafting a revised organization law, supporting in the approval process and following up on its enactment; 3) Implementation of the restructuring of MoEW • Develop the process for the performance monitoring and evaluation of RWEs including: 1) Monitoring body; 2) Performance indicators; 3) Tools and procedures • Clarify the distribution of responsibilities between municipalities and RWEs through update of Decree 8735/1974 regarding construction or upgrade of sewer lines <u>Economic</u> • Ensure financial sustainability of the RWEs through: 1) update of water tariffs; 2) update of taxes/fees for collection of wastewater; 3)	• Share of population with access to an improved sanitation system (total, urban, rural). • Wastewater collected and treated (in population equivalent) • Share of the treated wastewater according to the type of treatment (primary, secondary, tertiary) • Number of industrial discharge authorization issue	Biannual	MoE, CDR, MoEW/RWEs, Municipalities

Operational Target	Program of measures	Monitoring Indicator	Frequency	Responsibility
	development of wastewater discharge fees <u>Technical</u> • Rehabilitation and expansion of the sewer network covered by the Tripoli STP (including Mina area, Tripoli, Zgharta…) • Upgrade and expansion of sewer network covered by Saida's STP			
Reach 50% reduction in discharges, emissions and losses of mercury, cadmium and lead originating from the cement industry by year 2020 and 100% by year 2025 AND Reach 50% reduction in discharges, emissions and losses of zinc, copper and chrome originating from the cement industry by year 2020 and 70% by year 2025	<u>Technical</u> • Provide technical assistance to improve reduction and monitoring of emissions from cement industries • Develop a databank for industrial sector (including info about EIA, permit details and requirements, discharges loads, self-reporting data, GIS mapping, pollution modeling, …)	• Direct or indirect discharges, emissions and losses of mercury, cadmium and lead originating from the cement industry • Direct or indirect discharges, emissions and losses of zinc, copper and chrome • The number of accredited specialized laboratories equipped to test for heavy metals among others	Quarterly	MoE

Operational Target	Program of measures	Monitoring Indicator	Frequency	Responsibility
implement adequate waste reducing/reusing/ recycling measures in order to reach 3% plastic recovery from the general MSW stream by 2019 AND Reach 15% recyclables recovery from the general municipal waste stream by 2020 and 20% recovery by 2025	<u>Legal & institutional</u> • Review and enactment of the solid waste management law • Drafting related application decrees and texts • Strengthen the role of Municipalities and Municipal Unions through update of the Municipal law to improve the sector's governance by local authorities in the fields of collection and final disposal of MSW and marine litter management <u>Economic</u> • Provide funding sources for solid waste management projects implemented by local authorities (loans, etc.) • Develop economic instruments (tax breaks on recycled material and recycling industries …) <u>Technical</u> • Development of national awareness material (by MoE) on integrated solid waste management approaches (including waste minimization, reuse, recycling and options for final disposal) applicable in Lebanon and facilitate dissemination to public through municipalities and local NGOs • Provide technical assistance to local authorities to develop and manage SW projects through development of technical guide including info such as (legal, technical & financial tools and awareness material)	• Municipal waste generation per capita • Share of recycled, composted, incinerated, treated in waste-to-energy facilities or landfilled municipal waste with respect to collected amount • Share of generated municipal waste per waste composition category: paper/paperboard, textiles, plastics, glass, metals, other inorganic material, organic material	Quarterly	MoE, CDR, OMSAR, MoIM, Municipalities and Union of Municipalities
Close and rehabilitate 10% and 30% of illegal municipal solid waste dump sites identified as top 20 priorities (by the master plan for	<u>Economic</u> • Provide additional funding sources for closure and rehabilitation of Tyre open dump (loans, grants, etc.)	• Number of illegal dumpsites at coastal area that have been closed/remediated	Annual	MoE, CDR, OMSAR, MoTPW, MoIM, Municipalities and Union of Municipalities

Operational Target	Program of measures	Monitoring Indicator	Frequency	Responsibility
closure and rehabilitation of uncontrolled dumps) by 2020 and 2025 respectively	Technical • Closure and rehabilitation of Adweh open MSW dump • Closure and rehabilitation of Tripoli controlled MSW dump • Closure and rehabilitation of Hbeline controlled MSW dump • Closure and rehabilitation of Nabatiyeh open MSW dump • Rehabilitation of Bourj Hammoud open MSW dump •			
Strengthen existing national programs for Marine Litter Clean-up to reach a 50% reduction in marine litter deposition on the beaches by 2019	Legal • Strengthen the role of Municipalities and Municipal Unions in the field of marine litter management through update of the Draft Integrated solid waste management law Institutional • Strengthen the monitoring and enforcement mechanisms for control of marine litter through1) strengthen cooperation between MoE, MoTPW, Municipalities and local NGO named OBBA (through the design of a joint monitoring program with well-defined performance indicators) and information exchange (through clear definition of communication/data portal, accessibility to data, and development of a Databank for marine litter management) • Provision of necessary training targeting MoTPW for management and operation of beach cleaning and litter fishing equipment Economic	• Trends in the amount of litter washed ashore and/or deposited on coastlines, including analysis of its composition, spatial distribution and, where possible, source.	Quarterly	MoE, MoTPW, MoEW, MoIM/Municipalities/Union of Municipalities

Operational Target	Program of measures	Monitoring Indicator	Frequency	Responsibility
	• Provision of funding sources for procurement of beach cleaning and litter fishing equipment and provision of necessary training for operation and maintenance of equipment • Provide funding sources for marine litter management projects implemented by local authorities (loans, etc.) and NGOs <u>Technical</u> • Conduct a needs assessment study to identify 1) technological needs for beach cleaning and litter fishing equipment, 2) develop a national and sustainable marine litter clean-up program in close coordination with concerned stakeholders			

CHAPTER 10: CAPACITY BUILDING, AWARENESS AND PUBLIC PARTICIPATION FOR NAP IMPLEMENTATION

1. Capacity building and awareness raising

The capacity building plan was developed based institutional strengthening measures identified within the program of measures prepared under the scope of the current NAP update process. Soft interventions aim at complementing structural interventions or any other intervention relying on behavioral changes for successful implementation. Main deficiencies were highlighted in the municipal solid waste and marine litter management sectors. Table 20 below summarizes the proposed capacity building program. The table also includes details related to assignment of responsibilities, resources and budgets for training and capacity-building for the tasks to be undertaken for implementation of the NAP. The program include activities aimed at building the capacities of local NGOs in disseminating scientific environmental concepts among the public.

Table 20: Capacity building program

Sector	Target group	Resources	Responsible authority	Budget (Euros)
Municipal solid waste management	NGOs active in the field of municipal solid waste management (MSWM)	- Consultant to 1) develop a unified ToT training material targeting the public focused on 3 Rs and environmentally sound final disposal methods and 2) to assist in the implementation of the ToT workshop - Trainer to design and lead the ToT workshop	MoE	261,000
	MoIM	- Consultant to 1) Develop a guide covering the legal, technical, and financial tools available for MSWM as well as awareness material and 2) train municipalities' staff on the use of the guide and strengthen their role in attracting MSWM project and following up on operations - Trainer to design and lead the ToT workshop	MoE & MoIM	175,500
Marine litter management	MoTPW	- Consultant to conduct a technical training on management, operation and maintenance of beach cleaning and litter fishing equipment	MoE	28,500
	MoIM, Municipalities, NGOs active in the field of marine litter management	- Consultant to conduct a training on monitoring and enforcement mechanisms for marine litter control 2) on data collection and reporting regarding Marine litter trends (i.e.: trends in the amount of litter washed ashore and/or deposited on coastlines, composition, spatial distribution and, where possible, source)	MoE	8,000

2. Public participation

Without public support only limited progress is foreseen in the field of naturel resources preservation and marine environment protection more specifically. The international experience proved that by educating and involving the public in the decision making processes it has been possible to promote the project ownership culture among the communities hence enhancing adherence and compliance to environmental projects and regulation. Proposed public participation activities aimed at improving implementation of the updated NAP include:

- Produce of informational publications offering essential data on the updated NAP and the developed program of measures;
- Strengthen public consultation processes and stakeholders involvement during project inception and development processes;
- Promote watchdog concept especially among local communities and media should be involved in preparation and monitoring of the work progress, and informed on all details regarding the undertaken environmental protection measures; and
- Regularly inform general public about implementation progress of projects and effectiveness of corrective actions taken when applicable.

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ANNEX I: LAND BASED SOURCES OF POLLUTION WITHIN STUDY AREA

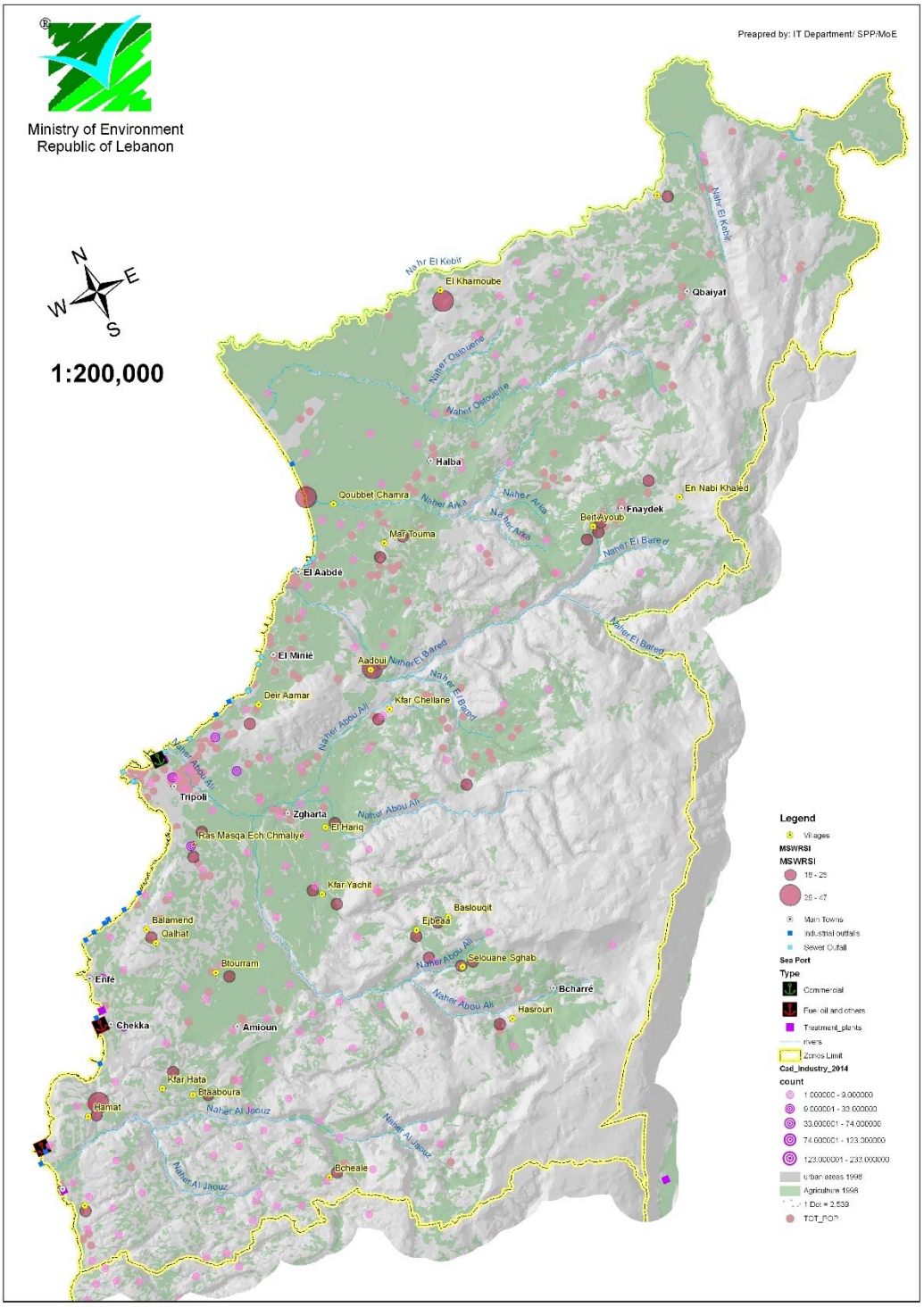


Figure 4: Land based sources of pollution in Zone A

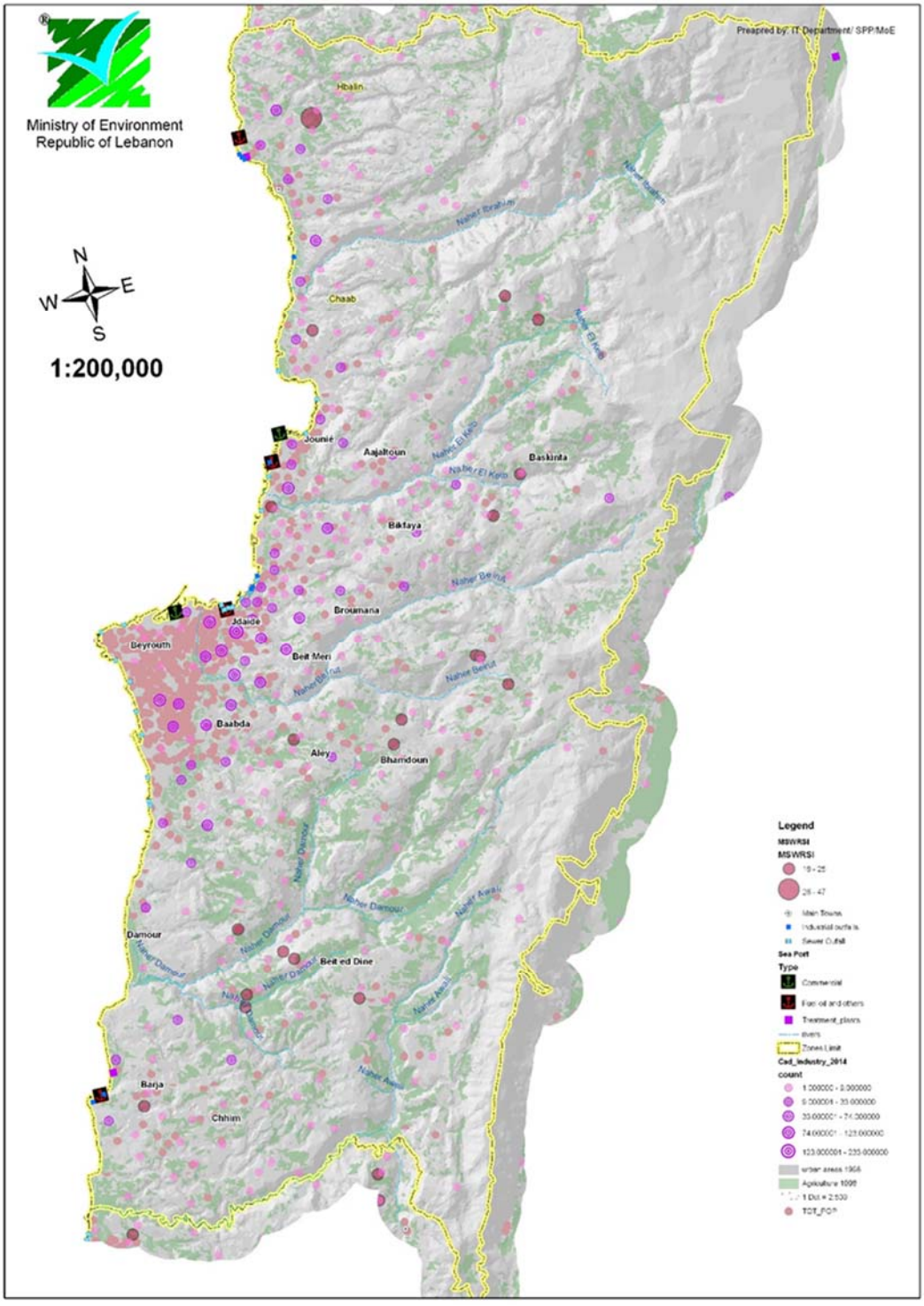


Figure 5: Land based sources of pollution in Zone B

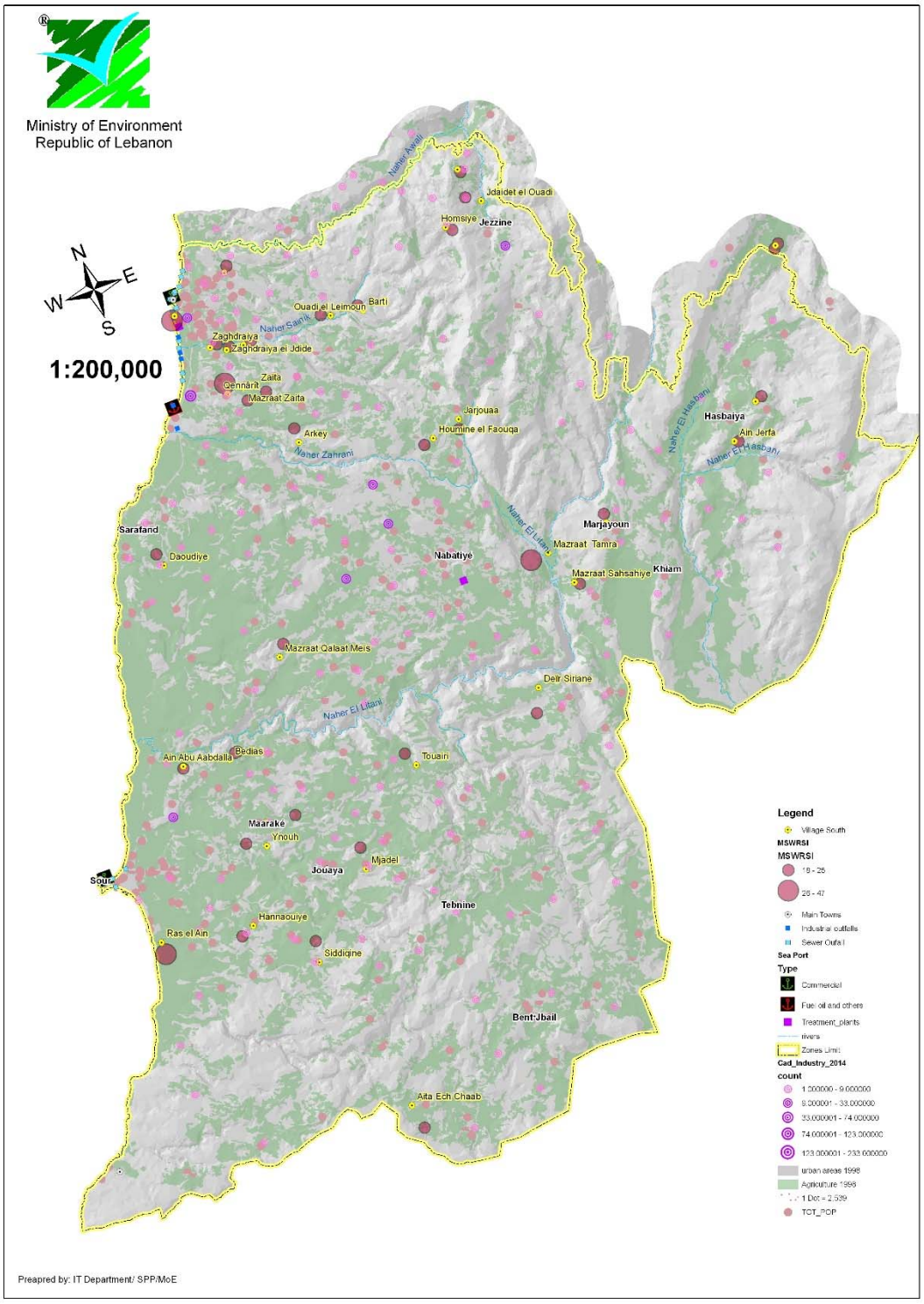


Figure 6: Land based sources of pollution in Zone C

NNEX II: TOTAL ANNUAL DISCHARGES OF PRIORITY POLLUTANTS

	PCDD/PCDF (gTEQ/yr)	VOCs (tons/yr)	Arsenic (kg/yr)	Hexane (l/yr)	Cadmium (kg/yr)	Chromium (kg/yr)	Copper (kg/yr)
	0.03		324.12		108.83	324.73	648.20
ate ric Acid							
	0.71						
ng of Refined		1.20					
	1x10-6		25,881		4,380	278,723	10,352,550
d plaster	1.88						
el	0.00003						
n Smelting	0.38						
melting	0.0020						
ng	0.35						
	2.25	4,740					
		774,850					
nd Glass	0.01						
t		2.34					
egetable Oils				330,000.00			
al waste	32.09						
	0.09						
g	0.26						
	38.03	**779,593.54**	**26,205.12**	**330,000.00**	**4,488.83**	**279,047.73**	**10,353,198.20**

Sector	HCl (kg/yr)	Mercury (kg/yr)	Ammonia (kg/yr)	Lead (kg/yr)	Benzene (kg/yr)	Benzo(a)pyrene (kg/yr)	Benzo(a)anthracene (kg/yr)
Energy production		32.41			57.88		1.11
Manufacture of Phosphate Fertilizers and Phosphoric Acid							
Paper and pulp							
Transport and Marketing of Refined Petroleum Products							
Manufacture of Cement	290,667,750	47,781	20,306,925	151,307	31,854,000	259	84
Manufacture of lime and plaster							
Casting of Iron and Steel							
Second-stage Aluminum Smelting							
Second-stage Copper Smelting							
Secondary Lead Smelting							
Manufacture of textile							
Paint manufacturing							
Manufacture of Glass and Glass Products							
Processing of Sugar Beet							
Manufacture of other Vegetable Oils							
Incineration of industrial waste							
Urban road transport							
Residential fuel burning							
Total	**290,667,750**	**47,813.41**	**20,306,925**	**151,307**	**31,854,057.88**	**259**	**85.11**

Sector	Benzo(b)fluoranthene (kg/yr)	Benzo(g,h,i)perylene (kg/yr)	Formaldehyde (kg/yr)	Indeno(1,2,3,-cd)pyrene (kg/yr)	Total PCDD (kg/yr)	Total PCDF (kg/yr)	F (kg/yr)
Energy production	0.42	0.60		0.60			10,418
Manufacture of Phosphate Fertilizers and Phosphoric Acid							1,328
Paper and pulp							
Transport and Marketing of Refined Petroleum Products							
Manufacture of Cement	111	155	915,803	99,544	6	1	
Manufacture of lime and plaster							
Casting of Iron and Steel							
Second-stage Aluminum Smelting							
Second-stage Copper Smelting							
Secondary Lead Smelting							
Manufacture of textile							
Paint manufacturing							
Manufacture of Glass and Glass Products							
Processing of Sugar Beet							
Manufacture of other Vegetable Oils							
Incineration of industrial waste							
Urban road transport							
Residential fuel burning							
Total	**111.42**	**155.60**	**915,803**	**99,544.60**	**6**	**1**	**11,746**

Sector	Benz(a)anthracene (kg/yr)	Fluoranthene (kg/yr)	Penthanthrene (kg/yr)	Cr (VI) (kg/yr)	Toluene (kg/yr)	Ni (kg/yr)	PAH (kg/yr)
Energy production	1.11	1.31	3.01	69.45	1,713.18	2,315.11	1,018.65
Manufacture of Phosphate Fertilizers and Phosphoric Acid							
Paper and pulp							
Transport and Marketing of Refined Petroleum Products							
Manufacture of Cement							
Manufacture of lime and plaster							
Casting of Iron and Steel							
Second-stage Aluminum Smelting							
Second-stage Copper Smelting							
Secondary Lead Smelting							
Manufacture of textile							
Paint manufacturing							
Manufacture of Glass and Glass Products							
Processing of Sugar Beet							
Manufacture of other Vegetable Oils							
Incineration of industrial waste							
Urban road transport							
Residential fuel burning							
Total	**1.11**	**1.31**	**3.01**	**69.45**	**1,713.18**	**2,315.11**	**1,018.65**

B- Liquid Emissions

Sector	F- (kg/yr)	Pb (kg/yr)	As (kg/yr)	Cr (kg/yr)	Hg (kg/yr)	BOD5 (Kg/yr)	Total N (Kg/yr)	Cr2O3 (Kg/yr)	COD (kg/yr)	Total P (kg/yr)
Manufacture of Phosphate Fertilizers and Phosphoric Acid	209,185	3.4	1.88	51.28	0.0399					
Tanning sector						972,000	151,200	70,200		
Textile manufacturing						39,500			85,000	
Manufacture of Paper and Pulp						720,000			3,045,920	
Animal Farming						161,861,145	24,583,715			13,537,290
Processing of Sugar Beet						5,200				
Manufacture of olive oil						1,041,295				
Manufacture of other Vegetable Oils						444,787			758,979	
Manufacture of wine and spirits						2,642				
Manufacture of beer						81,250				
Non-alcoholic beverage production						156,326				
Treatment plants for urban wastewater						119,348,000				
Total	**209,185**	**3.40**	**1.88**	**51.28**	**0.04**	**284,672,145**	**24,734,915**	**70,200**	**3,889,899**	**13,537,290**

ANNEX III: HOT SPOTS EVALUATION SHEETS

Table 21: Hot spots Categorization in Zone A

Categories and subcategories (Multiplier)		Location								
		Batroun /Selaata	**Chekka**	**Enfeh**	**Tripoli**	**Deir Amar**	**Minieh**	**Adweh**	**Arida**	**Aabdeh**
Public health	Population (4)	3	4	4	4	4	3	4	3	4
	Wastewater collection and treatment (4)	4	4	3	4	3	3	3	2	4
	Drinking water quality (4)	3	3	3	3	3	3	3	3	3
	Bathing water quality (4)	2	2	1	4	3	2	3	3	3
Score		**48**	**52**	**44**	**60**	**52**	**44**	**52**	**44**	**56**
Good Environmental Status	Organic matter (3)	3	3	3	3	3	3	3	3	3
	Nutrients (3)	3	3	3	3	3	3	3	3	3
	Contaminants (3)	3	3	3	3	3	3	3	3	3
	Marine litter (3)	3	3	3	4	3	3	4	3	3
Score		**36**	**36**	**36**	**39**	**36**	**36**	**39**	**36**	**36**
Economics	Economic activities and underpinning ecosystem services (4)	3	3	3	3	3	3	3	3	3
Score		**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**
Transboundary Effects	Transboundary/ Trans-regional Effects (1)	1	1	1	1	1	1	1	3	1
Score		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**1**
Total score (Classification)		**97 (B)**	**101 (B)**	**93 (B)**	**112 (A)**	**101 (B)**	**93 (B)**	**104 (B)**	**95 (B)**	**105 (B)**

Nomenclature of Hot spots:
Classification A: Priority hotspot
Classification B: Hot spot
Classification C: Potential hotspot/sensitive area
Classification D: Not hotspot

Table 22: Hot spots Categorization in Zone B

Categories and subcategories (Multiplier)		Location								
		Jiyeh	**Beirut**	**Bourj Hammoud/ Dora**	**Antelias**	**Bauchrieh**	**Zouk**	**Jounieh**	**Hbeline**	**Byblos**
Public health	Population (4)	3	4	4	4	4	4	3	3	4
	Wastewater collection and treatment (4)	3	4	4	4	4	4	3	2	4
	Drinking water quality (4)	3	3	3	3	3	3	3	3	3
	Bathing water quality (4)	4	4	4	4	4	4	4	4	2
Score		**52**	**60**	**60**	**60**	**60**	**60**	**52**	**48**	**52**
Good Environmental Status	Organic matter (3)	3	3	3	3	3	3	3	3	3
	Nutrients (3)	3	3	3	3	3	3	3	3	3
	Contaminants (3)	3	3	3	3	3	3	3	3	3
	Marine litter (3)	3	3	3	3	3	3	3	4	3
Score		**36**	**36**	**36**	**36**	**36**	**36**	**36**	**39**	**36**
Economics	Economic activities and underpinning ecosystem services (4)	2	3	3	3	3	3	3	3	2
Score		**8**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**8**
Transboundary Effects	Transboundary/ Trans-regional Effects (1)	1	1	1	1	1	1	1	1	1
Score		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Total score (Classification)		**97 (B)**	**109 (A)**	**109 (A)**	**109 (A)**	**109 (A)**	**109 (A)**	**101 (B)**	**100 (B)**	**97 (B)**

Nomenclature of Hot spots:

- Classification A: Priority hotspot
- Classification B: Hot spot
- Classification C: Potential hotspot/sensitive area
- Classification D: Not hotspot

Table 23: Hot spots Categorization in Zone C

Categories and subcategories (Multiplier)		Location				
		Saida	**Ghazieh**	**Sarafand**	**Sour**	**Ras el Ain**
Public health	Population (4)	4	4	4	4	4
	Wastewater collection and treatment (4)	4	4	3	4	3
	Drinking water quality (4)	3	3	3	3	3
	Bathing water quality (4)	4	4	4	1	3
Score		**60**	**60**	**56**	**32**	**52**
Good Environmental Status	Organic matter (3)	3	3	3	3	3
	Nutrients (3)	3	3	3	3	3
	Contaminants (3)	3	3	3	3	3
	Marine litter (3)	3	3	3	3	4
Score		**36**	**36**	**36**	**36**	**39**
Economics	Economic activities and underpinning ecosystem services (4)	3	3	3	3	3
Score		**12**	**12**	**12**	**12**	**12**
Transboundary Effects	Transboundary/ Trans-regional Effects (1)	1	1	1	1	1
Score		**1**	**1**	**1**	**1**	**1**
Total score (Classification)		**109 (A)**	**109 (A)**	**105 (B)**	**81 (C)**	**104 (B)**

Nomenclature of Hot spots:

- Classification A: Priority hotspot
- Classification B: Hot spot
- Classification C: Potential hotspot/sensitive area
- Classification D: Not hotspot

ANNEX IV: LIST OF MEASURES

Operational target	Proposed measures
Reach 15% recyclables recovery from the general municipal waste stream by 2020 and 20% recovery by 2025 **And** Implement adequate waste reducing/reusing/ recycling measures in order to reach 3% plastic recovery from the general MSW stream by 2019	<u>Policy</u> • Update MSW strategy of year 2010 to propose environmental suitable and economically feasible solutions prioritizing waste minimization, recovery and recycling approaches <u>Legal</u> • Approval and enactment by Parliament of the solid waste management law • Drafting related application decrees and texts • Strengthen the role of Municipalities and Municipal Unions through update of the Municipal law to improve the sector's governance by local authorities in the fields of MSW and marine litter management <u>Institutional</u> • Strengthen partnership between MoE and Local NGOs active in the field of SWM and marine litter management through direct coordination, review and comment on annual work plans to check alignments with national strategy <u>Economic</u> • Provide funding sources for solid waste management projects implemented by local authorities (loans, etc.) • Develop economic instruments (tax breaks on recycled material and recycling industries …) <u>Technical</u> • Development of national awareness material (by MoE) on integrated solid waste management approaches (including waste minimization, reuse, recycling and options for final disposal) applicable in Lebanon and facilitate dissemination to public through municipalities and local NGOs • Strengthen public private partnership as a pilot intervention through promotion of waste sorting at main commercial centers/malls in city of Beirut • Strengthen partnership between MoE and Local NGOs active in the field of SWM and marine litter management through direct coordination, review and comment on annual work plans to check alignments with national strategy • Development of a databank based on specific monitoring indicators and information sharing mechanism • Provide technical assistance to local authorities to develop and manage SW projects through development of technical guide including info such as (legal, technical & financial tools and awareness material) • Provision of equipment for launching of plastic bottles deposit/refund program in main supermarkets in the city of Beirut as a Pilot project • Develop and implement plastic and paper recycling and reuse projects with big commercial institutions in the city of Beirut as a Pilot project
Reach at least 80% urban wastewater network coverage and provide treatment coverage for 50% of the population residing within study area by 2019	<u>Policy</u> • Review and update of the wastewater strategy <u>Institutional</u> • Update Law 221/2000 to strengthen the role of MoEW in supervising and evaluating the performance of RWEs • Clarify the distribution of responsibilities between municipalities and RWEs through update of Decree 8735/1974 regarding construction or upgrade of sewer lines • Optimization of the human resources within RWEs • Create a NAP implementation follow up unit within the MoE responsible for multistakeholders' coordination, data collection and development a WWM databank (network coverage, collection efficiency, treatment coverage, STPs

Operational target	Proposed measures
	status, quality of discharges, treatment efficiency…), conducting data analysis through preparation of statistics and GIS mapping, and reporting progress to UNEP/MEDPOL Economic • Ensure financial sustainability of the RWEs through: 1) update of water tariffs; 2) update of taxes/fees for collection of wastewater; 3) development of wastewater discharge fees Technical • Upgrade available/operational STPs to secondary treatment taking into account the population growth and proper ELV • Rehabilitation and expansion of the sewer network covered by the Tripoli STP (including Mina area, Tripoli, Zgharta…) • Construction of Bourj hammoud STPs • Upgrade and expansion of sewer network covered by Saida's STP
Close 10% and 30% of illegal municipal solid waste dump sites identified as top 20 priorities (by the master plan for closure and rehabilitation of uncontrolled dumps) by 2020 and 2025 respectively	Institutional • Strengthen the role of Municipalities and Municipal Unions through update of the Municipal law to improve the sector's governance by local authorities in the fields of collection and final disposal of MSW and marine litter management • Conduct awareness and training sessions targeting municipal councils/police related to the adverse impacts of MSW open dumping and littering and enforcement tools/mechanisms Economic management • Provide funding sources for solid waste management and marine litter management projects implemented by local authorities (loans, etc.) • Develop economic instruments (waste taxation, fines on plastic packaging products such as bottles, bags, wrapping material…) Technical • Provide technical assistance to local authorities to develop and manage marine litter projects through development of technical guide including info such as (legal, technical & financial tools and awareness material) • Closure and rehabilitation of Adweh open MSW dump • Closure and rehabilitation of Tripoli controlled MSW dump • Closure and rehabilitation of Hbeline controlled MSW dump • Closure and rehabilitation of Bourj hammoud closed MSW dump • Closure and rehabilitation of Nabatiyeh open MSW dump

Operational target	Proposed measures
Reach 50% reduction in discharges, emissions and losses of mercury, cadmium and lead originating from the cement industry by year 2020 and 100% by year 2025 **AND** Reach 50% reduction in discharges, emissions and losses of zinc, copper and chrome originating from the cement industry by year 2020 and 70% by year 2025	<u>Policy</u> • Implementation of the Industrial waste management Master Plan • Implement proper zoning of Industrial areas through 1) conducting SEA for industrial zones; 2) reclassification of industrial zones according to SEA • Develop strategy and plans addressing solid and gaseous discharges produced by industrial sector <u>Legal</u> • Adopt stricter ELVs for 1) mercury, cadmium, lead, zinc, copper and chrome from cement industries • Develop the legal framework for industrial waste management • Develop the legal framework necessary for information exchange through definition of communication/data portal, accessibility to data, etc. <u>Institutional</u> • Define and set up the monitoring program and develop the performance indicators • Develop the Institutional and financial set up of the industrial sector monitoring program • Voluntary agreements and implementation of environmental performance certificates (especially with Cement industries in zones A and B) <u>Economic</u> • Provide funding sources for adoption of pollution control technologies (loans, etc.) • Implement fines and incentives to decrease pollution from cement industries <u>Technical</u> • Provide technical assistance for cement industries (Zone A and B) for CP adoption to reduce emissions of mercury, cadmium, lead, zinc, copper and chrome through review and evaluation of environmental auditing reports submitted to MoE • Develop a databank for industrial sector (including info about EIA, permit details and requirements, discharges loads, self-reporting data, GIS mapping, pollution modeling, …)
Ensure that all Industrial Food Plants outlined in Appendix I discharging more than 4000 PE into water bodies comply with the discharge requirement of a maximum COD 160 mg/l and BOD 30 mg/l by year 2020	<u>Institutional</u> • Strengthen the monitoring and enforcement mechanisms for control of direct discharges of industrial wastewater into sewer system through1) strengthen cooperation between RWEs, Municipalities and MoE in the fields of monitoring (through the design of a joint monitoring program with well-defined performance indicators) and information exchange (through clear definition of communication/data portal, accessibility to data, and development of a Databank for the Food industry sector); 2) Develop the financial set up of the industrial sector monitoring program; 3) Develop and implement a training and capacity building program for monitoring and information exchange targeting RWEs and MoE <u>Economic</u> • Implement water pollution (water consumption and WW discharges into water bodies) charges on Food sector industry • Provide financial incentives for reducing pollution loads in food sector industry • Provide funding sources for adoption of pollution control technologies (loans, etc.)

Operational target	Proposed measures
	Technical • Provision of technical assistance to food sector industries adopting CP will be accomplished through 1) conducting a survey identifying Industrial Food Plants (outlined in Appendix I) discharging more than 4000 PE into water bodies; 2) imposing the preparation of internal auditing reports on the concerned facilities; 3) recommendation by MoE for CP technologies based on the audit reports review • Create a pilot industrial zone in Ghadir area through 1) conducting a baseline assessment for the industrial zone including info about the zone's neighborhood environment characteristics (i.e.: landuse and baseline environmental conditions), types of industries (production type and capacity, class and coordinates), available environmental infrastructure, industrial discharges, etc…2) development and implementation of a green master plan in the area
Update ELVs for effluent discharged by food sector installations directly in the sewerage system and develop a discharge authorization system compatible with the operation and the emission discharge values of the urban waste water treatment plant by 2020	Legal • Update Decision 8/1 of 2001 - Annex 5 to include ELVs for discharges in sewer specific to food sector installations taking into consideration compatibility with the operation and the emission discharge values of the urban waste water treatment plant • Develop discharge permits for food sector industries
Strengthen existing national programs for Marine Litter Clean-up to reach a 50% reduction in marine litter deposition on the beaches by 2019	Legal • Strengthen the role of Municipalities and Municipal Unions in the field of marine litter management through update of the Municipal law Institutional • Strengthen the monitoring and enforcement mechanisms for control of marine litter through1) strengthen cooperation between MoE, MoTPW, Municipalities and local NGO named OBBA (through the design of a joint monitoring program with well-defined performance indicators) and information exchange (through clear definition of communication/data portal, accessibility to data, and development of a Databank for marine litter management) • Provision of necessary training targeting MoTPW for management and operation of beach cleaning and litter fishing equipment Economic • Provision of funding sources for procurement of beach cleaning and litter fishing equipment and provision of necessary training for operation and maintenance of equipment • Provide funding sources for marine litter management projects implemented by local authorities (loans, etc.) and NGOs Technical

Operational target	Proposed measures
	• Conduct a needs assessment study to identify 1) technological needs for beach cleaning and litter fishing equipment, 2) develop a national and sustainable marine litter clean-up program in close coordination with concerned stakeholders

ANNEX V: PRIORITIZATION OF TECHNICAL MEASURES

#	ID No.	Integrated measures at the national level	Scores of the prioritization categories						Total Score
			Achievement of pollution-related GES targets	Elimination of hotspots	Contribution to other pollution-related ecological objectives	Technical feasibility	Geographical scope	Implementation timetable/ urgency	
1	EO10/S2/M11	Provide the infrastructure for MSWM and final disposal	4	4	4	4	3	2	**21**
2	EO5/W1/M6	Upgrade STPs to secondary treatment taking into account the population growth and proper ELV	4	4	4	3	3	2	**20**
3	EO10/S1/M5	Technical support to local institutions and authorities to develop and manage SWM projects	3	4	4	4	3	2	**20**
4	EO5/W1/M10	Rehabilitation and expansion of the sewer network covered by the Tripoli STP (including Mina area, Tripoli, Zgharta…)	3	4	4	4	2	2	**19**
5	EO5/W1/M11	Construction of Bourj hammoud STPs	4	4	4	3	2	2	**19**
6	EO9/I1/M7, EO9/I2/M7	Provide technical assistance for cement industries for CP adoption	4	3	4	3	3	2	**19**
7	EO10/S2/M2	Closure and rehabilitation of Quoubet Chamra open MSW dump	3	4	4	4	2	2	**19**
8	EO10/S2/M3	Closure and rehabilitation of Tripoli controlled MSW dump	3	4	4	4	2	2	**19**

#	ID No.	Integrated measures at the national level	Scores of the prioritization categories						Total Score
			Achievement of pollution-related GES targets	Elimination of hotspots	Contribution to other pollution-related ecological objectives	Technical feasibility	Geographical scope	Implementation timetable/ urgency	
9	EO10/S2/M4	Closure and rehabilitation of Hbeline controlled MSW dump	3	4	4	4	2	2	**19**
10	EO10/S2/M5	Closure and rehabilitation of Bourj hammoud closed MSW dump	3	4	4	4	2	2	**19**
11	EO10/S2/M7	Closure and rehabilitation of Nabatiyeh open MSW dump	3	4	4	4	2	2	**19**
12	EO5/W1/M12	Upgrade and expansion of sewer network covered by Saida's STP	2	4	4	4	2	2	**18**
13	EO5/ I1/M6	Provide technical assistance to food sector industries adopting CP	2	3	4	4	3	2	**18**
14	EO9/I1/M17	Creation of a pilot industrial zone within Ghadir river area in Beirut (Zone B)	2	4	4	4	2	2	**18**
15	EO10/S3/M12	Strengthen marine litter management programs (Control onshore and offshore marine litter)	2	3	4	4	3	2	**18**
16	EO10/S4/M4	Develop and implement plastic recycling and reuse projects with commercial institutions, industrial, academic and business institutions	3	3	3	4	3	2	**18**
17	EO10/S4/M6	Implement a plastic bottles deposit/refund program in supermarkets	3	3	3	4	3	2	**18**
18	EO10/S2/M6	Closure and rehabilitation of Sour open MSW dump	3	2	4	4	2	2	**17**

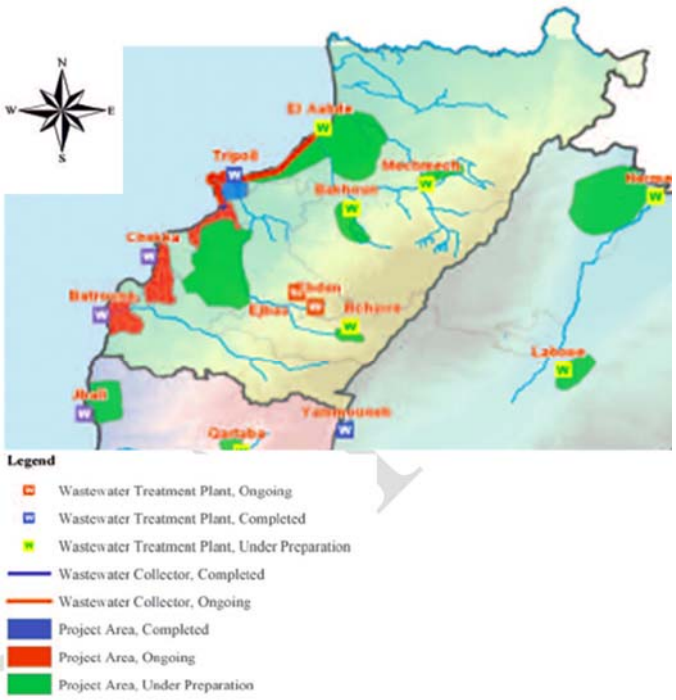
#	ID No.	Integrated measures at the national level	Scores of the prioritization categories						Total Score
			Achievement of pollution-related GES targets	Elimination of hotspots	Contribution to other pollution-related ecological objectives	Technical feasibility	Geographical scope	Implementation timetable/ urgency	
19	EO10/S2/M1	Closure and rehabilitation of Srar open MSW dump	3	1	4	4	2	2	**16**
20	EO9/I1/M16	Conduct capacity building on standard methods on monitoring of industrial sector	1	2	4	3	3	2	**15**
21	EO9/I3/M6, EO9/I3/M9	Technical support for available e-waste management projects	1	2	4	4	3	1	**15**
22	EO9/I4/M4	Conduct a national baseline assessment for mercury (sources, produced quantities, management practices, storage and disposal methods…)	1	2	4	4	3	1	**15**
23	EO9/I4/M6	Strengthen the infrastructure for management of mercury waste	1	2	4	4	3	1	**15**
24	EO10/S3/M11	Adopt fishing for litter practices	1	1	4	3	3	2	**14**

ANNEX VI: THE LIST OF PRIORITIZED MEASURES BASED ON THE MCA

Rank	Alternative	Score for economic & social evaluation	Score for economic & social evaluation with technical score
1	Provide technical assistance to local authorities to develop and manage SW projects through development of technical guide including info such as (legal, technical & financial tools and awareness material)	0.89691	0.89631
2	Strengthen the monitoring and enforcement mechanisms for control of marine litter through1) strengthen cooperation between MoE, MoTPW, Municipalities and local NGO named OBBA (through the design of a joint monitoring program with well-defined performance indicators) and information exchange (through clear definition of communication/data portal, accessibility to data, and development of a Databank for marine litter management)	0.87861	0.87666
3	Create a pilot industrial zone in Ghadir area through 1) conducting a baseline assessment for the industrial zone including info about the zone's neighborhood environment characteristics (i.e.: landuse and baseline environmental conditions), types of industries (production type and capacity, class and coordinates), available environmental infrastructure, industrial discharges, etc…2) Development of program of interventions to address pollution problems highlighted by the baseline	0.86639	0.86470
4	Provide technical assistance for cement industries (Zone A and B) for CP adoption to reduce emissions of mercury, cadmium, lead, zinc, copper and chrome through review and evaluation of environmental auditing reports submitted to MoE	0.84677	0.84642
5	Strengthen public private partnership as a pilot intervention through promotion of waste sorting at main commercial centers/malls in city of Beirut	0.84394	0.84242
6	Provision of technical assistance to food sector industries adopting CP will be accomplished through 1) conducting a survey identifying Industrial Food Plants (outlined in Appendix I) discharging more than 4000 PE into water bodies; 2) imposing the preparation of internal auditing reports on the concerned facilities; 3) recommendation by MoE for CP technologies based on the audit reports review	0.80644	0.80542
7	Closure and rehabilitation of Adweh open MSW dump	0.73723	0.73710
8	Closure and rehabilitation of Nabatiyeh open MSW dump	0.73716	0.73703
9	Closure and rehabilitation of Hbeline controlled MSW dump	0.73714	0.73701
10	Closure and rehabilitation of Tripoli controlled MSW dump	0.73335	0.73323
11	Rehabilitation & expansion of the sewer network covered by Tripoli STP (including Mina, Tripoli, Zgharta…)	0.73272	0.73260
12	Construction of Bourj hammoud STPs	0.72579	0.72520
13	Upgrade and expansion of sewer network covered by Saida's STP	0.71966	0.71908

Rank	Alternative	Score for economic & social evaluation	Score for economic & social evaluation with technical score
14	Closure and rehabilitation of Bourj hammoud closed MSW dump	0.70776	0.70765
15	Upgrade available/operational STPs to secondary treatment taking into account the population growth and proper ELV	0.12708	0.12887

ANNEX VII: PROJECT FICHES

Project Ref No.	1	
Project Name	Strengthening MSWM in the coastal zones of Lebanon	
Related Hot Spot	The whole coastal zone	
Sector (please tick ☑ one)	Wastewater	
	Solid Waste	✓
	Industrial Emission	
	Integrated (2 or more of the above in one project)	
Promoter	**Activities 1 & 2:** Ministry of Environment in collaboration with CDR, the Ministry of Interior and Municipalities and Municipalities/Union of Municipalities and OMSAR (Full Name, Phone, e-mail). **Activity 3:** Ministry of Environment in collaboration with the Ministry of Interior and Municipalities and Municipalities and the Ministry of Transport and Public Works (Full Name, Phone, e-mail)	
Estimated Project Value (€)	The total estimated project value is around 153,810,000 € including: **Activity 1 – Strengthening governance and local capabilities:** 785,000 € **Activity 2 – Closure/rehabilitation of open dumps:** 152,405,000 € **Activity 3 – Marine Litter Management:** 620,000 €	
General description	**Activity 1:** The current waste crisis demonstrated the inability of the central government and the municipalities to manage municipal solid waste properly. The central government developed and approved a number of strategies over the last 10 years and was not able to implement them. The legal and institutional framework for solid waste management is incomplete. A framework law for solid waste management was submitted to the CoM but is not enacted by the Parliament. The role of local authorities in managing solid waste is not clearly defined. During the waste crisis, the government issued a plan to decentralize the management of solid waste and to give municipalities' full responsibility to manage the waste in their areas. Municipalities	

lack the technical capacity to manage solid waste management projects and thus need technical assistance to be able to take the responsibility that was laid on their shoulders. The project aims at strengthening governance and the municipalities' capacities to be able to manage solid waste projects.
In this context, the legal framework for solid waste management and the strategy for the management of the sector will be prepared. A guide will be developed to provide municipalities with the legal, technical, financial information needed to manage solid waste projects. Training sessions will be held for the 33 Federation of municipalities. An awareness campaign will be developed and disseminated at the national level to promote waste minimization, reuse and recycling in addition to sorting at source. Economic instruments and financial sources for the management of solid waste will also be developed.

Activity 2: A study was conducted by UNDP, MoE and Elard for the preparation of a master plan for the closure and rehabilitation of uncontrolled dumps in Lebanon in 2011. The study identified 670 municipal waste dump at the national level. A Prioritization Decision Tool (PDT) was developed in order to prioritize dumpsites based on a Risk Sensitivity Index including ten (10) attributes as follows:

- Volume of waste at site (m^3);
- Geology;
- Hydrology;
- Distance to urban areas (m);
- Quantity of waste currently dumped at site (t/d);
- Presence of alternatives;
- Open burning of waste;
- Dump visibility;
- Depth of filling of waste (m); and
- Duration of exposure (years)..

Hbeline, Adweh, Bourj Hammoud and Nabatiyeh (Kfar Tibnit) dumps were among the priority dumps identified by this study. Tripoli dump was not included in the study as it was considered as rehabilitated. However, although it is considered as a controlled dump, it is today filled over its intended capacity and is contributing to marine litter. Its gas collection system is not operating properly and methane gas is contributing to greenhouse gases emissions and climate change.

Hbeline dump is one of the municipal waste dumps located in Jbeil, (zone B) and was selected as a hot sport under NAP 2015. The dump in 2011, covered an area of 25,000 m^2 and had a height of 15 meters. In 2014, a study conducted by MoE, UNDP under the STREG project to assess the environmental impact of the Syrian crisis on Lebanon estimated an incremental increase of 4,369 m^3 in the volume of the Hbeline dump by the end of 2014.
The proposed intervention for the dump included grading, capping, managing gases and leachate. The cost estimated for closure and rehabilitation was set at 4.43 USD/m^3.

Kfar Tebnit dump (Nabatiyeh) in 2011, covered an area of 29,580 m^2 and had a height of 10 meters. In 2014, a study conducted by MoE, UNDP under the STREG project to assess the environmental impact of the Syrian crisis on Lebanon estimated an incremental increase of 20,714 m^3 in the volume of the Kfar Tibnit dump by the end of 2014.
The proposed intervention for the dump included grading, capping, managing gases and leachate. The cost estimated for closure and rehabilitation was set at 4.43 USD/m^3.
The dump in 2011, covered an area of 15,000 m^2 and had a height of 10 meters.

In 2014, a study conducted by MoE, UNDP under the STREG project to assess the environmental impact of the Syrian crisis on Lebanon estimated an incremental increase of 28,643 m^3 in the volume of the **Adweh dump** by the end of 2014.
The proposed intervention for the dump included grading, capping, managing gases and leachate. The cost estimated for closure and rehabilitation was set at 4.43 USD/m^3.

Tripoli dump contains around 1,300,000 m^3 of waste. The proposed interventions for the dump include excavation, segregation and treatment of all waste components and refilling. Stationary and mobile sorting equipment was used. Organics were treated in two main methods: windrow composting and thermal desorption. Recovered plastics (mainly plastic bags) will be palletized for stockpiling, and all rocks and reinforced concrete will be crushed for recovery of aggregates and steel.

Bourj Hammoud dump contains around 6,000,000 m^3 of waste. The total cost of rehabilitation of the dump was previously estimated at around 142,000,000 USD. The proposed intervention for the dump included slopes stabilization, excavation, segregation and treatment of all waste components in addition to grading, capping, managing gases and leachate.

Through a grant received in 2015 from EU under SWAM III project rehabilitation of **Ras Al Ain** open dump was forecasted. The only obstacle remains the inability of the Municipality of Tyre to finance the land expropriation for the construction of the new sanitary landfill. A surface area of around 25 acres was previously estimated by OMSAR for the dump rehabilitation. Providing the necessary funds for land expropriation can be considered part of this project scope. However the total cost of this intervention is still not well defined.

It should be noted that the volume of the waste dumped in the open dumps changed with the current solid waste crisis that Lebanon is facing at the moment. More waste is being dumped in old dumps, some of which is even burnt from time to time.

Activity 3: Mismanagement of MSW in Lebanon is the main source of marine litter deposited yearly on the coast. There is no official mechanism put in place for marine litter clean-up along the Lebanese coastal area. Local NGOs organize cleanup campaigns for beaches and sea bed all year long. Unfortunately, sustainability and effectiveness of the campaigns depend on the limited financial resources usually received as donations.

	Much of the municipal waste is finding its way to the marine environment polluting coastal ecosystems and beaches and negatively impacting sectors dependent on marine and coastal resources. Direct action is still missing due to the lack of coordination among the various initiatives and the absence of a clear management plan. Under the context of MAP/MEDPOL activities to protect the Mediterranean Sea, the Marine Resources and Coastal Zone Management Program at the Institute of the Environment, University of Balamand, and in cooperation with the RAMOGE Agreement, received funding to carry-out a pilot study to assess marine litter off the coasts of Tripoli and El-Mina, Lebanon. The study found that six categories were present in the waters of El-Mina/Tripoli in the following percentages: 1) Cloth: 1.74%; 2) Fishing material: 1.74%; 3) Glass: 1.16%; 4) Metal: 16.81%; 5) Paper: 0.87%; and 6) Plastic: 77.68%. Litter was mostly found in areas of high anthropological stress. Based on the above, It is essential to develop a monitoring and enforcement plan for marine litter and to strengthen the capacities of concerned authorities to develop solutions to this pressing problem on the Lebanese coast in particular and the Mediterranean in general. The project is expected to clarify the responsibilities of monitoring and cleanup of marine litter; develop a monitoring, enforcement and information exchange mechanisms for control of marine litter; assess the technological needs for marine litter cleanup; procure necessary equipment for marine litter cleanup and train concerned stakeholders concerning the monitoring, enforcement and cleanup of marine litter.
Depollution potential	**Activity 1:** The quantity of solid waste generated daily in the coastal area defined by the NAP 2015 is 5,719 tons. A large portion of this waste generated mainly in Beirut and Mount Lebanon is currently being accumulated on the streets or collected from time to time and dumped in valleys, near rivers or in open dumps causing surface, ground and coastal water pollution. Litter is increasing in rivers and in the coastal area due to the mismanagement of the waste. The number of illegal open dumps is increasing in volume and in number. Practices of burning waste on different sites are increasing air pollution (emissions of dioxins, furans, PAHs, etc...) at the national level. There are a number of institutional, policy and market failures that are preventing a sustainable, efficient, and effective management of the municipal solid waste treatment and disposal subsector (World Bank, 2011). Legal and institutional reforms are needed to support policy implementation: enactment of SWM law and drafting application decrees, clear assignment of institutional responsibilities and improvement of governance in terms of accountability, regulation, O&M cost recovery, safeguarding, and compliance. The SWM strategy endorsed by the COM still needs to be implemented along a well-defined timetable. However, a number of constraints should duly be addressed when it comes to policy formulation such as NIMBYISM, synchronization with the NPMPLT that was endorsed by the COM early 2009. Capital investment needs are substantial, which will require leveraging from both development partners and the private sector. Cost recovery through tariff/fee/tax increases remains an afterthought in the SWM strategies, which precludes that a larger share of IMFU monies as well as the GOL Treasury advances will be needed to achieve the full cost recovery.

	Engaging the public at all levels (policy formulation to implementation) to reach a consensus and avoid repeating previous mistakes. Awareness campaigns should be designed to reflect a coherent policy and avoid an outcome of the past, such as the setting ablaze the Amroussieh incinerator by citizens. Strengthening the capacities of municipalities to find possible solutions for solid waste will decrease pollution of air, soil, groundwater sources, rivers and the coastal region and will decrease the quantity of litter in the sea. **Activity 2:** Hbeline dump contains around 379,369 m^3 of waste, Kfar Tibnit dump contains around 316,514 m^3; Adweh dump contains around 179,000 m^3 of waste; and Tripoli contains around 1,300,000 m^3 of waste; and Bourj Hammoud Dump contains around 6,000,000 m^3 of waste. Waste dumps can release methane, which, if not captured, adds to the global burden of greenhouse. These greenhouse gases contribute to the global warming. Socio-economic benefits are to be found in reduced global warming, reduced environmental and nuisance impact and use of the landfill gas as an energy resource. Total methane emissions are assessed at 170.2 million m^3 of methane emissions over the whole lifespan of the landfill plus its after-phase. This can be translated in a ratio of 170 m^3/ton landfilled solid waste management **Invalid source specified.**. The social and economic benefits are linked with the value of avoided CO_2 equivalent emissions and the effect of global warming. The carbon values used have a range of € 39 per ton to € 56 per ton for 2020 **Invalid source specified.**. Other environmental problems include soil erosion and soil destabilization caused by excavation work leading to increased frequency of odors and visual impacts; detrimental impact on wildlife populations (flora and fauna) and habitat destruction in a scarce terrestrial environment; loss of land value, migrating gases can cause serious health and safety hazards to the surrounding population and the prevalence of vector-borne diseases could increase; leachate and litter can affect groundwater as well as coastal and surface water. Closing and rehabilitating the dump will decrease pollution of air, soil, groundwater sources. **Activity 3:** It has been reported from a study conducted in 1997 that 30% of all fish caught along the Lebanese coast had plastic in their stomachs and recreational divers have been complaining about the presence of plastic in the water column and on the sea floor (Environmental Degradation of Lebanon, 2009). Entanglement and ingestion are the primary kinds of direct damage to wildlife caused by marine litter. Other threats to wildlife and the environment from marine litter include smothering of the seabed, and disturbance of habitats from mechanical beach cleaning. Marine litter is also increasingly believed to be a source of accumulation of toxic substances in the marine environment, and environmental changes due to the transfer and introduction of invasive species.
Technical description	**Activity 1:** The project will work on assessing and proposing a suitable institutional framework using models that can be adapted to Lebanon. The draft integrated solid waste management law will be put on track for enactment after a review of the institutional framework proposed in the law.

	An awareness and education campaign will be conducted to bring to public attention, accurate and reliable information, increase public awareness, and suggest practical alternatives to waste minimization and disposal. A guide to provide municipalities with the legal, technical, financial information needed to manage solid waste projects will be developed. Training sessions will be held for the 33 Federation of municipalities. Technical assistance will be provided to municipalities through making consultants for the period of the project to assist municipalities and respond to their enquiries. A gradual cost-recovery system will be designed taking into consideration initial capital costs and operational and maintenance costs. The acceptability of the citizens for any of the SWM options is crucial for the sustainability of the waste sector in the future. The solid waste fee should also be clearly identifiable to residents, so as to make the public aware of the fees for solid waste. Financial sources for capital investments of solid wastes will be studied and proposed. **Activity 2:** For Hbeline, Kfar Tebnit, and Adweh dumps, the proposed closure and rehabilitation consists of grading, capping, managing gases and leachate through active venting and concrete intercepting channels. The cost estimated for closure and rehabilitation was set at 4.43 USD/m^3. As for Tripoli and Bourj hammoud dumps the proposed interventions include whenever applicable excavation, segregation and treatment of all waste components and refilling. Stationary and mobile sorting equipment was used. Organics will be treated in two main methods: windrow composting and thermal desorption. Recovered plastics (mainly plastic bags) will be palletized for stockpiling, and all rocks and reinforced concrete will be crushed for recovery of aggregates and steel. **Activity 3:** The project will assess institutional responsibility for litter monitoring, enforcement and cleanup and propose solutions to strengthen the monitoring and enforcement mechanisms for control of marine litter. A joint monitoring program with well-defined performance indicators and information exchange mechanisms will be defined and endorsed by concerned stakeholders. Moreover, a needs assessment will be conducted to identify technological and financial needs for beach and litter cleanup. Based on the needs assessment, beach cleaning and litter fishing equipment will be procured and necessary training for operation and maintenance of equipment will be provided to concerned stakeholders. The Ministry of Transport and Public Works will be the main authority responsible of Maintaining and operating the procured equipment. The project will propose sustainable funding for the monitoring program and for litter cleanup.
Degree of preparation	**Activity 1:** A draft solid waste management law is available at the Parliament. The different strategies adopted by the GoL are available at MoE and CDR. The World Bank conducted in 2011 the country environmental analysis (CEA) including the solid waste sector. The CEA assessed the public expenditure on solid waste, legal and institutional framework, economic aspects or current practices in solid waste management and economic feasibility of different treatment and disposal options at the national level. Ramboll assessed the feasibility of adopting waste to energy option as proposed by the 2010 solid waste management strategy adopted by the GoL.

	Several guides were developed by local NGOs (Arcenciel) in 2015, by the Academic institutions and by OMSAR with funding from the EU to assist municipalities. These guides can be used as a baseline for the guide to be developed at the national level. **Activity 2:** A study was conducted by UNDP, MoE and Elard for the preparation of a master plan for the closure and rehabilitation of uncontrolled dumps in Lebanon in 2011, identified this municipal waste dump as one of the priority dumps for closure and rehabilitation. An Environmental impact assessment study was conducted for the Tripoli dump. **Activity 3:** Under the context of MAP/MEDPOL activities to protect the Mediterranean Sea, the Marine Resources and Coastal Zone Management Program at the Institute of the Environment, University of Balamand, and in cooperation with the RAMOGE Agreement, received funding to carry-out a pilot study to assess marine litter off the coasts of Tripoli and El-Mina, Lebanon in 2005-2006.
Economic & Financial	**Activity 1:** ▪ MoE worked on investment projects with several IFIs in the past 5 years namely GEF, EU, World Bank, Italian Cooperation, etc… ▪ This project will assist the municipalities in proper management of municipal waste and thus, preventing water air and soil pollution, and diseases. Enabling municipalities to develop solid waste management projects will create employment opportunities. Such projects will rely on the national private sector for construction and operation of solid waste management plants. The cost of environmental degradation from the solid waste sector before the waste crisis (year 2011) was estimated at US$ 19 million equivalent to 0.09% of GDP in 2005.[3] In 2011, the **European Commission** estimated the increased environmental benefits at the national level covering 5 categories: air, water, nature, waste, and global environment. The proportion of solid waste in these benefits was estimated at 0.2% of GDP in 2020 equivalent to € 106 million. In other words, in the case where pollution could not be reduced by 50 % in 2020, the cost of degradation considered could reach at least the equivalent of 0.4% of GDP in 2020.[4] **Activity 2:** ▪ MoE worked on investment projects with several IFIs in the past 5 years namely GEF, EU, World Bank, Italian Cooperation, etc… ▪ This project will be preventing greenhouse gases emissions, water and soil pollution, and diseases from the open dumps. ▪ The cost of environmental degradation from the solid waste sector before the waste crisis (year 2011) was estimated at US$ 19 million equivalent to 0.09% of GDP in

[3] World Bank CEA (2011).

[4] Doumani and Mucharrafiyeh. 2011. EU Benefit Assessment, Lebanon Report. Brussels. <www.environment-benefits.eu>.

2005.[5] In 2011, the European Commission estimated the increased environmental benefits at the national level covering 5 categories: air, water, nature, waste, and global environment. The proportion of solid waste in these benefits was estimated at 0.2% of GDP in 2020 equivalent to € 106 million. In other words, in the case where pollution could not be reduced by 50 % in 2020, the cost of degradation considered could reach at least the equivalent of 0.4% of GDP in 2020.[6]

Activity 3:

- The Ministry of Environment worked on investment projects with several IFIs in the past 5 years namely GEF, EU, World Bank, Italian Cooperation, etc…

Marine debris may potentially have a negative impact both on the economies of industries using the oceans and on the economic values of the ocean itself.
Fisheries, shipping and marine tourism industry sectors are most impacted by marine debris.
The economic impacts of marine debris can be measured by the diminished opportunities to exploit the marine environment for pleasure or profit. The different categories of economic costs in the marine debris are as follows:

- **Direct economic costs:** those costs which arise from damage to an industry or to an economic activity, for example the costs of vessel downtime due to marine debris entanglement on a vessel propeller.
- **Indirect economic impacts:** those costs which arise indirectly, for example from marine life ingesting plastic waste and contaminating the food chain, therefore impacting on fish and even humans.
- **Non-market values:** those costs which arise when marine debris compromises nonmarket values such as scenic values, or the values placed on the marine environment, or marine activities by people who do not necessarily access them. Marine debris is of concern to the community and there can be a willingness to pay, even on the part of non-users, to have the beaches cleaned (Faris and Hart 1994). For example, the levels and value of recreational activities in the marine environment are reduced by marine debris. Beach goers finding a variety of marine wastes on beaches will reduce their visits, or length of stay, with losses to tourism in the local economy. Measuring such non-market losses is not straightforward, as visitors may travel to another beach that has no marine debris, and it is the relative loss between beach sites that determines the loss of economic value.

The following marine activities and their economic value might be affected by marine litter.
Four main commercial ports are located in the major coastal cities namely Beirut (Zone B), Tripoli (Zone A) andSaida andTyre (Zone C). The Port of Beirut accounted for

[5] World Bank CEA (2011).
[6] Doumani and Mucharrafiyeh. 2011. EU Benefit Assessment, Lebanon Report. Brussels. <www.environment-benefits.eu>.

91% of total seaborne imports in 2013, while the Port of Tripoli accounted for only 6% and the Port of Sidon constituted a 3% share. On the exports side, the Port of Beirut is also dominant with an 84% share of total seaborne exports in 2013, compared to 10% and 6% shares of Port of Tripoli and Port of Sidon, respectively (BankMed, 2014). In 2014, the total revenues for the Beirut port were of approximately of 210.89 million USD (BLOM Bank, 2015). There is no complete information on the social aspect of maritime transport but data shows that Beirut Container Terminal Consortium employs 600 Lebanese individuals; the only terminal in the Middle East and North Africa region that employs 100% local staff (BCTC 2014). As for cruising and pleasure boating activities, in 2014, the country counted with 28 public ports, 13 private marinas and 5741 yachts. Furthermore, cruising and pleasure boating are likely to provide services for tourism related activities which play a key role for the country's economy (Plan Bleu, SES, 2015).

Fishing and marine aquaculture, along the coastal region, remain marginal, accounting for only 0.06 % of the country's GDP in 2011. The total marine capture fisheries production in Lebanon for the year 2011 was estimated at 4.9 thousand tons of seafood corresponding to an overall turn-over of approximately $27 million (Plan Bleu, SES, 2015). In 2006, it was estimated that fishing supported about 30,000 fishermen and their families (IUCN/Green Line, 2006) (Plan Bleu, SES, 2015). Fifteen fishing ports are commonly found in Zone A (accounting for 35% of both national number of ports and vessels). The city of Tripoli host one of the busiest fishing ports in the country.

Tourism is a main driver in the Lebanese economy; in 2013 the direct contribution of travel and tourism accounted for 6.9% of the country's GDP and the total contribution (taking wider effects into account) represented 19.2% of the GDP (WTTC, 2014). Tourism is considered one of the most important activities in the coastal zone. The total number of hotels and resorts on the Lebanese territory has reached 486, of which 71% are located on the coastal zone. Beirut and Jounieh (both coastal cities) host the highest percentages of touristic institutions in the country (UNEP/MOE 2013b). Travel and tourism activities directly generated 92,500 jobs in 2013 or 6.7% of total employment (WTTC, 2014). This includes employment by hotels travel agents, airlines and other passenger transportation services; it also includes the activities of restaurants and leisure industries directly supported by tourists (Plan Bleu, SES, 2015).

Zone A is the center for 37 hotels and resorts, most of which are located in coastal cities. The Palm island nature reserve located in Tripoli is considered one of the main attractions for locals as well as foreigners in addition to several recreational beaches identified in this zone. During the summer season, this Zone witnesses an increase in the number of beach goers and tourist, especially in the coastal towns of Batroun, Enfeh and Tripoli, whereas a significant number of locals relocate to their summer residences in the Mountains especially in the District of Bcharre. Zone B is the center for 271 hotels and resorts, around 42% and 28% of these are located in the Beirut and Jounieh respectively (ICZM). Several recreational beaches are identified in this zone attracting a number of local beach goers and tourists. A recent study classified Zone B a "natural and spiritual sanctuary" attracting tourists for its religious and natural sites, historical attractions, ruins and religious landmarks (REGOKO).

Although Zone C "has adopted the tagline on ancient Coastal Land" (REGOKO) only six hotels and beach resorts are established in this zone two of which are in Saida and

	the remaining four are located in Tyre (ICZM), probably due to the unstable security situation historically witnessed in this area.
Institutional & Regulatory Framework	**Activity 1:** ▪ The main public actors involved in this project are: ▪ The Ministry of the Environment ▪ The Ministry of Interior and Municipalities ▪ Municipalities and Union of Municipalities ▪ **The Ministry of the Environment (MOE)** is the regulatory agency of the Government. MSW is addressed by the Service of Urban Environment. The functions of this service is to assist in the preparation of the MSW policies, strategies and plans in collaboration with other sector ministries; prepare and propose legislation for MSW; review and approve environmental impact assessment reports; participate and review all studies related to SWM; and develop standards and guidelines for waste management technologies and monitoring and control landfills. The Ministry of Environment will be leading this project and will collaborate with the **Ministry of Interior and Municipalities (MOIM)** who is responsible for participating in the development of the national strategy. It coordinates and assists in the development of local waste management plans. Most importantly, the MOIM is managing with the Ministry of Finance (MOF) the Independent Municipal Fund (IMFU). The IMFU is provisioned by the MOF through 13 taxes and fees collected at the country level. The current regulatory framework for waste management is absent (the solid waste management law is not enacted yet). The latest waste strategies and plans gave responsibilities to municipalities to manage their waste. **Activity 2:** ▪ The main public actors involved in this project are: ▪ The Ministry of the Environment ▪ The Ministry of Interior and Municipalities ▪ Municipalities ▪ CDR ▪ The Ministry of the Environment (MOE) is the regulatory agency of the Government. MSW is addressed by the Service of Protection of Urban Environment. The functions of this service is to assist in the preparation of the MSW policies, strategies and plans in collaboration with other sector ministries; prepare and propose legislation for MSW; review and approve environmental impact assessment reports; participate and review all studies related to SWM; and develop standards and guidelines for waste management technologies and monitoring and control landfills. The Ministry of Environment is understaffed and is not able to train municipalities to undertake their responsibilities in terms of solid waste management. MOE will be leading this project and will collaborate with the Ministry of Interior and Municipalities (MOIM) who is responsible for participating in the development of the national strategy. It coordinates and assists in the development of local waste management plans. Most importantly, the MOIM

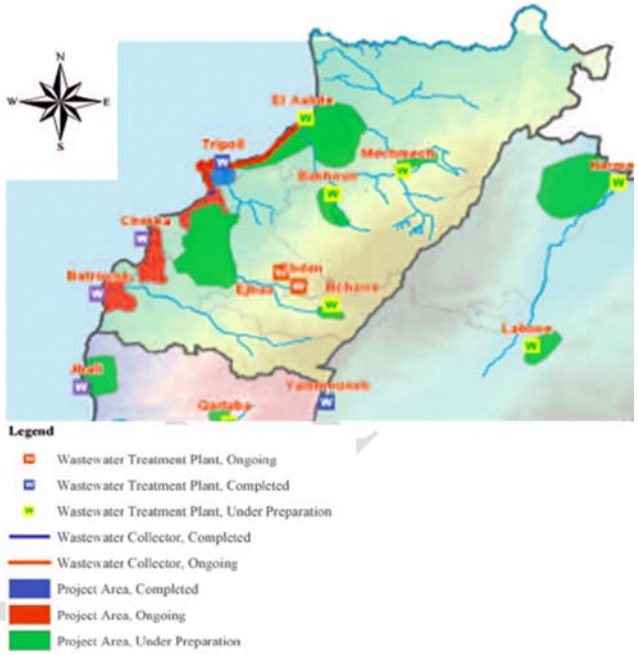
	is managing with the Ministry of Finance (MOF) the Independent Municipal Fund (IMFU). The IMFU is provisioned by the MOF through 13 taxes and fees collected at the country level. ▪ CDR is responsible The CDR lends support to the COM and manages infrastructure projects financed through international loan agreements. The current regulatory framework for waste management is absent (the solid waste management law is not enacted yet). The latest waste strategies and plans gave responsibilities to municipalities to manage their waste. **Activity 3:** ▪ The main public actors involved in this project are: ▪ The Ministry of the Environment ▪ The Ministry of Interior and Municipalities ▪ The Ministry of Transport and Public Works ▪ Municipalities ▪ NGO known as Operation Big Blue Association (OBBA) involved in beach and litter cleanup Decree 2275/2009 (Organization of the Ministry of Environment Units, their functions and conditions of appointments) gave the service of the Protection of the Natural Resources at MoE the responsibility of protecting natural resources including rivers and river banks and the coastal beaches and regional water from pollution. The GoL enacted Law 292/1994 for the ratification of the Protection of the Mediterranean Sea Against Pollution. Law 444/2002 for the Protection of the Environment gave MoE the responsibility of putting plans for the protection and management of coastal areas and beaches in coordination with the Ministry of Transport and Public Works and other national authorities as deemed necessary. Currently municipalities in coordination with local NGOs are taking initiatives for beach and river cleanup. Municipalities and NGOs work is based on availability of funds. The legal and institutional framework need more clarification and might need the issuance of application decrees to put clearly the role of each of the concerned entities in monitoring and enforcement for marine litter cleanup. In addition, the lack of human resources available at the concerned Ministries and lack of equipment for the cleanup operations are other constraints that should be addressed.
Social and Environmental Impact	**Activity 1:** The project will be implemented in full coordination with national stakeholders having experience in solid waste management. The project will engage the public at all levels (policy formulation to implementation) to reach a consensus and avoid repeating previous mistakes. The technical solutions that will be proposed will take into account climate mitigation aspects. **Activity 2:** The project addresses a number of the priority dumps identified by the Ministry of environment. The study was presented to concerned stakeholders when it was published in 2011.

	Activity 3: The project will be implemented in full coordination with concerned national stakeholders. Local municipalities and NGOs will be engaged at all levels (policy formulation to implementation). The project will have positive social and environmental impacts on the coastal area. It is enhance tourism, fishing, and prevent vessel downtime. It will reduce pressures on biodiversity in the area and the whole ecosystem.

Project Ref No.	2	
Project Name	Upgrade and expansion of Saida's sewer network and STP	
Related Hot Spot	Saida	
Sector (please tick ☑ one)	Wastewater	✓
	Solid Waste	
	Industrial Emission	
	Integrated (2 or more of the above in one project)	
Promoter	CDR is currently assigned the responsibility for planning and execution of Wastewater networks and Wastewater treatment plants. After execution, the responsibility of operation and maintenance falls within the jurisdiction of South Lebanon Water Establishment (Full Name, Phone, e-mail).	
Estimated Project Value (€)	As per CDR planned projects Construction of Saida Secondary networks and Treatment Plant will cost around 85 M USD (74,635,000 €) over 5 years Preparation of study and tender documents: 1 MUSD (945,000 €) Works including operation and maintenance for minimum 1 year: 75 MUSD (70,855,000 €) Supervision: 4 MUSD (3,779,000 €)	
General description	A wastewater treatment plant was built in Saida between 2001 and 2008 and was designed to treat around 55,000 m^3/day (Primary treatment). The project is supposed to cover Saida's coastal area, (hence serving the equivalent of 390,000 inhabitants). The plant is operational since the year 2010. The efficiency of the treatment has not been tested but doubts are raised around the quality of treated water discharged in the sea. CDR raised the issue of Saida's network deterioration leading to direct discharge of wastewater into the environment. The specific objective of this project is to upgrade the WWTP to secondary treatment and improve and expand the wastewater network connected to it, thereby increasing the flow of wastewater being conveyed to the existing plant, and ensuring better treatment of the wastewater before discharging it in the sea. Completing the sewer network and connecting it to the STP help in controlling coastal, surface and ground water pollution in the area.	
Depollution potential	The proposed collectors will improve the transmission of the waste water from localities including Saida, Ain el Heloue, Ghaziye, Hlaliye, Miye ou Miye, Aabra, Aanquoun, Aaqtanit, Ain ed Delb, Ain el Mir, Bayssour, Al Bramiye, Choualiq, Darb el Sim, Hara, Jinsnaya, Kefraya, Kfar Falous, Kfar Jarra, Lebaa, Maaymariye, Maghdouche, Majdelyoun, ouadi Baancdain, Qennarit, Qraiye, Salhiye, Bqosta, Karkha, Tanbourit, Houmine el Tahta, Zahraini, Mrah el Hbas, Jernaya, Kfar Chellal, Kfar Beit, Berti, Haitouli, Ouadi el Laimoun, Hassaniye, Mharbiye, Kfar Hatta, Mjeidel, Zaghdraya, Aarab ej Jall, Aarab Tabbaya, Bnaafoul, Mazraat Zeita, Mazraat Jinjlaya, Mazraat el Qnaitra, Roumine, Aazze, Erkay and Khzaiz to the existing waste water Treatment Plant. The WWTP will treat around 45,000 m^3/day of wastewater per day. The construction of the networks and upgrade of the WWTP will have a great environmental and health impact as they will protect the main potable water sources of the city from pollution due to waste water flows in the area and will protect the coastal zone from pollution. Fishermen and recreational centers on the coastal area will benefit from improved sea water quality.	

Technical description	The proposed network will improve the transmission of the waste water from localities including Saida, Ain el Heloue, Ghaziye, Hlaliye, Miye ou Miye, Aabra, Aanquoun, Aaqtanit, Ain ed Delb, Ain el Mir, Bayssour, Al Bramiye, Choualiq, Darb el Sim, Hara, Jinsnaya, Kefraya, Kfar Falous, Kfar Jarra, Lebaa, Maaymariye, Maghdouche, Majdelyoun, ouadi Baanqoudain, Qennarit, Qraiye, Salhiye, Bqosta, Karkha, Tanbourit, Houmine el Tahta, Zahraini, Mrah el Hbas, Jernaya, Kfar Chellal, Kfar Beit, Berti, Haitouli, Ouadi el Laimoun, Hassaniye, Mharbiye, Kfar Hatta, Mjeidel, Zaghdraya, Aarab ej Jall, Aarab Tabbaya, Bnaafoul, Mazraat Zeita, Mazraat Jinjlaya, Mazraat el Qnaitra, Roumine, Aazze, Erkay and Khzaiz to the existing waste water Treatment Plant and upgrading the existing plant to secondary treatment.
Degree of preparation	CDR prepared an estimated cost for the design, execution and supervision of sewer network and STP upgrade.
Economic & Financial	CDR is in charge of planning and executing donor-funded projects and has a long history of working with IFI including (EIB, EU, World Bank, Kuwait Fund for Development, etc...) ▪ The COED for Lebanon in 2005 was updated in the CEA and reached US$ 800 million (or US$ 969 million in 2008 prices) equivalent to 3.7 percent of GDP including the global environment with the following damage costs namely: water pollution (1.08% of GDP), air pollution (0.7% of GDP), coastal zones and cultural heritage (0.69% of GDP), soil pollution and wildlife (0.61%), Global environment (0.53%) and solid waste (0.09%). Water pollution remains the most prevailing cause of environmental damage. ▪ In 2007, a study was undertaken by the University of Balamand with the funding from the European Commission under SMAP III on the economic valuation of the coastal zone of the Mohafaza of North Lebanon. "The annual willingness to pay (WTP) derived through the survey for the entire population to preserve the Coastal Zone reached a mean USD 41 per household per annum in 2005 prices. The WTP to preserve the direct consumptive (e.g., extraction such as fisheries), direct non-consumptive (e.g., recreational, transport/trade, etc.), indirect (ecosystem services) and environmental health (ill-health attributed to externalities and behavior) values ranged between USD 10 to 11 per household per annum for each category. The WTP represents 0.5 percent of household income on average. The WTP also helped derive the direct-indirect resource use conservation value, which reached an average of USD 5.9 million (equivalent to PPP$ 6.9 million and € 4.4 million) per annum. This figure could equally be divided between direct consumptive, direct-consumptive and indirect use as well as environmental health to reach just about USD 1.5 million per annum" (Doumani, 2007). Improving waste water management has positive economic impacts on the coastal area. ▪ Such projects are usually executed by national private companies winning the bids prepared by CDR. Private Consultants will also be contracted to supervise the works of the contractors.
Institutional & Regulatory Framework	The Council of Development of Reconstruction (CDR) is in charge of planning and executing donor-funded water and wastewater investments **Invalid source specified.**. Law 221/2000 initiated the reform of the water sector and delegated the responsibility for the delivery of potable water, wastewater and irrigation to four financially and

	administratively autonomous Water Establishments (RWE) and to one pre-existing river basin agency (Litani River Authority) with a clear separation between policy-making and service provision **Invalid source specified.**. However, the implementation of Law 221/2000 is still incomplete with inconsistencies between legal, financial and responsibilities in effect. The RWEs are not yet empowered to act with full administrative and financial autonomy. The legal text to organize the work of MoEW has not been developed yet. MoEW's efforts are still dedicated to capital projects and O&M. RWEs suffer from a shortage of funds and technical staff **Invalid source specified.**. Wastewater collection – legally under the jurisdiction of the RWEs – is actually carried out by the municipalities and unregulated small-scale private operators. The operation and maintenance of large WWTPs is under the responsibility of the MoEW, given that RWEs do not have yet the capacity to take them over. The discrepancy between legal and de facto responsibilities has created institutional uncertainty, and weakened the accountability line between policy-makers and service providers **Invalid source specified.**. MoE is responsible for controlling pollution and regulating all activities that impact the environment and MoPH has the responsibility of maintaining health standards in the community **Invalid source specified.**. The project is in compliance with national regulations.
Social and Environmental Impact	This project was initiated in consultation with CDR and is part of CDR's plans. It also falls under the water sector strategy developed in 2010 by the MoEW in consultation with RWEs.

Project Ref No.	3	
Project Name	Technical assistance to improve wastewater management in the coastal area of Lebanon including Rehabilitation and expansion of the sewer network covered by the Tripoli STP (including Mina area, Tripoli, Zgharta…)	
Related Hot Spot	Tripoli 	
Sector (please tick ☑ one)	Wastewater	✓
	Solid Waste	
	Industrial Emission	
	Integrated (2 or more of the above in one project)	
Promoter	**Activity 1:** MoEW and RWEs **Activity 2:** CDR is responsible for planning and execution of donor funded Wastewater networks and Wastewater treatment plants. After execution, the responsibility of operation and maintenance falls within the jurisdiction of North Lebanon Water Establishment after 3 years of operation as per BOT contracts (Full Name, Phone, e-mail).	
Estimated Project Value (€)	The estimated project value is: **Activity 1:** 9,050,000 € **Activity 2:** 25,304,676€ (Including Construction of sewer network in Tripoli city - Qalamoun - Tripoli Section: - Works: 14,500,000 USD (13,698,630 €) - Supervision: 500,000 USD (472,366 €) Construction of a main sewer line between Koura and Tripoli (Ras Maska) - Works: 11,400,000 USD (10,769,957 €) - Supervision: 385,000 USD (363,722 €) Total: 26,785,000 USD (25,304,676€))	
General description	**Activity 1:** The institutional framework for the water sector in Lebanon involves a number of actors that sometimes duplicate each other's work and other times	

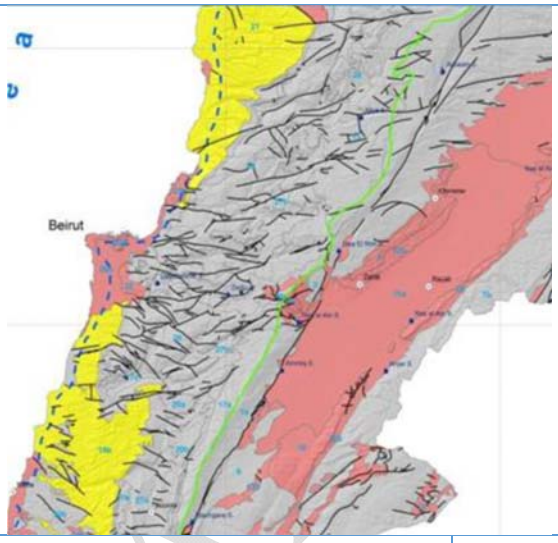
	complement each other; mostly operating through weak links of communication and responsibility. This has led to a lack of policy focus, with no one institution taking the effective lead of the sector**Invalid source specified.**. The Lebanese government has made reform of the water sector a national priority and has prepared a National Water Sector Strategy (NWSS), which was adopted by the Council of Ministers in March 2012. The NWSS goal is 'to ensure water supply, irrigation and sanitation services throughout Lebanon on a continuous basis and at optimal service levels, with a commitment to environmental, economic and social sustainability'. The strategy targets key outcomes that would improve water services and make them more financially and environmentally sustainable. This goal is to be attained through a combination of infrastructure, policy and institutional initiatives **Invalid source specified.**. This project aims at providing technical assistance to the MoEW to improve wastewater management. The project is in line with the water sector strategy developed in 2010 and that its implementation is behind the set schedule. The project consists of: • Reviewing and updating of the wastewater strategy • Updating Law 221/2000 to strengthen the role of MoEW in supervising and evaluating the performance of RWEs • Clarifying the distribution of responsibilities between municipalities and RWEs through update of Decree 8735/1974 regarding construction or upgrade of sewer lines Ensuring financial sustainability of the RWEs through: 1) updating water tariffs; 2) updating of taxes/fees for collection of wastewater; 3) developing wastewater discharge fees. **Activity 2:** A wastewater treatment plant was built in and started operation in 2011 and consists of a secondary treatment facility. The project is supposed to cover Tripoli coastal area, Al Qalamoun, some parts of Koura and Zgharta districts, the coastal areas of Beddawi, Deir Amar and El Minyeh (hence serving the equivalent of 1,000,000 inhabitants). Tripoli treatment plant is not yet operated at full capacity owing to incomplete of network connection works. Sea outfalls are commonly identified along the coastal zone and consist of around 16 domestic sewage and 14 industrial outfalls. Most outfalls extend only a couple of meters or terminate at the surface of the water thus not allowing effective dilution of wastewater (SOER, 2001). Towns not connected to the sewer system still rely on septic tanks (27.3%) or on direct discharge into the environment. Figure shows wastewater treatment projects completed and those in the pipeline (CDR, 2013). The specific objective of this project is to increase the treatment capacity of the existing waste water treatment plant by building new sewage systems, thereby increasing the flow of wastewater being conveyed to these existing plants. Completing the sewer network and connecting it to the STP help in controlling coastal, surface and ground water pollution in the area.
Depollution potential	**Activity 1:** Coastal waters in Lebanon receive untreated wastewater from at least 53 major sewage outfalls spread along Lebanon's 240 km coastline, of which 16 lie within the Beirut area. Coastal waters receive an estimated 162 MCM/year of untreated sewage (equivalent to 276,000 m^3/day), which is equivalent to 65% of the total sewage load in Lebanon **Invalid source specified.**. Syrian Refugees contribute to an increase between 26 and 43 MCM based on 31 May 2014 estimates and is expected to reach 34 and 56 MCM by the end of year 2014

	corresponding to an increase in national wastewater generation between 8 and 14 percent. **Activity 2:** The proposed main collectors will allow for the transmission of the waste water from localities in Koura & Qalamoun areas to the existing waste water Treatment Plant in Tripoli (that has a capacity of 135,000 m³/day, for an equivalent population of one million). In these localities, the secondary collectors and households connections are already built. These new collectors will provide waste water treatment services to approximately 300,000 additional people. About 39,000 m³ of waste water will reach daily the Tripoli plant. Tripoli being the second largest city of Lebanon with more than 500,000 inhabitants, the construction of these new conveyors will have a great environmental and health impact as they will protect the main potable water sources of the city from pollution due to hazardous waste water flows in the area.
Technical description	**Activity 1:** The project will consist of: 1- Restructuring MoEW's organization in line with the requirements of laws 221 and 247 to reflect more its water governance role, with main focus on policy making, planning and regulatory roles: • Development of revised organization structures for MoEW • Drafting a revised organization law, supporting in the approval process and following up on its enactment • Implementation of the restructuring of MoEW 2- Develop the process for the performance monitoring and evaluation of RWEs, including: • Monitoring body • Performance indicators • Tools and procedures 3- Setting a new wastewater tariff to customers connected to a sewer network and to a WWTP, where: • New tariff should be based on a proper cost analysis and cover at a minimum O&M cost in an intermediate stage, with an introductory tariff initially Wastewater charges can be a percentage of the water bill **Activity 2:** The project consists of the construction of sewer network in Tripoli city - Qalamoun - Tripoli Section and Construction of a main sewer line between Koura and Tripoli (Ras Maska). The following sections shall be constructed: 1. Construction of a waste water conveyor along El Hab valley, from Dahr el Ain to Bahsas 2. Construction of a waste water extension conveyor along El Hab valley 3. Construction of the Qalamoun-Bahsas waste water gravity system 4. Construction of a conveyor from the mouth of El Hab river in Bahsas, to existing sewage networks within the city of Tripoli (location known as "Spinneys Centre") 5. Construction of a waste water conveyor along Ouadi En Nakhleh, from Batroumine to Ras Masqa 6. Construction of a waste water conveyor linking the above conveyor to Abou Halqa, to join the Qalamoun-Bahsas networks

	These networks will increase the efficiency of Tripoli STP and convey around 39,000 m^3 of wastewater daily to the treatment plant. Considering the current yearly flat rate of LBP 50,000 (equivalent to EUR 25) paid per household for waste water treatment services, this programme shall contribute to a collection by the North Lebanon WE of about EUR 1.5 million per year.
Degree of preparation	**Activity 1:** A national water sector strategy was developed by the MoEW in 2010 to address gaps in water and wastewater sectors management. The World Bank in the country environmental analysis conducted in 2011 addressed the wastewater sector and studied wastewater sector mitigation costs. GIZ worked with the MoEW on the improvement of wastewater sector and the introduction of tariffs to recover O&M and include wastewater treatment. **Activity 2:** CDR prepared an estimated cost for the design, execution and supervision of works.
Economic & Financial	**Activity 1:** ▪ MoEW worked on investment projects with several IFIs in the past 5 years namely GIZ, World Bank, etc… ▪ The COED for Lebanon in 2005 was updated in the CEA and reached US$ 800 million (or US$ 969 million in 2008 prices) equivalent to 3.7 percent of GDP including the global environment with the following damage costs namely: water pollution (1.08% of GDP), air pollution (0.7% of GDP), coastal zones and cultural heritage (0.69% of GDP), soil pollution and wildlife (0.61%), Global environment (0.53%) and solid waste (0.09%). Water pollution remains the most prevailing cause of environmental damage. Improving the management of wastewater and ensuring its sustainability through the introduction of proper tariffs will contribute tremendously in decreasing the cost of environmental degradation at the national level. **Activity 2:** CDR is in charge of planning and executing donor-funded projects and has a long history of working with IFI including (EIB, EU, World Bank, Kuwait Fund for Development, etc...) ▪ The COED for Lebanon in 2005 was updated in the CEA and reached US$ 800 million (or US$ 969 million in 2008 prices) equivalent to 3.7 percent of GDP including the global environment with the following damage costs namely: water pollution (1.08% of GDP), air pollution (0.7% of GDP), coastal zones and cultural heritage (0.69% of GDP), soil pollution and wildlife (0.61%), Global environment (0.53%) and solid waste (0.09%). Water pollution remains the most prevailing cause of environmental damage. ▪ In 2007, a study was undertaken by the University of Balamand with the funding from the European Commission under SMAP III on the economic valuation of the coastal zone of the Mohafaza of North Lebanon. “The annual willingness to pay (WTP) derived through the survey for the entire population to preserve the Coastal Zone reached a mean USD 41 per household per annum in 2005 prices. The WTP to preserve the direct consumptive (e.g., extraction such as fisheries), direct non-consumptive (e.g., recreational, transport/trade, etc.), indirect (ecosystem services) and environmental health (ill-health attributed to externalities and behavior) values ranged between USD 10 to 11 per household per annum for each category. The WTP represents 0.5 percent of household income on average. The WTP also helped derive the direct-indirect resource use conservation value, which reached an average of USD 5.9 million (equivalent to PPP$ 6.9 million and € 4.4 million) per

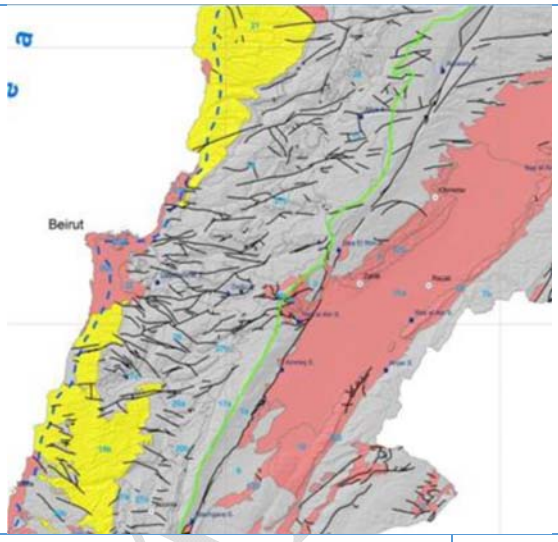
	annum. This figure could equally be divided between direct consumptive, direct-consumptive and indirect use as well as environmental health to reach just about USD 1.5 million per annum" (Doumani, 2007). Improving waste water management has positive economic impacts on the coastal area. ▪ Such projects are usually executed by national private companies winning the bids prepared by CDR. Private consultants will also be contracted to supervise the works of the contractors.
Institutional & Regulatory Framework	**Activity 1:** Law 221/2000 initiated the reform of the water sector and delegated the responsibility for the delivery of potable water, wastewater and irrigation to four financially and administratively autonomous Water Establishments (RWE) and to one pre-existing river basin agency (Litani River Authority) with a clear separation between policy-making and service provision **Invalid source specified.**. However, the implementation of Law 221/2000 is still incomplete with inconsistencies between legal, financial and responsibilities in effect. The RWEs are not yet empowered to act with full administrative and financial autonomy. The legal text to organize the work of MoEW has not been developed yet. MoEW's efforts are still dedicated to capital projects and O&M. RWEs suffer from a shortage of funds and technical staff **Invalid source specified.**. Wastewater collection – legally under the jurisdiction of the RWEs – is actually carried out by the municipalities and unregulated small-scale private operators. The operation and maintenance of large WWTPs is under the responsibility of the MoEW, given that RWEs do not have yet the capacity to take them over. The discrepancy between legal and de facto responsibilities has created institutional uncertainty, and weakened the accountability line between policy-makers and service providers **Invalid source specified.**. The Council of Development of Reconstruction (CDR) is in charge of planning and executing donor-funded water and wastewater investments **Invalid source specified.**. MoE is responsible for controlling pollution and regulating all activities that impact the environment and MoPH has the responsibility of maintaining health standards in the community **Invalid source specified.**. **Activity 2:**The Council of Development of Reconstruction (CDR) is in charge of planning and executing donor-funded water and wastewater investments **Invalid source specified.**. Law 221/2000 initiated the reform of the water sector and delegated the responsibility for the delivery of potable water, wastewater and irrigation to four financially and administratively autonomous Water Establishments (RWE) and to one pre-existing river basin agency (Litani River Authority) with a clear separation between policy-making and service provision **Invalid source specified.**. However, the implementation of Law 221/2000 is still incomplete with inconsistencies between legal, financial and responsibilities in effect. The RWEs are not yet empowered to act with full administrative and financial autonomy. The legal text to organize the work of MoEW has not been developed yet. MoEW's efforts are still dedicated to capital projects and O&M. RWEs suffer from a shortage of funds and technical staff **Invalid source specified.**. Wastewater collection – legally under the jurisdiction of the RWEs – is actually carried out by the municipalities and unregulated small-scale private operators. The operation and maintenance of large WWTPs is under the responsibility of the MoEW, given that RWEs do not have yet the capacity to take them over. The discrepancy between legal and de facto responsibilities has created institutional uncertainty, and weakened the

	accountability line between policy-makers and service providers **Invalid source specified.**. MoE is responsible for controlling pollution and regulating all activities that impact the environment and MoPH has the responsibility of maintaining health standards in the community **Invalid source specified.**. The project is in compliance with national regulations.
Social and Environmental Impact	**Activity 1:** The project is part of the water sector strategy prepared by the MoEW in coordination with national stakeholders. The strategy was endorsed by the GoL. **Activity 2:** This project was initiated in consultation with CDR and is part of CDR's plans. It also falls under the water sector strategy developed in 2010 by the MoEW in consultation with RWEs.

Project Ref No.	4	
Project Name	Technical assistance to improve reduction and monitoring of emissions from cement industries	
Related Hot Spot	Chekka & Sibline	
Sector (please tick ☑ one)	Wastewater	
	Solid Waste	
	Industrial Emission	✓
	Integrated (2 or more of the above in one project)	
Promoter	Ministry of Environment in collaboration with the Ministry of Industry, LIBNOR, Laboratories, Ministry of Energy and Water, (Full Name, Phone, e-mail).	
Estimated Project Value (€)	The estimated project value is: **Activity 1:** 4,000,000 € **Activity 2:** 20,000 €	
General description	**Activity 1:** This activity aims at reducing emissions from cement industries through improvement of the quality of the input material used for production and reviewing the existing standards in this regard. Noting that the co-processing of RDF has been proposed by cement industries, the project will work on developing specs of RDF and procedures for permitting and quality control of the feed to minimize emissions. At the moment local laboratories lack the capacities to sample and test air emissions from cement industries - Instead, samples are sent to international laboratory facilities for testing – hence the need to improve local capabilities to be able to better monitor emissions from these industries. **Activity 2:** The Ministry of Environment is currently suffering from a serious data deficiency and a paucity of systematically acquired data, particularly for the monitoring of the industrial sector. Data and information relevant to industrial discharges both historical and current baselines as well as continuous monitoring data is indispensable to understand the context, assess discharges loads, anticipate and proactively address problems to protect the environment, the natural resources as well as safeguard lives. The aim of this activity is to compile and structure the environmental dataset required to support the sustainable development in Lebanon while addressing issues of data availability, accessibility, update and management.	
Depollution potential	**Activity 1:** Existing cement plants are those of the dry process type. The production rate of the cement industries amounts to 5,309,000 tons in the year 2012 (US Geological Survey, 2014). The increase in production of cement and energy increased the releases of cadmium, mercury and chromium gas in 2013. Improving emissions'	

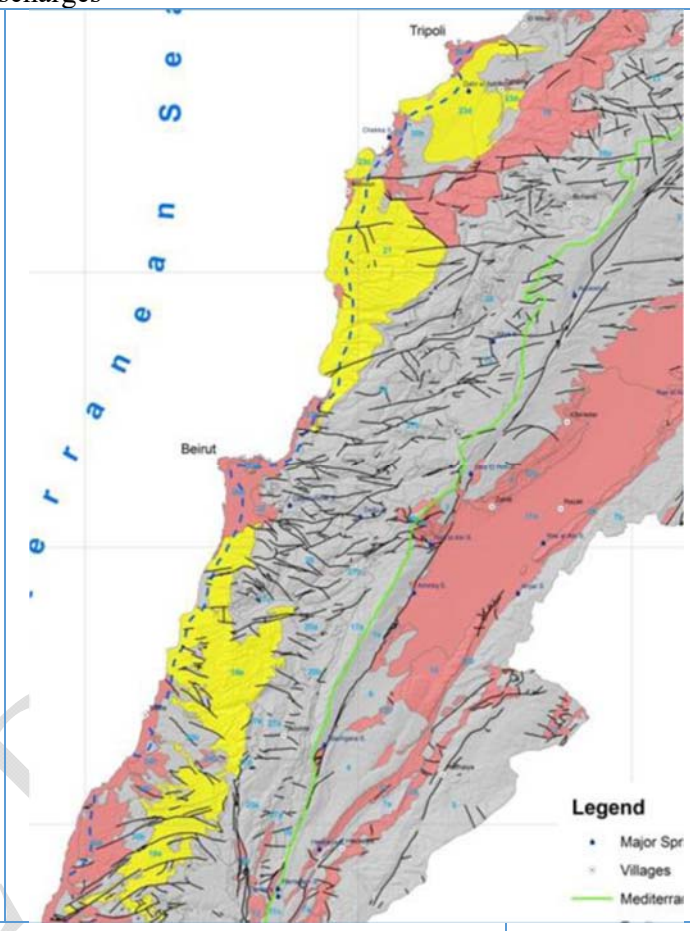
	monitoring and setting specs and quality control for RDF to be co-processed at the cement industries as well as the petcoke used as input material into the process contribute greatly to the minimization of air emissions from this sector.
Technical description	**Activity 1:** The activity consists of 1. Improving testing capabilities of local laboratories through building specialized accredited laboratories and the provision of necessary equipment to test for dioxins and furans, heavy metals, etc… this should be complemented by developing the technical capacities of existing staff in these laboratories to be able to use the laboratories and equipment and get necessary accreditations. 2. Controlling and improving the quality of input material, including petcoke used in cement industries. This would require a review and adoption of existing standards by LIBNOR following consultation with the ministries and with the actors of the sector. 3. Regulating the use of RDF for co-incineration in cement kilns through developing the Specs of RDF and procedures for permitting and quality assurance and control of feed, etc. **Activity 2:** The activity consists of 1. Understanding the local regulatory and data context to best cater for the function of the aspired environmental spatial dataset. 2. Proposing the scale and scope of the required environmental spatial dataset including the data required, structure and architecture in view of best practices and benchmarks 3. Assess the available data in terms of content and spatial and temporal coverage (with special focus on information covered by EIAs, permitting conditions requirements, environmental audit reports, self-reporting data, GIS mapping …) as well as prioritize and categorize missing data 4. Develop guidelines for generating/collecting new data including environmental information network, MOUs with data generators, surveys etc. 5. Develop the data management system/tool
Degree of preparation	**Activity 1:** Environmental impact assessment studies and environmental audit reports have been submitted by 2 cement industries to the Ministry of Environment in relation to the use of RDF in cement industries. **Activity 2:** Relevant data is generally available but sporadic in nature, unsystematic in approach and spread among the different institutions. Public agencies today, are hence, fully aware of the significance of data accessibility, update and centralization for effective management.
Economic & Financial	**Activity 1 & 2:** ▪ MoE worked on investment projects with several IFIs in the past 5 years namely EU, World Bank, GEF etc… ▪ The COED for Lebanon in 2005 was updated in the CEA and reached US$ 800 million (or US$ 969 million in 2008 prices) equivalent to 3.7 percent of GDP including the global environment with the following damage costs namely: water pollution (1.08% of GDP), air pollution (0.7% of GDP), coastal zones and cultural heritage (0.69% of GDP), soil pollution and wildlife (0.61%), Global environment (0.53%) and solid waste (0.09%). Water pollution remains the most prevailing cause of environmental damage. ▪ Developing and implementing necessary standards and procedures for use of RDF and other inputs in cement industries and reinforcing the capabilities of existing national laboratories to test parameters that cannot be tested at the moment,

	contributes largely in decreasing the cost of environmental degradation from air pollution at the national level. ▪ Developing tools to control and monitor emissions from the industrial sector will have a direct impact on reducing the cost of environmental degradation associated with direct industrial discharges into the environment.
Institutional & Regulatory Framework	**Activity 1 & 2:** The Ministry of Industry (MoI) was established by Law 642/1997 which gave the Ministry overall jurisdiction over the permitting of industrial facilities. According to Article 4 of the Decree 9765/2003 of the MoI, the authorities in charge of the industrial pollution control are the MoI Control Department, the municipalities and the competent authorities of MoE and MoPH The GoL enacted Decree No. 8471/2012 related to Environmental Compliance for (existing) Establishments which is the process of adhering to environmental regulations in effect, environmental policies, and requirements. This Decree was complemented by Decree No. 8633/2012 on "Fundamentals for Environmental Impact Assessment (EIA)", which is an important tool for ensuring that potential environmental impacts of new development projects, including industrial, are assessed and that proper mitigation measures are incorporated in the project design before project commencement through conducting EIA studies or Initial Environmental Examination (IEE) reports depending on the classification of the industrial enterprise. Enforcement capacities of the MoI and MoE need to be improved to control industrial pollution. The proposed project is in compliance with national legislation.
Social and Environmental Impact	**Activity 1 & 2:** This project was initiated after discussions with MoE and LEPAP and STREG projects.

Project Ref No.	5	
Project Name	The preparation of Business plan for abatement of industrial pollution in the Al-Ghadir drainage area	
Related Hot Spot	Beirut	
Sector (please tick ☑ one)	Wastewater	
	Solid Waste	
	Industrial Emission	✓
	Integrated (2 or more of the above in one project)	
Promoter	Ministry of Environment in collaboration with the Ministry of Industry, the Directorate General of Urban Planning, Municipalities in the project area (Full Name, Phone, e-mail).	
Estimated Project Value (€)	The estimated project value is around 200,000 €	
General description	The concept of developing a Business Plan for Combating Pollution of the Ghadir drainage area evolved from the recommendation of the Environmental Parliamentary Commission subsequent to the successful completion of a similar Plan for the Litani River and Qaraoun Lake. The drainage basin of the Ghadir WWTP extends over an area of around 173 km2 along the coastline of Lebanon. Major industrial areas within the Ghadir drainage area are Beirut Southern Suburbs, Choueifat/ Kfarchima and Haadath/ Baabda. Industries located along the river commonly discharge untreated wastewater directly into the river. elevated concentrations of certain pollutants such as Fe, Cd, Ni, Hg and CN observed in the wastewater currently reaching the plant may be explained by discharge of industrial wastewater into the municipal sewage network and the Ghadir River. Continued negative impacts on marine and aquatic fauna and flora due to the deterioration of the quality of coastal waters and an increase in river contamination; No law enforcement mechanism has been established to assure that all industries comply with their respective discharge requirements under MoE Decision 8/1 (2001). With the recent enactment of the environmental compliance decree (Decree 8471 of 2012), this situation is likely to improve in the near-to-medium future, assuming that a suitable enforcement mechanism is developed and adequate resources are allocated by the Competent Authorities. The Project aims at assessing industrial pollution sources in Al Ghadir drainage area and preparing an industrial pollution abatement program to eliminate all untreated sewage discharges to the sea and reduce uncontrolled discharges to the Ghadir River,	

	thus reducing sea water and river contamination and minimizing health risks along with protecting the marine flora and fauna. The Project aims at safeguarding compliance with the environmental standards imposed by international conventions and national legislation, with reference to wastewater discharges. The project consists of 1) conducting a baseline assessment for the industrial zone including info about the zone's neighborhood environment characteristics (i.e.: land use and baseline environmental conditions), types of industries (production type and capacity, class and coordinates), available environmental infrastructure, industrial discharges, etc…2) Developing an industrial pollution abatement program in the Al-Ghadir drainage area including a set of interventions to address pollution problems highlighted by the baseline.
Depollution potential	Based on the laboratory results conducted under the scope of an environmental and social impact assessment study by Horizon 2020 in 2012 for the Extension of Al-Ghadir Wastewater Treatment Plant (Lebanon), wastewater from the currently connected Ghadir drainage area is considered to have medium strength, since the annual average value of BOD5 for 2009 measured after the aerated grit chambers is 241 mg/l (maximum 284 mg/l). On the other hand, ammonia concentration was found to be high, even for high strength wastewater (MoE Decision 8/1-2001, SPD9 Wastewater Treatment). Additionally, increased concentrations (above the respective ELVs for discharging to sewers) are observed for certain pollutants which include Fe, Cd, Ni, Hg and CN. Increased concentrations of these pollutants in the wastewater may be explained by discharge of industrial wastewater into the municipal sewage network and the Ghadir River from the industrial areas and/or by the discharge of the leachate from the Naameh landfill (taking place daily and every hour via tanker trucks). The concentrations of TSS and VSS are also high, which is probably due to the sand and mud conveyed by the "open" Ghadir River to the plant. The do-nothing scenario would lead to continued negative impacts on marine and aquatic fauna and flora due to the deterioration of the quality of coastal waters and an increase in river contamination. The project will help identifying pollution sources and putting a mitigation plan for industrial emissions.
Technical description	The project consists of: 1. Conducting a baseline assessment for the drainage area identifying: a. The different sources of pressure (such as pressures from solid waste and wastewater and from different economic/industrial activities…) b. Baseline environmental conditions (such as neighborhood environment characteristics, river water and sediments' quality, etc…) 2. Conducting a situation analysis 3. Developing a business plan for implementation of mitigation measures for pollution abatement within the drainage area
Degree of preparation	No preparatory baseline or feasibility studies has been conducted on the project .
Economic & Financial	▪ MoEW worked on investment projects with several IFIs in the past 5 years namely GIZ, World Bank, etc… ▪ The COED for Lebanon in 2005 was updated in the CEA and reached US$ 800 million (or US$ 969 million in 2008 prices) equivalent to 3.7 percent of GDP including the global environment with the following damage costs namely: water pollution (1.08% of GDP), air pollution (0.7% of GDP), coastal zones and cultural heritage (0.69% of GDP), soil pollution and wildlife (0.61%), Global environment

	(0.53%) and solid waste (0.09%). Water pollution remains the most prevailing cause of environmental damage. ▪ Developing and implementing a pollution abatement plan for the industrial sector in Al Ghadir area contributes largely in decreasing the cost of environmental degradation at the national level.
Institutional & Regulatory Framework	The Ministry of Industry (MoI) was established by Law 642/1997 which gave the Ministry overall jurisdiction over the permitting of industrial facilities. According to Article 4 of the Decree 9765/2003 of the MoI, the authorities in charge of the industrial pollution control are the MoI Control Department, the municipalities and the competent authorities of MoE and MoPH The GoL enacted Decree No. 8471/2012 related to Environmental Compliance for (existing) Establishments which is the process of adhering to environmental regulations in effect, environmental policies, and requirements. This Decree was complemented by Decree No. 8633/2012 on "Fundamentals for Environmental Impact Assessment (EIA)", which is an important tool for ensuring that potential environmental impacts of new development projects, including industrial, are assessed and that proper mitigation measures are incorporated in the project design before project commencement through conducting EIA studies or Initial Environmental Examination (IEE) reports depending on the classification of the industrial enterprise. Enforcement capacities of the MoI and MoE need to be improved to control industrial pollution. The proposed project is in compliance with national legislation.
Social and Environmental Impact	This project was initiated after discussions with MoI & MoE where full support of the 2 administrations was shown.

Project Ref No.	6		
Project Name	Technical assistance to food sector industries to adopt cleaner production and reduce and control emissions and discharges		
Related Hot Spot	All hot Spots		
Sector (please tick ☑ one)	Wastewater		
	Solid Waste		
	Industrial Emission		✓
	Integrated (2 or more of the above in one project)		
Promoter	Ministry of Environment in collaboration with the Ministry of Industry (Full Name, Phone, e-mail).		
Estimated Project Value (€)	The estimated project value is around 800,000 €		
General description	The Food sector in Lebanon is the largest among manufacturing activities. According to the Ministry of Industry's 2007 census "The Lebanese Industrial Sector", the activity comprises the largest number of industrial establishments, with 736 producers accounting for 18.2 percent of total industrial enterprises. Lebanon produced roughly 310 million m³ of wastewater in 2012 of which 250 million m³ are from municipal and domestic establishments, and 60 million m³ are from industrial enterprises. Industrial waste generates about 185,000 tons/year as most of the waste is mixed with municipal solid waste. Industrial activities in Lebanon are putting greater environmental pressures and becoming increasingly prominent and visible while the Ministry of Environment (MOE) does not yet have the capacity to properly enforce standards. The project aims at providing technical assistance for food industries discharging more than 4000 PE into water bodies for adopting cleaner production options. The project consists of:		

	- Conducting a survey identifying Industrial Food Plants discharging more than 4000 PE into water bodies; - Preparation of internal auditing reports for food production facilities; - Developing recommendations for CP technologies based on the audit reports; - Issuing voluntary agreements and implementation of environmental performance certificates; - Introducing water pollution charges for Food sector industry; - Developing discharge permits for food sector industries. - Developing a self-monitoring program with concerned industries for sustainable monitoring of compliance.
Depollution potential	Lebanon produced roughly 310 million m³ of wastewater in 2012 of which 250 million m³ are from municipal and domestic establishments, and 60 million m³ are from industrial enterprises. Moreover, overall air pollution loads in 2005 reached: 36,000 tons/year of PM10, 185,000 tons/year of SO2 and 69,000 tons/year of NOx. Industrial waste generates about 185,000 tons/year as most of the waste is mixed with municipal solid waste The population that lives in the areas of the participating enterprises where emissions are released, effluents are discharged and waste is dumped. Additional global benefits include possible reduction in greenhouse gas emissions. However, it is difficult to determine the exact geographical area and the number of people who will benefit from the reduction of these externalities at the onset.
Technical description	The project consists of: - Conducting a survey identifying Industrial Food Plants discharging more than 4000 PE into water bodies; - Preparation of internal auditing reports for food production facilities; - Developing recommendations for CP technologies based on the audit reports; - Issuing voluntary agreements and implementation of environmental performance certificates; - Introducing water pollution charges for Food sector industry; - Developing discharge permits for food sector industries. - Developing a self-monitoring program with concerned industries for sustainable monitoring of compliance.
Degree of preparation	The proposed project builds on existing and ongoing efforts of GIZ's Environmental Fund for Lebanon (EFL) and the Lebanese Ministry of Environment (MoE) to implement the Lebanon Pollution Abatement Project (LEPAP) – an initiative supported by the World Bank. The LEPAP aims at reducing pollution by creating a sustainable and market-based financial incentive scheme offering preferential lending terms to public and private entities moving towards compliance with the environmental legal framework. It builds on the efforts of the EU €8.0 million StREG program that aims to strengthen the capacity for environmental inspection and enforcement. Last but not least, this project will also builds on the efforts of the EU funded Switch-Med-MEDTEST II project aimed at building the capacities of major environmental consultancy firms in RECP and is thus strengthening the local market for the provision of RECP services to industry in the country.
Economic & Financial	▪ MoE worked on investment projects with several IFIs in the past 5 years namely GIZ, World Bank, EU, GEF etc… The World Bank Country Environmental Analysis (CEA) for Lebanon (2011) estimated the cost of environmental degradation (COED) in Lebanon at US$800 million (equivalent to 3.7 percent of GDP in 2005). The largest proportion is attributed to water pollution (1.1% of GDP), followed by air pollution (0.7% of GDP).

	Improving environmental compliance and performance of the industrial sector alleviates the cost of environmental degradation, and reduces the pressure on the WWTP that are being developed by CDR and MoEW.
Institutional & Regulatory Framework	The Ministry of Industry (MoI) was established by Law 642/1997 which gave the Ministry overall jurisdiction over the permitting of industrial facilities. According to Article 4 of the Decree 9765/2003 of the MoI, the authorities in charge of the industrial pollution control are the MoI Control Department, the municipalities and the competent authorities of MoE and MoPH The GoL enacted Decree No. 8471/2012 related to Environmental Compliance for (existing) Establishments which is the process of adhering to environmental regulations in effect, environmental policies, and requirements. Enforcement capacities of the MoI and MoE need to be improved to control industrial pollution. Lebanon's track record of enforcement and compliance, however, has been poor. The fact that MOE is not the only enforcement agency further complicates the implementation of environmental Laws (other agencies with relevant responsibilities include the MOEW, Ministry of Industry (MOI), Ministry of Interior and Municipalities (MOIM), Ministry of Justice as well as municipalities) as reflected in SELDAS. The costliness and technical complexity of recently enacted Laws (e.g., Framework for the Protection of Environment no. 444-2002 and Decree no. 8471-2012) also pose some challenges for MOE. MOE therefore seeks to pursue a sequenced approach, by first targeting priority areas/sectors and assisting individual industries towards achieving compliance. The proposed project is in compliance with national legislation and STREG project road map.
Social and Environmental Impact	This project was initiated after discussions with MoE, LEPAP and STREG projects where full support of all concerned was shown.