PLAN D'ACTION POUR LA MÉDITERRANÉE (PAM)
CENTRE RÉGIONAL MÉDITERRANÉEN POUR L'INTERVENTION D'URGENCE CONTRE LA POLLUTION MARINE ACCIDENTELLE (REMPEC)

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PROGRESS REPORT OF THE MEDITERRANEAN TECHNICAL WORKING GROUP (MTWG)

ANNEX I

MEDITERRANEAN OIL SPILL WASTE MANAGEMENT GUIDELINES

Mediterranean Oil Spill Waste Management Guidelines

MEDITERRANEAN ACTION PLAN (MAP)
REGIONAL MARINE POLLUTION EMERGENCY RESPONSE CENTRE FOR THE MEDITERRANEAN SEA (REMPEC)

REGIONAL MARINE POLLUTION EMERGENCY

RESPONSE CENTRE FOR THE MEDITERRANEAN SEA (REMPEC)

MEDITERRANEAN ACTION PLAN

Mediterranean Oil Spill Waste Management Guidelines

Regional Information System, Part D, Section 12 – RIS/D/12

www.rempec.org

June 2010

Note

This document has been prepared, in the framework of the Mediterranean Technical Working Group (MTWG) Programme, by the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC), with the technical support of the “Centre de documentation de recherche et d’expérimentations sur les pollutions accidentelles des eaux” (CEDRE) and OTRA Sarl.

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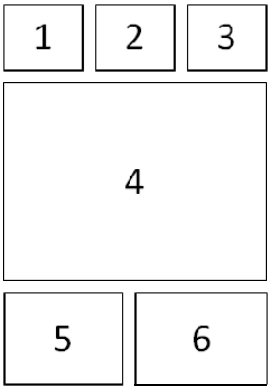

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The publication “Mediterranean Oil Spill Waste Management Guidelines” is downloadable from REMPEC’s website (www.rempec.org) in the section “Tools/Operational Tools/Waste Management Decision Support Tool”.

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Foreword

Due to the difficulties associated with the management of the waste, after a spill, from its removal, transport, treatment, to the final disposal, waste management is considered as being a key element of the contingency plan. It is thus a fundamental requirement that waste management is incorporated in the response strategy from the beginning of the response operation to ensure a successful response, avoid secondary contamination and minimize costs.

In the case of the “AMOCO-CADIZ” incident, from 223,000 tons of spilled oil, 250,000 tons of waste were recovered, whilst in the “ERIKA” incident approximately 250,000 tons of waste were recovered from a spill of 19,800 tons. In Lebanon, the spillage of an estimated quantity of 15,000 tons of IFO 150 in July 2006 resulted in the collection of 7,280 m^3 of contaminated waste including 1,026 m^3 of liquid oil, 238 m^3 of semi-solid oil and 6,016 m^3 of polluted sand, pebbles, debris, etc…

The lessons learnt from past incidents showed that logistics and legal constraints remain the bottleneck of the waste management. In order to define in advance a waste management strategy, each technical option should be analysed at national level taking into consideration the technical, logistical and legal constraints.

Recognizing the need for a regional decision support tool on waste management, the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) through the Mediterranean Technical Working Group (MTWG) and with the support of the International Maritime Organization (IMO) OPRC-HNS Technical Group has produced the “Mediterranean Guidelines on Oil Spill Waste Management” for the development of a decision support tool to be used by any Mediterranean country when establishing or revising its national waste management strategy for oily waste resulting from accidental marine pollution, aiming at facilitating the determination of the most suitable techniques for countries and also at highlighting, where necessary, regulatory amendments. The Mediterranean Guidelines served as a reference document for the development of the “IMO Guidelines on Waste Management of Oil Spills”.

Acknowledgements

The present document has originally been developed, in the framework of the Mediterranean Technical Working Group (MTWG) work programme (2008-2009), by the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) with the technical support of the “Centre de documentation de recherche et d’expérimentations sur les pollutions accidentelles des eaux” (CEDRE) and OTRA SARL who contributed significantly to the draft of the Guidelines. Ms. Florence Poncet (CEDRE, France) and Mr. Lindsay Page-Jones (OTRA, France) have served as contributors and co-editors of the guidelines, with the support of the IMO and REMPEC Secretariats.

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Initials and Acronyms

ADR	European Agreement concerning the international carriage of dangerous goods by road
API	American Petroleum Institute
BRGM	*Bureau de Recherches Géologiques et Minières*
BSW	Bottom Sediment and Water
CM	Centimetre
BSW	Bottom Sediment and Water
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CAPEX	Capital expenditures
Cedre	*Centre de documentation, de recherche et d'expérimentations sur les pollutions accidentelles des eaux*
DDE	*Direction Départementale de l'Equipement*
DM	Decimetre
DIREN	*Direction Régionale de l'Environnement*
DRIRE	*Direction Régionale de l'Industrie, de la Recherche et de l'Environnement*
DS	Dry Sediment
EC	European Commission
EIA	Environmental Impact Assessment
EU	European Union
EWC	European Waste Catalogue
FT	Feet
GC / MS	High resolution Gas Chromatography and Mass Spectrometry
GT	Gross Tonnage
HazMat	Hazardous Materials
HC	Hydrocarbon
HDPE	High Density Polyethylene
HTTD	High Temperature Thermal Desorption
HWIP	Household Waste Incineration Plant
IMO	International Maritime Organisation
IOPC Funds	International Oil Pollution Compensation Funds
ITOPF	International Tanker Owners Pollution Federation Limited
LDPE	Low Density Polyethylene
LTTD	Low Temperature Thermal Desorption
M^3	Cubic metre
MM	Millimetre
MS	*Matière sèche (Dry sediment – DS)*
NCV	Net Calorific Value
NOSCP	National Oil Spill Contingency Plan
OECD	Organisation for Economic Co-operation and Development
OPEX	Operational expenditures
OSW	Oil Spill Waste
OSWM	Oil Spill Waste Management
OSWMP	Oil Spill Waste Management Plan
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCT	Polychlorinated Terphenyl
PPB	Part per billion (= 0,001 mg/ kg)
PPE	Personal Protective Equipment
PPM	Part per million (= 1 mg/ kg)
PVC	Polyvinyl chloride (a type of plastic)

REMPEC	Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea
SPM	Suspended Particle Matter
T	Tons
TG	Technical Guidelines
THC	Total Hydrocarbon Content
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
VOC	Volatile Organic Compounds
VHOC	Volatile Halogenated Organic Compounds
WGS 84	World Geodetic System 1984
WTS	Waste Tracking Sheet

INTRODUCTION

In May 2007, the Eighth Focal Points Meeting of REMPEC:

- Considered the issue of waste management raised in the Working Document REMPEC/WG28/9/3, presented by the Centre related to the lessons learnt from the marine pollution incident in the eastern Mediterranean during the summer 2006.
- Unanimously agreed with the proposal by REMPEC (REMPEC/WG28/13) and recognized the need to task the Mediterranean Technical Working Group (MTWG) to introduce in its programme of work the development of a waste management standardized matrix approach based on the available technical guidelines.

The project "MEDITERRANEAN OIL SPILL WASTE MANAGEMENT STUDY AND DECISION SUPPORT TOOL" was then launched by REMPEC with a view to produce a decision support tool, to be used by any country when establishing or revising its national waste management strategy for **oily waste resulting from a marine accidental pollution**, **aiming at facilitating the determination of the most suitable techniques for the Countries and also at highlighting, where necessary, regulatory amendments**.

This Decision Tool will:

- Take into consideration technical, logistical, financial and legal aspects.
- Be based on international best practices and on the result of the analysis of the national waste management policies of the respective Mediterranean coastal States.
- Be developed in three phases:
    - Phase I : **Mediterranean Oil Spill Waste Management Study**. A questionnaire was sent to each country to assess the national status and capabilities regarding oil spill waste management.
    - Phase II : **Draft Mediterranean Oil Spill Waste Management Decision Support Tool.** This present document is designed to assist the countries to draft or update their oil spill waste management plan, choose Best Environmental Practical Option for the treatment and final disposal of oil spill waste and review their regulatory framework if necessary. The document sets the basis for the Phase III.
    - Phase III : **Electronic version of the Mediterranean Oil Spill Waste Management Decision Support Tool**. The Tool will be developed on the basis of the phase II of the project, to facilitate and guide Mediterranean Coastal States in developing/ improving their national waste management strategy.

About this Tool

The waste management operation is often the longest and costliest operation after a major oil spill. The main difficulty in planning oil spill waste management is to prepare a waste management plan for an unexpected nature and volume of oil spill waste, taking into account the possible types of waste, the facilities available and the treatment techniques required. Reference must also be made to legal, financial, environmental, operational and logistics issues. Figure 1 below illustrates the parameters to be taken into account when considering waste management.

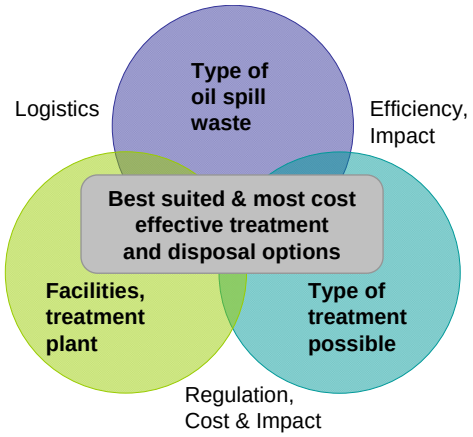


Figure 1 : Parameters to be taken into account for oil spill waste treatment

The Tool will assist any country of the Mediterranean Sea **to develop a complete and operational "Oil Spill Waste Management Plan - OSWMP"** covering:

- Preparedness: developing an oil spill waste management plan.
- Response: choosing the best oil spill waste treatment.

The term waste is defined as "any substance or object the holder discards, intends to discard or is required to discard" under the Waste Framework Directive (European Directive 2006/12/EC), which repeals the European Directive 75/442/EC as amended. Once a substance or object has become waste, it will remain waste until it has been fully recovered and treated and no longer poses a potential threat to the environment or to human health. Annex 1 of the Directive refers to "materials spilled, lost or having undergone other mishap, including any materials, equipment, etc., contaminated as a result of the mishap" (category Q4).

The Tool focuses on oil spill waste, i.e. oil, weathered and/or emulsified oil, oiled material, oiled sediment, oiled equipment, etc. recovered after an accidental oil spill.

As for any sustainable waste management plan, the Tool is based on general recommendations regarding the management of waste applicable to any pollution:

Reduce	Only the oil spill waste should be recovered (i.e. avoid the removal of clean sediment). Waste should be segregated, depending on their nature.
Re-use	Consideration should be given to re-use and make best use of waste that is produced (e.g. as a fuel, or a raw material such as in road construction).
Recover	Some processes are available to recover some of the spilled oil which can be re-used.
Disposal	Disposal is the least favoured option and usually means landfill.

Considerations for the development of an Oil Spill Waste Management Plan (OSWMP)

Assessment of the national status for oil spill waste management

It is the responsibility of each country to:

- assess their existing OSWMP;
- evaluate the need to update and/ or complete their OSWMP;
- identify the existing waste treatment facilities in country and the type of waste they can manage, and
- consequently, the waste that cannot be managed in the country.

To facilitate this task, the Questionnaire provided by REMPEC (see copy at the end of the document) may assist the countries in carrying out a first assessment:

- The results of Section 1, Questions 1-2, outline the basic requirements of a waste management plan.
- The following sections of the Questionnaire details the various items that should be contained in a OSWMP and issues that should be dealt with.

Recommendations

The OSWMP can be implemented in different ways in countries e.g. as:

- an independent operational document,
- provisions of the National Oil Spill Contingency Plan,
- regulations.

The level of work to be carried out in each country will depend on this preliminary assessment (based on the Questionnaire):

- A country with few and/or incomplete answers to the Questionnaire should consider developing a complete OSWMP.
- A country able to provide answers to most of the Questionnaire should simply consider updating and completing as required their existing OSWMP.

Refer to Questionnaire of REMPEC, Section 1, all questions.

Definition of the scope of the plan

As for a National Oil Spill Contingency Plan (NOSCP), an OSWMP is an operational document that relies on and takes into account the national rules and regulations.

The scope of the Plan must be defined, and roles and responsibilities clarified.

An OSWMP should cover the waste recovered and generated during response operations and clean-up operations following accidental oil pollution incidents of minor, medium or large magnitude (often known as Tier 1, Tier 2 and Tier 3 pollutions).

The term “Oil” usually covers persistent hydrocarbon-based products.

The term “Accidental” refers to any incident resulting in the release of oil into the environment. **Chronic pollution is not included in the scope of this document**.

Response and clean-up operations refer to all the operations implemented to respond to the oil pollution, which may result in:

- the recovery of oil at sea (using booms and skimmers),

- the collection of oil on land (using manual or other tools), often mixed with other materials (sand, waste, seaweed, etc.),
- generation of waste: oiled disposable response equipment (e.g. sorbent boom), oiled Personal Protective Equipment (PPE), etc.

ⓘ **See Appendix n°2**: “Response strategies and their effect on waste generation”, p.71

It must be emphasized that oil spill waste covers a wide variety of types of waste as illustrated in the figure below:

Figure 2 : Variety of oil spill waste

Prediction of volume of waste based on the original volume of oil spilled is a difficult task since it involves various parameters. Table 1 below shows that the same quantity of waste was generated following the ERIKA and the AMOCO CADIZ spills while the quantity of oil spilled was approximately 11 times more important in respect of the AMOCO CADIZ (however, changes in type of oil, legislation and response practice must also be considered between these two spills, separated by 21 years).

AMOCO-CADIZ oil spill (1978) 223,000 tons of light crude spilled	**ERIKA oil spill (1999)** 20,000 tons of very heavy fuel spilled
<> 250 000 tons of wastes And approx. 10 to 20% of oil recovered	<> 250 000 tons of wastes And approx. 1 to 30% of oil recovered

Table 1: Volume of waste compared to volume of oil spilled for two major spills

Figure 3 below provides an example of spilled oil mass balance. From 1,000 tons of light to medium crude oil spilled, 400 tons will remain (after 350 tons evaporate, 100 tons are recovered and 150 tons are dispersed). However, the remaining oil may emulsify resulting in 1,600 tons of emulsified oil at sea coming to the shore. Once grounded, the persistent emulsified oil will be mixed with sediment, solid waste etc. and oiled response equipment and consumables will also be disposed of.

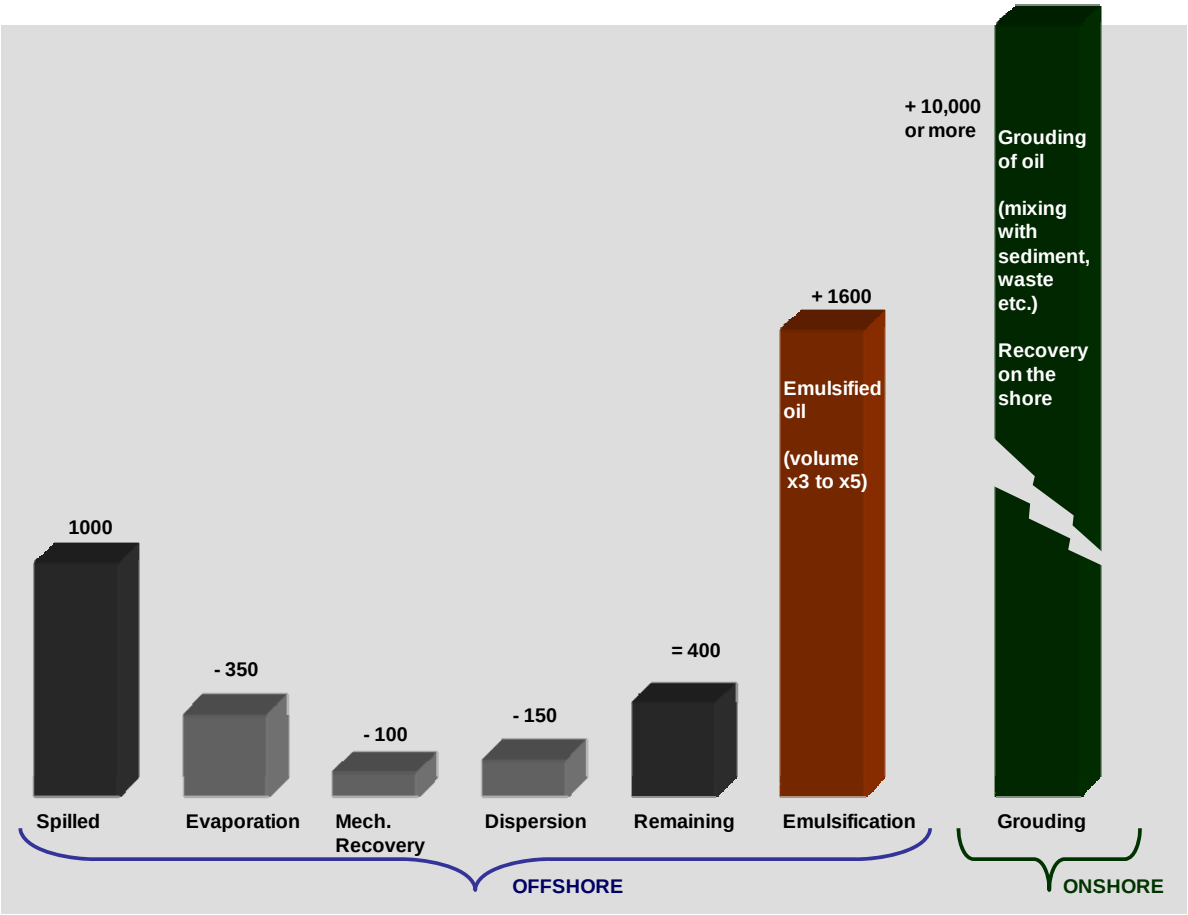


Figure 3 : Spilled oil mass balance

The major part of hydrocarbons (main compounds of oil) is biodegradable. However, some compounds biodegrade faster than others, i.e. alkane C10 to C24 and the monocyclic aromatics (particularly the BTEX). As a rule of thumb, it is generally considered that the heavier the molecular mass of the compound, the slower the biodegradation speed.

Participants in the development of the plan

The management of oil spill waste will involve representatives from various organisations (National Competent Authority, Ministries, specialized agencies, laboratories, industry etc.).

To prepare the OSWMP, it is recommended to set up a Technical Working Group supervised by the National Competent Authority and comprising representatives of the different services, e.g.:

Authority	Possible involvement
Ministry in charge of Transport	Transport of waste.
Ministry in charge of Industry	Analysis, technical solution, implementing treatment, etc.
Ministry in charge of Public Works	Set up of intermediate and long term waste storage sites, etc.
Ministry in charge of Environment	Technical advice for waste minimization and treatment, environmental monitoring, waste analysis, soil and water analysis of storage sites, monitoring of the rehabilitation of decommissioned storage sites, etc.
Ministry in charge of Mineral Resources/ Soil/ Petroleum	Choice of intermediate/long term waste storage sites, soil and water analysis, etc.
Ministry in charge of Home Affairs	Temporary and exceptional authorisation for waste storage, limitation of access to storage sites, etc.
Specialized national agency for waste management	Domestic and/or industrial landfills and/or incinerators or other equipments.
Representative of provincial authority	Depending on the national administrative organisation and on the national oil spill response organisation, the provincial authority may be in charge of the waste treatment in their respective province.
Representatives of the oil industry and waste treatment industry	Oil storage, refinery, port reception facility, oil exploration and production facilities, waste incinerator, cement kiln, etc.

Table 2: Authorities and their possible involvement

Depending on the National Organisation, this Technical Working Group will be included in the National Oil Spill Contingency Planning team, or will work independently. Table-top exercises inviting national organisations can be organised to discuss waste management policy and responsibilities.

Relationship with other policies and plans

The OSWMP must be integrated within:

- the National Oil Spill Contingency Plan, and
- the national regulatory framework regarding waste management (national waste management plan or other regulatory document).

Each country should have a regulatory framework regarding the management of waste. EU countries have the obligation to implement EU Directives on waste and waste management issued by the European Commission and Council.

Countries having signed the Basel Convention (on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal) shall take the necessary measures for its implementation.

In all cases, each country must assess their regulatory framework and identify the rules and regulations that would apply to the management of oil spill waste in order to ensure that the provisions of the OSWMP are consistent with the national rules and regulations.

Clarifications or derogations (i.e. regarding the status of OSW) can be envisaged to address the specific case of waste handling in emergency situations.

Using the Tool

The present document is organized in three main parts:

Development of an Oil Spill Waste Management Plan

Each section of this part can be considered as **a potential section of the Oil Spill Waste Management Plan to be developed** by the country and provides:

- a short introduction and objectives of the section,
- the recommended content to be developed for each section,
- practical information to develop the section. To facilitate this task, relevant links will be found here to the :
  - TG: Technical Guidelines,
  - Appendices with additional Data and the Questionnaire (***Note.*** *Part of the answers provided when considering the Questionnaire can be used directly to complete the OSWMP*).

Technical Guidelines (TG) for the development of an Oil Spill Waste Management Plan

Specific Technical Guidelines to support the development of the OSWMP and guidance for waste management are provided here:

- technical information on OSW minimization, sorting, transport and storage,
- tools to help assessment of possible or available treatment options,
- various template sheets ready to be completed, that may be used in the OSWMP.

Appendices

Various information and data sheets on OSW treatment can be found here:

- regulations,
- technical information (gas releases, etc.),
- bibliographic information, etc.

Questionnaire

A copy of the Questionnaire sent to all Mediterranean Coastal States during the Phase I of the project is provided here. Part of the answers can be used directly to complete the OSWMP.

Elements for Phase III: Transposition of the results of Phase II in an electronic Application format

Objective of the electronic Application

The objective of the electronic Application will be to transpose the method and tools developed on a paper basis (in the present document) into an electronic decision support tool which would enable each country to develop its waste management policy and identify the waste treatment methods, taking into account the types of waste (that may be produced during an oil spill) and the existing facilities in the country.

- The development of all potential sections of an OSWMP will be assisted by and integrated in the Application.
- The Application will also assist the user to choose waste streams:
  - knowing the type of waste, the Application should propose to the user the possible treatments and potential installations to implement the treatment(s), and
  - knowing the facilities, the Application should identify the possible treatments and the acceptable types of waste.

Note. The information will first have to be provided by the country.

Principle of the electronic Application

The Application will be an electronic Internet Application, of the present document, providing:

- electronic checklists to assist the user to develop an OSWMP (see "Development of an OSW Management Plan" in the present document), and
- electronic tools to assist the user to choose waste treatment (see the relevant Technical Guidelines in the present document).

The Application should be developed as a dynamic web site, database driven, easily accessible via common Internet browsers (Internet Explorer, Firefox). Each country should have a personalized login to implement his data in the system via an administrative interface.

Preparation phase

➔ Development of an Oil Spill Waste Management Plan

Contracting Parties to the Barcelona Convention will be able to use the Application to facilitate the development of their National OSWMP.

The Application will provide a series of checklists, to ensure each country has considered all the relevant issues to develop a comprehensive and operational OSWMP.
The user will be able to input in the Application (as text) the main provisions of his OSWMP, i.e. the answers to the Questionnaire, using a personalized administrative interface, with a specific login for each country.

The Application will also provide a tool to assist the Mediterranean Coastal State to define their national oil spill waste streams, i.e. dynamic electronic versions of the Technical Guidelines:

- n°10: "Assessment of national oil spill waste treatment capabilities", and
- n°11: "Treatment facility information sheet".

The Mediterranean Coastal States will be able to input the information into the electronic Application, as data and save it in the database of the Application.

Utilization Phase

➔ Consultation of the results from the Application

At anytime, and in particular in case of emergency, the States will be able to consult the information entered in the system:

- main provisions of the OSWMP of the country, and
- data on all the waste treatment facilities in the country, the type of OSW they can treat and the treatment(s) they can implement.

➔Use of the Application to define the optimum waste streams in country

The Mediterranean States will have the options to:

1) choose the type(s) of waste from a pre-defined list (one or more type of waste);

2) consult the various waste streams suitable (including pre-treatment and final disposal if required);

3) then for each waste treatment stream, compare the various treatment options, based:
   - on common generic criteria (from literature and past experience),
   - or preferably on the specific data inputted during the preparation phase by the Country;

4) for each treatment option, access to information on the type of treatment and on the suitable facilities identified in the country.

Conceptual structure of the use of the Tool and of the electronic Application

The conceptual structure of the use of the Tool and of the Application is outlined in the figure below.

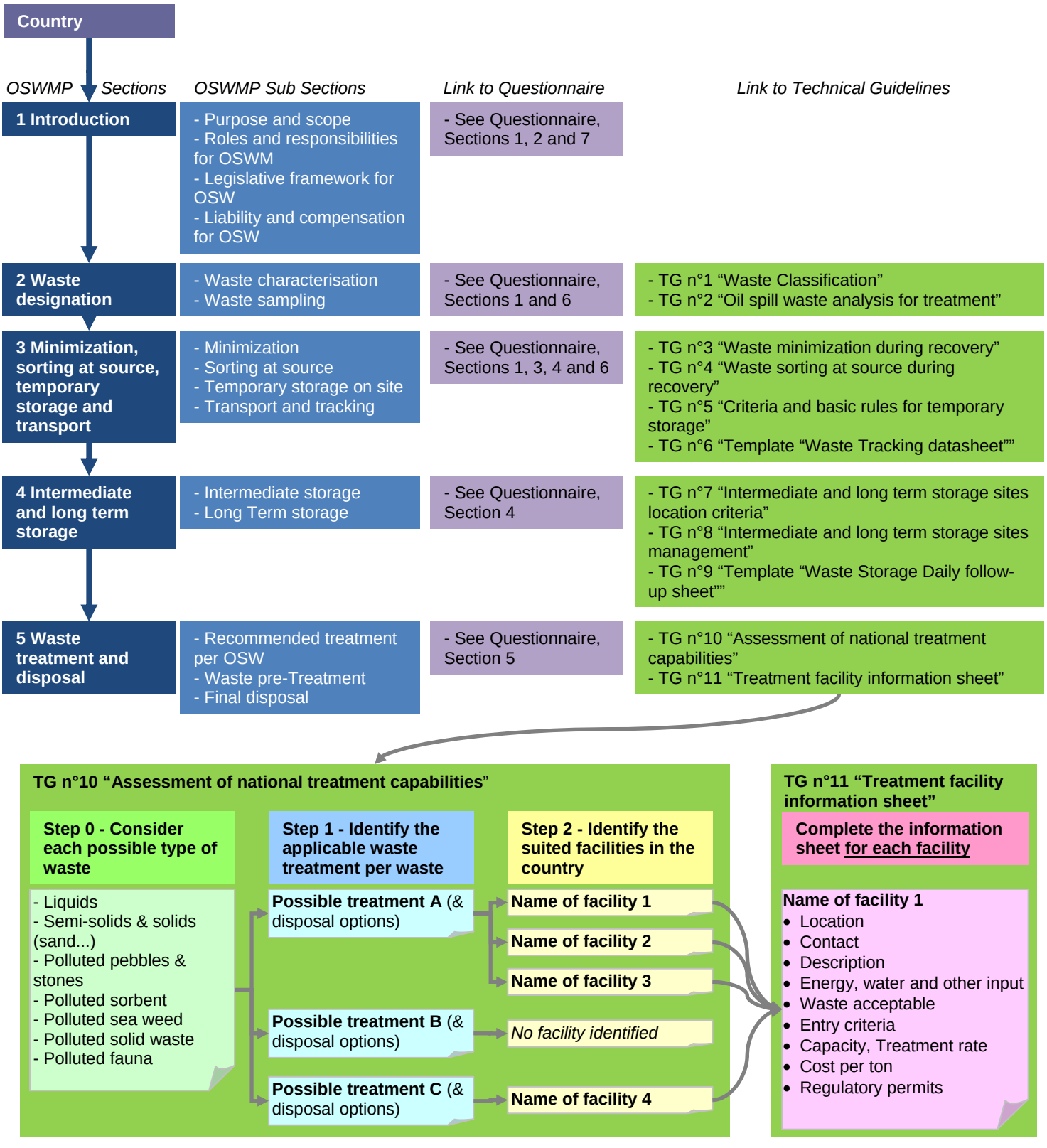


Figure 4 : Conceptual structure of the Tool and Application

Conceptual use of the electronic Application

The possible use of the Application is outlined in the figure below.

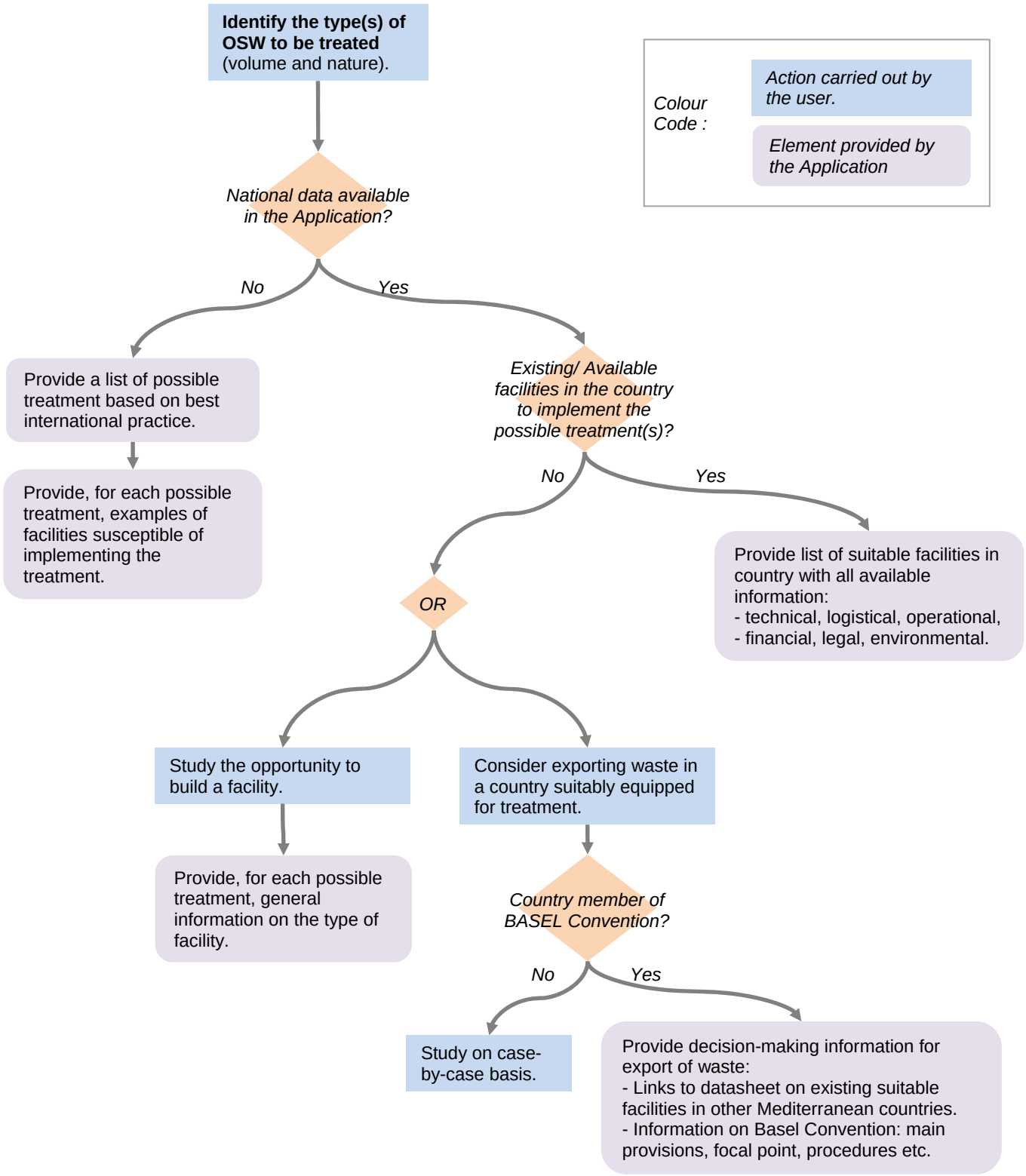


Figure 5 : Conceptual use of the Application

DEVELOPMENT OF AN OSW MANAGEMENT PLAN

Proposed summary of an Oil Spill Waste Management Plan

It is recommended that an OSWMP covers all issues related to the management of the waste as proposed in the following OSWMP summary, from the temporary storage and segregation of the recovered waste to the final disposal of treated material.

Section : Introduction

Outline of Sub Sections
↳ Purpose and scope ↳ Roles and responsibilities for oil spill waste management ↳ Legislative framework for oil spill waste ↳ Liability and compensation for waste management

Section : Waste designation

Outline of Sub Sections
↳ Waste characterisation ↳ Waste sampling

Section : Waste minimization, segregation, temporary storage and transport

Outline of Sub Sections
↳ Minimization ↳ Sorting ↳ Temporary storage on site ↳ Transport and tracking

Section : Intermediate and long-term storage

Outline of Sub Sections
↳ Intermediate storage ↳ Long term storage

Section : Waste (pre-)treatment and disposal

Outline of Sub Sections
↳ Recommended treatment per type of waste ↳ Waste pre-treatment

1 Introduction

Oily waste management, including the final disposal of the waste, is one of the most difficult problems to deal with when an accidental oil spill occurs. The quantity and diversity of waste generated by clean-up operations as a result of major spills, but also smaller ones, can cause major difficulties to response coordinators. It is essential that the NOSCP includes (or refers to) adequate provisions for the management and final disposal of all oily wastes.

1.1 Purpose and scope

The oil spill waste management plan (OSWMP) is developed in accordance with the regulations in force. It concerns the first phase of oily waste management including waste minimization, classification, segregation, storage and transport and the second phase including treatment and final disposal.

The OSWMP shall cover small, medium and large spills.

It is an operational document which identifies the:

- authorities in charge and involved in waste management, and possible industry support,
- objectives and recommendations for each step of the waste management process to optimize efficiency and cost,
- specialized service providers, laboratories, civil works and transport companies, PPE and containment suppliers to reduce the time required in an emergency to source them,
- treatment process and disposal facilities available.

The OSWMP also provides Technical Guidelines about:

- waste minimization, classification and segregation,
- model templates ready to use for waste tracking during transport and storage,
- criteria to establish temporary storage on site and pre-identification of possible intermediate and long-term storage sites,
- assessment tool to identify the best treatment process or disposal options in the country for each type of waste.

Proposed content of this Sub-Section of the Plan

➔ **Nature of waste product covered by the OSWMP.**

➔ **Type and magnitude of incident covered by the OSWMP.**

Recommendations to develop this subsection

Refer to Questionnaire of REMPEC, Section 1, Questions 1-1, 1-2 and Section 2, Question 2-3

1.2 Roles and responsibilities for oil spill waste management

The roles and responsibilities regarding preparation and involvement in response operations of the organisations in charge must be clearly identified and detailed for each issue (determination of storage sites or treatment facilities, preparation of authorisations when required, organization of transportation, etc.).

Proposed content of this Sub-Section of the Plan

➔ **Name of the national authority in charge of oil spill waste management.**

➔ **If applicable: name of other services or administrations involved in technical and/ or decision making for oil spill waste management.**

➔ **If applicable: Name of the national or regional representative(s) of the industry which could assist for the oil spill waste management (oil, cement kiln, incinerator, etc.).**

➔ **Name of the existing agreements between the national authorities and the industry (oil company and others for the management of oil spill waste).**

Recommendations to develop this subsection

Refer to Questionnaire of REMPEC, Section 1, Questions 1-1, 1-2, 1-3, 1-4 and 1-5

Depending on each national organisation, the preparation of the OSWMP as well as the involvement in the different aspects of response may be implemented at the national level or at a provincial (local) level.

Prior to any operations, the identification of possible support from the industry and the type of expected involvement is helpful.

1.3 Legislative framework for oil spill waste

Oil and polluted material collected in the context of response operations implemented after accidental water pollutions are considered as **"Waste**" (i.e. Substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law", Basel Convention).

Note. The EC legislative framework is used in this section as reference for legislative consideration under the OSWM. For non-EU Member States, this information is provided as reference material for their consideration.

"Oil wastes and wastes of liquid fuels" and "oil spills" are also often classified as "**Hazardous waste**". OECD and Basel Convention considers "Waste oil/water, hydrocarbon/water mixtures, emulsions" as hazardous. In the EU, Commission Decision of 3 May 2000 (2000/532/EC) classifies oil spill waste as hazardous.

The essential objective of all provisions relating to hazardous waste management is the protection of human health and the environment against harmful effects caused by the collection, transport, treatment, storage and disposal of waste. As national rules aim to achieve a good level of environmental protection and management of hazardous waste, legislation is becoming progressively more stringent and complex. It regulates all aspects of hazardous waste management: from classification to disposal.
However, international convention and regional regulations usually provide that emergency situations may require derogations from general regulatory framework and that it may be necessary to implement specific procedures to avoid human or environmental threats. This may occur when important volumes of OSW are collected and have to be managed quickly and suddenly.

Main regulations will concern:

- Overall management (e.g. in the EU, the waste management policy is covered by Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives).

- Transport (e.g. in the UE, the reference is the European Agreement concerning the international carriage of Dangerous goods by Road – ADR),

- Intermediate and long term storage,

- Treatments:
  - Landfill of waste with special requirements on Waste Acceptance Criteria (WAC) and procedure to check the conformity of waste (characterization, leaching limits...) with the requirement of the category of storage site (EC reference is Council Directive 1999/31/EC and 2003/33/EC and Council Decision of 19 December 2002),
  - Incineration with special requirements on compliance with emission limit values for some pollutants to reduce environmental atmospheric pollution due to incineration or co-incineration of waste (EC Reference is Directive 2000/76/EC),
  - Others if and when considered,

- Cross-border transfers regulated by the Basel Convention on the Control of trans-boundary movements of hazardous waste and their disposal of 22 March 1989 and OECD Decision C(92)39/FINAL on the Control of trans-boundary movements of waste destined for recovery operations of March 1992, and bi- and multi-lateral agreements (listed in the appendices of the Basel Convention).

Proposed content of this Sub Section of the Plan

➔ **Elements on International regulatory framework adopted by the country, specially the ratification of the Basel Convention.**

➔ **Elements on the Regional (European and Mediterranean) regulatory framework adopted by the country (regarding waste management and accidental pollution preparedness and response).**

➔ **Specific elements from the national regulatory framework.**

➔ **Legal status of oil spill waste in the country.**

Recommendations to develop this subsection

Refer to the Questionnaire of REMPEC, Section 2, Questions 2-1, 2-2, 2-3 and 2-4

Main aspects of legislative framework governing oily waste, i.e. classification (hazardous or not), handling, transportation, temporary storage and final disposal of oily waste streams must be provided in the OSWMP with their main implications.
Exemption cases and procedures must be provided.

ⓘ **See the Appendix n°10** “Main provisions of the Basel Convention”, p.111

1.4 Liability and compensation for waste management

The cost of oil spill waste treatment corresponds often to a large portion of the overall cost of the response operations (up to 50%). Some International Conventions, related to oil spill compensation, are relevant and may apply to the waste treatment.

A compensation regime for spills of persistent oil originating from tankers (bunker oil or cargo oil), was originally established in 1978 and is now based on two Conventions:

- the 1992 International Convention on Civil Liability for Oil Pollution Damage (1992 Civil Liability Convention),
- the 1992 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (1992 Fund Convention), and
- a Protocol to the 1992 Fund Convention was adopted in 2003, which established a Supplementary Fund.

The IOPC Fund Claims Manual indicates that:

> "*Clean-up operations frequently result in considerable quantities of oil and oil debris being collected. Reasonable costs for storing and disposing of the collected material are accepted. If the claimant has received any extra income following the sale of the recovered oil, these proceeds would normally be deducted from any compensation to be paid.*
> *(…)*
> *Presentation of claims*
> *It is essential that claims for the costs of clean-up are submitted with supporting documentation showing how the expenses for the operations are linked with the actions taken.(…)*
> *Cost of temporary storage (if applicable) and of final disposal of recovered oil and oily material, including quantities disposed, unit cost and method of calculating the claimed rate*."
>
> (Source: International Oil Pollution Compensation Fund, 2008. *Claims Manual*)

This three-level compensation regime can cover expenses related to oil spill waste treatment operations (as well as the cost incurred by the temporary and intermediate storage, the transport and handling of the oil and oily waste) if the incurred costs are "reasonable", i.e. covering technically well-suited and cost-effective solutions.

In the rare cases involving persistent oil spills from tankers where the compensation limit is exceeded, further claims may be made against parties involved.

Note. The 1992 Civil Liability Convention does have a "channelling" of liability which involves that claims can only be made against the registered owner of the tanker concerned and prohibits claims against the servants or agents of the owner, members of the crew, the pilot, the charterer, manager or operator of the ship, or any person carrying out salvage operations or preventive measures. The owner is entitled to take recourse action against third parties who are not similarly protected, e.g. the shipper of the goods, in accordance with national laws.

A spill of non-persistent oil falls outside the above-mentioned international compensation regime, though incidents of this kind are less damaging to the environment and have not led to claims compare to spills of persistent oil. In this case, domestic laws will apply.

For European countries, the Waste Directive could provide a remedy against the ship-owner as well as the charterer and shipper, in the absence of domestic laws to the contrary.

In case of oil spills of heavy bunker fuel from non-tankers, the International Convention on Civil Liability for Bunker Oil Pollution Damage (entered into force on 21 November 2008) can apply. The strict liability under this Convention extends beyond the registered owner to the bareboat charterer, manager and operator of the ship.

This Convention requires the registered owner of ships greater than 1,000 GT to maintain insurance or other financial security.

For all other oil spills (from tank farms, bunkering installations, exploration or production or storage installations, etc.), the national laws will apply. Claims are usually made to the "producer" of the waste, i.e. the polluter, and will be settled on a case-by-case basis.

Proposed content of this Sub-Section of the Plan

➔ **Recommendations on liability and compensation in case of unknown producer of waste.**

➔ **Recommendations on liability and compensation in case of known producer of waste, and considering the different nature of OSW and origin of pollution.**

Recommendations to develop this subsection

Refer to Questionnaire of REMPEC, Section 7, Questions 7-1 and 7-2

ⓘ **See the following web sites** for general documentation and full text of the Conventions and for information on the limit of liabilities:

- http://www.iopcfund.org : web site of the International Oil Pollution Compensation Funds (IOPC Funds).
- http://www.itopf.com : web site of the International Tanker Owner Pollution Federation Limited (ITOPF).

2 Waste designation

2.1 Waste characterisation

Every spill produces specific waste according to:

- the quality of oil spilled (characteristics and weathering of the oil spilled),
- the sea and weather conditions,
- the substrate and the presence of seaweed and debris,
- the recovery and clean-up techniques implemented, and
- the quantities recovered.

The recovered materials may consist of (Source: IMO):

- oil or emulsified oil recovered at sea,
- oil or emulsified oil recovered during shoreline clean-up operations,
- oiled sand and gravel,
- oiled beach debris (wood, plastic, seaweed..),
- oiled dead birds and mammals,
- tar balls,
- oil contaminated clean-up materials, equipment and protective clothing,
- contaminated soil from storage sites, and
- residues generated by wash-down stations employed to clean response equipment or to clear birds and mammals..

All these materials will be more or less mixed and contaminated with oil. For example, liquid oil recovered from the shoreline will almost always contain some sand and small debris.

Three levels of characterization can be identified:

1. The first characterization of waste will be carried out directly on site (i.e. classification), based on visual criteria to define segregation during waste collection and first storage on site.

2. Some basic analysis can be required for a first diagnostic that help to validate or eliminate some treatment options (water content, Total Hydrocarbon Content, sand content, organic matter).

3. Detailed and specific analysis will be required to check the most appropriate treatment for waste and compliance with entry criteria required for each type of treatment or disposal facilities (calorific power, Chlorine, Sulphur…) and evaluation of environmental impact by water or gas emissions (Polycyclic Aromatic Hydrocarbon – PAH, volatile compounds like benzene, toluene, ethylbenzene and xylene – BTEX, Metals). Specific analytical requirements have to be detailed for the entry criteria into each facility.

The first two levels of characterisation of waste are also useful ways to estimate the volume of recovered oil. Balance between volume spilled and volume recovered is always a difficult exercise. Visual estimation and basic HC content dosage can help rough balance estimation.

An estimation of the quantity of each type of waste is an important issue to deal with and this point will be developed in the section “Minimization, sorting at source, temporary storage & transport”, p.27.

Proposed content of this Sub-section of the Plan

➔ **Recommendations for the classification of OSW on site.**

Recommendations to develop this Sub section

Refer to the Questionnaire of REMPEC, Question 1, of REMPEC, Section1-2

Refer to TG n°1 “Waste classification”, p.41. A table is provided classifying the OSW into seven categories depending on their nature and relative content of oil and corresponds to distinct management and treatment processes.

It is recommended to include in the OSWMP a table providing the classification of the different types of waste generally produced by clean-up operations at sea and on the shoreline. This will help operators to keep in mind the need for segregation.

The content of the table must be adapted to the specific context of each country, the type of process and facilities available.

See Appendix “Response strategies and their effect on waste generation**”**, p.71, illustrating how different environments and different clean-up techniques generate different types of waste.

Badly sorted OSW: Semi-solids mixed with some solid waste (Source: Cedre)

2.2 Waste sampling

Laboratory analyses of oil samples may be required for various objectives:

- to identify “responsible party” for judicial purpose;
- to compare the spilled oil with a potential source of pollution;
- to characterize the oil spilled in case of unknown source of spilled oil;
- to characterize oily waste mixtures collected during response to choose treatment options.

Refer to “Manual on Oil Pollution – Section VI, IMO. Guidelines for sampling and identification of oil spills”, 1998 Edition 1578 E, giving detailed and illustrated Instructions and recommendations on sampling methodology (equipment, safety, sampling procedures for different types of oily mixtures, samples identification, etc.).

In a judicial procedure, there are very strict rules to ensure that sampling can be used as evidence. In the case of waste management, when sampling for fingerprinting, these general procedures and guidelines are useful for sampling any type of oily material.

Proposed content of this Sub-section of the Plan

➔ **Recommendations on oil spill waste sampling and analysis capabilities.**

Recommendations to develop this Sub-section

Refer to the Questionnaire of REMPEC, Section 6, Question 6-2

Refer to TG n°2 “

Categories	
Liquids	 (source : Cedre)

Solids and semi-solids (oiled sand...)	 (source : Cedre)
Polluted pebbles & stones	 (source: Cedre)
Polluted sorbent	 (source : OTRA)

Polluted seaweed

(source : OTRA)

Polluted solid waste

(source : OTRA)

Polluted fauna

(source : OTRA)

Visual estimation on oil content in different types of waste in not an easy exercise

Sand aspect and related hydrocarbon content in oiled sediment samples	
Jyeh accident (Lebanon) Coarse sand lightly oiled Total Hydrocarbon content: 5,5 g/kg dried matter (0.5%)	
Jyeh accident (Lebanon) Fine sand heavily oiled Total Hydrocarbon content 34 g/kg dried matter (3.4%)	

For a first rough quantitative determination of oil content in waste (sediment, debris etc.) a gravimetric analysis can be done (after solvent extraction, the solution is dried and weighed and compared to the weight of original sample).

This approach does not replace Total Hydrocarbon Content precise analysis needed to determine waste treatment options.

Oil spill waste analysis for treatment", p.42.
A Technical sheet may be included in the OSWMP as well as the list and contacts of official and approved laboratories with sufficient capabilities to carry out the analysis of oil.

Sampling of OSW in glass container for analysis (Source: ITOPF)

3 Minimization, sorting at source, temporary storage & transport

3.1 Minimization

Historical data shows that oil spills impacting the shoreline can in extreme cases produce up to 30 times more waste than the volume originally spilled, although small spills have also sometimes created large amounts of waste. However, this varies depending on the characteristics and behaviour of the oil, response techniques and management. It is essential to reduce the amount of waste, thus limiting the difficult problem of dealing with the quantity of waste generated in a very short period, and limiting environmental and economical impacts (Source: IPIECA guidelines).

Waste minimization must be a **permanent objective** during the clean-up operations and in situ handling of OSW. Expert advice should be obtained for the selection of the best technical choices for clean-up. Emphasis should be put on methodical management of clean-up sites to avoid spreading and secondary contamination of unaffected sites and also by choosing the recycling options for the oiled equipment.

- Waste minimization must start with the first response operations on the site and remain a permanent effort. Information and control of the personnel and companies working on site is essential.
- Use appropriate clean-up techniques to minimise the volume of sediments collected.
- Prefer in situ washing techniques instead of the removal of oiled sediment (e.g. surf washing, sand flushing, etc.).
- Avoid additional contamination:
  - Prevent soil contamination by using liners under drums, tanks and at bottom of storage pits, and
  - Control the accesses to the clean-up sites and protect them using lining and/ or geo-textiles.

Proposed content of this Sub -section of the Plan

➔ **Recommendations on oil spill waste minimization.**

Recommendations to develop this Sub-section

Refer to the Questionnaire of REMPEC, Section 1, Question 1-2.

Refer to TG n°3 “Waste minimization during recovery”, p.49, with explanation of some techniques for selective collect and in situ handling of oily material. Operational instructions should be included in the OSWMP.


Re-use equipment, e.g. draining of Pom Pom on site for re-use (Source: Le Floch Depollution)


Avoid removing lightly polluted sand/pebbles. Prefer in-situ clean-up techniques (Source: OTRA)


Avoid additional contamination by using the adequate equipment (Source: Cedre)

3.2 Sorting at source

Segregating the waste at the source allows choosing specific and best suited methods for each type of waste, ensuring cost effective and ecologically sound treatment (and diminishes the cost related to pre-treatment). Contaminated material should be segregated into liquid, solid, non biodegradable (oiled plastics, contaminated clean-up equipment…), biodegradable (oiled seaweed, fauna) types. The OSW classification should be used for this purpose.

Taking into account that waste will not be "pure" but already more or less mixed, the need for the best waste segregation must be emphasized, as early as possible, on the working sites by appropriate management of waste collection and temporary storage. This will require the immediate use of different waste containers for the different types of waste and clear labelling and identification to avoid mixing of containers during the rest of the management process.

Segregation efforts on site, up to individual waste streams, can be adapted to the:

- volume of oil spilled and related waste amount expected, and
- final disposal and treatment options available previously identified.

Response personnel need to be trained and informed about the importance of segregating the waste and about the related consequences and costs of an inappropriate mixing of OSW.

Proposed content of this Sub-section of the Plan

➔ **Recommendations for sorting at source.**

➔ **Operational instructions for sorting** (refer to the OSW classification)**, storage on site and list of suppliers** (What container for what type of OSW?).

Recommendations to develop this Sub-section

Refer to the Questionnaire of REMPEC, Section 1, Question 1-2.

Refer to TG n°4 "Waste sorting at source during recovery", p.51.
With reference to the waste categories previously identified, and to comply with this objective of sorting at source, recommendations on possible storage material should be included in the OSWMP.
It is recommended to identify the adequate containers (bins, bucket etc…) available in the country, and the suppliers, quantities immediately available, costs etc. This can allow reducing the time required to organise the collection of the polluted material.

3.3 Temporary storage on site

Because oil spills can occur in isolated and inaccessible locations on the coast, or when large volumes of polluted material are generated or if processing is required before disposal, it may be difficult and expensive to transport material directly to the disposal or treatment site and therefore, temporary storage facilities are needed. Advantages of temporary storage are:

- optimising response team efficiency, and
- allowing greater flexibility in the OSW management of flow (buffer role).

It is difficult to pre-designate areas for emergency storage on working sites, therefore it is an issue that need to be addressed as the need arises. Thus it will be important to include in the OSWMP pre-established criteria for site selection and recommendations to comply with.

A temporary storage is:

- an emergency staging area for the immediate deposit of the waste collected and before its transfer to an intermediate, long term storage or if possible directly to a treatment facility,
- a key moment in waste management process for sorting, labelling and quantifying the natures and volumes of waste collected and when possible reducing volumes to be transported by pre-treatment implementation.

Size, number and location of sites will depend on the amount and nature of material collected, on the distribution of the pollution along the shore, and on the number of working sites:

- oily mixtures collected at sea will need port facilities to be unloaded;
- oily wastes from shoreline clean-up will require a staging areanear shore.

Site selection will meet some criteria:

- in port facilities: adequate mooring, unloading facilities and enough space in the port, and
- on shore sites: access to road with a distance as short as possible from the clean-up site and a flat area with enough space away from environmentally-sensitive areas(vegetation, groundwater) and out of reach of the sea, tides and waves.

Temporary storage sites require protection to avoid pollution spreading and environmental contamination, i.e. soil of staging area or pit needs to be protected by watertight plastic liners, rain water or effluent needs to be managed, decontamination area must be organized to avoid the spreading of the pollution due to workers or contaminated vehicles' wheels.

The duration of a temporary storage site depends on the clean-up operations. The complete removal of oil and restoration of the site at the end of the operations is required to truly end the clean-up operations.

Proposed content of this Sub-section of the Plan

➔ **Recommendations on the temporary storage of oil spill waste (on working site).**

Recommendations to develop this Sub-section

Refer to Questionnaire of REMPEC, Section 4, Question 4-1.

Refer to TG n°5 "Criteria and basic rules for temporary storage", p.52.

See Appendix n°5 "Watertight protection of storage sites", p.79.

See Appendix n°6 "Examples of equipment for the storage of oil", p.80.


Avoid disposing of oiled containers in non-protected areas (Source: OTRA)


Ensure the temporary storage sites and accesses are protected (Source: Cedre)

Adequate temporary waste storage sites (Source: Le Floch Depollution)

3.4 Transport and tracking

The transfer of waste from primary storage sites to intermediate and long term storage or to treatment and disposal facilities should be carried out by suitable vehicles, e.g. road tankers for liquid waste and trucks for solid waste. During an emergency, a variety of vehicles not normally used for oil transport may be required. This may include vacuum trucks, tipper trucks, skips or refuse trucks. Sources of transport means should ideally be identified in the OSWMP and agreements made in advance.
Transport should be organised in accordance with applicable national legal requirements for the transport of waste by road, by train, or by fluvial and maritime means. Key issues include: conditions for packaging and labelling, vehicle characteristics and safety equipments, conditions and limitations for circulation, movement and traceability.

The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) was established in Geneva on 30 September 1957 under the auspices of the United Nations Economic Commission for Europe (UNECE), and it entered into force on 29 January 1968. The Agreement itself is short and simple. The second Article is essential and states that, apart from some excessively dangerous goods, other dangerous goods may be carried internationally in road vehicles subject to compliance with the conditions laid down in Annex A for the goods in question, in particular as regards their packaging and labelling; and the conditions laid down in Annex B, in particular as regards the construction, equipment and operation of the vehicle carrying the goods in question. The 2009 edition, published by the United Nations, can be found in ECE/TRANS/202, Vols I and II.

In this framework, rules are very constraining in term of goods classification and labelling, characteristics required for packaging and vehicles, loading and transport procedures. If specific dispositions are not already provided in the existing national laws, or if the emergency of the situation generated by medium or major oil spill require adaptation, authorities can issue derogations to deal with OSWM constraints and define minimum safety and traceability requirements. The major points to consider are as follow:

- ensure traceability for collected waste by appropriate control measures when leaving the storage sites and on arrival in treatment or disposal sites;
- avoid spreading pollution by leaching from inappropriate transportation means or by lack of decontamination of truck wheels when necessary;
- provide authorities with recommendations on suitable routes and in some case, implement a traffic scheme to mitigate the risks and inconvenience.

Proposed content of this Sub-section of the Plan

➔ **Recommendations on the regulations for the transport of oil spill waste.**

➔ **Recommendations on waste transport logistics.**

➔ **Recommendations on oil spill waste tracking system.**

Recommendations to develop this Sub-section

Refer to the Questionnaire of REMPEC, Section 3, Questions 3-1, 3-2, and Section 6, Question 6-1

Refer to TG n°6 *"*Template "Waste tracking datasheet"*"*, p.53, for a template to adapt to identify the producer of the waste, the transport company and the destination.

For further information, see:
- List of Member States and competent authorities for the application of ADR : http://www.unece.org/oes/nutshell/member_States_representatives.htm
  - UNECE – Transport Division Home Page :http://www.unece.org/trans/conventn/legalinst.html
  - Annexe A and B, regularly modified and updated since their entry in force, can be consulted on the following site : http://www.unece.org/trans/danger/publi/adr/adr2007/07ContentsF.html

4 Intermediate and long-term storage

Intermediate and long-term waste storage sites are very often required in case of medium or major pollution with shoreline clean-up operations involving the collection of large volumes of different types of waste.

ⓘ **See Appendix n°3** “Case study: ERIKA oil spill, France, 1999”, p.72

4.1 Intermediate storage

Once the waste is collected from the shore (or transferred from vessels), direct transport to the treatment facility is possible. However, using “intermediate” storage sites, located at a reasonable distance, is an efficient and cost-effective option, as they allow:

- setting up a buffer site between the temporary storage sites and the treatment (or long-term storage site), to face reception delays and/ or possible saturation in either sites;
- sorting and repackaging the waste as required before transferring to the long-term storage/ treatment facility, e.g. small lorries are used between the temporary storage site and the intermediate storage. Large articulated lorries are preferably used to transfer the waste from the intermediate storage, reducing the total number of lorries required (and related pollution);
- better management and tracking of the waste.

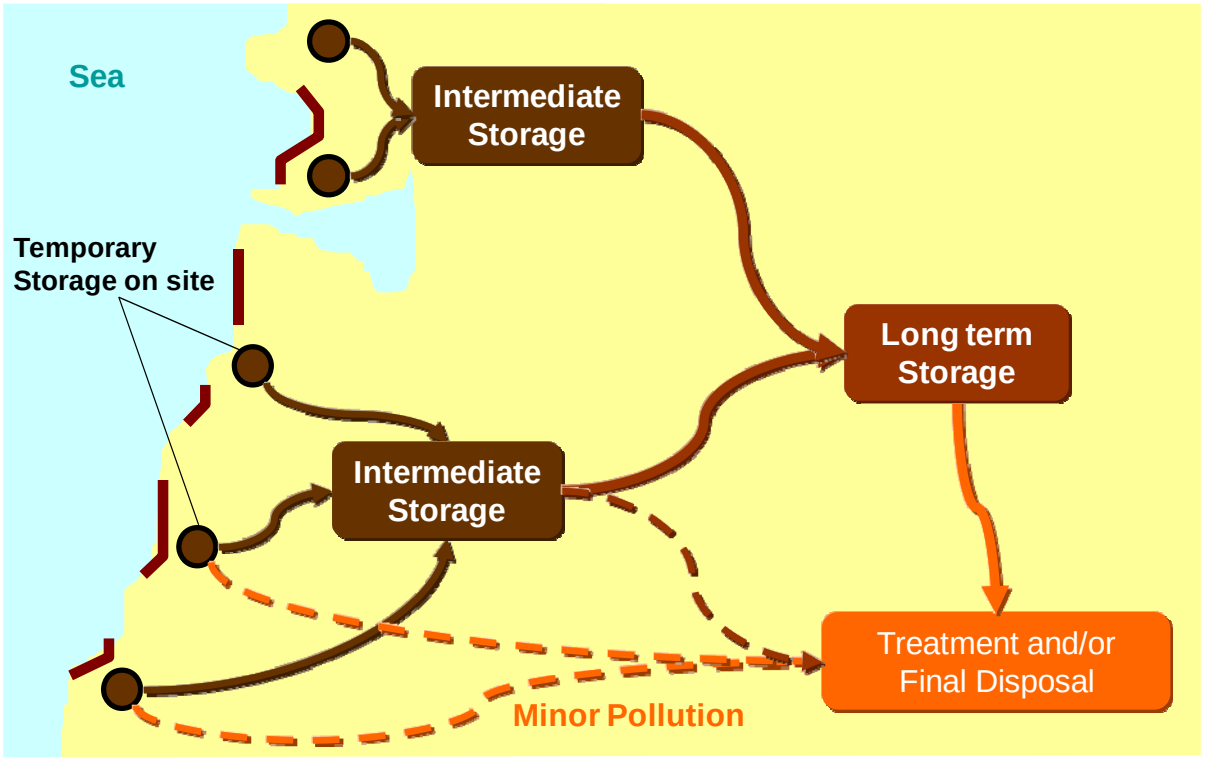


Figure 6 : Intermediate and long-term waste storage sites

Intermediate storage sites should:

- be located close to the coast, and of easy access;
- be pre-identified and listed in the OSWMP. The proposed intermediate sites should be approved by the national authority in charge of environment and health (and local authorities informed); and
- have no legal issues. All required authorizations should be obtained prior to their use.

The set-up of intermediate storage sites will depend on the volume and nature of waste collected in each region, and to be stored (e.g. simple storage place for containers and bags, or specifically built pits). The intermediate sites will be separated into different areas, one for each type of OSW to store. Particular attention will be given to limit and recover any run-off water or leachate (liquid that drains or 'leaches" from a landfill and/ or a waste storage).

Intermediate storage requires continuous management during all operations:

- competent supervisors on site,
- continuous recording of lorries entering and leaving the site,
- health and safety management (suitable PPE for the personnel on site, clear marking of the different areas on site, limitation of the traffic, limitation of the spreading of the pollution, etc.),
- environmentally-sound management (leak-proof containers, ground and soil protection, monitoring of leachate, management of run-off water, waste handling, etc.),
- identification of the waste stored on site and continuous tracking of the waste entering and leaving the sites (at least volume/weight, nature, packaging, producer, origin etc.),
- up-to-date documentation on all the waste transferred by the site, and
- complete rehabilitation of the site once all waste has been evacuated.

Proposed content of this Sub-section of the Plan

➔ **Recommendations on the intermediate storage of oil spill waste.**

➔ **Recommendations on the intermediate site restoration.**

➔ **Mapping of all the pre-identified potential sites for intermediate storage.**

Recommendations to develop this Sub-section

Refer to the Questionnaire of REMPEC, Section 4, Question 4-2.

Refer to TG n°6 "Template "Waste tracking datasheet"", p.53.

Refer to TG n°7 "Intermediate and long-term storage sites location criteria", p.55.

Refer to TG n°8 "Intermediate and long-term storage sites management", p.56.

Refer to TG n°9 Template "Waste Storage Daily follow-up sheet", p.58.

See Appendix n°4 "Watertight protection of storage sites", p.79.

For information on environmental monitoring, see the Australian Maritime Safety Agency - AMSA, 2007. *Management and disposal of oil spill debris* at: http://www.amsa.gov.au/Marine_Environment_Protection/National_Plan/Supporting_Documents/Management_and_disposal_of_oil_spill_debris.asp

4.2 Long-term storage

Intermediate storage is not recommended for long periods (from an environmental point of view). It is recommended to implement "long term storage" when required, i.e.:

- the total volume of waste exceeds the treatment capability in the country;
- installations have to be adapted (or built) to provide the suitable (pre-)treatment depending on the type of waste and treatment chosen;
- negotiating contracts for the treatment (or the export of waste) may be a lengthy project.

Long term storage enables:

- the storage of waste for year(s) in a secured and environmentally suitable location, time for the treatment and final disposal facilities to be completed for all the categories of waste collected,
- the further sorting of the waste (once the treatment options are finalized), and
- supplying waste to the treatment installations at a rate matching their treatment capability.

Long-term storage sites must be pre-identified during the planning process and be officially approved by the National Competent Authority. Large areas will be required to receive waste from major pollutions. Due to the potentially large amount of waste that may be stored on the site for a long period, a risk assessment should be carried out to choose a site where potential infiltration of oil and oily water into the ground would have the least impact.

The long-term storage sites will have to be set up and managed accordingly to the long period of use of the site. Reception facilities will be manned and secured on a 24/7 basis during the clean-up operations. A complete waste tracking system during the operations, i.e. waste movement on site, and environmental site monitoring system must be implemented. Once reception of waste is completed, the site must be checked regularly, with regular analysis of the soil and ground water quality.

The final rehabilitation of the site will be carried out after a complete environmental assessment of the impacts of the waste storage and should include soil and ground water de-pollution if required.

Proposed content of this Sub Section of the Plan

➔ **Recommendations on the long term storage of oil spill waste.**

➔ **Mapping of all the identified and validated sites for long term storage.**

Recommendations to develop this Subsection

Refer to the Questionnaire of REMPEC, Section 4, Questions 4-3.

Refer to TG n°7 "Intermediate and long-term storage sites location criteria", p.55.

Refer to TG n°8 "Intermediate and long-term storage sites management", p.56.

Refer to TG n°6 "Template "Waste tracking datasheet"", p.53.

Refer to TG n°9 "Template "Waste Storage Daily follow-up sheet", p.58.

See Appendix n°4 "Watertight protection of storage sites", p.79.

For information on environmental monitoring, refer to Australian Maritime Safety Agency - AMSA, 2007. *Management and disposal of oil spill debris* at: http://www.amsa.gov.au/Marine_Environment_Protection/National_Plan/Supporting_Documents/Management_and_disposal_of_oil_spill_debris.asp

5 Waste treatment and disposal

5.1 Recommended treatment per type of waste

The choice of an OSW treatment method depends on:

- the type and volume of waste, and
- the facilities and treatment techniques available in the country, their rate, cost and the related legislation in place.

Each pollution incident involves a particular type of oil, which will undergo weathering and be recovered on various shoreline locations, thus producing different types of waste.

However, based on past experience, spills involving persistent crude oil or refined products usually produce the same main categories of waste. To manage these wastes, various types of treatment may be implemented.

Each treatment facility usually requires a pre-treatment, i.e. a preparation of the waste to ensure that it will be accepted by the treatment facility. Each pre-treatment is specific and depends on the treatment chosen and on the entry criteria of the treatment facility. The figure below outlines the main types of treatment and pre-treatment for OSW.

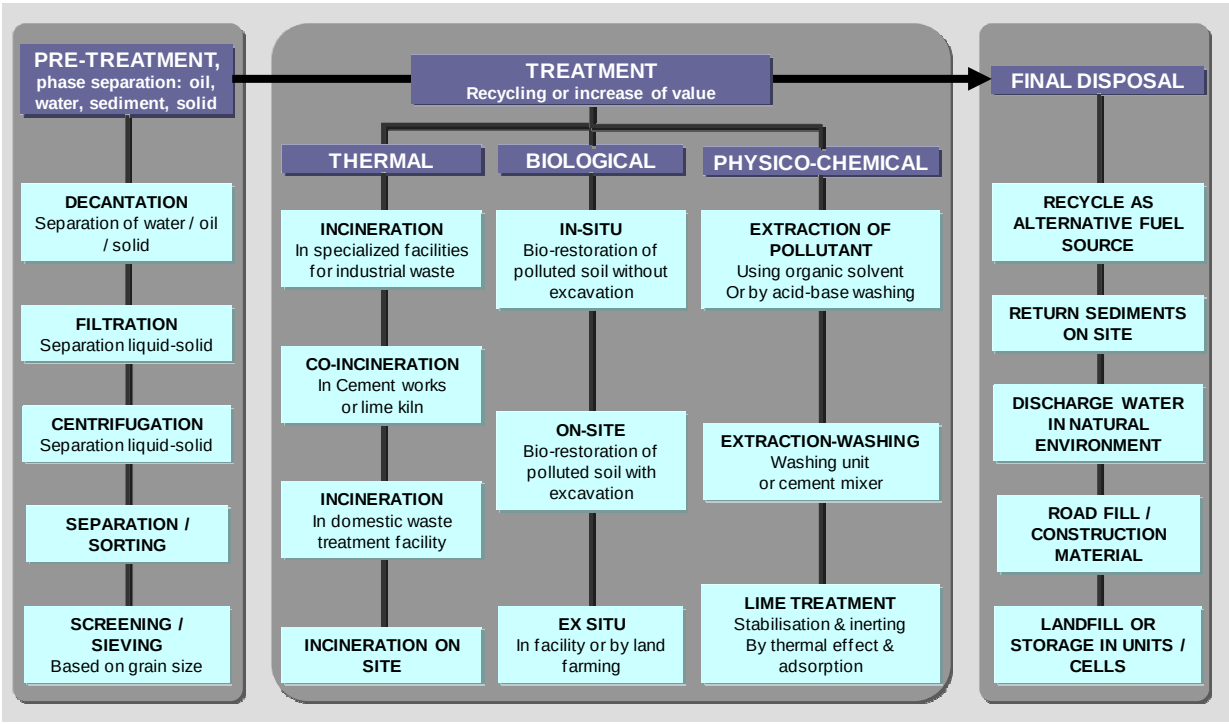


Figure 7 : Oil spill waste treatment streams

(Source: Cedre)

Where large amounts of waste need treating, it is recommended to test the (pre-)treatment techniques before implementing a full scale waste (pre-)treatment system:

- treatment techniques can be tested in laboratory (e.g. quicklime stabilization);
- pilot (pre-)treatment facilities may also be implemented for small scale testing.

The results of these tests should enable authorities to confirm the technical feasibility of the treatment option, and should also confirm the environmental performance of the treatment. An analysis of the waste prior to any treatment is required.

When considering the set up of a waste treatment plant, the capacity (and related cost) of the plant is a primary concern. CAPEX are the capital costs to build the installation, mainly depending on the required capacity and type of treatment of the plant. OPEX are the running costs (manpower, energy, additional material, etc.) depending on the flow rate and type of plant and planned duration of treatment (related to the capacity/ flow rate of the plant, defined at the planning stage).

When considering a new plant, one must consider the sum of CAPEX and OPEX costs, divided by the total amount of waste to be treated (tons) to evaluate the cost of the treatment per ton of waste.

In case of major pollution, the volume of waste generated, and the complex nature of the waste (mix of oil, sand, debris etc.) may be large enough to justify the construction of a dedicated treatment plant, with significant treatment capabilities.

ⓘ **See Appendix n°3**: “Case study: ERIKA oil spill, France, 1999”, p.72.

Proposed content of this Sub-section of the Plan

➔ **List of facilities in country that can treat OSW.**

➔ **Complete information sheet on each facility.**

➔ **Mapping of all the (pre-) treatment installations and final disposal facilities identified and suitable.**

➔ **Summary table of all types of waste acceptable in country, with the suitable facilities and treatment.**

➔ **List of waste non-acceptable in country.**

➔ **Discussion on the opportunity to develop/adapt specific plants or to export the non-acceptable waste.**

Recommendations to develop this Subsection

Refer to the Questionnaire of REMPEC, Section 5, Questions 5-1, 5-2 and 5-3.

🗎 **Refer to the TG n°10** “Assessment of national treatment capabilities”, p.59.

🗎 **Refer to the TG n°11** “Treatment facility information sheet”, p.65.

ⓘ **See Appendix n°6** “Data sheets on (pre-)treatment and final disposal”, p.85.

ⓘ **See Appendix n°9**: “Main provisions of the Basel Convention”, p.111.

5.2 Waste pre-treatment

Pre-treatment of the waste is required to meet the entry criteria of the treatment facility. One of the main objectives of the pre-treatment is the **separation of the different phases** (oil/ water/ solid) of the oily waste recovered, depending on the **entry criteria** of the treatment plant.

Once the main national treatment options have been identified (during the preparedness phase, and before any incident), the requirements for pre-treatment should be assessed taking into account:

- the entry criteria of the identified facility and their operational constraints, e.g.:
  - a cement kiln can only use recovered oil as fuel source if the oil is fresh, non emulsified, does not contain water, or salt etc.;
  - some specialized landfills can accept all types of waste without any pre-treatment;
- the possible types of oily waste generated by oil spill response operations:
  - in some cases, oil is recovered very quickly, fresh, non emulsified, at the surface of the sea, before it reaches the shore;
  - however, in most cases, oil will be emulsified/ weathered/ mixed with sand, debris, seaweed, etc.

Some entry criteria are linked to the nature of the waste, compared to the treatment capability of the plant and the type of waste acceptable. In this case, phase separation and preparation of the waste (screening, crushing etc.) will often be required.

Some entry criteria may also be restrictive, related to the nature of the waste (presence of toxic compounds) and will limit the daily volume of waste acceptable by the plant. In this case, OSW will have to be "diluted" with the normal waste managed by the plant, at the suitable rate for the equipment.

The pre-treatment option can be implemented on the site of the treatment facility or on the intermediate/ long term storage sites.

The choice of the pre-treatment required will be ascertained during the pollution:

- once the treatment options have been confirmed,
- depending on the nature of the OSW recovered, and on the "quality" of the segregation of the waste at the source on site.

Specific facilities have often to be adapted or built to implement pre-treatment. One of the main difficulty is choosing the best suited scale for the facility, i.e. finding a reasonable balance between the capital expenditures and the running costs (CAPEX vs. OPEX), compared to the total volume of waste to be pre-treated.

It is the responsibility of each country to define the pre-treatment suited to the treatment facility chosen since each treatment facility is specific and each country has its own rules and regulations.

Recommendations to develop this Sub-section

Refer to the TG n°10 "Assessment of national treatment capabilities", p.59 for an overview of pre-treatment options depending on the type of waste.

See Appendix n°7: "Data sheets on (pre-)treatment and final disposal", p.85 for information on pre-treatment method and installation.

See Appendix n°4 "Case study: JYEH power plant oil spill, Lebanon, 2006", p.74 for examples of treatment, and required pre-treatment.

Sorting of waste prior to pre-treatment (required in the absence of sorting during collection) (Source: Le Floch Depollution)

Manual sand sieving (Source: Le Floch Depollution)

Mechanical sand/gravel/pebble sieving (Source: Le Floch Depollution)

5.3 Final disposal

Some treatments result in the total destruction of the OSW (e.g. co-incineration in cement kiln). However waste treatment often results in the production of an ultimate material that has to be disposed of.

Possible final disposal options comprise:

- recycle as alternative fuel source (power plant, refinery, cement works etc.) or raw material,
- discharge water in natural environment,
- return sediments on site,
- use treated material for road fill/construction,
- storage in landfill or special units/cells.

As for the treatment options, the entry criteria for each final disposal option has to be ascertained, particularly the environmental and technical regulations that apply to the re-use of material and return of treated sediment and water in the environment.

Each country should include in their OSWMP the minimum criteria for returning in the environment (beach, open water, road fill, construction, etc.) of the treated material:

- Total Hydrocarbon Content (THC), and
- other Hazardous and Noxious Substances content.

Treated material that may be used for road fill and/or construction must:

- have geotechnical properties suited to their use e.g.:
    - measurement of the risk of liquefaction in case of seismic solicitation or in presence of vibrations,
    - measurement of specific gravity of the treated sediment,
- comply with the relevant regulations regarding these materials (although special authorisation may be delivered).

Recommendations to develop this Sub-section

Refer to the TG n°10 “Assessment of national treatment capabilities”, p.59 and see the table and figure for an overview of treatment and final disposal options.

See Appendix n°3 “Case study: ERIKA oil spill, France, 1999”, p.72 for examples of final disposal.

TECHNICAL GUIDELINES

TG n°1 Waste classification

The following table, proposed as a reference (Source: Cedre), provides a classification of the waste in seven categories depending on their nature and relative content and corresponding to distinct waste management streams.

Please note that the percentages are given in weight and simply provide an indication of the relative values.

Categories	% Oil	% Water (free)	Mineral matter	Organic matter	Comments
Liquids	> 10%	0 to 90%	< 10%	< 10%	Remove as much water as possible by settling.
Semi-solids & solids (sand...)	> 10%	10% to 20%	> 10%	< 10%	Define threshold according to pollutant.
Polluted pebbles & stones	> 10%	1%	> 80%	< 10%	Choice criterion: degree of surface polluted.
Polluted sorbent	> 5%	< 10%	< 10%	< 5%	Bulk, mops, pillows, sheets...
Polluted seaweed	> 5%	< 20%	< 20%	> 80%	Fermentable substance (oleo factory disturbance).
Polluted solid waste	> 5%	< 10%	< 10%	variable	Including gloves, boots, overalls, plastics, wood...
Polluted fauna	> 5%	< 15 %	< 10%	> 70%	Bird and mammal corpses.

Table 2: Waste classification

(Source: Cedre)

It should be noted that other classification could be used such as the one reported in the IPIECA (2004) Guidelines for oil spill waste minimization and management – Volume 12:

- pure oil,
- oil and water,
- oil and sediment,
- oil and organic debris, and
- oil and PPE/equipment.

Categories	
Liquids	 (source : Cedre)
Solids and semi-solids (oiled sand...)	 (source : Cedre)
Polluted pebbles & stones	 (source: Cedre)

Polluted sorbent

(source : OTRA)

Polluted seaweed

(source : OTRA)

Polluted solid waste

(source : OTRA)

Polluted fauna

(source : OTRA)

Visual estimation on oil content in different types of waste in not an easy exercise

Sand aspect and related hydrocarbon content in oiled sediment samples	
Jyeh accident (Lebanon) Coarse sand lightly oiled Total Hydrocarbon content: 5,5 g/kg dried matter (0.5%)	
Jyeh accident (Lebanon) Fine sand heavily oiled Total Hydrocarbon content 34 g/kg dried matter (3.4%)	

For a first rough quantitative determination of oil content in waste (sediment, debris etc.) a gravimetric analysis can be done (after solvent extraction, the solution is dried and weighed and compared to the weight of original sample).

This approach does not replace Total Hydrocarbon Content precise analysis needed to determine waste treatment options.

TG n°2 Oil spill waste analysis for treatment

For each type of treatment or disposal option, analysis will be required to check the compatibility of the waste with the requirements of the process and with the environmental legislation for atmospheric or water releases.

The most frequent analyses conducted to assist in the choice of a treatment or disposal options are:

- Total Hydrocarbon Content (THC): for example when sand contains more than 20% of oil it is possible to recover this oil by washing, as much as 5% of oil concentration is acceptable for composting in biopile treatment but less than 1 to 2% is required for land farming and less than 0,5% of oil is often requested for use as incoming raw material in cement kiln,
- PAHs (Polycyclic Aromatic Hydrocarbons),
- water content and dry matter,
- sand content and grain size,
- organic matter,
- Net Calorific Value,
- chlorine and halogen content are important entry criteria for re-use of oil as energy source in cement kilns,
- sulphur content,
- metals (Nickel, Vanadium), and
- BTEX.

For detailed guidelines on sampling, refer to the IMO, 1998. *Guidelines for sampling and identification of oil spills, Manual on oil pollution, Section VI*, 38 p.

TAKING OIL SAMPLES FOR ANALYSIS

DATA
Substrates: loose or hard sediment
Pollution: all types
Pollutant: fluid to highly viscous

EQUIPMENT NEEDED

Protective clothing for responders:

- oil-resistant gloves (nitrile or neoprene).

Sampling equipment:

- surface pollutant: stainless steel spoons and spatulas or a shovel, sorbent (sheet), polyurethane sponge, Teflon film,
- pollutant in sediment: shovel or core sampler,
- labels, water resistant felt pen, paper towels, plastic bag for rubbish.

Storage equipment:

- wide-neck glass bottle, with capsules and Teflon or High Density Polyethylene (HDPE) seals,

or

- glass bottles with metal cap or lined on the inside with aluminium foil,
- box and aluminium foil.

DESCRIPTION/PRINCIPLE

For an ordinary analysis of the physical characteristics of the pollutant or oil waste (oil identification, water content, sand content, Total Hydrocarbon Content…), complying with the following recommendations should be sufficient.

In order to determine the three physical characteristics:

- samples of approximately **500 ml** would be required;
- for oil identification by high resolution Gas Chromatography and Mass Spectrometry - GC/MS, the minimum amount of pure pollutant required is **10 grams**, approximately **100gr** are needed if it is not pure oil.

When sampling and storing a pollutant, only use inert and non-contaminating materials such as glass, Teflon, High-Density PolyEthylene (HDPE), stainless steel and aluminium; otherwise the sample will be unusable. Prefer brown glass bottles that can protect the sample from photo-oxidation.

Never ever use plastic but HDPE.

If no inert recipients are available, wrap the sample in aluminium foil and transfer to an adequate recipient. If you are using glass bottles with plastic or metal caps, always remember to insert a sheet of aluminium foil between the cap and bottle neck so as to isolate the sample.

Recipients and utensils must be clean.

Use containers that are suited to the samples you are taking: flask, glass bottle for samples for loose sediment, aluminium sheet or box for pebbles, etc.

Samples have to be shipped as soon as possible and if possible reach the laboratory within 8 days.

Samples have to be kept at positive but cold temperatures (between 0 and 10°C).

Samples will have to be identified by a data sheet such as the one on the following page. You are advised to fix two labels, one on the glass bottle and the other on the plastic bag.

ADMINISTRATIVE AND LEGAL SAMPLING

Recommendations for samples required for administrative and judicial purpose (e.g. groundings from unknown origin) will be :

- apply the above recommendation for content and sampling procedure;
- send the samples to the appropriate and certified laboratories that have the skills and the equipment to carry out the analysis (e.g. high resolution gas chromatography and mass spectrometry) and meet legal requirement of the country;
- ask laboratories to outline method and standards procedures applied;
- check country administrative requirements (often samples will have to be in triplicate, taken by a court appointed expert and sent to the certified laboratories).

Each sample of waste should be identified. A label will be stuck on each sample container. The table below provides an example of waste sample label.

GENERAL INFORMATION
Name of sampler:
Position / Organisation:
Phone number:
E-mail:
Address:
Date of shipment:
SAMPLE INFORMATION
Origin (name of place where sample was taken):
Date of sampling:
Time of sampling:
Observations (viscosity, colour, type of site: beach, rocks, harbour):
Nature (type of pollutant, sediment, pebbles):
Sample number:

Table 3: Example of waste sample label

TG n°3 Waste minimization during recovery

Various actions can reduce the amount of generated waste with significant results.

Minimizing contamination and secondary spreading

- **Sites at risk can be, before any groundings of oil, cleared of seaweeds, debris and rubbish to reduce the final amount of contaminated material.**
  Depending on the quantity of material to be cleared, this recovery is carried out either manually, with mechanical support for waste removal, or mechanically using public works machinery equipped with a claw or a wire loader or using specialised machinery such as sand screeners, mechanical rakes, etc. This recovery must of course be as selective and methodical as possible, so as to comply with the different disposal or upgrading categories. Natural groundings can sometimes simply be moved to the upper beach, if the site allows it.

- **Avoid secondary contamination of un-polluted areas by methodical management:**
  - protecting ground from contamination by polluted machinery and personnel by lining and channelling access and establishing traffic circulation plan for vehicles;
  - using watertight decontamination area to clean personnel and machinery before they leave the clean-up area (designation of “clean”, “decontamination” and “dirty” zones);
  - protecting clean ground from projections during on site oil collection or washing operations.

Recycling equipments

- Reusable Personal Protective Equipments should be utilized where appropriate, such as rubber boots, gloves, etc. that should be wiped at the end of each day with rags dipped in gasoil, rinsed and dried.
- Recovery equipment should be cleaned in the same way and reused rather than discarded (bins, shovel, etc.).

Choosing selective techniques and in situ handling of oily material

- Encourage selective collection, for example for liquid oil is normally collected with large volumes of seawater. Selective collection and primary separation on site of oil and water can very often be improved and allows reducing significantly the volume to be transported and treated. For example, in many cases, conventional vacuum tanks, as used in agriculture or sanitation, are particularly effective in a wide range of situations, in ports and harbours or on beaches, to remove the pollutant from the water surface. To avoid pumping large quantities of water with the oil, they can be equipped with a floating suction head. In any case, primary separation of oil and water must take place on site, by allowing the mixture to settle and then removing water from the tank itself by draining off the water periodically from the bottom of the container to maximise the capacity of the truck.

- Encourage in-situ handling of oily material using various specific techniques, e.g.:
  - Flushing of oiled sediments (for buried oil in fine to coarse sand) consists of using a flushing gun to inject a water and air mix into the sand to remobilize to the surface the oil trapped in the sediment. The resurfacing oil is recovered at the surface of the beach using either sorbent and/ or skimmer.

  - Surfwashing (for pebbles, shingle and sand) consists in moving the polluted sediments into the surf zone using loaders. The energy of the breaking waves “cleans” the sand, remobilises the oil and redistributes the sand across the beach. The oil tends to be

deposited along the high tide mark (from where it should be removed as soon as possible) or carried away by long shore currents (in such cases, oil should be contained and recovered using skimmers and/or sorbent material). The disturbance to the beach is only temporary: the sea usually moves the sediments back close to their original location, rebuilding the slope of the beach. However, this technique, which relies on natural dynamic processes, poses certain geomorphologic risks (i.e. erosion of the beach) in the event of poor implementation. It should therefore be carried out during a favourable tidal period under the control of geomorphology experts who can define the feasibility of the technique and methods on a case-by-case basis according to the local sedimentary and oceanographic characteristics.

- Washing of pebbles and shingle on site consists of washing the polluted stones using a high pressure cleaner within an installation, or "cage" built on site, which directly recovers the effluents (instead of removing the oiled stones from the beach). This "cage" is a light metal frame with a perforated metal base, on which the stones are washed, and three lateral sides, covered with geotextile, to contain the spray of effluents and oil. All the washing effluents pass through the base and are collected using sorbent material placed in a recovery device set up under the washing cage. Small stones can be placed in plastic mesh bags, such as oyster bags placed on sorbent material, which are turned over during washing, to stop them from being projected out of the cage, when using high pressure cleaners.

Washing of pebbles on site (Source: Cedre)

- Sand sieving by beach cleaning machines is useful for tar balls (non sticky). Various models exist, ranging from large screeners (either towed, mounted or self-propelled) to small self-propelled screeners (sieving can also be achieved manually depending on the level of contamination). Most of them function via the same principle: the surface layer of sand is removed by an adjustable blade, then lifted by a continuous conveyor belt, on which the screening takes place, and the refuse is collected at the end of the stroke of the belt. Although the performance of the different models of sand screeners may vary, the quality of screening does not only depend on the machine (the tractor, which must have certain particular characteristics), but also on the operator in charge of making the appropriate adjustments; both play an equally important role. One must also consider that this technique is non-selective and will remove any objects of a certain size, therefore potentially increasing the amount of waste and removing living organisms and sea weed essential to the ecosystems of sandy beaches.

TG n°4 Waste sorting at source during recovery

Bulk oily material collected can be held in storage pits lined with appropriate watertight and oil impermeable material. However, when possible, adequate containers should be used.

Choose appropriate storage containers

There are a variety of possible containers not originally designed for waste collection (buckets, plastic bags, big bags i.e. flexible intermediate bulk containers, bins, plastic or metal drums, skips, tanks etc.). Some recommendations can be given to select the most suitable storage:

- adapt the storage to the viscosity of the product collected, i.e. if oil is pumpable at ambient temperatures, it can be stored in closed tanks, highly viscous materials are best stored in open containers;
- volume and durability of the container must be adapted to its use, i.e. adapted to the weight and the nature of collected waste and to possible manual transportation;
- container material must be compatible with the disposal options, i.e. some plastic bags may be incompatible with final disposal options and be very difficult to separate afterwards from the sticky polluted material;
- containers should be leak-proof, made from durable materials compatible with the waste to be collected and the storage duration assessed before final disposal;
- containers should be stable and easy to handle (often lack of handles generate unexpected difficulties and secondary contamination);
- containers should be equipped with a cover for protection from rain water and to limit the odours;
- volume of the containers must be well known to help response supervisors on site to estimate the volume of waste collected (once the containers are full);
- containers should have a drain cock at the bottom to drain water after decantation of oil and water;
- containers may have to be protected from prolonged exposure to sunlight in hot regions;
- ensure a correct labelling of the containers to avoid mixing the different types of OSW.

Anticipate requirements

List of the suppliers of storage containers and availability in the country, using the template below.

Type of container	**Characteristics**					**Suppliers contact**	**Price**	**Stock immediately available**
	Material	Volume	Cover	Drain cock	Water tight			

Table 4: List of suppliers for waste containers (template)

TG n°5 Criteria and basic rules for temporary storage

Criteria for site selection (sources: IPIECA, IMO, Cedre, ITOPF):

- close proximity to the site of clean-up,
- good access to roads for heavy trucks (unpaved track may require to be reinforced and restored afterwards),
- sufficient space to ensure segregation of various waste is possible and, if necessary, storage of machinery unsuitable for roads,
- be at a distance from natural sensitive area (or with additional containment measures if it is unavoidable to locate the storage in a sensitive area), and
- agreement of the site owner and/or local authority.

Basic rules for setting up facilities:

- access points and traffic clearly organized,
- cleaning facilities for personnel, machinery and vehicle to avoid spreading of pollution and clear delineation between oily areas and clean ones,
- soil and subsoil must be protected with watertight geotextiles and membranes,
- bed of fine gravel or sand at the base of the storage pit to protect the plastic liner (depending on ground characteristics),
- protection from rain fall (tarpaulins, caps on storage pits or containers) and correct drainage of the area by run-off channels.

Depending on the volume of waste, site characteristics and availability of containers, storage can be:

- watertight pit (long and narrow for easy access),
- watertight platform within earth walls to avoid contamination due to rainfall, and
- watertight platform for bagged solids and liquids in tank.

Management of the site must ensure:

- correct labelling for each waste category,
- quantification of waste by category,
- security to prevent unauthorized dumping, and
- complete removal of oil and restoration of the site at the end of operation.

Figure 8 : Organisation of shoreline clean-up working site

TG n°6 Template “Waste tracking datasheet”

This template can be used (as is or adapted) to track the waste movement(s).

WASTE TRACKING SHEET	Incident:	Sheet Nbr:

PRODUCER		
Contact		
Name of company: Address:	Tel: Fax: Mail:	Person in charge: Tel:
Waste delivered		
Type of waste (oil, oil & sand, etc) Quantity of waste (tons or m3)	Consistency: ☐ Liquid ☐ Pasty ☐ Solid	Packaging type: Packaging number/ registration:
Destination		
Name of facility: Address of facility:	Name of contact in facility: Tel:	Reference of acceptance in facility: ☐ Storage ☐ (Pre-)Treatment ☐ Final disposal
Comments:	I attest to the accuracy of the information above, and that the materials comply with the relevant transportation regulation.	Date of expedition: Name: Signature:

TRANSPORTER		
Contact		
Name of transport company: Address:	Tel: Fax: Mail:	Type of vehicle: ☐ Rigid Lorry ☐ Artic. lorry ☐ Other/ Registration:
Waste transported		
Type of waste (oil, oil & sand, etc.) Quantity of waste (tons or m3)	I attest to the accuracy of the information above, and that transportation was compliant with the relevant national regulation.	Date of pickup: Date of delivery: Name: Signature:

DESTINATION		
Contact		
Name of company: Address:	Tel: Fax: Mail:	Person in charge: Tel:
Waste received		
Type of waste (oil, oil & sand, etc.) Quantity of waste (tons or m3)	Consistency: ☐ Liquid ☐ Pasty ☐ Solid	Packaging type: Packaging number/ registration:
Operations planned		
☐ Storage segregated ☐ Storage pooled	☐ (Pre-)treatment Specify:	☐ Final disposal Specify:
☐ Refusal of waste. Specify reasons:	I attest that I have received the waste and to the accuracy of the information above.	Date: Name: Signature:

Table 5: Waste tracking data sheet (template)

The identification and listing of companies specialised (or not) in the provision of transportation service and equipment (skips, tipper trucks, tank trucks…) should be maintained in the OSWMP.

Company name	Observations	Address	Phone	Means

Table 6: Listing of specialised companies in the provision of transportation service and equipment (example)

TG n°7 Intermediate and long-term storage sites location criteria

The table below provides considerations and criteria for intermediate and long term storage which will be required for major oil spills (adapted from Cedre and IPIECA).

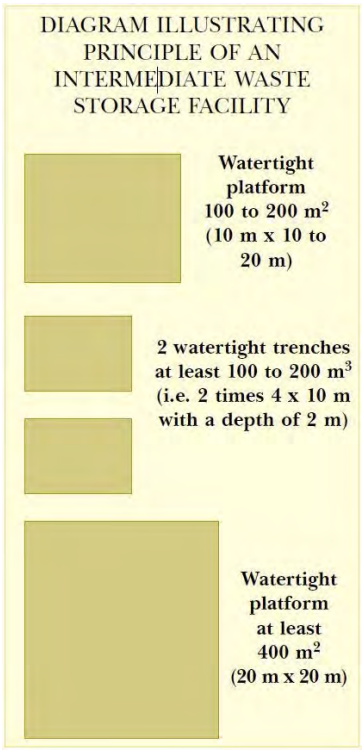
Criteria	Intermediate storage	Long Term storage
Occupancy	• Plan on occupying for 0 to 1 year (more in extreme cases).	• Plan on occupying for up to 5 years. • There may be legal restrictions.
Example of storage capacities	• 1,500–3,000 m2 surface area. • Storage pits (100–200 m3). • Storage for debris, bags, barrels, tanks etc.	• 20,000–100,000m2 surface area. • Storage pits (1,000–10,000 m3). • Sorting, pre-treatment, stabilization.
Distance from recovery/ transfer sites	• Not more than 5 km if possible, 30 to 50 km maximum.	• Not more than 50 to 100 km; or one hour by road from previous storage.
Land conditions	• Flat and graded to accommodate settling tanks. • Rain runoff collection facilities may be required.	• Flat and graded to accommodate settling tanks. • Build appropriate rain runoff facilities.
Access and earthworks	• Access by heavy lorries necessary, plan for decontamination areas for the vehicles.	
Regulatory requirements	• Comply with local land occupation and environmental regulations. • Plan for long term availability and potential occupation.	
Hydrogeological conditions	• Load-bearing capacity must be adequate. • Impermeable subsoil, either naturally or artificially. • Avoid groundwater systems.	
Environmental conditions	• At a safe distance from populated areas (50 m or more). • Beware of the impacts of lorries. • Avoid protected areas, cultural or archaeologically sensitive sites.	
Management and maintenance conditions	• Supervise all traffic on site. • Track all waste. • Sort waste. • Assess quantities. • Organize final disposal contracts. • Water management. • Security to prevent unauthorized dumping. • Site restoration.	

Table 7: Choice criteria for intermediate and long-term storage sites

TG n°8 Intermediate and long-term storage sites management

The figure below provides examples of set up of intermediate and long term storage sites which will be required for major oil spills.

Example of set-up of intermediate storage sites



Example of set up of long-term storage sites

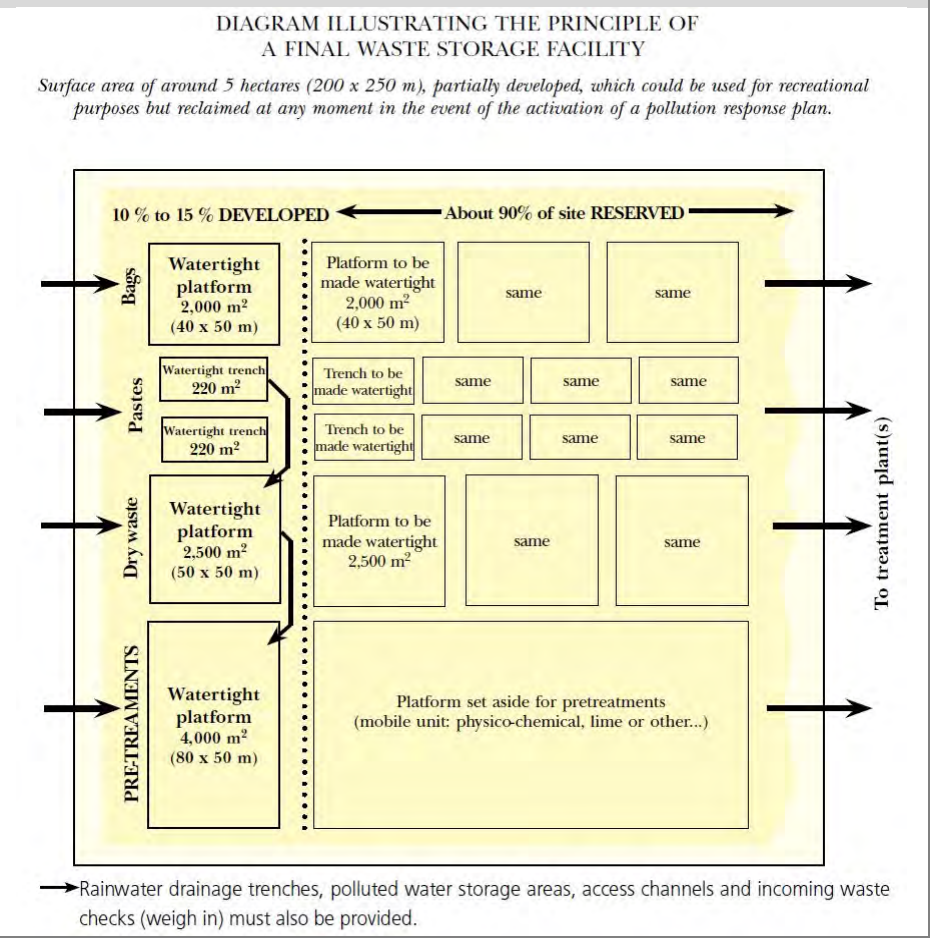


Figure 9 : Examples of set-up of intermediate and long-term storage sites

(Source: Cedre)

Recommendations for the protection and management of the sites are summarized below.
(Source: Cedre)

INTERMEDIATE STORAGE SITES

Protection	Management
Keep damage and harmful effects to a minimum by taking the following measures: - Protect the soil and subsoil. - Organize drainage of seepage and divert run-off water. - Set up a hydrocarbon recovery system by skimming or pumping. - Implement a one way traffic system for machinery to facilitate operations and keep collision risk to a minimum. - Signpost access roads and control entry to avoid polluting clean areas.	Managing a storage site requires the following: - Permanent technical supervision of the operations (quality control of incoming materials and their transfer, estimation of quantities and pollutant content, waste record logbook to report all movements and incidents. - Watertight skips, containers, platforms or trenches for waste storage. - Maintenance and surveillance of the facility (compliance with safety regulations, security and hygiene). - Water management to avoid dispersion into the natural environment (run-off, seepage on site or off site if a storm-water tank is being managed). - Organisation of waste transfer to a treatment plant or final storage facility, if activated, to avoid saturation.

LONG TERM STORAGE SITES

Protection	Management
Careful site development and management will reduce risks of damage and harm to the environment to a minimum: - Pits with guaranteed water tightness. - Drainage system to channel seepage waters to a water treatment plant (oil-water separator, lagoon for run-off water and site drainage, outfall pipe controlling total hydrocarbon content). - Cover (watertight tarpaulin, lid) for full storage facilities (pits, containers or skips) and channelling of run-off; vents to let any fermentation gases escape. - Decontamination area for machinery. - Regular checks using piezometers placed downstream of the site to ensure that the water management scheme is working correctly. A piezometer positioned upstream of the site will act as a control (standard sampling and testing procedures). - Separate pits for waste with high and low pollutant content. If materials used on the worksite have not already been incinerated, reception platform for this waste (personal protective equipment, sorbents, oiled nets, etc.). - Basins or tanks for liquids. - Unpacking area (e.g. waste delivered in big-bags).	Devise a traffic circulation plan to facilitate onsite movements and keep accident risks to a minimum, with signposting and regulation. Set up permanent technical supervision of arrivals and departures: - Identify pits. - Check trucks using tracking slips and identify waste. - Direct and supervise unloading. - Keep a daily record book of all arrivals, departures and incidents. - Inspect and maintain the facility (safety rules, supervision, and cleanliness). - Ensure as many containers as waste categories are continually in operation and anticipate their duration in order to prepare to open new reception capacities where necessary.

TG n°9 Template “Waste Storage Daily follow-up sheet”

Use this template to keep track of the movements of the waste on the intermediate and long-term storage sites.

Date:				**Person in charge:**				
Name of Transport Company	**Type of vehicle**	**Registra-tion of vehicle**	**Waste Tracking Reference**	**Incoming waste**		**Leaving waste**		**Packaging of waste**
				Specify origin	Weight, tons or volume, m^3	Specify destination	Weight, tons or volume, m^3	Bulk, bag, big bag, container etc.
				Total waste incoming (tons or m^3)		**Total waste leaving (tons or m^3)**		
Total waste on site (tons or m^3)				**Observa-tion**				

Note. Always specify if volume and weight are measured or evaluated.

Table 8: Waste storage daily follow-up sheet (template)

TG n°10 Assessment of national treatment capabilities

In order to define the most suitable treatment, countries have first to assess their treatment capabilities for all waste and identify the suitable facility(ies).

Each country may achieve this work by following the actions outlined below.

1	**Identify the facilities in country considering all types of waste and possible treatments.**	
1 – A	**Step 0**. Consider **all possible treatments** for each type of waste.	**See Figure 10: Main oil spill waste streams based on international practice,** after the table below in this TG.
	Step 1. **Identify facility(ies) in country that <u>could</u> treat the waste** for each type of waste, and recommended treatment.	🗎 **Use the Table 9: Waste treatment options assessment table,** below in this TG **Refer to the Questionnaire** of REMPEC, Section 5
	Step 2. For each facility identified, fill the "Treatment facility information sheet" to **assess the capability**, suitability and limitations of the facility. And summarize the limitations, entry criteria, and comments.	🗎 **Refer to the TG n°11** "Treatment facility information sheet", p.65
	Step 3. Confirm that the facility can treat the type of waste: YES or NO	
1 – B	**Summarize the types of waste** that can be treated in country. **Identify the type(s) of waste that cannot be treated** with existing facilities.	
2	**Evaluate the different options for the waste that cannot be treated in country.**	
2 – A	Study the interest of **planning the building** specific installation and/ or **the adaptation** of existing installation for waste that cannot be treated in the country.	ⓘ **Refer to Appendix n°7** "Data sheets on (pre-)treatment and final disposal", p.85 for general information on treatment, techniques and criteria to consider.
2 – B	Study the opportunity of **exporting** the waste to another country able to treat these waste (accordingly to the Basel Convention if applying).	ⓘ **Refer to Appendix n°10** "Main provisions of the Basel Convention", p.111 for general information

All waste (mixed)	**Possible pre-treatment**	**Example of potential facilities**	**Step 1 Name of facility(ies)?**	**Step 2 Limitations / Entry Criteria?** *Fill info sheet for each facility (TG n°11)*	**Step 3 Confirm?** *Yes / No*	*Recommended Final disposal*
All (mixed)	Screening	Public works, construction				
All (mixed)	Sediment size sorting	Public works, construction				
Oil/ water mix	Decantation (Settling)	Deballasting station, port reception facilities				
Oil/ water/ sediment mix	Filtration	Deballasting station, port reception facilities				
Oil/ water/ sediment mix	Centrifugation	Deballasting station, port reception facilities				
Emulsion	Emulsion breaking	Deballasting station, port reception facilities				
Sorbent	Draining	Deballasting station, port reception facilities				
Liquid waste	**Step 0 Consider possible treatments**	**Potential facilities**	**Step 1 Name of facility(ies)?**	**Step 2 Limitations / Entry Criteria?** *Fill info sheet for each facility (TG n°11)*	**Step 3 Confirm?** *Yes / No*	*Recommended Final disposal*
Oil	Recycle as Alternative Fuel source	Use in refinery, Co-incineration in cement works, lime kiln, power plant etc.				*N/ A*
Water – low HC content	Not required (?)	Waste water treatment plant				*Discharge in environment*
Water – higher HC content	Decantation (Settling), Filtration, Centrifugation	De-ballasting station				*N/ A*
	Evapo-incineration	Evapo-incinerator				*N/ A*
	Incineration in hazardous waste collection centre	Industrial incinerator				*N/ A*
	Co-Incineration in cement works	Cement works				*N/ A*
Other?	Other?					
Other?	Other?					
Semi-solids and solids waste	**Step 0 Consider possible treatments**	**Potential facilities**	**Step 1 Name of facility(ies)?**	**Step 2 Limitations / Entry Criteria?** *Fill info sheet for each facility (TG n°11)*	**Step 3 Confirm?** *Yes / No*	*Recommended Final disposal*
Fine sediment – low HC content	Washing	Soil washing plant, mines/ quarries				*Return on site Or Landfill/ road fill/ construction*
	Flotation	Specialized unit/ company				*Id. as above*

	Stabilisation (quicklime)	Specialized soil remediation company				*Id. as above*
	Low Thermal Desorption	Specialized unit/ company				*Id. as above*
	Bio-treatments (in situ)	Specialized soil remediation company				*Id. as above*
	Landfarming	Specialized soil remediation company/ industrial/ urban mud treatment company				*Id. as above*
	Composting	Specialized soil remediation company, industrial/ urban mud treatment company				*Id. as above*
	Bio-pile	Specialized soil remediation company, industrial/ urban mud treatment company				*Id. as above*
	Surf washing	Public works company				*Return on site*
Fine sediment – higher HC content	Incineration in hazardous waste collection centre	Industrial incinerator				*N/ A*
	Co-Incineration in cement works	Cement works				*N/ A*
	Thermal desorption	Specialized unit/ company				*N/ A*
	Vitrification	Specialized unit/ company				*N/ A*
Other?	Other?					
Other?	Other?					
Pebbles	**Step 0 Consider possible treatments**	**Potential facilities**	**Step 1 Name of facility(ies)?**	**Step 2 Limitations / Entry Criteria?** *Fill info sheet for each facility (TG n°11)*	**Step 3 Confirm?** *Yes / No*	*Recommended Final disposal*
Pebble & small cobble (<15cm)	Hot water and high pressure washing	Spill response company				*Return on site*
Large cobble and boulder	Washing (special units, concrete mixer)	Public works, depollution, mines/ quarries				*Return on site*
Other?	Other?					
Other?	Other?					
Solid waste	**Step 0 Consider possible treatments**	**Potential facilities**	**Step 1 Name of facility(ies)?**	**Step 2 Limitations / Entry Criteria?** *Fill info sheet for each facility (TG n°11)*	**Step 3 Confirm?** *Yes / No*	*Recommended Final disposal*
All types (mixed)	Storage in special units / cells	Specialized unit/ company				
All types (mixed)	Vitrification	Specialized unit/ company				

Used materials from worksites: PPE, nets, bags, ropes, boom & Oiled solid waste	Incineration in hazardous waste collection centre	Industrial incinerator				*N/ A*
All types (some restrictions)	Incineration in mobile incinerators	Specialized unit/ company				*N/ A*
All types (some restrictions)	Co-Incineration in cement works (Alternative Raw Material)	Cement works, lime kiln				*N/ A*
Solid waste lightly oiled	Incineration in domestic incinerators	Domestic waste incinerator				*N/ A*
Lightly oiled vegetation	Burning on site	None specific				*N/ A*
	Other: - Evapo-incineration - Pyrolysis	Specialized unit/ company				
Sorbent	**Step 0 Consider possible treatments**	**Potential facilities**	**Step 1 Name of facility(ies)?**	**Step 2 Limitations / Entry Criteria?** *Fill info sheet for each facility (TG n°11)*	**Step 3 Confirm?** *Yes / No*	*Recommended Final disposal*
Sorbent full of oil, risk-free composition	Incineration in domestic incinerators	Domestic waste incinerator				*N/ A*
Sorbent full of oil, <u>non</u> risk-free composition	Incineration in hazardous waste collection centre	Industrial incinerator				*N/ A*
	Incineration in cement works	Cement works, lime kiln				*N/ A*
Other?	Other?					
Other?	Other?					
Sea weed	**Step 0 Consider possible treatments**	**Potential facilities**	**Step 1 Name of facility(ies)?**	**Step 2 Limitations / Entry Criteria?** *Fill info sheet for each facility (TG n°11)*	**Step 3 Confirm?** *Yes / No*	*Recommended Final disposal*
Seaweed lightly oiled (oil content <5%)	Bio-treatment in-situ	Specialized soil remediation company				*N/ A*
Seaweed lightly oiled (oil content <5%)	Composting	Specialized soil remediation company				*N/ A*
Seaweed oiled (oil content <20%)	Bio-pile	Specialized soil remediation company				*N/ A*
Seaweed oiled (oil content <20%)	Incineration in domestic incinerators	Domestic waste incinerator				*N/ A*
Seaweed heavily oiled (oil content >20%)	Incineration in hazardous waste collection centre	Industrial incinerator				*N/ A*

	Incineration in cement works	Cement works, lime kiln				*N/ A*
Other?	Other?					
Other?	Other?					
Fauna	**Step 0 Consider possible treatments**	**Potential facilities**	**Step 1 Name of facility(ies)?**	**Step 2 Limitations / Entry Criteria?** *Fill info sheet for each facility (TG n°11)*	**Step 3 Confirm?** *Yes / No*	*Recommended Final disposal*
Dead oiled birds or mammals	Incineration	Knacker's yard				*N/ A*
Other?	Other?					

Table 9: Waste treatment options assessment table

➔ Refer to the Appendix n°7 "Data sheets on (pre-)treatment and final disposal", p.85 for further information on the each treatment method.

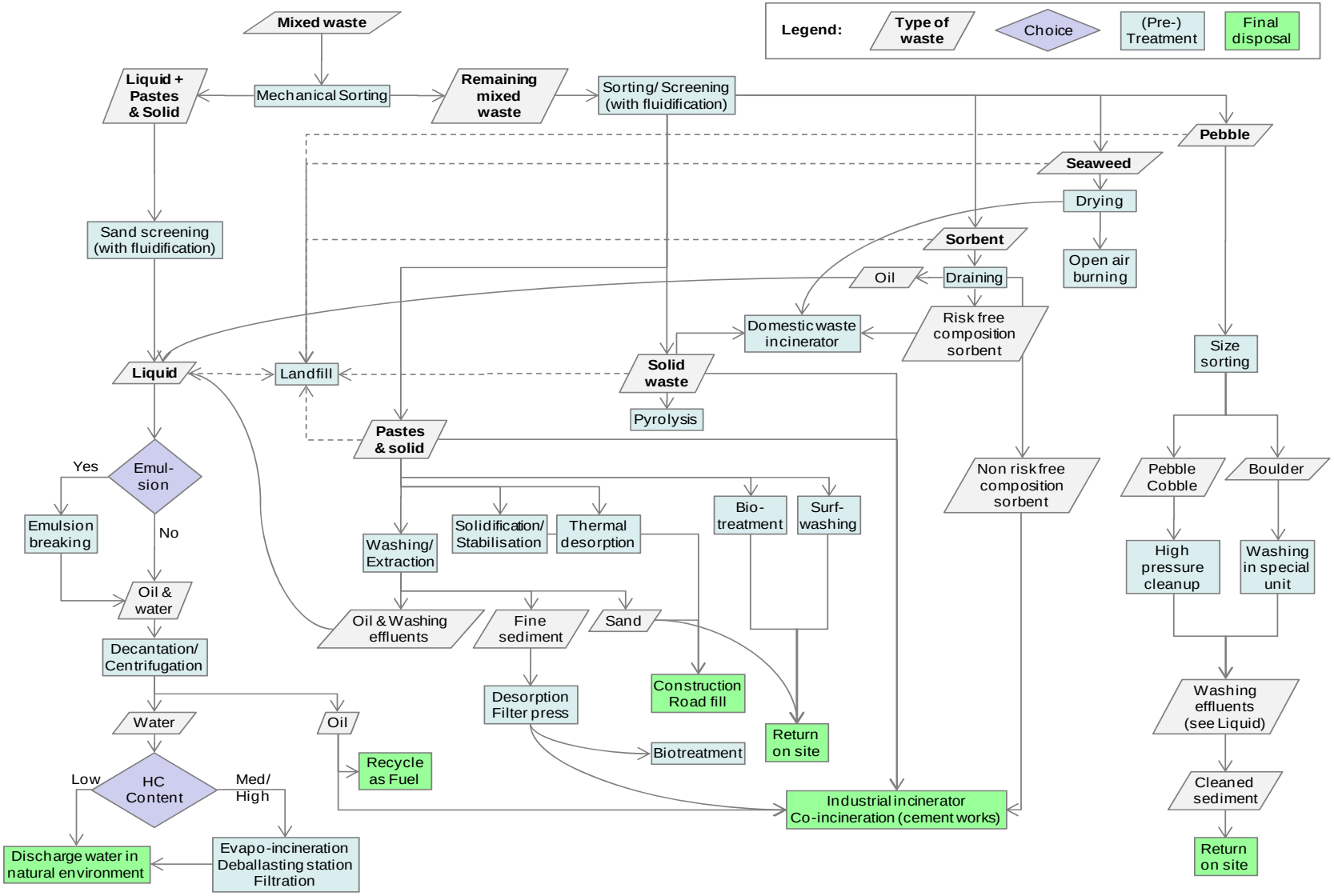


Figure 10: Main oil spill waste streams based on international practices

(Source: modified from Cedre)

TG n°11 Treatment facility information sheet

Use this data sheet to identify and assess each waste treatment facility identified. Use the table next page to summarize your findings. These completed data sheets should be included in the Appendices of the OSWMP.

Name:	
Process(es):	
INFORMATION ON THE FACILITY	
Name and location(s) of the facility(ies) (provide coordinate - W.G.S. 84 datum)	
Contact information Name(s), telephone numbers, fax numbers, addresses and email addresses	
Brief description of installation Production / use? Fixed installation(s) or mobile unit(s)?	
Type of waste acceptable and entry criteria	
Type of waste accepted	
Entry criteria (solid/ liquid proportion, water/ salt content, etc.). **Specify pre-treatment** required.	
Capacity (tons of waste per day/ month/ year)	
Logistics/ Operational requirements & constraints	
Energy, water and other input required (nature and amount per ton treated)	
Nature of product that can be accepted: - Analysis performed on the oil spill waste before (pre-)treatment - upper viscosity limit of OSW that can be accepted - maximum degree of water contamination (for 2-phase oil/water mix and water-in-oil emulsions) of recovered oil that can be accepted - any other restrictions on the composition of recovered oil that can be accepted (e.g. contamination by dispersants, surfactants or de-emulsifiers, salt, sulphur etc).	
Reception facilities: - By sea (size of vessel)? By road? By train? - Daily reception capacity?	
Quality of produced material (from the waste): - e.g. What are the requirements for the quality of the recovered oil in order to be used as a substitute to commercial products in your country? - What are the requirements to use the products for land filling (environmental, technical criteria), Etc.	
Potential environmental impacts	
Noise	

Atmospheric releases	
Solid refusal	
Leachate or liquid effluents produced	
Others	
Legal constraints	
Details of existing regulatory permits in place in the facility.	
Required E.I.A. (Environmental impact assessment), specific authorisation, etc.	
Efficiency	
Treatment rate, e.g. ton per hour	
Interest of treatment: Complete treatment? Potential valorization of the waste? Re-use of the treated waste? Required treatment and/ or final disposal?	
Cost	
Treatment rate, e.g. ton per hour	
Cost per ton treated	
RANKING INFORMATION.	**TO FILL FOR EACH TYPE OF TREATMENT**
Treatment A:	
Type of waste acceptable and entry criteria **+** Little variety of waste acceptable to **+ + +** Wide variety of waste acceptable	
Potential environmental impacts **x** Little impact to **x x x** Potentially severe impact	
Pre-treatment required (for the treatment and final disposal) ✔ = Possible in country, without authorisation, **x/**✔ = Possible, with authorisation, **x**= Forbidden	
Legal constraints ✔ = Possible in country, without authorisation, **x/**✔ = Possible, with authorisation, **x**= Forbidden	
Cost **x** Low cost to **x x x** Highly expensive	
Treatment B:	
Type of waste acceptable and entry criteria **+** Little variety of waste acceptable to **+ + +** Wide variety of waste acceptable	
Potential environmental impacts **x** Little impact to **x x x** Potentially severe impact	
Pre-treatment required (for the treatment and final disposal) ✔ = Possible in country, without authorisation, **x/**✔ = Possible, with authorisation, **x**= Forbidden	
Legal constraints ✔ = Possible in country, without authorisation, **x/**✔ = Possible, with authorisation, **x**= Forbidden	
Cost **x** Low cost to **x x x** Highly expensive	
Treatment C:	
Etc.	**...**

Table 10: Treatment facility information sheet (template)

Technique	Type of waste acceptable and entry criteria + Little variety of waste to + + + Wide variety	Logistics/ Operational requirements & constraints Specify	Potential environmental impacts x Little impact to x x x Potentially severe impact	Legal constraints ✔ = Possible, without authorisation, x/✔ = Possible, with authorisation, x= Forbidden	Efficiency Specify	Cost x Low cost to x x x Highly expensive	Comments Specify
PRE-TREATMENT							
TREATMENT							
FINAL DISPOSAL							

Table 11: Waste treatment options evaluation table

APPENDICES

App. 1 First results from REMPEC's Questionnaire

Assessment of the waste management capabilities and regulatory framework of the Mediterranean countries: first analysis of the REMPEC questionnaires sent to the Contracting Parties of the Barcelona Convention

Up dated on the 12th of December 2008, on the basis of eight replies (Bosnia & Herzegovina, Egypt, Greece, Israel, Italy, Monaco, Morocco, Tunisia) received by REMPEC.

The following comments can be made.

Management

- authorities in charge of oil spill waste management are identified in all countries;
- all countries have a National Waste Management Plan and all but one have a NOSCP;
- five, of the seven countries having a NOSCP, have a specific section on oil spill waste management in their NOSCP;
- for half of the countries, there are recommendations regarding waste minimization or sorting at source of the oily waste. There is one positive answer about the identification of final disposal facilities;
- in three countries, there are local oil spill contingency plans in place, with a section and/or recommendations addressing waste management;
- for half the countries, there is a requisition procedure for the transport, storage and/or treatment of oil spill waste;
- a representative of the oil industry which could assist for oil spill waste management is identified, in two countries, but there is no formal agreement between the identified company(ies) and the National Authorities;
- four countries already had experience in dealing with oil spill waste management.

Regulation

- all countries are member of the Basel Convention on transboundary movements of waste and for most of them, provisions of the convention are implemented in their national regulatory framework, focal points are identified and hazardous waste exportation was already experienced;
- countries member of the E.C. have transposed European regulations related to waste management into their national regulation (management, transport, shipment, disposal, treatment, etc.);
- regarding the Mediterranean regulatory framework (i.e. Barcelona Convention and Protocols), all the countries have ratified the Protocol for the Protection of the Mediterranean Sea from land based sources. All of them have ratified the 1976 Emergency Protocol but only two have ratified the 2002 Emergency Protocol. Seven countries have signed but not ratified the Hazardous Waste Protocol;
- oil spill waste is considered hazardous in all countries;
- in five countries, general national rules related to general waste management are applicable to oil spill waste, which have a legal status defined only in a little more than half the countries.

Transportation rules and logistic

- Four countries have a specific regulation in place for the transportation of oil spill waste; however a specific authorisation is required in five countries;
- in five countries, there are specific requirements for oil spill waste transportation;
- Two countries provided information on specialized waste transport companies or cost for the transportation of oil spill waste.

Storage rules and conditions

- In six of the seven countries having a NOSCP, there are recommendations for the temporary storage of oil spill waste and for recommended equipment to be used;
- regarding the management of intermediate storage, in six countries, the authority in charge is identified. In half the countries, the authority in charge is the national authority; for the other countries, responsibility is local or undefined;
- regarding intermediate storage, in three countries, there are rules or regulations applicable to choose and manage intermediate waste storage sites; and in most cases, potential sites are not pre-identified. Management and equipment are only available in two countries. Generally costs are not known;
- regarding long term storage, the authority in charge is identified in six countries and provisions exist in the national rules and regulations (or conventions are in place with neighbouring countries);
- long term storage sites are identified only in four countries. Available equipment and management are identified also only in half of the countries, and only one gave cost estimate.

Pre-treatment and final disposal

- in five countries, there are specialized national companies identified to manage oil spill waste;
- only three countries have provided answers regarding the type of pre-treatment or treatment available in the country.

Sampling capabilities

- in five countries, laboratories, public or private, or both type capable of carrying out oil spill waste analysis are identified. These laboratories are recognized by the National competent authority in three countries.

Liability for waste management

- in case of unknown origin of the spill, the liability is defined in seven countries: it is generally passed on the national authority;
- in case of known producer, six countries answered that the producer is liable for the management of the waste, under the supervision of an authority, designated by the National Competent Authority.

App. 2 Response strategies and their effect on waste generation

Clean-up technique		Effect on waste stream	Type of waste generated
Dispersant application 	Dispersant chemicals are used to break down the oil slick into small droplets so that the diluting effect of the ocean is better able to reduce hydrocarbon concentrations. This strategy will not work with all oils and is not appropriate for use in certain environments.	Waste concentrations are minimal as the oil is suspended in the water column and allowed to biodegrade naturally.	• No hydrocarbon waste is generated. • PPE • Empty dispersant drums/considerations
At sea response operations 	Recovery devices, e.g. booms and skimmers, are deployed from ships or small craft to recover oil from the sea surface. Suitably sized storage systems may be needed which, in the case of highly viscous or waxy oils, will require heating elements. Transfer systems and reception facilities will also be needed to sustain operations over the long term.	Recovery operations will potentially give rise to a large quantity of waste oil and water for treatment. The volume of the storage systems available must be consistent with the recovery capacity of the skimmers. The type of oil spilled will have an effect on the resultant waste; viscous and waxy oils in particular will entrain debris and can create large volumes of waste. They can also present severe handling difficulties.	• Oiled equipment/vessels • Oiled PPE and workforce • Recovered oil • Oily water • Oiled vegetation • Oiled sorbent materials • Oiled flotsam and jetsam • Animal carcasses

Shoreline clean-up 	Oils are recovered from shorelines either using mechanical or manual means. Manual recovery is the preferred method because it has the effect of minimizing the amount of waste generated. Machines can be used to transport the waste from the shoreline to the primary storage site. Portable tanks or lined pits can be used to consolidate recovered oil at the operating site. The shoreline type, and degree of access to it, will dictate the types of strategies used which, in turn, will determine the amount of waste recovered.	The type of spilled oil will often have a profound effect on the amount of oily waste generated. Waste segregation and minimization techniques are critical to ensure an efficient operation. These should be established at the initial recovery site and maintained right through to the final disposal site otherwise waste volumes will spiral out of control. Waste sites should be managed in such a way as to prevent secondary pollution.	• Oiled equipment/vessels
			• Oiled PPE and workforce
			• Recovered oil
			• Oiled vegetation
			• Oily water
			• Oiled sorbent materials
			• Oiled beach material:
			  ▪ sand
			  ▪ shingle
			  ▪ cobbles
			• Oiled flotsam and jetsam
			• Animal carcasses
			• Oiled transport

In-situ burning 	This involves a strategy of burning spilled oil using fire booms to thicken the oil layer to sustain combustion. Weathering and emulsification of oil will inhibit the process. The strategy cannot be used on all oil types or in all environments. The resultant air pollution and the production of viscous residues can limit the application of the strategy.	*In-situ* burning can reduce the amount of oil in the environment. However, the remaining material may be more persistent.	• Burnt oil residues • Oiled/fire damaged boom • Oiled vessel • Oiled PPE

Table 12 : Response strategies and their effects on waste generation

Source IPIECA, guidelines for Oil Spill Waste Minimization and Management, Report Series, vol. 12.

App. 3 Case study: ERIKA oil spill, France, 1999

(Source of text: http://www.drire.gouv.fr/)

Recovered on over 400 km of coastline, the oil spill waste resulting from the ERIKA oil spill was composed of **emulsified fuel (10 %), of sands (80 %), and also seaweed and various oiled material (wood, plastic…)**. The waste was first stored in approximately **forty intermediate waste storage sites**, along the oiled shore and close to the clean-up sites.

After a few weeks, these sites were dismantled. Soil analysis proved that there was no secondary soil contamination.

Four long term storage sites (Total refinery: 55,000 tons, Frossay: 18,000 tons, Arceau 1: 73,000 tons, Arceau 2: 54,000 tons) were set up in the region of Basse-Loire to store all the waste from the intermediate waste storage sites, while waiting for a decision for the treatment and final disposal. The water-tightness of the sites was ensured by the installation of geo-textile membrane. The ground water was regularly analysed. The sites, managed by Total, were classified as “industrial installations” and were monitored by the Agency in charge of the industry.

A Protocol signed on 13 September 2000 between the State of France and the company Total transferred the responsibility of the oil spill waste treatment to Total, using all appropriate means, in accordance with rules and regulations related to the protection of the environment, and ensuring a complete waste tracking until the final disposal of the waste.

Total, within the framework of the Protocol, took over the management of the four long term storage sites and implemented a specific waste treatment plant, close to the refinery of Total in Donges.

The treatment of the waste in Donges started in April 2001. The waste treatment plant was a classified industrial installation and subject to the relevant rules and regulations, and closely monitored by the French Agency in charge of the industry. Objectives were assigned to Total regarding the treatment of the sands, the tracking of the washed sands and of the washing effluents.

The “Arrêté préfectoral” of 7 December 2000 defined the criteria to be met to be able to use the washed sands for Public Works:

- maximal hydrocarbon content: 2,500 mg/kg,
- use in working sites of a minimum quantity of 500 tons, outside of any sensitive area (water intake, wetland, etc.),
- implementation of a tracking system for all material treated.

The maximum hydrocarbon content was 5,000 mg/kg for storage in specialized landfill.

To ensure transparency and inform the public, a Local Monitoring and Information Commission was set up (“Arrêté préfectoral” of 20 July 2000) and meetings were regularly organized each year of the project.

Initiated in April 2001, the treatment of the waste was completed in May 2004. A total of 267,158 tons of waste were treated.

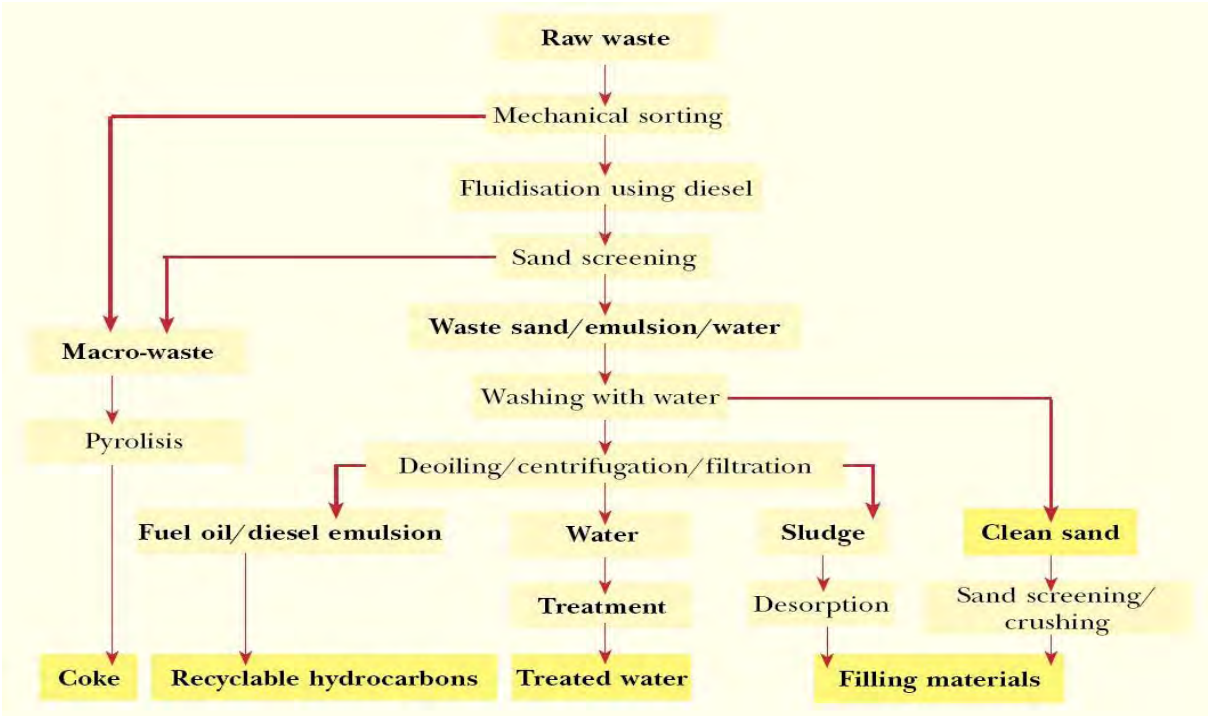


Figure 11 : Physico-chemical treatment procedure used to treat OSW from the ERIKA pollution

(Source: Cedre)

The treatment, using water and benzene, resulted in the production of:

- **200,838 tons of sediment** (mainly fine to coarse sand), which were disposed of in Public Works,
- **63,591 tons of mud** (mix of water and fine sediment having absorbed hydrocarbons). These mud were pre-treated on site (using quicklime and crushing) and:
  - 69 % were disposed of in cement kilns (France and Belgium) as raw material and energy source,
  - 25 % were stored in specialized centres in France,
  - 5 % were incinerated in specialized incinerators in France.
- **49,121 tons of fluidized fuel** (mix of recovered fuel and benzene), which were transferred to the refinery of Donges to recover and re-use the hydrocarbon products,
- **1,494 tons of emulsion** (mix of fuel and hydrocarbons), treated in a specialized centre in France,
- **371 tons of solid waste** (plastic, wood, sea weed etc.) incinerated in domestic waste incinerators in France,
- **155 tons of metal**, which were transferred to the usual metal waste stream.

The treatment implemented by Total allowed very good results for the cleaning of the sediments. The hydrocarbon content of the washed sediment was inferior to 500 mg/kg, which is considerably less than 2,500 mg/kg (French official limit in such cases).

The decommissioning of the storage and treatment plant were completed in May 2004. The different sites were controlled: There was no impact on the soil or ground water.

The overall cost of the waste treatment was 72,000,000 euros.

App. 4 Case study: JYEH power plant oil spill, Lebanon, 2006

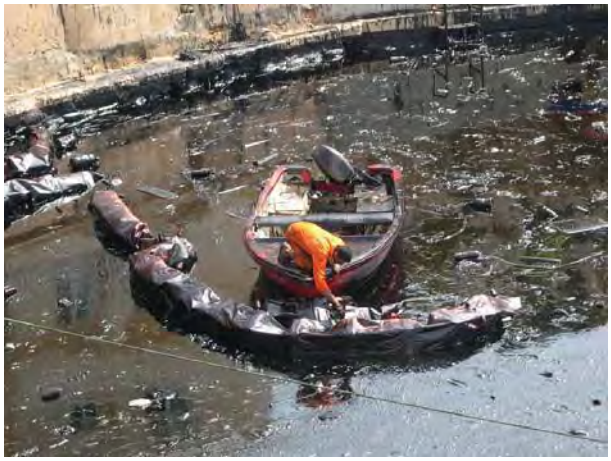
On the 13 and 15 July 2006, the Jyeh power utility located 30 km south of Beirut directly on the coastline was hit by Israeli bombs. Part of the storage tanks caught fire and were still burning 10 days on. The fuel that did not catch on fire was spilled into the Mediterranean Sea as a result of the blast.

Due to winds blowing south-west to north-east and water current movement, the oil spill was partly carried out to sea and partly dispersed along the coast of Lebanon. It affected 70 – 80 km of both public and private rocky and sandy beaches along the Lebanese coast including public and private marinas/ports for boats/ships of fishermen and tourist resorts from the Damour region south of Beirut through to Tripoli in the north.

(Source of text: http://www.moe.gov.lb/rescuelebanon.htm/)

Approximately 10,000 to 15,000 tons of unburned fuel oil were spilled at sea, and drifted to the north, pushed by south-westerly winds. The pollution impacted almost half of the 200 km of Lebanese coastline, affecting various substrates: sand, stones, rocks, port facilities. The product spilled appeared to be an IFO 150 (Intermediate Fuel Oil).

Oiled cobble and rocky shore



Oil slick and oiled debris trapped in a port

The waste collected was estimated as follow:

Update – July 2007	**Liquid/oil**	**Semi solid**	**Polluted sand**	**Polluted pebbles**	**Polluted debris ***	**Polluted equipments**
Total quantities removed (liquid and solid) **4 547 m^3**	567 m^3	173 m^3	1,814 m^3	264 m^3	1,969 m^3	60 m^3
		Total of 3,980 m^3				
		* including 1212m^3 of mixed semi-solid/sand/debris in unknown proportion				

One major problem was the large amount of debris that was already stranded on the coast of Lebanon and that became oiled, thus generating a large volume of polluted waste.

A study identified the existing treatment facilities available in Lebanon, and the methods that could be implemented in Lebanon.

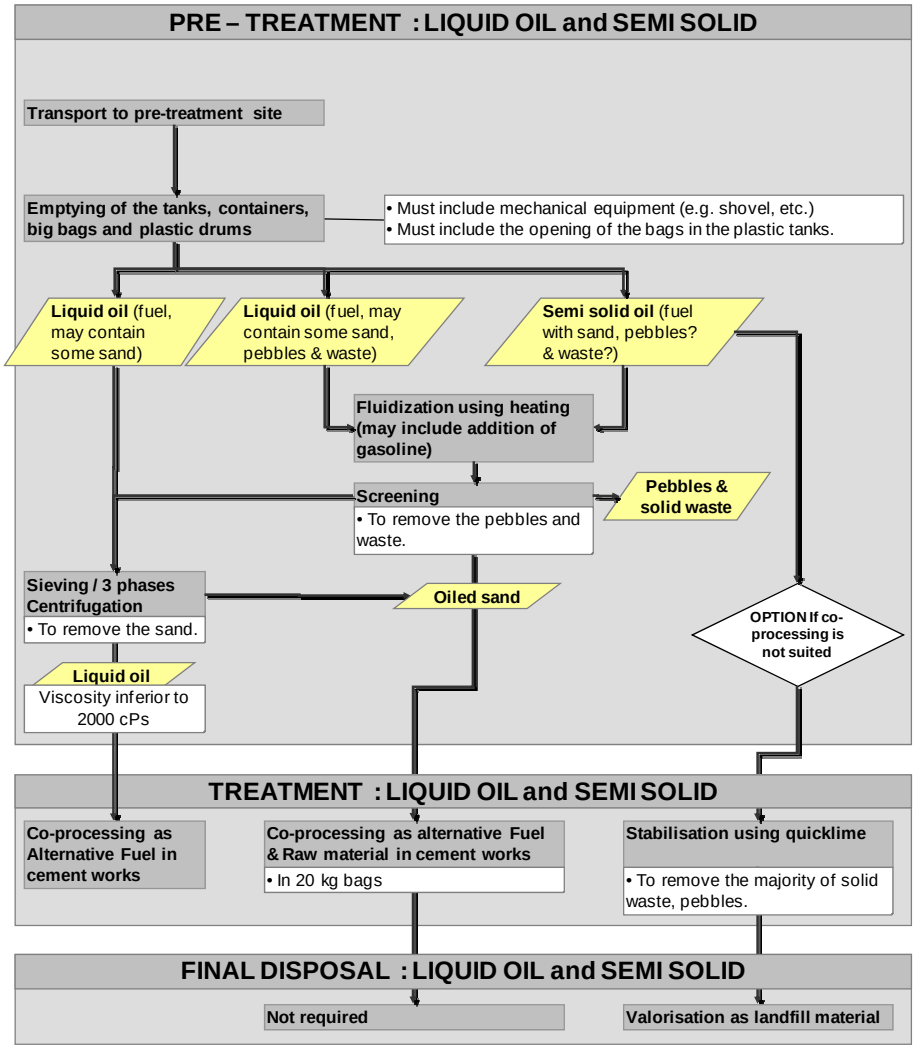
Treatment	Existing in Lebanon	Required external input
Settling / centrifugation / emulsion breaking	No facilities identified.	Site, equipment and expertise.
Washing (solid waste)	There are no existing washing facilities in Lebanon for the washing of oiled solid waste.	Site, equipment and expertise.
Washing of pebbles (using washing units or hot water/ high pressure for bigger pebbles)	There are no existing washing units or hot water and high pressure washing facilities in Lebanon for the washing of oiled pebbles.	Site to implement the operations. Expertise to setup the facility. Equipment could be found in Lebanon (concrete mixer, high pressure cleaner, sorbent, decanter, etc.)
Surfwashing (sand and pebbles on site)	Surfwashing has already been used successfully (on the sand beaches of Beirut and south of Beirut). Efficiency on weathered oil has to test.	Expertise to manage the operations. *Performed on site.* *Note. Equipment consists in earth moving machines, booms and sorbent which can be acquired in Lebanon.*
Stabilisation using quicklime (semi-solid and oily sands)	There is no existing stabilisation site in Lebanon.	Site to implement the operations. Expertise to manage the operations. Quicklime is used to stabilize the waste. Available earth moving machines can be used to mix the waste and quicklime.
Bio-treatments (lightly polluted waste)	There is no existing bio-treatment site in Lebanon.	Site to implement the operations. Expertise to manage the operations. *Note. Equipment consists mainly in earth moving machines.*
Incineration in domestic incinerators	There are no domestic incinerators in Lebanon.	.
Incineration in hazardous waste collection centre/ incinerator	There are no hazardous waste collection centres / incinerators in Lebanon.	Site, equipment and expertise for mobile incinerator.
Incineration in cement works/ industrial furnace as Raw Alternative material	Three cement works in Lebanon could potentially use oily waste as Alternative Fuel and Raw material, but only one was adequately equipped.	None for the treatment. Expertise (and equipment) may be required for the pre-treatment of the waste to ensure a correct incineration.
Low Temperature Thermal Desorption	There is one Low Temperature Thermal Desorption unit in Lebanon (Beirut).	Expertise, maintenance, manpower and energy.
Burning of lightly oiled vegetation, wood	Burning has already been performed for lightly oiled vegetation recovered from the beaches.	None.

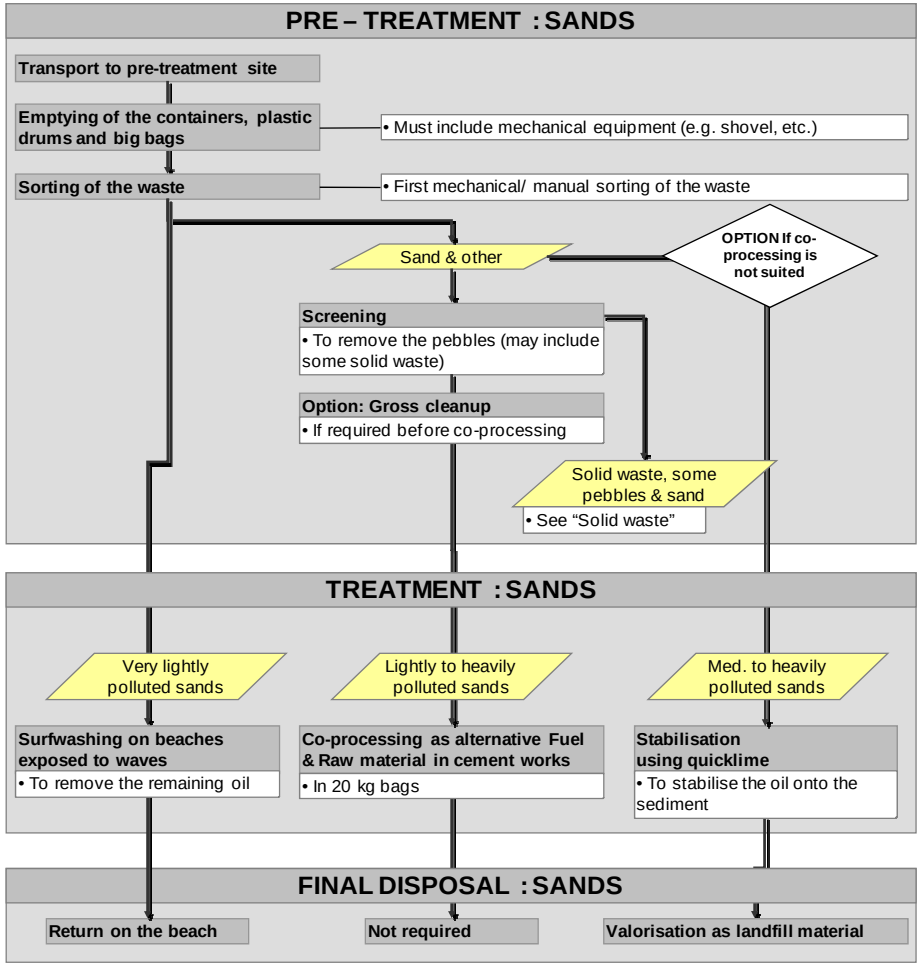
The final disposal options available in Lebanon were also identified.

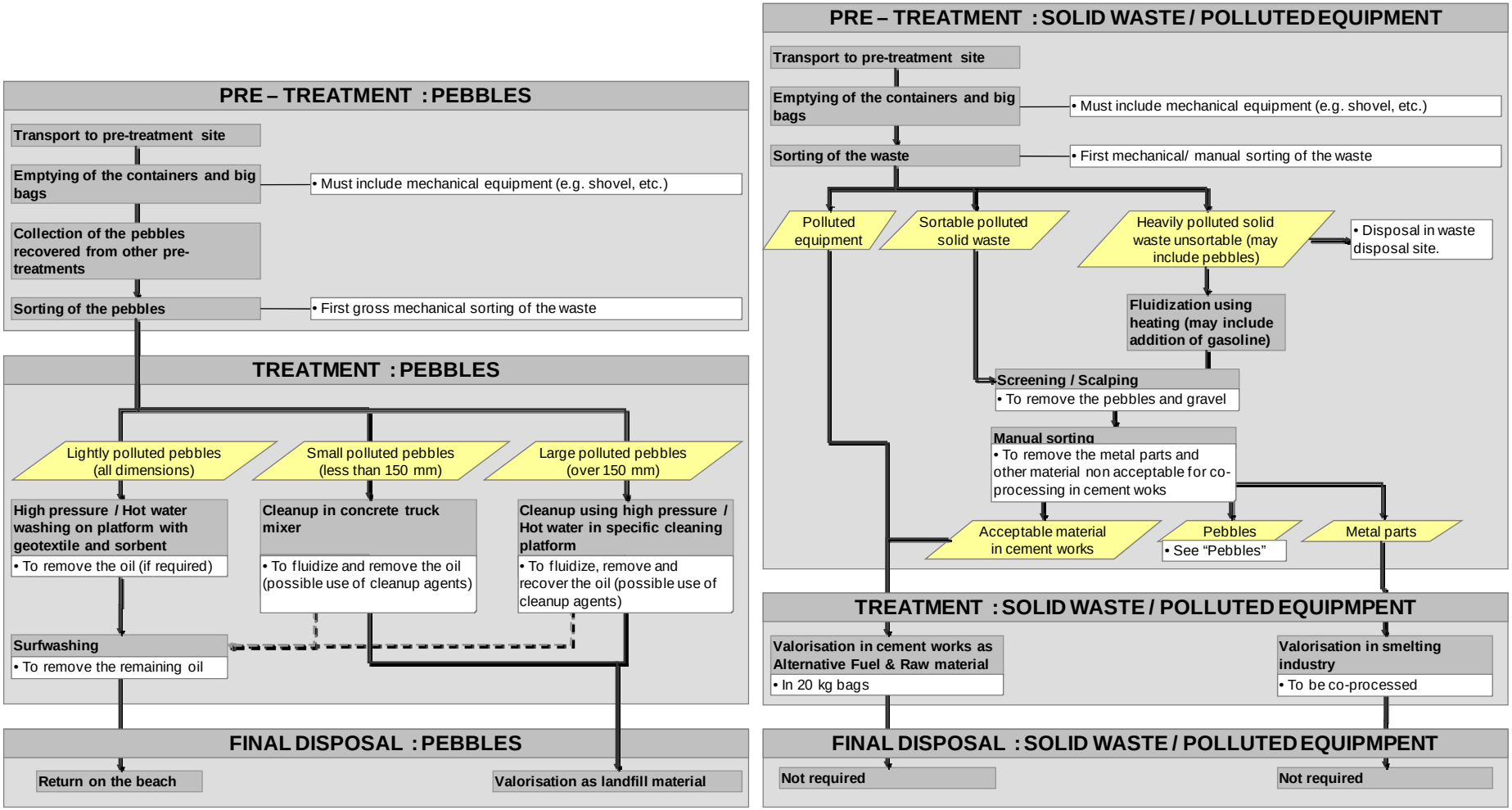
Treatment	Existing in Lebanon	Required external input
Return of clean sediment on site	Clean sediments have already been returned on site during clean-up operations.	None.
Discharge in natural environment	Water from clean-up operations has already been discharged in the environment during clean-up operations (after decantation).	None.
Storage (controlled containment and/ or landfills)	Three landfills were identified, but are considered nearly full.	Expertise for long term storage of waste. Equipment for storage (cells).
Re-use as road work material	There is no example of re-use as road work material in Lebanon.	Road work site.
De-ballasting station	There are no de-ballasting stations in Lebanon.	Site, equipment and expertise.
Evapo-incineration	There are no existing evapo-incineration facilities in Lebanon.	Site, equipment and expertise.

Based on these treatments and final disposal options, the operational, environmental and legal constraints, the following pre-treatment, treatment and final disposal options were proposed to dispose of the oily waste collected on the shoreline of Lebanon following clean-up operations (see next pages).

(Source: KESSACI C. (ANTEA), PAGE-JONES L. (ANTEA), ROUVREAU L. (ANTEA), PONCET F. (CEDRE), 2007. Study for the management of oily wastes generated by the cleaning operations of the Lebanese coast following the oil spill of JIYEH. Report A 47 825 / B, Project No: METP070010, France, 85 p.


PRE – TREATMENT : LIQUID OIL and SEMI SOLID
Transport to pre-treatment site
Emptying of the tanks, containers, big bags and plastic drums
• Must include mechanical equipment (e.g. shovel, etc.)
• Must include the opening of the bags in the plastic tanks.
Liquid oil (fuel, may contain some sand)
Liquid oil (fuel, may contain some sand, pebbles & waste)
Semi solid oil (fuel with sand, pebbles? & waste?)
Fluidization using heating (may include addition of gasoline)
Screening
• To remove the pebbles and waste.
Pebbles & solid waste
Sieving / 3 phases Centrifugation
• To remove the sand.
Oiled sand
OPTION If co-processing is not suited
Liquid oil
Viscosity inferior to 2000 cPs
TREATMENT : LIQUID OIL and SEMI SOLID
Co-processing as Alternative Fuel in cement works
Co-processing as alternative Fuel & Raw material in cement works
• In 20 kg bags
Stabilisation using quicklime
• To remove the majority of solid waste, pebbles.
FINAL DISPOSAL : LIQUID OIL and SEMI SOLID
Not required
Valorisation as landfill material


PRE – TREATMENT : SANDS
Transport to pre-treatment site
Emptying of the containers, plastic drums and big bags
• Must include mechanical equipment (e.g. shovel, etc.)
Sorting of the waste
• First mechanical/ manual sorting of the waste
Sand & other
OPTION If co-processing is not suited
Screening
• To remove the pebbles (may include some solid waste)
Option: Gross cleanup
• If required before co-processing
Solid waste, some pebbles & sand
• See “Solid waste”
TREATMENT : SANDS
Very lightly polluted sands
Lightly to heavily polluted sands
Med. to heavily polluted sands
Surfwashing on beaches exposed to waves
• To remove the remaining oil
Co-processing as alternative Fuel & Raw material in cement works
• In 20 kg bags
Stabilisation using quicklime
• To stabilise the oil onto the sediment
FINAL DISPOSAL : SANDS
Return on the beach
Not required
Valorisation as landfill material


PRE – TREATMENT : PEBBLES
Transport to pre-treatment site
Emptying of the containers and big bags
• Must include mechanical equipment (e.g. shovel, etc.)
Collection of the pebbles recovered from other pre-treatments
Sorting of the pebbles
• First gross mechanical sorting of the waste
TREATMENT : PEBBLES
Lightly polluted pebbles (all dimensions)
Small polluted pebbles (less than 150 mm)
Large polluted pebbles (over 150 mm)
High pressure / Hot water washing on platform with geotextile and sorbent
• To remove the oil (if required)
Cleanup in concrete truck mixer
• To fluidize and remove the oil (possible use of cleanup agents)
Cleanup using high pressure / Hot water in specific cleaning platform
• To fluidize, remove and recover the oil (possible use of cleanup agents)
Surfwashing
• To remove the remaining oil
FINAL DISPOSAL : PEBBLES
Return on the beach
Valorisation as landfill material
PRE – TREATMENT : SOLID WASTE / POLLUTED EQUIPMENT
Transport to pre-treatment site
Emptying of the containers and big bags
• Must include mechanical equipment (e.g. shovel, etc.)
Sorting of the waste
• First mechanical/ manual sorting of the waste
Polluted equipment
Sortable polluted solid waste
Heavily polluted solid waste unsortable (may include pebbles)
• Disposal in waste disposal site.
Fluidization using heating (may include addition of gasoline)
Screening / Scalping
• To remove the pebbles and gravel
Manual sorting
• To remove the metal parts and other material non acceptable for co-processing in cement woks
Acceptable material in cement works
Pebbles
• See "Pebbles"
Metal parts
TREATMENT : SOLID WASTE / POLLUTED EQUIPMPENT
Valorisation in cement works as Alternative Fuel & Raw material
• In 20 kg bags
Valorisation in smelting industry
• To be co-processed
FINAL DISPOSAL : SOLID WASTE / POLLUTED EQUIPMPENT
Not required
Not required

App. 5 Watertight protection of storage sites

Waste storage facilities should be systematically accompanied by a system to ensure that they are watertight in order to reduce the impact on the environment and in particular to prevent infiltration and contamination by run-off.

Watertightness can be ensured using different types of materials, in general geomembranes or plastic films.

Geomembranes are flexible materials with standardised application techniques and conditions. Those that are recommended for hydrocarbons are the type HDPE (thickness of 1.5 to 2mm, in rolls of 100m with a width of 5 to 10m). Geomembranes are made watertight by sealing, carried out by a specialist.

Plastic films are tarpaulins used in particular in agriculture or construction, with a thickness of generally less than 0.25 mm. They are much more flexible, easier to handle, less expensive and more widely available (agricultural cooperatives, construction and public works material wholesalers) than geomembranes. They are however less resistant to impact, ripping and tension. Several layers should therefore be used together, along with geotextiles(*).

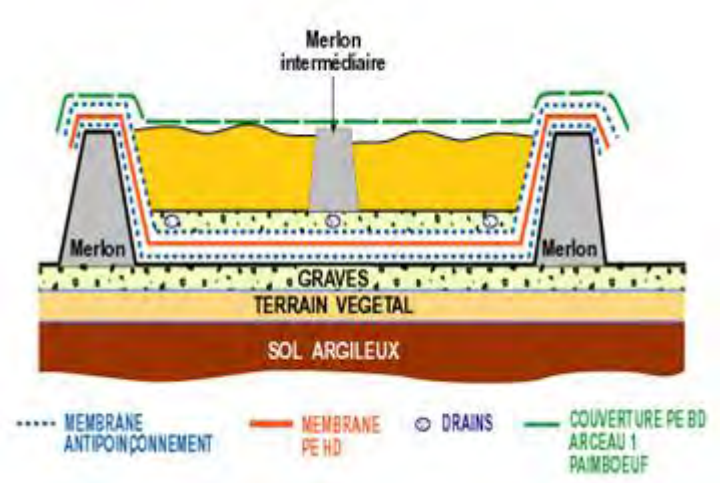
When the aim is simply to form an anti-contamination barrier under watertight tanks or skips, use an ordinary plastic film. Make sure to prepare the ground accordingly. Lay a geotextile between the ground and the plastic film to avoid perforation of the film.

In the case of bulk storage of pastes, geotextiles can be laid without sealing or sticking but a quadruple covering should be ensured by folding two sheets one over the other. Place a geotextile as an under layer to reduce piercing and cross over successive layers.

Intermediate and final storage pits should be made thoroughly watertight, taking into account specific technical aspects (choice of geomembranes, sealing of strips of textiles…). Pits should be lined from the bottom to the top with an impenetrable geotexile, a hydrocarbon-resistant geomembrane, a second impenetrable geotexile and a layer of sand for protection against the traffic of heavy duty machinery.

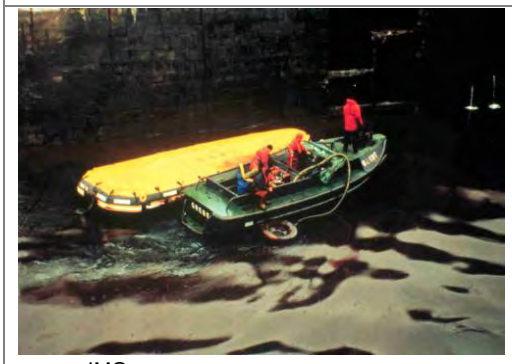
(Source: Cedre)

*Geotextiles are synthetic fabrics, with a weight of 300 to 500 g/m2 which come in rolls of 100 m and different widths (3, 4, 5m or even 6 m), used as under layers to reduce impact on geomembranes and watertight films.



Long term storage facility for the ERIKA oil spill waste (Donges, FRANCE)

App. 6 Examples of equipment for the storage of oil

PHOTOS OF STORAGE	NAME AND DESCRIPTION
AT SEA	
 source IMO	**Floating Storage Units (tanks)** • Suitable for liquid oil • Varying capacities • Large tanks require substantial towing force • Can be difficult to remove viscous oils
 source IMO	**Floating Storage Units (barge)** • Suitable for liquid oil • Varying capacities • Large tanks require substantial towing force • Can be difficult to remove viscous oils
 source Cedre	**Big Bag on barge** • Suitable for oily macro waste collection • Maintain a large opening and stability
SHORELINE	
 source Cedre	**Shoreline recovery pit** • Suitable for large volume of liquid or when lack of containers • Plastic liner to prevent infiltration and substrate contamination • May require layer of sand to prevent puncture of liner from rocks

 source Cedre	**Open top collapsible containers with supporting frame (large)** • Suitable for oily waters • Allow continuous settling and decantation on site • Treated water can be directly discharged on site • Minimize volume of oil to be transported and treated
 source Cedre	**Open top collapsible containers with supporting frame (medium)** • Suitable for liquid oil • Capacities <10m^3 • Smaller ones can be used on deck of landing craft near shore • Not moveable when full
 source Otra	**Open top collapsible container with supporting frame (small)** • Suitable for oily waters collection during clean-up operations like flushing, high pressure cleaning • Allow continuous settling and decantation on site • Treated water may be directly discharged on site
 source Cedre	**Shoreline recovery pillow tanks** • Suitable for liquid oil • Capacity <20 m^3 • Not transportable when full • Maybe difficult to remove viscous oil

 source Cedre	**Metallic drums 200 litres** • Suitable for macro waste soaked with liquid oil • Holes punched in the drums for evacuation by crane • Easy to find every where
 source Cedre	**Tank** • Suitable for liquid oil or macro waste mixed with liquid oil • Ensure a large opening on top of the tank to help the manual discharge of the tank
 source Cedre	**Plastic drums with top** • Capacity 1000 litres • Difficult to handle when full due to lack of handle • bottom discharge valve needed for liquid
 source Cedre	**Skips** • Robust containers suitable for storing solid debris and transporting it to disposal sites • Can be transported by barge or landing craft to remote sites

 source Cedre	**Bulk liquid containers with frame (I.B.C.)** • Suitable for liquid oil • 600 to 1000 litres capacity • Stability • Allows decantation if there is a bottom discharge valve • Top can be cut of and removed for paste and solid wastes collection • Easy to find in all countries
 source Cedre	**Open top bins 75 to 150 litres** • Suitable for manual beach clean-up of oily solid and small debris • Handles allow manual transportation • Easy to find every where
 source Cedre	**Small plastic drums** • Capacity around 60 litres • Tight lid or top • Large opening • Handles to transport from shore
 source Otra	**Plastic bags** • Suitable for manual collection of oily sand and small debris • Easily manhandled when partially full • Consider resistance when filling • Plastic may add to disposal problem
TEMPORARY / INTERMEDIATE STORAGE	

 source Le Floch Dépollution	**Containers (20 ft and 40 ft)** • Possible solution for temporary and intermediate storage* • Fill with watertight drums or bags
LONG TERM STORAGE	
 source Cedre	**Long term water tight storage pit** • Geotextile liners • Layer of sand to avoid puncture by rocks

App. 7 Data sheets on (pre-)treatment and final disposal

PRE-TREATMENT	Screening
Description	Separation of the polluted solid waste and sand and pebbles from the liquid phase (oil and/ or water). Screening is the term used for large particles (few cm's, French equivalent is "dégrillage", and few 10's of dm, French equivalent is "criblage"). Sieving is the term used for smaller particles (few mm's, French equivalent is "tamisage"). Note. Some equipment are specifically designed to sort out metal from non-metal elements (and plastic from non-plastic), using magnetic sorting equipment.
Waste	Liquid Polluted sand and pebbles/ stones Polluted solid waste
Situation / Potential in the country in the country	Use of public work/ construction work equipment easy to import and implement in any country.
Interest	Allows segregating the solid and sediment from the liquid phase for more specific waste treatment.
Entry criteria	Any type of liquid with semi-solids and solid, polluted sand/ pebbles/ solid waste.
Operational constraints	Requires personnel, specific screening equipment, energy, and storage for segregated material. May not be carried out on heavy / weathered / emulsified oil trapped in sediment without fluidization. Possible installation ranges from simple screen to heavy industrial screening equipment.
Impacts	Minimal if equipment is suitable, correctly operated and there are no oil leaks.
Legal constraints	Refer to those applying to the transport, handling and storage of oil products.
Efficiency	Depending on equipment.
Cost	CAPEX and OPEX vary widely depending on the installation purchased/ rented.
PRE-TREATMENT	**Size sorting**
Description	Sorting of the sediments (and other waste) based on their size (fine sediment, sand, gravel, pebble, cobble, boulder).
Waste	Polluted sand and pebbles/ stones
Situation / Potential in the country in the country	Use of public work/ construction work equipment easy to import and implement in any country.
Interest	Some machinery applies to sand, other to gravel, others to pebble and cobble. Most organic and inorganic contaminants tend to bind to the fine fraction of a soil (i.e. clay and silt). Thus, separating the fine clay and silt particles from the coarser sand and gravel soil particles concentrates the contaminants into a smaller volume of soil that can then be treated or disposed.
Entry criteria	Any type of semi-solids and solid, polluted sand/ pebbles/ solid waste.
Operational constraints	Requires personnel, specific sorting equipment, energy, and storage for the sorted sediment. May not be carried out on sediment trapped in heavy / weathered / emulsified oil without fluidization (because oil fills in the pores of the sorting equipment).
Impacts	Minimal if equipment is suitable, correctly operated and there are no oil leaks.
Legal constraints	Refer to those applying to the transport, handling and storage of oil products.
Efficiency	Depending on equipment, can allow sorting waste / various size of sand and pebbles (depending on the screen used in the machine). The size of the installation ranges from simple sorting equipment (few 10's of cubic metres per hour) to heavy of industrial equipment, e.g. Trommel screening type (screened cylinder used to

	separate materials by size, 200 to 300 cubic metres per hour).
Cost	CAPEX and OPEX vary depending on the installation purchased/ rented.
PRE-TREATMENT	**Mills/ Shredders/ Shearing machines/ Crushers**
Description	Equipment used to downsize the solid waste. Equipment used depends on the type of waste. • Mills: breakable solid waste • Shredders: cardboard, polystyrene • Shearing machines: plastic, paper, cardboard, wood • Crushers: wood/ log, rubble, plastic, large pieces of waste
Waste	Solid waste Mineral waste (gravel, pebble, boulder)
Situation / Potential in the country	Equipment can be imported and implemented easily.
Interest	Allows preparing smaller size material for treatment (e.g. incineration, co-incineration etc.).
Entry criteria	Depends on the type of equipment.
Operational constraints	The equipment wears off very rapidly. Main pieces must be changed frequently.
Impacts	Environmental impacts are limited to the noise.
Legal constraints	Limited.
Efficiency	Very good when implemented adequately.
Cost	CAPEX: price of the equipment ranges from few thousands Euros to few millions Euros depending on the capabilities and complexity of the equipment. OPEX vary accordingly.
PRE-TREATMENT	**Drying of sea weed**
Description	Drying of oiled sea weed and sea grass before incineration. Sea weed and sea grass are disposed in piles (e.g. 2m x 2m), height must not exceed 20 cm.
Waste	Sea weed and sea grass lightly (to medium) oiled
Situation / Potential in the country	Pre-treatment can be implemented very easily with limited equipment (earth moving equipment).
Interest	Allows decreasing the overall weight of a minimum of 50% of the sea weed and grass (and removing water) before incineration, thus reducing the cost and facilitating the incineration.
Entry criteria	Drying is used for lightly to medium oiled marine vegetal waste.
Operational constraints	The drying requires non sensitive land areas. Ground must be protected to avoid infiltration.
Impacts	Environmental impacts are limited to the odours (if infiltration is managed).
Legal constraints	Limited
Efficiency	In temperate country, sea weed dries off in 15 days, less on hotter conditions.
Cost	Limited to the rental cost of earth moving machines, personnel and land.
PRE-TREATMENT	**Decantation (settling)**
Description	Separation of a liquid phase (oil or oily water) from another phase (liquid and/ or solid) either on the field during response operations or after the response operations in specialized installations (refinery, deballasting stations, etc.).
Waste	Liquid (may contain limited volumes of semi-solids and solid)
Situation / Potential in the country	Equipment easy to implement in any country (requires tanks for settling and storage, and pumps able to pump water and oil).

Interest	Allow separating oil and water from an oil and water mix (may also allow recovering sediment depending on equipment). During response operations, it can be accepted that the separated water is discharged in the environment thus reducing the need for storage capabilities (on the working sites and on the spill response vessels recovering oil offshore).
Entry criteria	Any oil, water and solid particle mix may be decanted to a certain degree. Oil and water cannot be recovered directly from emulsified oil. The de-emulsification is necessary prior to decantation.
Operational constraints	Requires personnel, a suitable site and storage capabilities for the recovered oil, water and solids (and/ or the possibility to discharge the recovered water in the environment).
Impacts	➔ First decantation on the field during the response operations: the decantation has limited impact. It is often accepted that the recovered water is discharged in the environment (during the spill response operations). ➔ During waste treatment in specialized plants (once emergency response operations is completed): minimal if equipment is suitable, correctly operated and there are no oil leaks.
Legal constraints	Refer to those applying to the discharge of water in the environment. Higher concentrations of oil in water (in the discharged water) are acceptable during spill response operations.
Efficiency	Typical maximum flow rate depends on the pumps and decantation equipment. ➔ First decantation on the field during the response operations: decantation time depends on the oily water recovered (typical time is one hour). Pumps with typical flow rates of 10 to 50m3/ hr are used. ➔ During waste treatment in specialized plants: few cubic metres to 10's of cubic metres per hour.
Cost	CAPEX, mobilisation cost: • First decantation on the field during the response operations: costs of rental/ purchase for storage tanks (10 m3 or more) and volumetric pumps (10 to 50 m3/ hr flowrate) • None if existing installation OPEX: varies depending on the type of installation; however costs are limited (around 50 euros/ per m3 of waste to decant).
PRE-TREATMENT	**Centrifugation**
Description	Separation of phases: oil - water – sediment using specific centrifugation machine.
Waste	Liquid (with limited fraction of sediments, threshold depends on equipment). Simple centrifugation may also be used to recover oil form heavily polluted sands.
Situation / Potential in the country	Equipment easy to import and implement in any country.
Interest	Allow separating oil, water and sediment. Recovered oil may be re-used.
Entry criteria	Typical feed limit characteristics for centrifugation equipment: • **Oily sludge pumpable** by standard volumetric pumps • **Dry solid content : maximum 15 %** • Grain size : no particles bigger than 5 mm (plastic, sand, stones, wood, rust and other materials) • Oil content : 0 - 100 % • Water content : 0 - 100 % Note. Other equipment allow centrifugation of heavily oiled sands.
Operational constraints	Requires personnel, site (surface of 200 m2 minimum), and input: • Electrical supply • Polymer (flocculant) powder can be used to facilitate the recovery of fine sediment (use 10 to 12 kg per ton of dry solid) • Demulsifying chemicals can be used for emulsion. • Water may be required in case of heavy sludge with low water content, to liquefy the product before inputting into the centrifugation machine.
Impacts	Minimal if equipment is suitable, correctly operated and there are no oil leaks.
Legal constraints	Refer to those applying to the transport, handling and storage of oil products.

Efficiency	Typical maximum flow rate : • 750 kg dry solids per hour • 12 m^3/h maximum. Based on experience, 40 to 60 cubic meter of sludge can be treated daily (based on an 8 hours working day). Quality of oil recovered: • Contains 5% < BSW < 10%. Depending on the type of mud and machine tuning. Quality of water output by centrifuge machine: • Contains 2%<oil<10% and 0,1%<SPM<3%. Depending on the mud & machine tuning. • Water can be retreated in a lamellar decanter to reach a content of oil inferior to 0,1% and SPM inferior to 0,1%. Quality of sediment: • Contains 5 < Oil leachate < 10% and 30% < DS < 45%. • Depends on the type of mud, machine tuning and additives (flocculants).
Cost	CAPEX: example of mobilisation cost for centrifugation equipment with above mentioned efficiency: • Trans Mediterranean transport of equipment (2 x open-top containers: 1 x 20 ft container, and 1 x 40 ft container) : approx. 10,000 euros • Installation and start-up: approx. 25,000 euros OPEX: Treatment of 1 cubic meter of sludge (using centrifuge decanter and lamellar decanter for the water and including flocculants and de-emulsifier): approx. 60 euros/ m^3 of sludge treated.
PRE-TREATMENT	**Emulsion breaking**
Description	Breaking up of emulsion of water in oil to water and oil phases, either on site or in a suitable facility plant. Water in oil emulsions are very viscous and may contain up to 50 to 80% of water. ➔ Unstable emulsions can be broken by simple decantation or by heat treatment followed by decantation. The oil/water mixture should preferably be heated by circulation through an external heat-exchanger. ➔ Stable emulsions can be broken up by using demulsifying chemicals, which should be used as early as possible. The recommended dose rate varies with the type of oil and the age of the emulsion, but are usually very low (ranges from 250 to 5,000 ppm). Process lasts a minimum of 10 to 20 minutes.
Waste	Emulsified oil
Situation / Potential in the country	Heating equipment can be easily implemented. Demulsifying chemicals are easy to import and implement in any country.
Interest	Any decrease of the content of water in the emulsion implies less waste to treat afterwards. Water and oil can then be recovered separately using decantation or centrifugation.
Entry criteria	Any emulsified oil.
Operational constraints	➔ Heating. The safe working temperature limits is usually considered to be the flash point of the oil less 8°C. Generally, a working temperature of 60-66°C is used with a maximum temperature of 80°C to maintain operational safety. ➔ Use of demulsifying chemicals. There is no « universal » product. Screening and test will be required.
Impacts	Emulsion breaking: minimal if equipment is suitable, correctly operated and there are no oil leaks. ➔ Demulsifying chemicals may remain in the water after separation so care will be needed when disposing of the water. ➔ The water phase may be discharged in the environment when emulsion breaking is carried out on the recovery site (since the residual oil content is unlikely to increase damage to any species in an area already affected by a significant oil spill). If emulsion breaking is carried out after the clean-up operations, the water recovered should undergo further treatment via a separator unit to further reduce the oil content
Legal constraints	Refer to those applying to the transport, handling and storage of oil products, and discharge of water in the environment.
Efficiency	Generally, after separation into two layers, the water phase contains less than 1,000ppm of oil.

Cost	CAPEX will depend on the type of installation used but will be limited (specially for demulsifying agent). OPEX are also limited as installations are simple, and limited personnel are required (less than 50 euros / m3).
PRE-TREATMENT	**Draining of sorbent**
Description	Draining of oil from sorbent prior to treatment (e.g. incineration) to recover the oil.
Waste	Oiled sorbent (may also be used for heavily oiled solid waste)
Situation / Potential in the country	Easy to implement in the country.
Interest	Allows recovering the major part of the oil for waste from the sorbent before further treatment.
Entry criteria	Any type of sorbent.
Operational constraints	Mainly related to the handling of the oily waste. No other specific technical requirements.
Impacts	Minimal if the oil and sorbent are recovered and managed correctly.
Legal constraints	Refer to those applying to the transport, handling and storage of oil products.
Efficiency	Limited, only to be used to recover bulk oil coating the waste or from sorbent.
Cost	Limited (depends mainly on personnel cost, equipment required is limited).
NATURAL TREATMENT	**Monitored Natural Attenuation**
Description	Comprises a range of physical and biological processes, which, unaided by deliberate human intervention, reduce the concentration, toxicity, or mobility of contaminants. Natural attenuation can be classified as destructive and non-destructive. • Destructive processes include biodegradation, photo-oxydation and hydrolysis. Biodegradation or bioremediation is by far the most prevalent destructive mechanism. • Non-destructive attenuation mechanisms include sorption, dispersion, dilution (most important non-destructive mechanisms) and volatilization.
Waste	Residual pollution (soil and groundwater on site)
Situation / Potential in the country	Does not require any equipment (apart from monitoring capabilities).
Interest	No investment (apart from monitoring capabilities).
Entry criteria	Controversial technique from a public and environmental point of view. May only be considered on residual and biodegradable pollution (or pollution that may be attenuated by the non-destructive mechanism).
Operational constraints	Long-term monitoring is necessary to demonstrate that contaminant concentrations continue to decrease at a rate sufficient to ensure that they will not become a health threat or violate regulatory criteria.
Impacts	Natural Attenuation is not appropriate where imminent risks are present.
Legal constraints	Refer to those applying to polluted soil and groundwater.
Efficiency	To be ascertained by the monitoring program. Research is ongoing.
Cost	Related to the monitoring program (expertise, sampling and analysis).

PHYSICAL TREATMENT	**Washing of oiled sediment and soil** (also known as “Chemical extraction” if solvent are used).
Description	Soil washing uses water to remove contaminants from soils. The process works by either dissolving or suspending contaminants in the wash solution (using hot water, 30° to 50°C and solvent/ dispersant chemical agent when required). It is often used in conjunction with other physical separation techniques (see decantation, centrifugation etc.).
Waste	Contaminated sediment and soil.
Situation / Potential in the country	Equipment may exist in public works, construction industry, mining etc. or mobile units may be imported.
Interest	Soil washing starts by the separation of soil by particle size. Most organic and inorganic contaminants tend to bind and sorb to clay, silt, and organic soil particles. This fine sediment is separated from the remaining soil during the washing by scrubbing, water and possible solvant. Washing does not treat the pollution but also helps removing the pollutants bound to the finer sediments from the coarser sediments and concentrates them in a small volume of oily water, easier to treat and dispose of afterwards.
Entry criteria	The pollutants must be dilutable with solvent (adsorbed to the fine sediment). Soil washing is a technique of concentrating contaminants through separation. It does not destroy or immobilize the contaminants. Consequently, the resulting concentrated contaminated soil and/ or effluents must be disposed of carefully.
Operational constraints	The "clean" portion of the separated soil must be analyzed for residual contamination before it is disposed of as clean material. Sand and gravel are relatively easy to wash. However, mud and clay retain, by adsorption, some oil and will require an additional treatment (Source: Bocard). Wash water requires treatment before it can be discharged, as it usually contains smaller particles or organic particles.
Impacts	Limited if wash waters are managed adequately and treated material is analysed before further treatment or disposal.
Legal constraints	Refer to those applying to polluted soil and groundwater and to the management of oily water.
Efficiency	Depending on the installation, may treat from few 10's of tons of waste per day to few 100's of tons.
Cost	OPEX: around 150 Euros / m3 (Source: KOLLER)
PHYSICAL TREATMENT	**Washing of heavily oiled solid waste**
Description	Washing the solid waste from the oil before the storage or other final disposal using various techniques: ➔ Cold Water Flushing, simple technique, moderately successful, to wash large quantities of oiled debris with a high pressure hose to loosen and float away oil. The resulting oil/water mixture can then be treated via a separator ➔ Warm/Hot Water Flushing to clean pebbles, gravel and sand contaminated with oil or emulsion, using standard mineral processing equipment coupled to a conventional oil/water separator. ➔ High velocity steam jets directed onto an inclined, vibrating, perforated tray placed above a collector to trap oil and condensate, may be used to clean oil-contaminated sand. Possible use of demulsifier. ➔ Solvent Extraction may be considered as a possible mean of removing oil from collected sand, pebbles and debris. Limited research has been carried out in relation to the use of this technique.
Waste	Polluted solid waste and sediment
Situation / Potential in the country	Small installations are easy to implement (however, depends on the size of the equipment).
Interest	Recovery of recyclable material (e.g. plastic and other type of waste). Possibility of incinerating the cleaned waste or storing the cleaned waste in landfills. Possible recovery of oil (if decantation / centrifugation is used after the washing).

Entry criteria	Any type of heavily oiled solid waste or sediment.
Operational constraints	Requires personnel, specific site, washing equipment, energy, washing effluents management facility, cleaning products and large volumes of water.
Impacts	Minimal if the washing effluents are managed correctly. However, requires large volume of water.
Legal constraints	Refer to those applying to the management of oily water.
Efficiency	Depending on the equipment used.
Cost	OPEX: around 150 Euros / m3 (Source: KOLLER) CAPEX and OPEX vary depending on the size and flow rate of the installation.
PHYSICAL TREATMENT	**Flotation (using heated water)**
Description	Flotation of oil from oiled sand in a tank filled with heated water tank (to fluidify the oil) by insufflating air bubbles at the bottom of the tank. The air bubbles mobilize the oil from the sediment and re-float it at the surface of the water.
Waste	Polluted sand
Situation / Potential in the country	Mobile installation may be easily implemented in the country.
Interest	Allows cleaning the sand, which may be returned on the beach (with possible final clean-up using surfwashing).
Entry criteria	Lightly to medium polluted sand (oil from heavily polluted sand should be recovered prior to flotation using e.g. centrifugation).
Operational constraints	Requires the setup of a complete installation, power supply and water supply. Requires effluents management (for the recovered oil and the used water).
Impacts	Minimal if the washing effluents are managed correctly.
Legal constraints	Refer to those applying to the management of oily water.
Efficiency	Flotation is reportedly capable of cleaning about 1 ton of oil contaminated sand per hour. When operating with sand containing up to 2% of oil, approximately 95% of the oil may be removed.
Cost	Varies depending on the size and capabilities of the installation.
PHYSICAL TREATMENT	**Filtration**
Description	Filtration is the physical process whereby particles suspended in water are separated by forcing the fluid through a porous medium (i.e. a filter). The suspended particles are trapped in the filter. Filtration relies on the pore size of the membrane, which can be varied to remove particles and molecules of various sizes. Micro-filtration processes generally work best for separating very fine particles (0.1-0.001 microns) from the liquid.
Waste	Liquid (oil, oily water, water) with sediment (usually fine sediment)
Situation / Potential in the country	Easy to import and implement in country.
Interest	Allows removing the (fine) sediments from a liquid waste before treatment.
Entry criteria	The liquid phase must not be too viscous to flow through the filtering device.
Operational constraints	Limited. The filtering device must be cleaned and/ or changed frequently.
Impacts	Minimal if equipment is suitable, correctly operated and there are no oil leaks.
Legal constraints	Refer to those applying to the transport, handling and storage of oil products.
Efficiency	Depends on the type of installation, few cubic metres to few hundred's of cubic metres per day. Sampling the filtered water monitors the effectiveness of these processes.
Cost	CAPEX depends on the type of installation used (and its capabilities). OPEX are limited to the personnel, power supply and maintenance of the filtering device.

PHYSICAL TREATMENT	**Washing of pebbles (concrete mixer or hot water/ high pressure)**
Description	Cleaning of the pebbles and stones using high pressure and hot water cleaners.
Waste	Polluted pebbles/ stones
Situation / Potential in the country	Required equipment could be sourced in any country
Interest	Allows returning the clean pebbles on the beach.
Entry criteria	Any polluted pebbles and stones.
Operational constraints	Requires personnel, specific site, high pressure cleaner / steam cleaners, energy, washing effluents management facility. Steam cleaners that can work with sea water should be used preferably to limit the use of freshwater.
Impacts	Minimal if the washing effluents are managed correctly and if sea water is used.
Legal constraints	Refer to those applying to the management of oily water.
Efficiency	Depends on the number of cleaner used.
Cost	CAPEX: one high pressure / hot water cleaner working with sea water: 7,000 euros. One portable concrete mixer (benzene engine): 1,000 euros. OPEX is mainly related to the cost of manpower (3 to 4 workers per high pressure machine/ concrete mixer).
	 **Pebble washing on site (Source: Le Floch Depollution)**
PHYSICAL TREATMENT	**Surf-washing**
Description	Cleaning of the polluted sand and pebbles by moving the sediments into the breaking waves zone.
Waste	Medium to lightly polluted sands Medium to lightly polluted pebbles & stones
Situation / Potential in the country	May be tested in every country, requires marine geologist advice and testing in situ.

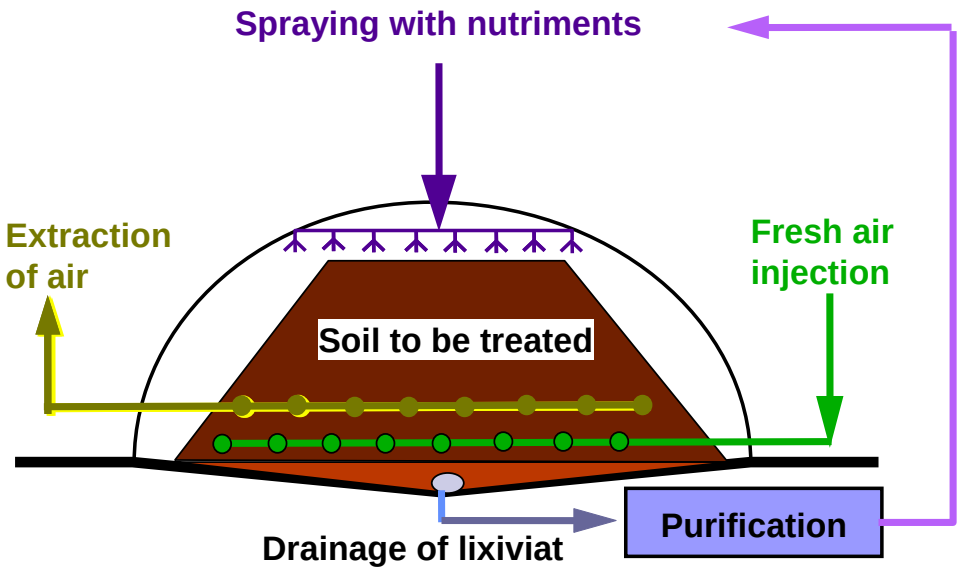
Interest	Use of the “natural” energy of the waves and return of the sediments on the beach. Low cost and no specific, costly equipment required.
Entry criteria	Usable only for sediments that will remain on the beach and that are lightly to medium polluted.
Operational constraints	Requires personnel and earth moving equipment (to push the polluted sediment in the wave breaking zone and sorbent material to recover the oil.
Impacts	Minimal if the oil is correctly recovered using sorbent.
Legal constraints	Refer to those applying to the management of oily water and quality of coastal water (however, special authorisation should be delivered for such work).
Efficiency	Depending on viscosity and weathering of oil, temperature, exposition to waves.
Cost	CAPEX : none (if local equipment is rented) OPEX for one working site and team: daily cost of one or two mechanical shovel, team of one supervisor, 10 personnel, PPE and sorbent.
STABILISATION TREATMENT	**Stabilisation, using binding agent, e.g. quicklime (semi-solids and solid and oily sands)**
Description	This process comprises two steps: • Solidification: transforms the waste into a granular solid with limited porosity and interesting mechanical characteristics, • Stabilisation: transforms soluble compounds into stable less soluble compounds. The oxydo-reduction reaction of the quicklime with the oil (on the sediments) stabilises the thickest oil compounds and (partially) degrades the lightest compounds of the oil. Stabilisation may be carried out on the working site or in specialized units.
Waste	Semi-solids and solid Polluted sands Note. Liquid waste should not be treated if oil content is too high.
Situation / Potential in the country	Quicklime is easily available and cheap. Other proprietary Hydraulic Binding Materials are also available.
Interest	• Stabilizing the leachate of oil and toxic compounds. • Produces a granular hydrophobic material, physically and chemically suitable for use as a filling material, as raw material in civil works (quality of the material must be tested prior to any use), or to be left in-situ in a stabilised condition.
Entry criteria	Avoid polluted waste, polluted sorbent and pebbles.
Operational constraints	Requires easily available equipment (e.g. earth moving equipment to mix the quicklime with the polluted material), little personnel, and binding agent (e.g. quicklime). In case of oil content too high or high temperature, there is a risk of fire. The grain size of the bulk quicklime has to be adapted to the grain size of the oiled sediment to treat (the smaller the sediment, the coarser the quicklime, e.g. quicklime grain of 20 to 40mm to treat silt and sand mix).
Impacts	The oxydo-reduction reaction is followed by atmospheric releases of dust, gases and fumes. Leachate of stabilised material has less than 1% of oil (in the worst case). The stabilized material is limited in time, the gradual degradation of the stabilisation process and the release of the remaining contaminants in the environment must be anticipated, when considering the final disposal environment.
Legal constraints	Refer to atmospheric releases legislation (however, special authorisation should be delivered for such work). May require THC and leachate testing, and EIA or legal authorisation.
Efficiency	80 m^3/ day of waste treated with one mechanical shovel and one experienced driver.
Cost	CAPEX/ OPEX: the price for the stabilisation of 1 m3 of waste is approx. 150 to 200 euros per m3 of waste to treat (depending on the local availability of binding agent).

STABILISATION TREATMENT	Stabilisation - Vitrification
Description	Vitrification uses heat to melt (at very high temperature, above melting point, e.g. 1,500° to 2,300°C) the waste, then decrease abruptly the temperature to solidify harmful chemicals in a solid mass of glasslike material. It can be applied on soil in-situ (in-situ vitrification or ISV) and ground in a treatment unit (ex-situ).
Waste	Ultimate waste from pollution (e.g. polluted soils, solid waste)
Situation / Potential in the country	Equipment can be imported and installed. Transportable vitrification systems exist.
Interest	Contaminants is stabilized and solidified in a glasslike material, with better long term performance than other solidification means (hydraulic binding agent).
Entry criteria	Complete characterization of the candidate waste stream is essential, before initiating either in-situ or ex-situ vitrification, to determine what glass forms are already present in the waste and what additional glass stabilizers and fluxes need to be added. Debris greater than 60 mm in diameter typically must be removed prior to processing.
Operational constraints	Use, storage, or disposal of the vitrified slag is required. High level of heat/ energy is required.
Impacts	Concerns include the durability of the vitrified waste. Although, vitrified waste, as compared to a grouted or cemented waste form, are expected to be more stable over longer periods due to the corrosion resistance of glass. The heat used to melt the soil can also destroy some of the harmful chemicals and cause others to evaporate. The evaporated chemicals must be captured and treated.
Legal constraints	Related to waste management and disposal (for the glass like material) and to gas emission and treatment during vitrification.
Efficiency	Vitrification is a proven technology that has been employed during various oil spills. However, very high level of energy is required, which leads to high costs.
Cost	OPEX: from 150 to 230 Euros/ ton (Source: KOLLER), depending on the size and capabilities of the installation, to more than 300 Euros/ ton for specific waste.
BIOREMEDIATION TREATMENT	**Bioremediation: enhanced bioremediation <u>In Situ</u>**
Description	Stimulating bioremediation by addition of micro organisms (e.g., fungi, bacteria, and other microbes) and/ or nutrients (e.g. oxygen, nitrates) to the subsurface environment to accelerate the natural biodegradation process by the naturally occurring microorganisms of the soil. Bioremediation can take place under aerobic or anaerobic conditions. There are four major processes, briefly described below. **Bio-Stimulation:** • **Gaseous Nutrient Injection** In this case, nutrients are fed to contaminated groundwater and soil via wells to encourage and feed naturally occurring microorganisms. • **Oxygen Enhancement** with Hydrogen Peroxide as an alternative to pumping oxygen gas into groundwater. • **Nitrate Enhancement** A solution of nitrate is sometimes added to the groundwater to enhance anaerobic biodegradation. **Bio-augmentation** Sometimes acclimated microorganisms are added to the soil to increase biological activity. However, the efficiency of this technique is not as well proven as the bio-stimulation. The first three methods are preferred because they stimulate the naturally occurring indigenous micro-organisms, already adapted to the environment.

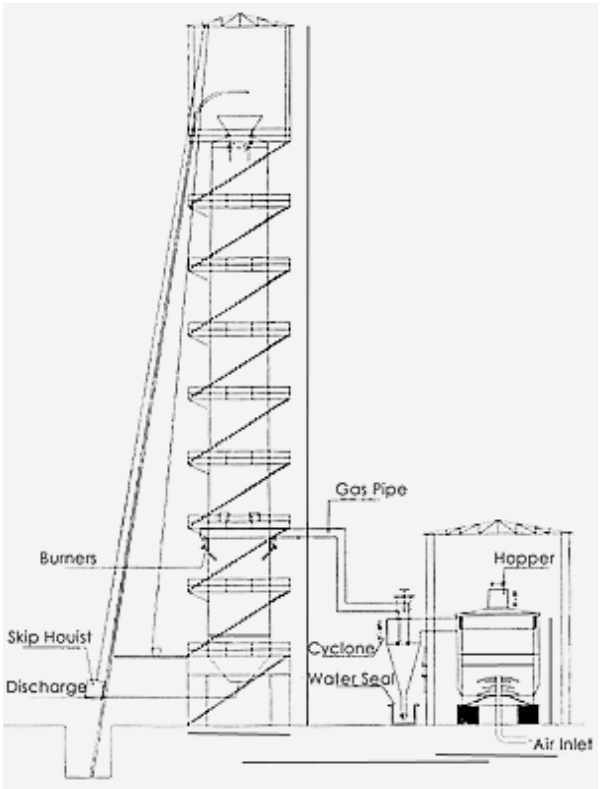
Waste	Lightly oiled sediment (sand, gravel, soil, mud). Oiled seaweed and vegetation (even fauna) may be treated
Situation / Potential in the country	May be easily implemented on any polluted site (usually considered for coastal sheltered sites with slow natural clean-up by waves or inland sites).
Interest	• it is relatively inexpensive with low energy requirements • it can be carried out without elaborate equipment
Entry criteria	Oil with a high asphaltene and resin content degrades slowly due to the molecular recalcitrance of the hydrocarbons while oil with a high aliphatic and aromatic content is a much more nutrient-dependent process and will degrade more rapidly within the adequate environment. It is recommended to carry out a GC/ MS analysis to define the composition of the oil and evaluate its biodegradability. To achieve maximum biodegradation, sediment pore water should exhibit concentrations of 1.5 mg nitrate/litre, Phosphorous concentrations of approximately one-tenth of the nitrate levels, with oxygen levels above 2 mg/litre (Source: AMSA). High permeability soils are required to allow the nutrients to reach the indigenous microorganisms (avoid fines clays).
Operational constraints	Easy access to the treatment site. Bio degradation is less efficient at low temperature. Soil must be humid. Pollutants must not be adsorbed to clay and/ or mud. In this case, they are unavailable for the micro organisms.
Impacts	Under anaerobic conditions, contaminants may be degraded to a product that is more hazardous than the original contaminant. Nitrate injection to groundwater is of concern because nitrate is a regulated compound. Bio-augmentation using non-native micro-organisms is also controversial. The circulation of water-based solutions through the soil may increase contaminant mobility and necessitate treatment of underlying groundwater.
Legal constraints	Refer to those applying to the management of polluted soils in situ. Special authorisation should be delivered for such work.
Efficiency	Bioremediation is a long term process (months to year(s)). Bioremediation degrades aromatics, N-alkanes and iso-alkanes. Resins and Asphaltenes are usually resistant to bioremediation. Cyclic hydrocarbons (Saturated and Aromatics) are partially biodegraded. The efficiency of biodegradation can reach satisfactory levels when correctly implemented on biodegradable material.
Cost	Limited, less than 30 euros / m3 (Source: KOLLER), 15 to 75 euros/ ton (Source: Bocard) Related to the manpower, equipment for the spreading and purchase of stimulating agent.
BIOREMEDIATION TREATMENT	**Bioremediation: land farming**
Description	Contaminated soils are mixed with soil amendments such as soil bulking agents and nutrients, and then they are tilled into the earth. The oily debris should be evenly spread over the scarified land surface in a layer 2-10cm thick. Contaminants are degraded, transformed, and immobilized by microbiological processes and by oxidation.
Waste	Semi-solids and solids lightly oiled.
Situation / Potential in the country	May be very easily implemented.
Interest	Allows biodegradation of oily waste with little equipment (requires large area of land away from ground water and human settlements).

Entry criteria	Oil with a high asphaltene and resin content degrades slowly due to the molecular recalcitrance of the hydrocarbons while oil with a high aliphatic and aromatic content is a much more nutrient-dependent process and will degrade more rapidly within the adequate environment. It is recommended to carry out a GC/ MS analysis to define the composition of the oil and evaluate its biodegradability. Lightly oiled sediment (sand, gravel, soil, mud), less than 1 to 2% of oil. Land farming is best suited for debris comprised of small particles such as oiled soils, and should not be attempted for waste comprised of particles larger then 15cm to avoid handling difficulties and problematic mixing of the waste.
Operational constraints	Requires large area of land in a suitable environment: land farming is best suited to warm climates with moderate precipitation and evaporation. The degradation process may stop when temperatures fall below freezing. Regular tilling is necessary for aeration. Sufficient moisture is required in the oil/soil mixture to support microbial activity, which is usually naturally available except in very dry areas. Areas should be located where water bodies and other supplies of potable water are not at risk from the possible release of contaminants. Slope of area should be less than 4% (or else plan for run-off water management). Soil permeability should be low to avoid percolation of leachates into the ground water. Slope should also be low to avoid running. Additions of nitrogen (as ammonium nitrate) and soluble phosphorous (e.g. super-phosphate) are necessary for the degradation of oily wastes at optimum rates. Environmental monitoring is necessary (soil and ground water analysis).
Impacts	Main risk is the contamination of the ground water by percolation of contaminants and running surface water carrying the contaminant away from the land farming area.
Legal constraints	Refer to limits of contaminants that can be spread on land (e.g. regulations related to land farming of mud from sewage water treatment plants). May require EIA or legal authorisation.
Efficiency	Land farming degrades oil into carbon dioxide gas, water and matter within 2 years or less. Bioremediation is a long term process (months to year(s)). Bioremediation degrades aromatics, N-alkanes and iso-alkanes. Resins and Asphaltenes are usually resistant to bioremediation. Cyclic hydrocarbon (Saturated and Aromatics) are partially biodegraded.
Cost	Cost of the equipment is limited (earth moving equipment). However, land farming requires large areas of land (to rent or purchase for years). OPEX: • 5 to 50 Euros / m^3 for the “natural” treatment (without nutriments and/ or enzymes) and without any treatment of leachate. • 20 to 150 Euros / m^3 for the treatment with nutriments or enzymes and without any treatment of leachate (Source: UNDP).
BIOREMEDIATION TREATMENT	**Bio-treatment: composting**
Description	Composting is the biological conversion of organic waste solids into stable, humic material (which contributes to the soil structure as well as its nutritional status). Composting is achieved by mixing with bulking agents and organic amendments, spreading the oily waste in windrow (or other shapes), regular tilling for oxygenation and addition of nutrients. There are three major designs used in composting. • aerobic static pile/ compost is formed into piles and aerated with blowers or vacuum pumps, • use of a vessel similar to a bio-reactor, where the compost is mechanically agitated and aerated, • windrow composting, usually considered the most cost-effective composting alternative.
Waste	Lightly oiled seaweed and vegetation (i.e. biodegradable material), sand may be present
Situation / Potential in the	May be very easily implemented.

country	
Interest	• Recovery of natural resource (sand) • Low cost • Larger quantity will result in economy of scale
Entry criteria	Oil with a high asphaltene and resin content degrades slowly due to the molecular recalcitrance of the hydrocarbons while oil with a high aliphatic and aromatic content is a much more nutrient-dependent process and will degrade more rapidly within the adequate environment. It is recommended to carry out a GC/ MS analysis to define the composition of the oil and evaluate its biodegradability. Usable only for oiled vegetal that are lightly to medium polluted, and should not contain cobble or boulder.
Operational constraints	Requires personnel, expertise, earth moving equipment, nutriments and large surface of ground, particularly for in-situ treatment options. The site must meet hydro-geological and physical requirements. Selection criteria include the following items: • no oil is recovered; • requires a lot of testing, monitoring, foundation and mechanical work; • requires large surface area; • dispersed quantity of contaminated soil increases the cost.
Impacts	Minimal if suitable monitoring and containment program is implemented. But possible increase of VOC (Volatile Organic Compound) emissions, and windrow composting has a high dust emission.
Legal constraints	Refer to waste and oily water / soil legislation.
Efficiency	Composting is faster than enhanced bioremediation on site: process lasts less than one year (may be 3 to 6 months depending on the degree of pollution of the waste). Bioremediation degrades aromatics, N-alkanes and iso-alkanes. Resins and Asphaltenes are usually resistant to bioremediation. Cyclic hydrocarbon (Saturated and Aromatics) are partially biodegraded.
Cost	Costs compare to the cost of land farming (usually less than 50 Euros per ton). However, composting does not require large areas of land and compost can be sold at 15 to 23 Euros per ton (Source: Damien).
BIOREMEDIATION TREATMENT	**Bioremediation: Bio-pile** (“biopile” or “biotertre” in French)
Description	A bio-pile is a bioremediation technology in which excavated soils are mixed with soil amendments, formed into compost piles, and enclosed for treatment. The basic bio-pile system includes a treatment bed, an aeration system, an irrigation/nutrient system and a leachate collection system. Note. Systems known as Bio-Reactors are usually used to treat sewage water. They can also treat oily water, and testing is on going to treat polluted soils with this technique. Contaminated groundwater is circulated in an aeration basin where microbes degrade organic matter, forming a sludge that is disposed of or recycled.
Waste	Oily water Lightly to medium polluted sediment (up to 5% of oil, more depending on installation)
Situation / Potential in the country	Technically easy to implement if land is available on long term basis (few years).
Interest	Bio-pile is a more controlled and efficient treatment than composting, allowing treatment of more oiled sediment and waste. The material may be returned on site once the treatment is completed.
Entry criteria	Oil with a high asphaltene and resin content degrades slowly due to the molecular recalcitrance of the hydrocarbons while oil with a high aliphatic and aromatic content is a much more nutrient-dependent process and will degrade more rapidly within the adequate environment. It is recommended to carry out a GC/ MS analysis to define the composition of the oil and evaluate its biodegradability. Treatability testing should be conducted to determine the biodegradability of contaminants and appropriate oxygenation and nutrient loading rates. Laboratory or field treatability studies are

	needed to identify the best amendments.
Operational constraints	The site of implementation of the biopile depends on the land availability in the area and on the volume of waste to treat (cost of the transport). Testing (in laboratory and on limited quantities) is necessary. Continuous contaminant and environmental monitoring program is necessary (moisture, heat, nutrients, oxygen, and pH).
Impacts	Biogas and leachate must be managed adequately. The treatment area is generally covered or contained with an impermeable liner to minimize the risk of contaminants leaching into an uncontaminated soil.
Legal constraints	Refer to waste and oily water / soil legislation.
Efficiency	Bioremediation is a long term process, although speed is increased in biopile, degradation of resistant oil compound may still take more than 2 years. Bioremediation degrades aromatics, N-alkanes and iso-alkanes. Resins and Asphaltenes are usually resistant to bioremediation. Cyclic hydrocarbon (Saturated and Aromatics) are partially biodegraded.
Cost	Varies depending on the volumes to be treated. Ranges from 60 to 200 euros per tons of waste to treat (if there is less than 100 tons) to 50 to 100 euros per ton (for 1,000 tons or more of waste) including the analysis.
	 **Figure 12 : Conceptual model of a Bio-pile**
THERMAL TREATMENT	**Incineration in domestic waste incinerators**
Description	Incineration of the waste in incinerators used for domestic waste.
Waste	Liquid Semi-solids and solid Lightly polluted sorbent Lightly polluted solid waste
Situation / Potential in the country	Some domestic waste incinerators may be technically suited to receive oily waste.
Interest	• Permanent waste elimination. • Could achieve up to 99% volume reduction. • Operated at very high temperature (at 1,200°C), the process is suitable for the destruction of many hazardous air pollutants.

Entry criteria	The list of types of domestic waste that can be treated in the plant is often defined by national regulations. This list may be temporarily and exceptionally enlarged to accept oil spill waste. Domestic incinerators can manage lightly to medium oiled waste, but may not be able to handle heavily oiled waste (which may cause the outbalance of energetic/ thermal balance of the incinerator), except if diluted sufficiently with the "normal waste".
Operational constraints	Domestic waste incinerators are generally not the best suited incinerators since chlorides from sea water leads to corrosion. The oily waste may have to be diluted with the "normal" waste, thus decreasing the treatment rate. Requires personnel, site, incinerator and waste handling equipment. • Treatment rate is limited (oily waste must be diluted with other type of waste). • No energy is recovered. • Air pollution control devices might not be suitable. • Salt in recovered oil could increase corrosion in system.
Impacts	Incinerators may release carcinogenic and toxic chemicals, including heavy metals, partially-burned organic material such as polyvinyl chloride (PVC), and other organic chemicals, including polycyclic aromatic hydrocarbons (PAHs), dioxins and furans. The concentration of the release depends on the type of waste, of incinerator and of filter installed on the chimney.
Legal constraints	Refer to incineration and atmospheric releases legislation. Special authorisation may be required for such work.
Efficiency	Relies on the type of incinerator and gas treatment.
Cost	For the construction of a domestic incinerator: CAPEX: high investment cost, OPEX: 100 to 400 euros / m3 (Source: KOLLER), depends on the size and personnel of the installation, and on pre-treatment required.
THERMAL TREATMENT	**Incineration in industrial incinerator or other type of furnace / kiln or power plant**
Description	Incineration of the waste in specialized incinerators used for hazardous waste / industrial waste.
Waste	Any type of waste but mainly used for: Liquids Semi-solids and solid Polluted solid waste
Situation / Potential in the country	Installation that may incinerate oil spill waste: • Industrial incinerator (850° to 1,100°C) • Power plant • Lime kiln (operates at 950° to 1050° C) • Glass industry • Smelting industry
Interest	• Permanent waste elimination. • Could achieve up to 99% volume reduction. • Operated at very high temperature (at 1,200°C), the process is suitable for the destruction of many hazardous air pollutants. • Able to handle waste with hazardous substances (Cl, S, heavy metals, PAH, PCB…).
Entry criteria	Industrial incinerator can accept a wide variety of waste, even heavily oiled (over 30% of oil). Entry criteria depends on the gas and fume treatment capability of the plant. Power plant can accept solid waste (when operating with grill incinerator or fluidized beds). Power plants with fuel burner/ gas burner can accept liquid waste and solid waste (if it is finely shredded). Other kilns have more restrictive entry criteria, e.g. for lime kiln (France): • Size of particle < 10 mm, • Calorific power > 2500 kcal/Kg, • Water content < 30%,

	• Sulphur < 1%, • Total halogens (Cl, Br, F, I) < 1%, • PCB < 100 mg/Kg, and PCT < 100 mg/Kg. The oily waste will be added to the incinerated material in a proportion depending on the composition of the oily waste.
Operational constraints	Requires personnel, site, incinerator and waste handling equipment. • No energy is recovered. • Air pollution control devices must be suited to monitor the incineration of large quantities of petroleum product. • Salt in recovered oil could increase corrosion in system. • If the facility does not exist, this type of project needs a long period to be implemented.
Impacts	Incineration (e.g. in power plants) results in the production of ashes and co-products that must be disposed of correctly. Incinerators may release carcinogenic and toxic chemicals, including heavy metals, partially-burned organic material such as polyvinyl chloride (PVC), and other organic chemicals, including polycyclic aromatic hydrocarbons (PAHs), dioxins and furans. The concentration of the release depends on the type of waste, of incinerator and of filter installed on the chimney.
Legal constraints	Refer to incineration and atmospheric releases legislation. Special authorisation may be required for such work.
Efficiency	Relies on the type of incinerator and gas treatment.
Cost	CAPEX: very high investment cost. OPEX: 100 to 400 euros / m3 (Source: KOLLER).
	 **Figure 13 : Lime kiln**
THERMAL TREATMENT	**Co-incineration as fuel source (in cement works, lime kiln, power plant or other kiln)**
Description	Incineration of the liquid oil recovered as fuel source in cement works (and/ or industrial furnaces) Note. Co-incineration is the incineration of waste in industrial incinerators, kilns, furnaces as an alternative or complementary fuel source and/ or as material source.

Waste	Liquid Pasty waste Depending on installation: solid waste
Situation / Potential in the country	Some cement facilities have special adaptations to receive OSW as fuel.
Interest	Liquid : • Recovery and re-use of oil as valuable energy source • Cost recovery option
Entry criteria	Waste has to meet stringent technical specifications: • heavy metals, mercury, MgO and zinc (e.g. less than 1%), • chlorine (e.g. less than 2%), • sulphur (e.g. less than 4%), etc. • (Possible reference to the Stockholm Convention). The kiln operator will evaluate the calorific power of the waste, minimum of 2,500 to 3,000 kcal/ kg is required. Additional monitoring requirements will be required by the kiln operators regarding sulphate, alkalin, and solid residue content. ➔ Some cement kilns have restrictive criteria: • no sand, • dry residue: 2% maximum, at 90 microns maximum, • no (or very little) chlorine), • plastic is possible but no PVC or chlorine. Pre treatment is often needed.
Operational constraints	Waste must be homogeneous and of a controlled and quantified calorific power. Requires personnel, site, incinerator and waste handling equipment. • salt in recovered oil could increase corrosion in system; • depends on the installations (i.e. burners and injectors); • content in chlorine and sulphate must be limited; • requires **pre-treatment** (processing and screening) which is labour intensive; • quality of oil recovered could be a limiting factor.
Impacts	Incinerators may release carcinogenic and toxic chemicals, including heavy metals, partially-burned organic material such as polyvinyl chloride (PVC), and other organic chemicals, including polycyclic aromatic hydrocarbons (PAHs), dioxins and furans. The concentration of the release depends on the type of waste, of incinerator and of filter installed on the chimney. ⓘ **See the Appendix** "Emission limits for co-incineration in cement kilns", p.109
Legal constraints	Refer to incineration and atmospheric releases legislation. Special authorisation may be required for such work.
Efficiency	Depends on the substitution rate : from 1 to 1.5 tons/ day
Cost	CAPEX: use of already existing installation, may require adaptation to handle oil spill waste. OPEX: Estimated to 30 to 50 Euros/ ton (may be 0 euro if oil does not need pre-treatment), depending on the quality of the recovered oil and on the additional cost for waste pre-processing in the plant (demulsifying, screening for absence of heterogeneous elements etc.)
THERMAL TREATMENT	**Co-incineration as raw alternative material (in cement works or other)**
Description	Incineration of polluted sand and solid waste in cement works as Alternative Raw material (Sand is a natural raw material consumed in cement production).

	Note. Co-incineration is the incineration of waste in industrial incinerators, kilns, furnaces as an alternative or complementary fuel source and/ or as material source.
Waste	Polluted sand Polluted solid waste
Situation / Potential in the country	Some cement facilities have special adaptations to use OSW (sands, muds, solid waste) as raw material.
Interest	• Contaminated solid waste (woods, plastic, and other macro-waste) could be processed in kiln as Alternative Fuel and Raw material. • Final elimination of contaminated sand and of most solid waste material. Previous successful experience in Holcim France for treatment of waste generated from Erika spill (Source: Holcim Europe direct communication).
Entry criteria	➔ Depending on each facility: • Sand may be processed; • No pebbles is allowed in the system; • Plastic is possible but no/ very little PVC or chlorine. The kiln operator must maintain an overall waste composition comprising: • Si O2 : 21 to 24%, • Al2 O3 : 4.5 to 6%, • Fe2 O3 : 3 to 4%, • Ca O : 64 to 66%.
Operational constraints	The content of oil in the waste must be limited to avoid outbalancing the energetic balance of the kiln (e.g. waste must have less than 0.5% THC in France) Requires personnel, site, incinerator and waste handling equipment. • salt in recovered oil could increase corrosion in system; • should be free of mercury, zinc, MgO and ferrous metals as it effects kiln operation; • potential change in emission characteristics due to waste characteristics; • require **pre-processing** which is labour intensive.
Impacts	Loss of natural sand resources. Incinerators may release carcinogenic and toxic chemicals, including heavy metals, partially-burned organic material such as polyvinyl chloride (PVC), and other organic chemicals, including polycyclic aromatic hydrocarbons (PAHs), dioxins and furans. The concentration of the release depends on the type of waste, of incinerator and of filter installed on the chimney. ⓘ **See Appendix** "Emission limits for co-incineration in cement kilns", p.109
Legal constraints	Refer to incineration and atmospheric releases legislation. Special authorisation may be required for such work.
Efficiency	Depends on the substitution rate : from 1 to 5 tons/ day
Cost	OPEX: from 30 to 150 Euros / ton according to waste condition. Mostly no additional cost if lightly contaminated soil with oil and solid waste (Source: Holcim Europe direct communication)
THERMAL TREATMENT	**Thermal Desorption** (Low Temperature Thermal Desorption LTTD)
Description	Thermal desorption separates contaminants from soil. Soil is heated in a chamber in which water, organic contaminants and certain metals are vaporized. A gas or vacuum system transports vaporized water and contaminants to an off-gas treatment system (the design of a system aims to volatize contaminants, while attempting not to oxidize them; otherwise, thermal desorption would be another way of saying incinerator). It is important to note that thermal desorption does not destroy organic compounds. Based on the operating temperature, this process is categorized into two groups. In **Low Temperature Thermal Desorption (LTTD),** wastes are heated to between 90° and 320°C. LTTD is most often used for remediating fuels in soil. Unless heated to the higher end of the LTTD temperature range, organic components in the soil are not damaged, which enables

	treated soil to retain the ability to support future biological activity. In **High Temperature Thermal Desorption (HTTD),** wastes are heated to 320° to 560 °C. HTTD is not used for oil/ fuel contaminated soil treatment.
Waste	Polluted soil, sand and often small pebble (e.g. no larger than 5cm)
Situation / Potential in the country	Equipment can be imported and installed.
Interest	• Very effective in reducing concentrations of petroleum products including gasoline, jet fuels, kerosene, diesel fuel, heating oils, and lubricating oils.
Entry criteria	• Applicable to constituents that are volatile at operating temperatures.
Operational constraints	Requires personnel and expertise to operate, site, waste transport and handling equipment. • Treatment of the off-gas must remove particulates and contaminants. • Dewatering may be necessary to achieve acceptable soil moisture content levels. • Technique developed for soil remediation (not accidental pollution treatment), applicability for OSW depends on the characteristics and on the hydrocarbon content of the waste. • THC concentration should be maximum 3% (except for systems operating in an inert atmosphere e.g. thermal screw). System is not suited for high concentrations of oil in waste (e.g. 20 to 30%). • Due to the low temperature used, it is probable that weathered oil generally recovered on beach will not be treated (would require higher temperature to evaporate).
Impacts	Minimal, if the vaporized hydrocarbons are correctly treated in a secondary treatment unit: afterburner, catalytic oxidation chamber (which destroys the organic constituents), condenser, or carbon adsorption unit (which trap organic compounds for subsequent treatment or disposal) prior to discharge to the atmosphere.
Legal constraints	Refer to incineration and atmospheric releases legislation. Special authorisation may be required for such work.
Efficiency	• Rapid treatment time; most commercial systems capable of over 25 tons/ hr throughput. Thermal screw: up to 15 tons/ hr. • Can consistently reduce THC to below 10 ppm and BTEX below 100 ppb (and sometimes lower).
Cost	Total cost of treatment for one m3 ranges from 40 to 200 euros / ton (Source: Bocard) Typical cost for oily waste treatment is approx. 150 euros (Source: Cedre)
THERMAL TREATMENT	**Incineration in mobile incinerators**
Description	Incineration of the waste in mobile incinerators.
Waste	Liquid Semi-solids Oiled seaweed and vegetation Solid waste
Situation / Potential in the country	May be easily implemented in the country.
Interest	Complete incineration of the waste.
Entry criteria	Some plastic and metal may cause problem (e.g. sorbent, gloves, complex plastics etc.). Sand, gravel and stones will not be incinerated.
Operational constraints	
Impacts	Incinerators may release carcinogenic and toxic chemicals, including heavy metals, partially-burned organic material such as polyvinyl chloride (PVC), and other organic chemicals, including polycyclic aromatic hydrocarbons (PAHs), dioxins and furans. The concentration of the release depends on the type of waste, of incinerator and the filter installed on the chimney.

	ⓘ **See Appendix** "Example of incinerator gas release", p.110
Legal constraints	Refer to incineration and atmospheric releases legislation. Special authorisation may be required for such work.
Efficiency	Modern incinerators are efficient and allow treating on site the gas.
Cost	Highly variable depending on the size, capabilities and emission treatment capabilities of the incinerator.
THERMAL TREATMENT	**Burning of lightly oiled vegetation (open air)**
Description	Burning on site of vegetation (i.e. wood) lightly oiled.
Waste	Lightly oiled vegetal waste
Situation / Potential in the country	
Interest	Permanent elimination of oiled vegetal waste.
Entry criteria	Vegetation must be lightly oiled to avoid atmospheric releases of burnt HC.
Operational constraints	Requires adequate site, and personnel. Burn vegetation away from any sensitive areas, houses, etc. Ensure that fire is controlled.
Impacts	Limited if only vegetation such as wood is burnt.
Legal constraints	Refer to legislation related to burning of vegetation and atmospheric releases (open air burning of waste is often prohibited, but may be tolerated in emergency cases, for remote locations or islands for example). Specific authorisation may be delivered.
Efficiency	Allow reducing the volume of vegetation and wood by 80 to 90%. Ashes may be dispersed in fields.
Cost	CAPEX: none required. OPEX: limited to the operators.
THERMAL TREATMENT	**Evapo-incineration**
Description	This technique combines incineration and physico-chemical treatment. It involves thermal cracking, during which the aqueous phase of the oil-water mixture vaporises: • Water evaporates (water in the vapour phase is treated by high temperatures in order to remove the residual organic phase). • An oil condensate forms that can easily be incinerated.
Waste	Liquid waste (Oily water, oil with water)
Situation / Potential in the country	May be implemented in the country.
Interest	Complete elimination of the waste.
Entry criteria	Can manage solid waste and sediment.
Operational constraints	Depends on the type of machine used.
Impacts	Minimal when processes are well managed and monitored regularly.
Legal constraints	Refer to incineration and atmospheric releases legislation. Special authorisation may be required for such work.
Efficiency	High with latest installation.
Cost	CAPEX: very high if no existing installation. OPEX: to define depending on installation.
	75 to 300 euros / m3 (Source: Koller)

THERMAL TREATMENT	**Pyrolysis**
Description	Pyrolysis is a form of incineration that chemically decomposes organic materials in the absence of oxygen. Pyrolysis typically occurs under pressure and at operating temperatures above 430 °C (as opposed to incineration and co-incineration which use oxygen so it oxidizes bulk quantities of waste that may be in liquid and solid phase). Several types of pyrolysis units are available, including the rotary kiln, rotary hearth furnace, or fluidized bed furnace.
Waste	Semi-solids and solid Polluted sand
Situation / Potential in the country	There are little installations available (recent technology).
Interest	Organic materials are transformed into gases, small quantities of liquid, and a solid residue containing carbon and ash. These co-products can be re-used (as energy or material).
Entry criteria	The technology requires drying of the soil prior to treatment. Particulate removal equipment is also required.
Operational constraints	Depends on the type of equipment used.
Impacts	Pyrolysis results in the production of solid residues (char), liquid residue (oil/ water) and gases that must be disposed of adequately. Incinerators may release carcinogenic and toxic chemicals, including heavy metals, partially-burned organic material such as polyvinyl chloride (PVC), and other organic chemicals, including polycyclic aromatic hydrocarbons (PAHs), dioxins and furans. The concentration of the release depends on the type of waste, of incinerator and the filter installed on the chimney.
Legal constraints	Refer to incineration and atmospheric releases legislation. Special authorisation may be required for such work.
Efficiency	Pyrolysis is still a recent technology. First tests have proven the efficiency of the system.
Cost	CAPEX: very high if no existing installation. OPEX: to define depending on installation.
	75 to 300 euros / m3 (Source: Koller)
FINAL DISPOSAL	**Re-use of oil in refinery**
Description	Re-use of oil in refinery.
Waste	Oil (recovered and treated)
Situation / Potential in the country	Depends on the reception/ installation of the refineries in country.
Interest	Re-use of the oil as fuel.
Entry criteria	Oil must be compliant with the specific criteria of the refinery.
Operational constraints	Requires personnel, transport equipment and oil handling/ transfer equipment.
Impacts	None additional to those of the refinery.
Legal constraints	Depends on local regulations for refining oil.
Efficiency	Complete.
Cost	CAPEX: use of existing refineries. OPEX: limited to the handling of the oil and integration into oil production circuit of the refinery.
FINAL DISPOSAL	**Return of clean sediment on site**
Description	Return on the beaches of sediments (sand and pebbles) to limit the erosion.
Waste	Clean to lightly polluted sand and pebbles
Situation /	

Potential in the country	
Interest	• Limits the coastal erosion. • Diminishes the volume of waste to dispose of.
Entry criteria	Sediment must be clean to be returned on the beaches (however, sediments will continue to be cleaned in exposed areas by the action of the waves, see "surfwashing"). There are no general rules for the return of the sediments on site. Each situation will be studied on a case by case basis by the National Authorities. Example of ERIKA oil spill in France: the threshold was set at 2,500ppm for the cleaned sediments.
Operational constraints	Requires personnel, transport equipment and earth moving equipment.
Impacts	None for clean to very lightly oiled sediments.
Legal constraints	None.
Efficiency	Complete.
Cost	CAPEX: no specific equipment required. OPEX: hire existing equipments and personnel.
FINAL DISPOSAL	**Discharge in natural environment**
Description	Discharge of water following decantation of washing effluents from operations (washing of solid waste, high pressure clean-up of pebbles, etc.)
Waste	Recovered oil (from decantation) Treated washing effluents (from washing operations)
Situation / Potential in the country	During clean up operations, it is usually tolerated that recovered water (from the oil and water mix) is discharged directly in the sea, after decantation in decantation tanks. This discharged water will have very little to insignificant impact compared to the ongoing oil spill. During waste treatment, more restrictive threshold value must be in force (as time and equipment should be available to treat adequately effluents): • concentration for discharge at sea, • daily volume limit for the discharge at sea.
Interest	Avoids the treatment of lightly to very lightly polluted sea water resulting from clean-up operations.
Entry criteria	HC content of the discharged water must not exceed certain amount – to be validated by the National Authorities.
Operational constraints	Water must not be discharged close to sensitive areas. Check the HC content of the discharged water.
Impacts	None if HC content is low.
Legal constraints	Refer to legislation related to coastal water quality. Specific authorisation may be delivered.
Efficiency	Complete.
Cost	CAPEX: none. OPEX: none (related to the cleaning operations).
FINAL DISPOSAL	**Land filling (controlled containment in specialized cells and/ or landfills)**
Description	Storage in landfills or specialized industrial waste storage or specialized cells. Oil spill debris can also be incorporated into an active landfill along with municipal refuse or industrial wastes. Co-disposal with domestic waste may also be considered. Oil can biodegrade slowly with the domestic waste and also remains absorbed by all type of domestic waste, with little tendency to leach out. "*As a general guide, oily waste should be deposited on a top of at least 4m of domestic refuse either in surface strips 0.1m thick or in silt trenches 0.5m deep to allow free drainage of water. The oily material should be covered by a layer of soil followed by a minimum of 2m of domestic waste to facilitate degradation* (...)". Source: IMO. Burial is another landfilling option. Oil spill debris is deposited into pits, trenches or other

	depressions prepared for debris disposal onsite. The excavated soil is used as intermediate and final cover of the debris.
Waste	Liquid Semi-solids and solid Polluted sand and pebbles Polluted sorbent Polluted solid waste
Situation / Potential in the country	Landfills are present in all countries. However, only controlled landfills must be considered.
Interest	**In landfills:** • May be suitable for disposal of lightly oiled waste, which is usually mixed with domestic at a 1 to 5 % ratio, to allow biodegradation of the oil. • Most cost effective solution. **In specialized OSW cells** (industrial landfill) • Depends on the type of storage that could be implemented.
Entry criteria	**In landfills:** • Landfills usually have strict and precise entry criteria. They can be adapted by the authorities: e.g. waste with less than 5% oil contamination. • Restriction on acceptance of oil solid waste types. **In specialized OSW cells**. • Depends on the type of storage and national regulation.
Operational constraints	Requires personnel, specific site, transport equipment, weatherproof containers and cover layer, etc.: • subject to stringent long term monitoring; • will not permanently eliminate the waste; • medium-long period for implementation; • potential higher cost for land filling of oil waste compared to normal domestic waste disposal cost.
Impacts	Leachate and biogas must be managed adequately. Limited if safe storage is implemented with a monitoring program (to avoid potential release of toxic compounds). However, landfills do not lessen the toxicity, mobility or volume of waste: they only control migration.
Legal constraints	Requires agreement of the National Authorities.
Efficiency	Complete if safe storage is used.
Cost	In controlled landfills: 75 to 270 euros / m3 (for French installation, Source: Koller), 100 to 300 euros/ ton (Source: Bocard)
FINAL DISPOSAL	**Re-use as road work material**
Description	Re-use of treated material as road fill or construction material.
Waste	Stabilized material
Situation / Potential in the country	No specific requirements.
Interest	Reduces the demand on raw material needed for construction efforts if non-hazardous can be reused.
Entry criteria	Characteristics of material output to be ascertained.
Operational constraints	Personnel, energy, consumables, place, installation, etc.
	If test reveals hazardous material, then the material cannot be re-used: • Requires pre-processing; • Cost of raw material might be cheaper than cleaning of contaminated sand.
Impacts	Mishandling could result in offsite contamination.
Legal constraints	Refer to legislation regarding the characteristics of construction/ filling material (physical, chemical, geotechnical).

Efficiency	Complete
Cost	None if waste is usable on a “as is” basis.
FINAL DISPOSAL	**De-ballasting station**
Description	Facilities where oil tankers can berth and unload their washing waters from their tanks. These waters are then treated in the deballasting station by decantation often using API basin allowing skimming of the oil in surface and recovery of the settled sediment before discharging the water.
Waste	Liquid oily water (if not too weathered or emulsified and with no waste or no sediment) Washing effluents (from washing operations)
Situation / Potential in the country	Depends on installation that may be present in the country.
Interest	Allows treating oily washing effluents and/ or oily water in a controlled environment before discharging in the environment.
Entry criteria	Must be liquid waste.
Operational constraints	Limited capacities Recovered oil is routed to oil refineries. Water is discharged after treatment in the environment.
Impacts	Minimal when processes are well managed and monitored regularly.
Legal constraints	Refer to legislation regarding waste management.
Efficiency	High with latest installation.
Cost	CAPEX: high if no existing installation. OPEX: to define depending on installation.

App. 8 Emission limits for co-incineration in cement kilns

An environmental monitoring program should be implemented (for the test burns and the co-processing) to monitor the emissions. The following values from the European Community are given as guidelines for the monitoring of the gas emissions for any burning in cement works.
See http://ec.europa.eu/environment/wasteinc/newdir/2000-76_en.pdf.

Volatile Organic Compounds – VOC, should not exceed 50 mg/ Nm^3.

Total Emission limit values for cement kilns co-processing waste (Directive 2000/ 76/ EC Incineration of Waste)	
Pollutant	**Concentration** Daily average values in mg/m3
Particulate emissions (Total dust)	30
Hcl Hydrogen Chloride	10
HF Hydrogen Fluoride	1
NOx Nitrogen Oxides	500 (new plants) / 800 (existing plants)
Cd + Ti (Cadmium and Tallium)	0.05
Hg - Mercury	0.05
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V	0.5
Dioxins and Furans	0.1 ng/m3
SO2 - Sulphur Dioxide	50 (exceptions may be authorized by competent authority in case SO2 and TOC do not result from the incineration of waste)
TOC – Total Organic Carbon	10 (exceptions may be authorized by competent authority in case SO2 and TOC do not result from the incineration of waste)

Table 13: Total emission limit values for cement kilns co-processing waste

Daily average values are calculated by adding the half-hourly average values. The results of the measurements made to verify compliance with the emission limit values shall be standardised at the following conditions: Temperature 273 K, pressure 101.3 kPa, 10 % oxygen, dry gas.

Emission limits for co-incineration in other kilns

Refer to Directive n°2001/ 80/ CE which specifies the limits for solid waste and liquid waste, depending on the power of the kiln.

App. 9 Example of incinerator gas release

A gas and fume treatment unit can be installed on some industrial incinerators to limit the atmospheric releases.

The following values were provided by ATI (www.ati-incinerator.com)

	Before treatment	After treatment
Dust (mg/m^3)	< 500	< 100
Chlorine (mg/m^3)	< 1000 (1)	< 50
SO2 (mg/m^3)	< 500	< 100
Heavy metals (mg/m^3)	< 5	< 1
CO (mg/m^3)	< 100	< 100
C.O.T. (mg/m^3)	< 20	< 20
Gas release speed (m/sec)	> 8	> 8

Note. If the quantity of PVC in the waste does not exceed 5%.

Table 14: Before and after gas treatment releases for an industrial incinerator

App. 10 Main provisions of the Basel Convention

(Source of the information of this Appendix: www.basel.int, June 2010)

General Regulatory framework

The **Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal** aims:

- to minimize the generation of hazardous wastes in terms of quantity and hazardousness;
- to dispose of them as close to the source of generation as possible;
- to reduce the movement of hazardous wastes.

Adopted on 22 March 1989, it entered into force in 1992 and now has 172 Parties (for the full text of the Convention, refer to www.basel.int > "Text of the Convention"). The Secretariat is administered by the United Nations Environment Programme (UNEP).

Note. Countries will also consider OECD Decision C(2001)107 final (as amended by C(2004)20, unofficial consolidated text) - applies to shipments of green-listed wastes for recovery, and bilateral and multilateral agreements (as registered under the Basel Convention), if applicable.

Definitions under the Basel Convention

"Waste"
Wastes are substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law.

- Annex I of the Convention, as further clarified in Annexes VIII and IX, lists those wastes that are classified as hazardous and subject to the control procedures under the Annex II of the Convention.
- Convention identifies those wastes that require special consideration (known as "other wastes", and which primarily refer to household wastes).
- Parties may also inform the Convention Secretariat of additional wastes, other than the wastes listed in Annexes I and II of Convention, that are considered or defined as hazardous wastes under their national legislation and of any requirements concerning Trans-boundary movement procedures applicable to such wastes.

Oil spill waste is usually considered as part of Annex 1: Categories of wastes to be controlled, and as such hazardous waste.
Note. National definitions vary, some chemicals are hazardous in some circumstances and not others, and many wastes are a mix of different substances and may contain only very small amounts of toxic chemicals.

"Trans-boundary movement"
"Trans-boundary movement" means any movement of hazardous wastes or other wastes from an area under the national jurisdiction of one State to or through an area under the national jurisdiction of another State or to or through an area not under the national jurisdiction of any State, provided at least two States are involved in the movement.

"Competent Authority"
"Competent authority" means one governmental authority designated by a Party to be responsible, within such geographical areas as the Party may think fit, for receiving the notification of a trans-boundary movement of hazardous wastes or other wastes, and any information related to it, and for responding to such a notification

Main provisions of the Basel convention regarding trans-boundary shipments of hazardous waste

- First, the Basel Convention regulates the trans-boundary movements of hazardous and other wastes applying the "Prior Informed Consent" procedure (shipments made without consent are illegal). Shipments to and from non-Parties are illegal unless there is a special agreement.

Each Party is required to introduce appropriate national or domestic legislation to prevent and punish illegal traffic in hazardous and other wastes. Illegal traffic is criminal.

- Second, each shipment of hazardous waste or other waste shall be accompanied by a movement document from the point at which a trans-boundary movement begins to the point of disposal.
- Last, the Convention obliges its Parties to ensure that hazardous and other wastes are managed and disposed of in an environmentally sound manner (ESM). To this end, Parties are expected to minimize the quantities that are moved across borders, to treat and dispose of wastes as close as possible to their place of generation and to prevent or minimize the generation of wastes at source. Strong controls have to be applied from the moment of generation of a hazardous waste to its storage, transport, treatment, reuse, recycling, recovery and final disposal.

Implementation of the Basel Convention

At national level

As for all international instruments, the Basel Convention, Article 4(4) of the Convention provides that: "Each Party shall take appropriate legal, administrative and other measures to implement and enforce the provisions of this Convention, including measures to prevent and punish conduct in contravention of the Convention".

At bi-lateral and regional level

Some bilateral, multilateral or regional agreements or arrangements have been entered into by two or more parties. E.g. a 2002 decision by OECD addressed the waste movements between member countries and makes a distinction between non hazardous waste, which is not subject to a preliminary notification (Green Control Procedure) and hazardous wastes (Amber Control Procedure) for which the provisions of the Basel Convention should apply (*C(2001)107/FINAL, 21 May 2002, Decision of the council concerning the revision of decision C(92)39/final on the control of trans-boundary movements of wastes destined for recovery operations)*

The Basel convention: General Obligations (extracts of Article 4)

(...) *1. (a) Parties exercising their right to prohibit the import of hazardous wastes or other wastes for disposal shall inform the other Parties of their decision pursuant to Article 13.*

(b) Parties shall prohibit or shall not permit the export of hazardous wastes and other wastes to the Parties which have prohibited the import of such wastes, when notified pursuant to subparagraph (a) above.

(c) Parties shall prohibit or shall not permit the export of hazardous wastes and other wastes if the State of import does not consent in writing to the specific import, in the case where that State of import has not prohibited the import of such wastes.

2. Each Party shall take the appropriate measures to:

(a) Ensure that the generation of hazardous wastes and other wastes within it is reduced to a minimum, taking into account social, technological and economic aspects;

(b) Ensure the availability of adequate disposal facilities, for the environmentally sound management of hazardous wastes and other wastes, that shall be located, to the extent possible, within it, whatever the place of their disposal;

(c) Ensure that persons involved in the management of hazardous wastes or other wastes within it take such steps as are necessary to prevent pollution due to hazardous wastes and other wastes arising from such management and, if such pollution occurs, to minimize the consequences thereof for human health and the environment;

(d) Ensure that the trans-boundary movement of hazardous wastes and other wastes is reduced to the minimum consistent with the environmentally sound and efficient management of such wastes, and is conducted in a manner which will protect human health and the environment against the adverse effects which may result from such movement;

(e) Not allow the export of hazardous wastes or other wastes to a State or group of States belonging to an economic and/or political integration organization that are Parties, particularly developing countries, which have prohibited by their legislation all imports, or if it has reason to believe that the wastes in question will not be managed in an environmentally sound manner, according to criteria to be decided on by the Parties at their first meeting;

(f) Require that information about a proposed trans-boundary movement of hazardous wastes and other wastes be provided to the States concerned, according to Annex V A, to state clearly the effects of the proposed movement on human health and the environment;

(g) Prevent the import of hazardous wastes and other wastes if it has reason to believe that the wastes in question will not be managed in an environmentally sound manner;

(h) Co-operate in activities with other Parties and interested organizations, directly and through the Secretariat, including the dissemination of information on the trans-boundary movement of hazardous wastes and other wastes, in order to improve the environmentally sound management of such wastes and to achieve the prevention of illegal traffic. (...)

Control Procedure for the movements of waste

The table below outlines the main items of the control procedure to implement.

Responsibility to notify	The State of export shall notify, or shall require the generator or exporter to notify in writing, using appropriate documentation of the competent authority of the State of export, the competent authorities of the States concerned of any trans-boundary movement of hazardous wastes or other wastes.
Documentation and general notification	Specific documents are to be used to notify the competent authorities in the concerned countries of all trans-boundary movements of hazardous wastes and other wastes and, subsequently, to accompany the movement of waste. ➔ The Notification document for trans-boundary movements/shipments of waste, ➔ The Movement document for trans-boundary movements/shipments of waste.
Contracts	The existence of a contract between the exporter and the disposer (complying with the requirements set in the Basel Convention and in relevant national legislation) specifying environmentally sound management of the waste in question is an important precondition for the authorization of the trans-boundary movement of waste. A contract should normally be concluded before the notification is provided and the competent authorities have issued their authorizations.
Financial guarantees	"Any trans-boundary movement of hazardous wastes or other wastes shall be covered by insurance, bond or other guarantee as may be required by the State of import or any State of transit which is a Party" (Art. 6, para. 11) to provide for immediate funds for alternative management of the waste in cases where shipment and disposal cannot be carried out as originally intended.
International transport rules and regulations	Hazardous wastes and other wastes subject to trans-boundary movement shall be packaged, labelled, and transported in conformity with generally accepted and recognized international rules and standards in the field of packaging, labelling, and transport, and that due account is taken of relevant internationally recognized practices (Art. 4, para. 7(b)).
Environmentally sound management of hazardous wastes and other wastes	the Technical Working Group of the Basel Convention has prepared technical guidelines to assist relevant authorities and other bodies to assess and improve the standard of disposal operations on their waste streams and disposal operations to ensure that hazardous wastes and other wastes are disposed of in an environmentally sound manner.

Case of the European Union
(Source: http://europa.eu/legislation_summaries/environment/waste_management/l11022_en.htm)

The European Union has set up a system for the supervision and control of shipments of waste within its borders and with the countries of the European Free Trade Association (EFTA), the Organisation for Economic Cooperation and Development (OECD) and third countries which are party to the Basel Convention (Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste).

Summary
This Regulation aims at strengthening, simplifying and specifying the procedures for controlling waste shipments to improve environmental protection. It thus reduces the risk of waste shipments not being controlled. It also seeks to include into Community legislation the provisions of the Basel Convention as well as the revision of the Decision on the control of trans-boundary movements of wastes destined for recovery operations, adopted by the OECD in 2001.

Scope
This Regulation applies to shipments of waste:

- between Member States, within the Community or with transit through third countries;
- imported into the Community from third countries;
- exported from the Community to third countries;
- in transit through the Community, on the way from and to third countries.

The Regulation concerns almost all types of waste shipped. Only radioactive waste and a few other types of waste do not fall within its application, insofar as they are subject to separate control regimes. Derogations concern, for example, shipments of waste generated on board vehicles, trains, aeroplanes and ships, until such waste is offloaded for recovery or disposal, etc.

Lists of wastes
The Regulation also reduces the number of lists of wastes whose shipment is authorised from three to two. Wastes subject to notification are set out in the “Amber List” (Annex IV), while wastes subject only to information requirements are set out in the “Green List” (Annex III). Wastes for which export is prohibited are listed separately (Annex V).

Applicable procedures
This Regulation also reduces the number of waste shipment control procedures from three to two:

- the “green listed” procedure applies to non-hazardous waste intended for recovery;
- the notification procedure applies to shipments of all waste intended for disposal and hazardous waste intended for recovery;

Whatever the procedure, all persons involved in shipment must ensure that they take all necessary measures in order that waste is managed in an environmentally sound manner throughout the shipment process and when it is recovered or disposed of. The notification procedure requires that the competent authorities of the countries concerned by the shipment (country of dispatch, country of transit and country of destination) give their consent prior to any shipment.

Waste shipments must be the subject of a contract between the person responsible for shipping the waste, or having it shipped, and the consignee of such waste. Where the waste in question is subject to a notification requirement, the contract must include financial guarantees.

Under the notification procedure, the notification must be submitted by the notifier only to the competent authority of dispatch which, in turn, will be responsible for passing it on to the competent authorities of destination and transit. The competent authorities must give their consent (with or without conditions) or express their objections within 30 days. Any changes involving the main aspects of the shipment (quantity, itinerary, etc.) must be the subject of a new notification, save in cases where all the competent authorities grant the notifier an exemption from this obligation.

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Name of Country: ……..	
Completed by:	**On (date):**
Full name	
Full name of the institution	
Department or position	
Address (number, street, city)	
Telephone	
Telefax	
E-mail	

I. Objectives of project

In May 2007, the eighth Focal Points Meeting of REMPEC:

- Considered the issue of waste management raised in the document presented by the Centre related to the lessons learnt from the marine pollution incident in the eastern Mediterranean during the summer 2006.
- Recognized the need to task the Mediterranean Technical Working Group (MTWG) to introduce in its programme of work the development of a waste management standardized matrix approach based on the available technical guidelines.

The project "MEDITERRANEAN OIL SPILL WASTE MANAGEMENT STUDY AND DECISION SUPPORT TOOL" was then launched by REMPEC with a view to produce a decision support tool, to be used by any country when establishing or revising its national waste management strategy for **oily waste resulting from a marine accidental pollution**, **aiming at facilitating the determination of the most suitable techniques for the Countries and also at highlighting, where necessary, regulatory amendments**.

This decision tool will:

- Take into consideration technical, logistical, financial and legal aspects.
- Be based on international best practices and on the result of the analysis of the national waste management policies of the respective Mediterranean coastal States.
- Be developed in two phases:
    - Phase I **Mediterranean Oil Spill Waste Management Study**. The present document is a questionnaire to assess the national status and capabilities regarding oil spill waste management (include general information on waste management).
    - Phase II **Draft Mediterranean Oil Spill Waste Management Decision Support Tool.** This tool will be developed to assist the countries to draft or update their oil spill waste management plan, choose Best Environmental Practical Option for the treatment and final disposal of oil spill waste and review their regulatory framework if necessary.

II. Context and general considerations:

II. 1. Definition of waste:
The term “waste” can be define in different manner, however for the purpose of this questionnaire the European definition has been considered since it is one of the most complete. The term waste is therefore defined as "any substance or object the holder discards, intends to discard or is required to discard" under the Waste Framework Directive (European Directive 2006/12/EC), which repeals the European Directive 75/442/EC as amended. Once a substance or object has become waste, it will remain waste until it has been fully recovered and no longer poses a potential threat to the environment or to human health. Annex 1 of the Directive refers to “materials spilled, lost or having undergone other mishap, including any materials, equipment, etc., contaminated as a result of the mishap” (category Q4). This questionnaire focuses on **Oil Spill Waste**, i.e. oil, weathered and/ or emulsified oil, oiled material, oiled sediment, oiled equipment, recovered after an accidental oil spill.

II. 2. Waste classification
As a matter of homogeneity of the response provided by the Mediterranean coastal State, the following table will be used as reference (Source: *Cedre*). The table provides a classification of the waste depending on their nature and relative content. Please note that the percentages are given in weight and simply provide an indication of the relative values.

Cedre categories	% Oil	% Water (free)	Mineral matter	Organic matter	Comments
Liquids	> 10%	0 to 90%	< 10%	< 10%	Remove as much water as possible by settling
Semi-solids & solids (sand...)	> 10 %	10% to 20%	> 10%	< 10%	Define threshold according to pollutant
Polluted pebbles & stones	> 10 %	1%	> 80%	< 10%	Choice criterion : degree of surface polluted
Polluted sorbent	> 5%	< 10%	< 10%	< 5%	Bulk, mops, pillows, sheets...
Polluted sea weed	> 5%	< 20%	< 20%	> 80%	Fermentable substance (Oleo factory disturbance)
Polluted solid waste	> 5%	< 10%	< 10%	variable	Including gloves, boots, overalls...
Polluted fauna	> 5%	< 15 %	< 10%	> 70%	Bird and mammal corpses

II. 3. Waste management
The waste management operation is often the longest and costliest operation in clean-up operation after a major spill. The main difficulty of planning oil spill waste management is to develop a waste management plan for an unexpected nature and volume of waste following an oil spill.

Any sustainable waste management plan is based on general recommendations applicable to any pollution:

Reduce	Only the oil spill waste should be recovered (i.e. avoid the removal of clean sediment from the beaches). Waste should be segregated through efficient practice, depending on their nature during the clean-up and recovery operations.
Re-use	Consideration should be given to re-use and make best use of waste that is produced (e.g. as a fuel, or a raw material such as in road construction).
Recover	Some processes are available to recover some of the spilled oil. Cleaned material can be returned to site but recovered oil is of limited use.
Disposal	Disposal is the least favoured option and usually means landfill

III. Recommendations for completion of questionnaire

The following questionnaire is designed to assist REMPEC assessing the waste management capabilities and regulatory framework of each Mediterranean country. The results of the assessment will be used for the development of a decision support tool to assist Mediterranean coastal States to develop/improve their waste management strategy. You are kindly requested to:

- Answer as precisely and as completely as possible. Dedicated answer spaces are highlighted in light grey; and
- Add any additional query, comment or suggestions to assist REMPEC drafting the Decision Tool.

You are invited to read the entire questionnaire prior to answering the questions.

It is recommended to fill in the questionnaire directly on the electronic version to ensure a proper reading of the information provided and to enable you to add as much information as required.

For multiple choice answers (i.e.: Yes/No), kindly keep only the correct answer and delete the wrong answer. To facilitate some answers ticking boxes have been added to the questionnaire, for this questions kindly tick the correct box when required.

To assist you in this task a general waste treatment option for oil spill waste is provided in the appendices. You are kindly invited to consult the appendices prior and during the completion of the questionnaire.

Thanks for your cooperation!

Table of Content

1 National organisation for accidental oil pollution preparedness and response

☐	1-1 Authority in charge of oil spill waste management
Full name of the institution	
Department or position	
Address (number, street, city)	
Telephone	
Telefax	
E-mail	

☐	1-2 Existing national and local (oil spill) waste management plan	
Is there a National Waste Management Plan / Policy / Legislation?	YES / NO	Please specify:
Is the Oil Spill Waste Management issue dealt with in your National Oil Spill Contingency Plan (NOSCP)?	YES / NO	Please specify:
Is there a specific Oil Spill Waste Management Section included in the NOSCP?	YES / NO	Please specify:

Does this Waste Management Plan include :	
- Recommendations for waste minimisation and sorting at source?	YES / NO
Please specify:	
- Recommendations for the classification of the waste? *Example. Classification proposed by the French Institute Cedre: Liquids / Semi-solids and solids (sand…) / Polluted pebbles and stones / Polluted sorbent / Polluted seaweed / Polluted solid waste / Polluted fauna* *For more details on the proposed classification, kindly refer to Section 2.3 of the present questionnaire*	YES / NO
Please specify:	
- Recommendations for identification and set up of oil spill waste storage facility(ies) : temporary, intermediate, long term storage?	YES / NO
Please specify:	
- Recommendations for identification of pre-treatment, treatment and disposal options depending on the nature of the waste?	YES / NO
Please specify	
- Recommendations for collection and transport of oil spill waste?	YES / NO
Please specify:	
- Recommendations for final disposal (including for some waste : use as road work/filling material, return of clean sediment on site, discharge in natural environment, water/ treated washing effluents)?	YES / NO
Please specify:	
- Other Recommendations?	YES / NO
Please specify:	

Are there Local Oil Spill Contingency Plans and/ or local waste management plans?	YES / NO	Please Specify :

Is there a specific Oil Spill Waste Management Section included in the Local Oil spill Contingency Plans?	YES / NO	Please Specify :
Does this Waste Management Plan include recommendations listed above for the NOSCP ?		
Please specify:		
Do you consider your national regulation well suited and sufficient for oil spill waste management (following an accidental oil spill)?	YES / NO	
Please specify:		

☐ **1-3 Existence of requisition procedure**

As regard storage sites, transport means and treatment facilities, is there a requisition procedure?	YES / NO
If yes, please specify	
Who is the authority in charge?	
What procedure has to be followed?	
National law reference	

☐ **1-4 National or Regional representative(s) of the oil industry which could assist in the oil spill waste management**

Full name of the institution	
Department or position	
Address (number, street, city)	
Telephone	
Telefax	
E-mail	

☐ **1-5 Existing agreements between the National Authorities and the industry and/ or oil company for the management of oil spill waste**

Name of agreement	Comment

☐ **1-6 Past experience of management of oil spill waste from marine spill and/ or land spill**

Location, Year of incident, Name of vessel or installation (when relevant):	Quantity and nature of oil spill waste collected and treated:
Waste treatment and/or disposal used for this oil spill waste:	

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2 Regulatory framework for oil spill waste management

☐	**2-1 International regulatory framework : Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal of 22 March 1989**
Is your country party to the Basel Convention?	YES / NO
Please specify:	
Are the provisions of the Basel Convention implemented in your national regulatory framework (focal point, forms, regulations, etc.)?	YES / NO
Please specify:	
Who is the Basel Convention focal point?	
Name / Organisation:	
Address / Contact	
Does your country have past and/ or present experience of import/ export of hazardous waste?	YES / NO
Please specify:	

☐	**2-2 European regulatory framework (for European countries)**
If your country is not a member of the European Community, kindly move to the next question on Mediterranean regulatory framework. If your country is a member of the European Community, how the EU regulations regarding waste classification, management and transport transposed are implemented? i.e.	
- Waste general definition and framework • Directive on waste 2006/12/EC (that replace Directive 75/442 EEC) • Directive on Hazardous Waste 91/689/EEC Directive (modified by Directive 94/31/CE) complete Directive on waste with specific mesures for hazardous waste management. Include the possibility to take specific measures or derogations in case of emergency (article 7) • European waste catalogue and hazardous waste list (1 january 2002) for classification of all waste	National Law references:
Please specify:	
- Waste transport (by land) e.g. • Transport of dangerous goods by road	National Law references:
Please specify:	
- Specific waste streams, e.g. • Disposal of waste oils, packaging waste, port reception facilities etc.	National Law references:

Please specify:	
- Treatment & disposal of wastes, e.g. • Landfill of waste, incineration of waste etc.	National Law references:
Please specify:	
- Shipment, import and export, e.g. • Supervision and control of trans-boundary shipments of waste	National Law references:
Please specify:	

☐	**2-3 Mediterranean regulatory framework**

Have you transposed in your national law the following regional (Mediterranean) regulation regarding waste classification, management and transport and how it is implemented?

1. Barcelona convention protocols: Protocol Concerning Cooperation in Combating Pollution the Mediterranean Sea by Oil and other Harmful Substances in case of Emergency	YES / NO National Law references:
Please specify:	
2. Protocol for the protection of the Mediterranean Sea against pollution from land - based sources, 1996	YES / NO National Law references
Please specify:	
3. Protocol on the Prevention of Pollution of the Mediterranean Sea by trans-boundary movements of hazardous waste and their disposal, 1996 (with interest only to by products produced from the treatment of ship-generated wastes)	YES / NO National Law references
Please specify:	

☐	**2-4 National regulatory framework**

Are oil spill waste considered Hazardous or Non hazardous in your country?	YES / NO
Please specify:	
Are there national rules and regulations applicable to <u>oil spill waste</u> management in your country?	YES / NO National Law references:
Is there a legal status of the <u>oil spill waste</u> in your country (ownership of oil recovered at sea and oil spilled, oil spill waste removed from the shore or land) ?	
- In case of known producer?	YES / NO

Please specify:	
- In case of unknown producer?	YES / NO
Please specify:	
Do you consider your national regulation well suited and sufficient for oil spill waste management (following an accidental oil spill)?	YES / NO
Please specify:	
Please specify (include National Law references):	
Is a waste or an oil spill waste classification available in your country?	YES / NO
Please specify (include National Law references):	
Is there a legal status of the oil spill waste in your country (ownership of oil recovered at sea and oil spilled, oil spill waste removed from the shore or land)?	
- In case of known producer?	YES / NO
Please specify:	
- In case of unknown producer?	YES / NO
Please specify:	
What are the main national rules and regulations applicable to oil spill waste management in your country? i.e. rules and regulations regarding:	
- Land filling	YES / NO National Law references:
- Incineration / Co-incineration	YES / NO National Law references:
- Port reception facilities	YES / NO National Law references:
- Environmental impact of waste treatment / contaminant threshold for release in the environment?	YES / NO National Law references:

- Others?	YES / NO National Law references:
Please specify:	

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3 Collection and transport of oil spill waste

☐ **3-1 Regulations for the transport of oil spill waste**	
In your country, is a specific regulation implemented for the transport of oil spill waste (following recovery and clean-up operations)?	
Please specify (include National Law references):	
Does the transport of oil spill waste require a specific authorization/ certificate in your country?	YES / NO
Please specify (include National Law references):	

☐ **3-2 Transport logistics**	
Are there some specific requirements for the transport of oil spill waste?	
- Declaration or authorisation?	YES / NO
Please specify:	
- Limitations (e.g. road/ train/ boat transport? etc.)?	YES / NO
Please specify:	
- Packaging? Labelling?	YES / NO
Please specify:	
Are existing transport companies specialized (or not) in the transport of oil spill waste?	YES / NO
- name and location of company:	Please specify:
- equipment of company (for transport of liquid / pasty / solid oil spill waste):	Please specify:
- daily transport capacity for each company:	Please specify:
What is the estimated cost of transport of 1 ton of oil spill waste on 100km in your country?	

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4 Temporary, intermediate and long-term storage of oil spill waste

☐	**4-1 Temporary storage of oil spill waste (on working site)** **i.e.: Temporary deposit platforms, close to the recovery or clean-up site, before transfer to an intermediate storage site**
Are there recommendations for the temporary storage of oil spill waste (close to working site)?	YES / NO
Please specify:	
Are there equipment identified / recommended for the temporary storage of oil spill waste (close to working site)? Are potential manufacturers or suppliers identified? - Appropriate heavy duty plastic bags – big bags – drums – dustbins – barrel – container – skid – pits – others?	YES / NO
Please specify:	
☐	**4-2 Intermediate storage of oil spill waste** **i.e.: Storage located near the coast, to store waste from a number of temporary storage sites and that can be accessed by heavy duty lorries. They can also be used to sort and repackage waste and for pre-treatment purposes, in order to reduce the volume of waste and facilitate waste handling.**
Which authority is in charge of managing the storage of oil spill waste (local, city/ provincial/ national)?	
Please specify:	
Are there rules and regulations applicable to intermediate oil spill waste storage sites?	YES / NO
Please specify (include National Law references):	
Are potential intermediate storage site(s) identified?	YES / NO
Please specify: Name and location of the facilities (please specify if the facilities are public or private)	
Are equipment and management available in the country for such sites?	YES / NO
Please specify:	
What is the estimated cost of storage per ton in intermediate sites?	YES / NO
Please specify:	
☐	**4-3 Long term storage of oil spill waste** **i.e.: Places where concentrations of large quantities of waste are gathered in order to prepare and engage calmly in the treatment and ultimate disposal phases. Definitive storage can only be envisaged for ultimate, stabilised waste after a treatment which fulfils the criteria in force. Final storage facility becomes necessary when the quantities of waste expected exceed the available tight flow treatment capacities.**
Which authority is in charge of managing the storage of oil spill waste (local, city/ provincial/ national)?	

Please specify:
What are the rules and regulations applicable to long term oil spill waste storage sites (in existing industrial / hazardous waste storage site and/ or in domestic waste storage site and/ or in other specific waste storage site)?
Please specify (include National Law references):

Are potential long term storage site(s) identified?	YES / NO
Please specify: Name and location of the facilities (please specify if the facilities are public or private)	
Are equipment, management available in the country for long term sites and companies identified?	YES / NO
Please specify:	
What is the estimated cost of storage per ton in long term sites?	

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5 (Pre-)treatment and final disposal of oil spill waste

5-1 Oil spill response and waste management specialized companies

Are there specialized national or international companies in the country able to manage oil spill waste (oil spill response, industrial waste or polluted soil treatment companies)?
Provide for each company:
• Name and location(s) of the company: (*Provide geographic coordinate - W.G.S. 84 datum for geo-positioning in a Geographical Information System*):
• Contact information (Name(s), telephone numbers, fax, numbers, addresses and email addresses):
• Brief description of company (installation, equipment and capabilities):
• Name and location(s) of the company: (*Provide geographic coordinate - W.G.S. 84 datum for geo-positioning in a Geographical Information System*):
• Contact information (Name(s), telephone numbers, fax, numbers, addresses and email addresses):
• Brief description of company (installation, equipment and capabilities):

… Add as many companies as required.

5-2 Overview of (pre-) treatment and final disposal facilities or equipment in the country

In case of a lack of established waste management facilities and infrastructures, specify, in the table below, if the following waste (pre-) treatment and final disposal options are available in the country and what type of oil spill waste could be managed with such options in existing other facilities.
The list of (pre-) treatment is given as a baseline; other treatment options can be used and should be added to the table.

Reference. See **General waste treatment options for oil spill waste in appendices**

☐	**Pre-treatment (on storage site or before treatment)**	**Available? Yes/ No?**	**Name of facility / entity?**	**Confirm the type of waste acceptable. See the classification in chapter II.2. (or specify)**
By separation of phases *Example: de-ballasting station / port reception facilities, cement plant….*				
	- Settling / Decantation - Filtration - Fluidization of oil coating some debris - Centrifugation			
By sorting - selection *Example : Cement plant, Civil works companies or quarry facilities …*				
	- Screening - sieving - Extraction - washing			
By Physical – chemical action *Example : Civil works facilities/ de-ballasting station*				
	- Emulsion breaking			
	- Pre-treatment with lime			
☐	**Treatment**			
Mechanical *Example: Civil work facilities*				
	- washing units or hot-water washing units			
Physico-chemical *Example: Civil work facilities, de-ballasting station*				
	- Extraction of pollutant			
	- Stabilisation with lime			
Biological *Specialized company*				

	- In situ			
	- On site			
	- Off site			
Thermal				
Incineration : *Example: hazardous waste collection centre/ industrial incinerator, other type of furnaces (smelting industry, etc,) HWIP (domestic incinerators)*				
Co-incineration *Example: in cement works as fuel source or raw alternative material*				
Specialized (heating) unit *Example: Low Temperature Thermal Desorption*				
Evapo-incineration				
In-situ incineration (e.g. burning of lightly oiled vegetation)				
☐	**Final disposal**			
	- Re-use as fuel source			
	- Storage in controlled containment or storage in landfills			

5-3 Detailed assessment of available (pre-)treatment and final disposal options

For each waste (pre-)treatment and final disposal options identified above, specify when possible in the tables provided next pages (or forward this section of the questionnaire to the relevant companies):

Information on the facility/ entity	• Name and location(s) of the facility(ies) (if available provide geographic coordinate - W.G.S. 84 datum for GIS implementation)
	• Contact information
	  o Name(s), telephone numbers, fax, numbers, addresses and email addresses
	• Brief description of installation
	  o Production / use?
	  o Fixed installation(s) or mobile unit(s)?

Waste acceptable	• Entry criteria (solid/ liquid proportion, water/ salt content, etc.) • Capacity (tons of waste per day/ month/ year)

Logistics/ Operational requirements and constraints	• Energy, water and other input required (nature and amount per ton treated)
	• Nature of product that can be accepted:
	  o Analysis performed on the oil spill waste before (pre-)treatment
	  o upper viscosity limit of oil spill waste that can be accepted
	  o maximum degree of water contamination (for two-phase oil/water mixtures and also water-in-oil emulsions) of recovered oil that can be accepted
	  o any other restrictions on the composition of recovered oil that can be accepted (e.g. contamination by dispersants, surfactants or de-emulsifiers, salt content, sulphur content etc).
	• Reception facilities:
	  o By sea (size of vessel)? By road? By train?
	  o Daily reception capacity?
	• Quality of produced material (from the waste):
	  o e.g. What are the requirements for the quality of the recovered oil in order to be used as a substitute to commercial products in your country?
	  o What are the requirements to use the products for land filling (environmental and technical criteria),
	• Etc.

Potential environmental impacts	• Noise • Atmospheric releases • Solid refusal • Leachate or liquid effluents produced • Others
Legal constraints	• Details of existing regulatory permits in place in the facility/ entity • Required E.I.A. (Environmental impact assessment), specific authorisation, • etc.
Cost and efficiency	• Treatment rate, e.g. ton per hour • Cost per ton treated

☐	**Waste (pre-) treatment option ? ……**
Information on the facility/ entity	
Please specify:	
Waste acceptable	
Please specify:	
Logistics/ Operational requirements & constraints	
Please specify:	
Potential environmental impacts	
Please specify:	
Legal constraints	
Please specify:	
Cost and efficiency	
Please specify:	
☐	**Waste (pre-) treatment option ? ……**
Information on the facility/ entity	
Please specify:	
Waste acceptable	
Please specify:	
Logistics/ Operational requirements & constraints	
Please specify:	
Potential environmental impacts	
Please specify:	
Legal constraints	
Please specify:	
Cost and efficiency	
Please specify:	
	.....add as many treatment options as required

Notes:
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6 Monitoring and control of waste management

☐	6-1 Waste control and tracking system
Is there a national waste monitoring / tracking / control system in place for transport, treatment and disposal?	YES / NO
Please specify the reference of the system? (include National Law references)	

☐	6-2 Sampling and analysis capabilities
Are there identified existing laboratories for sampling and analysis of oil spill waste?	YES / NO
Are these laboratories private or public?	Private / Public
Please specify the name and contact of the laboratories, as well as their analysis capabilities.	
Is the laboratory recognized by national competent authorities?	YES / NO

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7 Liability for waste management

☐	7-1 Liability in case of unknown producer of waste
Who is in charge /liable for waste collection, transport, treatment and disposal?	
Please specify (include National Law references):	

☐	7-2 Liability In case of known producer of waste
Who is liable for:	
- Oil spill waste from oil-carrying tanker?	
Please specify (include National Law references):	
- Oil spill waste from a vessel other than oil-carrying tanker (i.e. bunker oil)?	
Please specify (include National Law references):	
- Oil spill waste from oil exploration-production facility / refinery / terminal / storage / other type of oil handling facility?	
Please specify (include National Law references):	

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