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Analysis for the identification of the key impact of SME's on the territory in harbor contest

Livorno

February 2010

SUMMARY

INTRODUCTION

This analysis, developed by E-Cube srl, is part of the REEEP project "A tool for evaluating RES power plants for SME's industrialized areas and harbours in Mediterranean" ref code 107010243 .
The aim of this activities is to highlight the factors, in harbour contest, that have the more relative impacts on the environment, in order to implement a web-based tools that will help the harbour authorities, to develop energy efficiency intervention in the Mediterranean Basin.
After a testing period in Livorno harbour (Italy), the web tool will be available for all harbour authorities, with special regard to South Mediterranean harbour.

LIVORNO HARBOR DESCRIPTION

Livorno harbor is considered a *multipurpose port,* with large surfaces and efficient services that permit to work with different kind of goods (bulk and general cargo) and exceptional goods for measures and characteristics.
Significant Data on Livorno harbour are:

- Water Surfaces: 1.600.000 sqm;
- Terrestrial Area used: about 2.500.000 sqm, of whom 800.000 sqm inside customs area;
- Public property areas: 1.270.000 sqm;
- Areas granted to other operators: 1.143.000 sqm;
- Harbor terminal: 1.000.000 sqm open air, 70.000 sqm covered;
- Seabed depth: till 13 m;
- N. 2 dry dock for shipment reparation till 300.000 tonnes;
- N. Floating docks;
- N. 2 naval dockyard;
- N. 4 silos.

Figure 1: Livorno harbour plan (Source Livorno Port Authority)

In particular the harbour area is divided in four different section

- Porto Vecchio
- Darsena Inghirami
- Industrial Channel
- Darsena Toscana

Porto Vecchio

In the Area "A" area there are all services for passengers transit, administration of Harbor authority, and the railway station.

In the Area "B" there are more commercial activities, for fruits commerce, forestry products, container movements and great dimension motor vehicles, that couldn't be debarked in the Darsena Toscana (entirely dedicated to motor vehicle commerce)

In table 1 is summarized the subdivision of services and use of the structures in the Porto Vecchio basin.

Table 1 *Porto Vecchio Area (Source Livorno Harbor Authority)*

	"A": Sgrallino – Punto Franco Carrara – Railway station (sqm)	**"B" Alto fondale – Orlando Pisa – D. Calafati (sqm)**	**"C" K – M Docks and surroundings (sqm)**
Docks used(sqm)	--	14.000	20.000
Docks not or semi-used	13.900	--	--
Silos used	--	--	5.000
Ferry terminal	2.000	--	--
Docks and railway station	4.800	--	--
State administration docks	5.100	2.220	--
Road network	21.500	33.700	14.000
Rail lines	20.000	31.200	6.000
Quail rail for cranes	6.500	6.000	3.000
	1.200	2.700	2.000
Lunch room	--	1.200	--
Machine shop	--	4.000	--
Little Shipyards	--	2.000	--
Covered areas (total)	**74.000**	**97.000**	**50.000**
Not covered areas (total)	**100.000**	**62.000**	**82.000**
Total	**174.000**	**159.000**	**132.000**

Darsena Inghirami

The area of Darsena Inghirami is dedicated to commercial ferries, included grat ships.

It is principally assigned to RO/RO traffic with an average volume of 150.000 truck trailer.

In the Darsena there are 5 operational quail for a total surface of 145.000 sqm with seven ship approaching places (table 2)

Table 2 *Darsena Inghirami Area (Source Livorno Harbor Authority)*

	Sqm
Warehouses	1.000
Machine shops, offices and residential buildings	3.700
Road network	30.000
Rail lines	5.000
Other services	2.300

Covered areas (total)	**42.000**
Not covered areas (total)	**103.000**
Total	**145.000**

Industrial Channel

In particular along one side of the channel are located industrial processes necessary in the quay and Sintemar terminal for container traffic.

In particular:

- inshore repository for petroleum and chemical products storage
- Cereol Italia plant for seed oil production
- Geopescal terminal for deep freeze products storage

On the other side of the industrial channel are located important terminals dedicated to peculiar goods:

- AGIP terminal for oil product dump towards the refinery
- Rhodia Chem industrial building with annexed sulphuric acid deposit
- Leonardo da Vinci Terminal for unloading and storage of new motor vehicles
- Molini del Tirreno Plant with dedicated silos for wheat storage
- Laviosa Plant, producing concrete aggregate
- Coastal Gas terminal Livorno, for discharge and storage of GNL in underground caves
- Oil product warehouse.

At the present time in this area are located activities for containers' reparation and 20.000 sqm are destinated to an alimentation parc for refrigerators.

Table 3 *Industrial channel (Source Livorno Harbor Authority)*

	Industrial Channel West side (sqm)	**Industrial Channel East side (sqm)**
warehouses used(sqm)	8.500	2.000
Machine shops, offices and residential buildings	1.500	600
Road network	30.000	12.000
Rail lines	12.000	5.000
Silo	--	2.500
Mill	--	2.200
Other services	2.000	3.700
Covered areas (total)	**54.000**	**28.000**
Not covered areas (total)	**150.000**	**107.000**
Total	**204.000**	**135.000**

Darsena Toscana

This part of Livorno harbor is strictly connected with motor vehicle commerce: is the nodal point for the delivery to the car dealers of products, arrived in the port by train and wheels.

One part of the Darsena works as waste management plant (SEAL) and for the decontamination of train wagons.

The rest of the surface is the terminal containers of the whole structure.

Table 4 *Darsena Toscana (Source Livorno Harbor Authority)*

	Darsena Toscana East side (sqm)	**Darsena Toscana West side (sqm)**

Warehouses used(sqm)	22.500	--
Tensile structures	3.000	--
Sheds	2.500	--
Machine shops and offices	10.000	2.000
Railway lines	13.000	40.000
Areas still available	--	150.000
Respect area	--	10.000
Road network	20.000	50.000
Covered areas (total)	**71.000**	**252.000**
Not covered areas (total)	**216.000**	**283.000**
Total	**287.000**	**435.000**

Finally the terminals in the harbor has the following characteristics (table 5)

Table 4 *Livorno harbor terminals (Source Livorno Harbor Authority)*

N°	Terminal	Gestione	Caratteristiche	Utilizzo	Note
1	Darsena Toscana	Soc. T.D.T.	Sup.: 412.000 mq di cui banchina: 25.000 mq di cui per container: 180.000 mq Lung. Banchine: 1.600 ml	Movimentazione Container	Capacità: 800.000 contenitori 60 prese frigo Terminal ferroviario da 49.000 mq 6 portainer di banchina su rotaia per contenitori 5 transtainer su gomma (fino a 60 t) mezzi elevatori (fino a 40 t)
2	Darsena Toscana Sponda est		Sup.: 57.000 mq Lung. Banchine: 1.200 ml	Polivalente (Multipurpose)	In fase di completamento i lavori
3	Paduletta	C.I.L.P.	Sup.: 35.000 mq di cui coperta: 2.000 mq	Movimentazione auto	8 magazzini con capacità totale 170.000 mc Terminal ferroviario
4	Livorno Terminal Marittimo (L.T.M.)	Livorno Terminal Marittimo s.r.l.	Sup.: 80.000 mq	Merci varie (traffico SSS e RO/RO)	Darsena 1
5	Lorenzini	Lorenzini & C.	Sup.: 42.000 mq	Merci varie (traffico SSS e RO/RO)	Magazzino coperto per prodotti forestali
6	Giolfo & Calcagno	Giolfo & Calcagno	Sup.: 24.000 mq di cui coperta: 13.000 Lung. Banchine 80 ml	Pesce congelato	Celle frigo per una capacità totale di 4.700 mq
7	SINTERMAR	SINTERMAR	Sup.: 150.000 mq di cui coperta: 3.000 mq Lung. Banchine: 560 ml	Movimentazione Container	Capacità: 200.000 contenitori prese frigo Terminal ferroviario con 4 binari 3 portainer di banchina su rotaia per contenitori 4 transtainers 1 gru mobile (da 80 t) mezzi elevatori
8	D.O.C. Livorno	D.O.C. Livorno		Stoccaggio prodotti chimici, solventi ed olii vegetali	65 cisterne di capacita di 100.000 mc 21 cisterne di capacità di 3.700 mc (lattice naturale)
9	D'Alesio	D'Alesio	Sup.: 78.000 mq	Rinfuse liquide	43 cisterne di capacità di 190.000 mc
10	Agip Gas	Agip Gas		Gas Propano Liquido	
11	Livorno Forestali			Moviment. prodotti forestali e cellulosa	
12	Leonardo da Vinci		Sup.: 107.000 mq Lung. Banchine: 167 ml	Movimentazione auto e servizi connessi	Raccordo ferroviario
13	Bartoli	F.lli Batoli s.r.l.	Sup.: 17.600 mq di cui coperta: 3.100 mq Lung. Banchine: 210 ml	Movimentazione rame e materiali non ferrosi	
14	Tozzi	N. Tozzi s.r.l.	di cui coperta: 2.403 mq	Moviment. prodotti forestali e cellulosa	
15	Porto Commerciale	C.I.L.P.	Sup.: 10.000 mq Lung. Banchine: 760 ml	Polivalente (container, prodotti forestali, cellulosa)	2 portainer di banchina su rotaia per contenitori Gestisce il terminal Dock Etruschi, con magazzini per 5.000 mq
16	Marchi	Marchi Terminal s.r.l.	Sup.: 15.500 mq di cui coperta: 5.000 mq	Movimentazione prodotti forestali e cellulosa	
17	Figli di Nado Neri	Figli di Nado Neri s.p.a.	Sup.: 33.000 mq di cui coperta: 7.200	Movimentazione prodotti forestali e cellulosa	30 mezzi di movimentazione (fino a 75 t)
18	Scotto	Scotto & C. s.r.l.	Sup.: di cui coperta: 2.000 mq	Movimentazione prodotti forestali e cellulosa	5 mezzi di movimentazione (fino a 20 t)
19	Calata Orlando (TCO)	Terminal Calata Orlando s.r.l.	Sup.: 15.400 mq Lung. Banchine: 450 ml	Merci rinfuse solide	2 carri-ponte per movimentazione rinfuse 3 semoventi (Fantuzzi Reggiane) gru varie Magazzini:Nuovo magazzino Prodotti forestali (5.000 mq) TAF Nord(5.000 mq)
20	Dole	Dole Term s.r.l.		Movimentazione frutta fresca (banane e frutta esotica)	100 prese elettriche per contenitori frigo centrale produzione freddo da 500.000 frig/ora capacità celle 35.000 mc
21	Porto Livorno 2000			Traffico passeggeri	

All terminals and the Industrial channel represents an important context to analyze energetic aspects: the energy consumptions for these activities are relevant and are still possible intervention to reach considerable energy efficiency targets.

The following part of this report will point out the key elements that will be considered in the following project

phases.

KEY ELEMENT OF IMPACT ON THE ENVIRONMENT IN HARBOR CONTEST

The most important elements that produce impacts on the environment are linked with the energy needing for all the harbor activities.

In particular the analyzed for the assessment of energy

- energy consumption
  - electricity
  - heat generation
  - refrigeration
- transports
- logistics

For all aspects is important to consider also the energetic sources used, and the possibility to use the energy in a more rational way.

The first step is so to construct a energy audit tool that can reveal, on the basis of present situations, which are the activities with more relevant energy consumption, what can be the possible solution that can be applied to have a better environmental performance, and what will be the results of the intervention.

Indicators for energetic analysis

Indicators for energy analysis are the following:

1. Power consumption for industrial activity;
2. Consumption for loading/unloading;
3. Consumption for commercial activity [the same quantity of civil houses];

To collect data for the indicators construction is necessary the energetic investigation, that will consider:

- Type of supply contract;
- Consumption of the last 3 years;
- Division in use/sub-use for average year.

In particular for:

Natural Gas:

- Metano [ASA s.p.a. (supplier company)];
- Industrial activity [Energetic environmental-plan];
- Space heating.

Electricity consumption:

Division of different energy use compartment [breakdown of consumption by purpose of use]:

Natural Gas:

- Industry;
- Heating;
- Thermoelectric.

Electricity:

- Industry;
- Rest.

Gasoil:

- Transport;
- Heating;
- Agriculture.

Emissions balance

Direct and indirect impacts in the atmospheric environmental component:

- Gasses emissions;
- Particulate emissions.

[information derived through the IRSE (inventario regionale delle sorgenti di emissione in aria ambiente)]

Distinction between sources of emissions:

- Hot-spot;
- Linear;
- Spread.

[It is possible compare the emissions on three scales: regional, provincial and municipal]

The emissions balance allow characterize territorial system within which is placed the port; activities on the municipal area are in strong connection with the activities in the port and vice versa.
• The characterization of emissions is a key to understand the interactions between the port and the surrounding.
• $EMISSIONS_{TOT}$ are expressed in **ton CO_2 annual equivalent**;

The contribution of port activities is much lower than industry activities;

Estimated municipal emissions:

- Territorial pressure [Kg pollutants/km^2];
- Environmental pressure for citizen [Kg pollutants/citizens unit].

• Energy demand and power for heating buildings;
• Building energy audit;
• Normalized energy requirements [FEN];
[must be lower than that prescribed by law, according to the different climatic zones]

Critical state:

- The climatic zones and the “degree days” are determined by Italian legislation;
- The buildings of the port area have different uses and are partially attributable to the law.

• Physical and geometrical characterization of buildings;
[are taken into account only the significan ones (only those heated and excluding those for storage)]

• Creation of checklists to building audit;

• **ESSENTIAL:** Port Authority, safety management, environment and quality [is required to connect those searches with the users of the port];

During the visits it is necessary analyze in detail both the geometric/constructive and the geothermal of buildings features;

Audit building

- Structural buildings files [users surveyed]:
  - All utilities;
  - Geometrical/structural information.
- Buildings thermal files:

        - Utilities index;
        - Energetical/plant information.
    - Plan of port area;
    - Images of each building.

• Baseline and characterization of different source;
• For the characterization of the movement of goods is necessary to refer to different classes of goods, each of which is necessary to define a specific process model;

Sources:

- Handling;
- Dock's process;
- Loading and unloading (vessels);
- Loading and unloading (transportation);
- Loading and unloading (passenger and transport);
- Processes for conversion and storage;
- Energetic conversion.

Definition of a process model according to types of movement classes, characterized on the basis of the detail of the whole supply chain process [for every type of cargo handled is necessary to analyze the whole chain of process related];
• Budget related to the transport outside of the port area [referring to the average of 1 year].

Energy parameter:

- Electrical;
- Thermal.

Energy consumption density [consumption for unit of goods];

It is possible analyze the port system in terms of environmental load:

- Assessment of flows [emissions balance];
- Assessment of effects [impacts balance].

• Structural importance of transport in the overall port system [transport system is dependent on the type of management system chosen; energy balance of the port has a significant balance resulting from energy consumption determined by the transport system].

Division into classes:

- Transportation or goods entering the port;
- Transportation or goods leaving the port;
- Port area internal transportation;
- Secondary transport.

It is possible identify the following classes:

- Heavy wheeled transport;
- Passengers transportation on wheeled;
- Special vehicles to serve the port or the internal transport;
- Rail transport;
- Vessels;
- Support vessels.

The characterization of different flows is based on the identification of classes of goods taken as a reference, on the basis of whose movements have determined the specific impacts (energy and environmental) flows.

• Creating a representative model of port operations;
• Construction of a dynamic model of energy balance and performance indicators for the assessment of impacts due to flow variables of port scenarios.

Analysis of entryways and exit of goods through the gates of the port:

- Definition of courses of different types of goods;
- It is possible specify the features of the municipal urban network travelled by goods;
- Division into classes of different types of transports.

• Evaluation of the distance covered by the transport, represent the effect of energy consumption and environmental pressure associated with transport system the mobility of goods on land.

• Flow model of transport by which It is possible determine the energy and environmental balance;
• Internal flow port area balance;
• Characterization of the process of handling of maritime transport;
• Transport grouped by class;
• Representative portion sample of all the movements that took place [characterization of the average time];
• Assesing the consumption of fuels [should be apply different methods of calculation depending on the type of transport].

The diagnosis must be divided into 3 different sections:
In a first part, were analyzed consumption (at regional, provincial and municipal scale) of gas and electricity, using statistical data provided by the company that provide services.
The second part focuses on the analysis of consumption linked to winter heating and summer air conditioning of buildings in the port area.
In the end, were analyzed consumption related to handling of transport inside the port area.
In the previous analysis, the global consumption were found to be mainly carried by the movement of vessels (over 92%), the movement of goods (3%) and minimally by consumption of buildings (1%) (table 5 band 6).

Table 5 *Distribution of energy consumption for harbour activities*

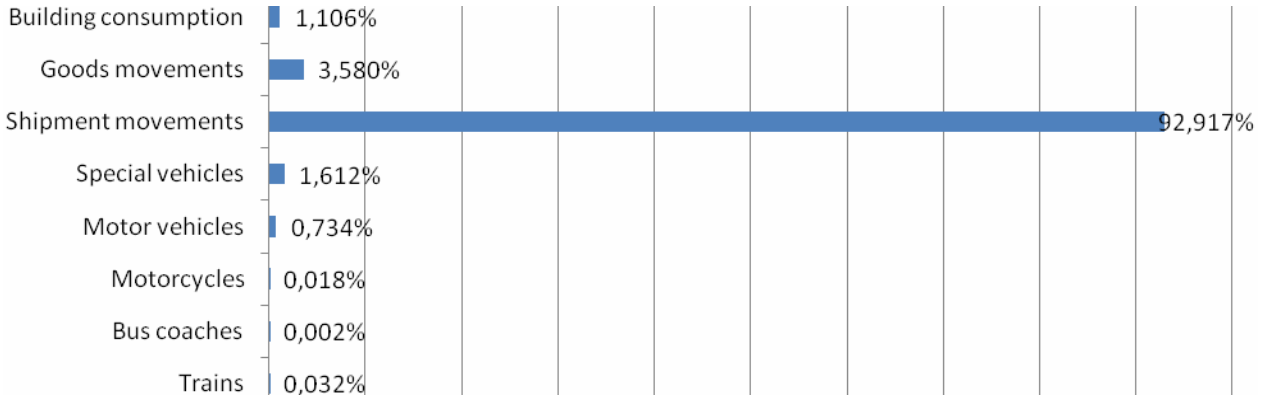
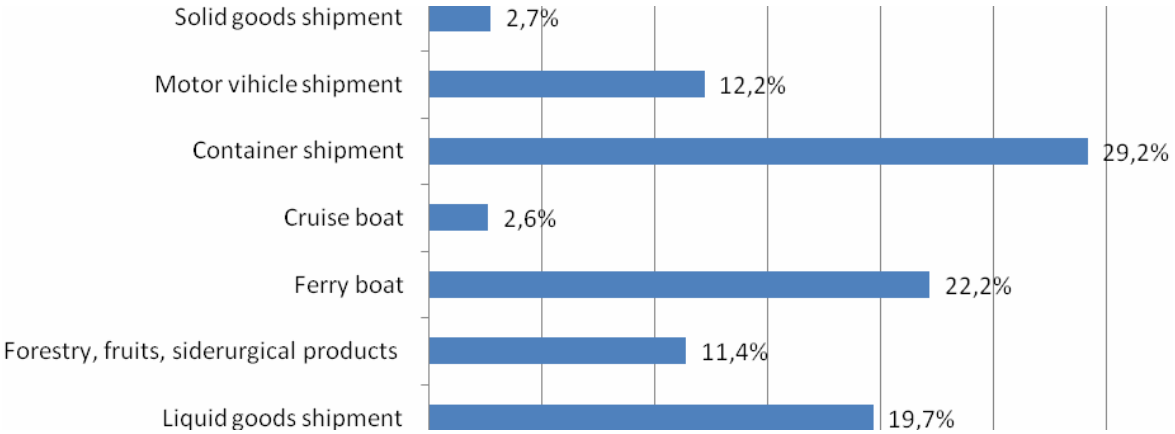


Table 6 *Distribution of energy consumption for maritime transports*



AIR AND WATER POLLUTION

Harbor areas emission in the atmosphere

In harbor areas emission are mainly characterized by air and water pollutants. To identify the harbor areas pollutant diagnosis checklist, the emission data of Livorno harbor have been analyzed, in order to find the most significant elements and how they are related to the energy managing.

Atmospheric emission

In the case of atmospheric pollution, the Emission Source Regional Inventory (IRSE) data can be used to identify the main sources of the emission caused by harbor area activities.
The following table shows the amount (tons per year) of every air pollutant released by the main sources.

Table 7 *Pollutant emission from Livorno harbor (data: IRSE)*

	CH_4 *[t/a]*	CO *[t/a]*	CO_2 *[t/a]*	COV *[t/a]*	N_2O *[t/a]*	NOX *[t/a]*	PTS *[t/a]*	SOX *[t/a]*
Terminali marittimi di comb. liquidi (escl. benzine)	0,00	0,00	0,00	2.076,00	0,00	0,00	0,00	0,00
Verniciatura di navi	0,00	0,00	0,00	22,50	0,00	0,00	0,00	0,00
Porti	7,18	3.605,80	134.500	837,20	53,86	942,70	36,50	168,20
Traffico marittimo	2,64	114,40	49.400	37,10	19,77	881,40	15,20	61,80
Pesca	0,42	17,91	7.744	5,81	0,26	137,93	2,38	50,25

The same values have been compared with the total Livorno municipality area emission (percent):

Table 8 *Pollutant emission from Livorno harbor (data: IRSE)*

	CH_4 *[%]*	CO *[%]*	CO_2 *[%]*	COV *[%]*	N_2O *[%]*	NOX *[%]*	PTS *[%]*	SOX *[%]*
Terminali marittimi di comb. liquidi (escl. benzine)	0,00	0,00	0,00	27,04	0,00	0,00	0,00	0,00
Verniciatura di navi	0,00	0,00	0,00	0,29	0,00	0,00	0,00	0,00
Porti	0,19	19,97	5,19	10,90	5,34	11,07	5,34	1,07
Traffico marittimo	0,07	0,63	1,91	0,48	1,96	10,35	2,22	0,39
Pesca	0,01	0,10	0,30	0,08	0,03	1,62	0,35	0,32
TOTAL	**0,27**	**20,71**	**7,40**	**38,79**	**7,33**	**23,05**	**7,91**	**1,79**

This table show which are the pollutants principally coming from the harbor area activities: carbon monoxide (CO), volatile organic carbon (VOC) and nitrogen oxide (NOX).
Considering from which activities these pollutants come from, and above all how much that activities are involved in the energy issue, it is possible to leave out some of that pollutant. In particular the hydrocarbon stocking activities and the ship painting, and their emission, are not related to energy consumption in the harbor areas. So, for example, the VOC emission contribute go down from 30,79% to 11,46%.
Moreover it is possible to ignore the fishing activities because of their low contribution to air pollution and because of the extremely fractionated nature of the sources (every boat is an emission point).
Than the remaining components are the general harbor activities (load and movement of goods), which contribute to all the pollutant emissions considered above, and the port traffic, mainly responsible of nitrogen oxide emission.
Both kind of sources are related to combustion process or indirect emissions due to electric energy consumption (CO_2eq.), in this case not polluting the harbor area.
As consequence it will be important to verify the presence of electric power generator, to evaluate the

possibility of the substitution with the electric greed connection. For example the electric needs of the cruises waiting in the port could be satisfied with a greed connection instead of board engines.

Two most significant elements will be consider in the developing accountability instrument :

- total electric needs satisfied by power generator and kind of used combustible, in the port area;
- total power satisfied by cruise board engine;

Moreover every action to improve energy efficiency and renewable energy use in the harbor area will directly or indirectly contribute to reduce air pollutant and greenhouse gases emission.

Water pollution: situation and impacts of harbour for the biodiversity of the basin

The Mediterranean Region, is a complex geographic, ecological set up based around the Mediterranean Sea Basin.
The particular characteristic of this Region (meteorology, tourism) took to a huge urbanization particularly growing along the coastal strip, and a consequent substantial modification of the coast itself and adverse effects on the quality of the environment.
In this contest, is important to consider the impact on the environment due to the spill of persistent toxic substances (PTSs) into the Mediterranean Basin, with particular relevance on the impact of harbours activities.

Sources of PTSs

For many Mediterranean countries no detailed informations are available on the release of PTSs from point sources (industry and urban centres). In general, there is a lack of adequate data sets to perform a quantitative source assessment, a cause of in adequate control and monitoring activities by local and national authorities.
The present situation can be summarized as following:

- For persistent pesticides, including lindane, the sources are multiple and diffuse. Although there is a decreasing tendencies in the use of this compounds in the Region as a result of international procedures and conventions, there is a lack of control regarding the existing stockpiles of obsolete pesticides. DDT and derivates are still been using in the Mediterranean Region as precursor of dicofol production, with a total amount estimated inthe range of thousand tonnes.
- For industrial PTSs the situation in the Region presents multiple aspects. Equipments containing Polychlorinated biphenyls (PCBs) have been largerly used, and the production during the period 1954 - 1984 amounts at about 300.000 tonnes. There is a lack of information regarding thne quantity and the status of remaining stock of such equipment.
- For unintentional PTSs, dioxins and furans, the assessment indicates that main principal sources are thermal, and controls and optimisation in inceneration plants, have achieved a decrease of emission from municipal waste incineration. Remaining sources of these polluttant are metallurgical industry, the uncontrolled combustion of waste in lndfills and the wood combustion. Anyhow emission estimates indicate a decrease during the last decade of twentieth century, in the Region.
- For other PTSs of concern the situation in the region is as follows:
    - The main sources of PAHs in the Mediterranean basin are connected to oil shipping operations, that represent a value of about 1.000 tonnes per year, while continental emission and runoff contribute for a range of 40 – 700 tonnes/year. Finally rivers contribute for 40 tonnes per year.
    - Release from antifouling painting in commercial shipping is the source of TBTs in the region. The present release rates estimates are in order of 240 tonnes/year, specially produced in the harbors in the North West Mediterranean and in the Adriatic sea.

- Emission of brominated flame retardands is increasing in the region, hence the absolute level is at the moment low.
- The release of non –ionic surfactants is important, in a range of 167.000 tonnes/year specially dur to the large consumption of detergents. The release of these polluttants is due especially to the five UE countries (50% of total) .

This situation highlights priorities in reducing PTSs sources:

- better control of remaining stockpiles of PCBs, avoiding use of obsolete pesticides and equipement containing such polluttants;
- develop of sustainable destruction capacity;
- better control of oil shipping operations in order to reduce PAH release;
- the commercial shipping is also responsible of sizeable amounts of TBTs in the Region.

The contribution of harbours for the water pollution of the Mediterranean Sea

The contribution of harbours for water pollution of Mediterranean Region can be summarized as follows:

- Shipment release in harbour Areas;
- Tributyltin compounds (TBTs)
- Hydrocarbons PAH(included used lubrificant oils

TBTs

While hydrocarbons impacts due to harbours activities are difficult to extimete, TBTs release due to the harbours activities is possible to be extimate and is a specificly connected with harbours localization.

The main source of TBTs release is in fact from antifouling paintings in ships, even if since January 2003 the International Marine Organization (IMO) Convention banned the use of these compounds for ship paints, the real results of the application of the Convention is at the moment not precise.

A study conducted by UNEP MAP1 in 2002,tried to estimate the release of TBTs to Mediterranean Sea due to maritime activities.

The study estimated the total descharges on the basis of leaching rates considering the data as following:

- the IMO recommended a maximum leaching rate of 4 µg/cm2/day at 25°C;
- estimation of the number of ships longer than 25 meters:
- approximately 20% of merchant marine sail across the Mediterranean Sea: 17.000 ships;
- ships smaller than 500 tonnes but longer than 25 meters: 4.000
- total ship considered in the study: 21.000
- average surface in touch with the water for each unit: 700 m^2;
- total surface susceptive of discharging is 14.700.000 m^2.

Taking in consideration that the IMO regulation fix the maximum value for the leaching rate, the approximate leaching rate is 588 kg/day, corresponding to 214 tonnes of TBT release from commercial shipping.

The hot spot for TBT release in the region is associated with the major commercial harbour, so the study, considering the MEDPOL practice, divided the Mediterranean Sea in different areas, that are showed in the following table (table 5)

[1] UNEP Chemicals *"Mediterranean Regional Report"* UNEP's Technology, Industry and Economic Division.

Table 9 *Estimated distribution of TBTs in the Mediterranean Sea*

Zone	Countries (Harbours	Sea traffic/ Annual TBTs release(tonnes)
North-West	Spain (Marbella, Alacant, Valencia, Balearic Islands, Barcellona), Monaco, France (Marseille, Nice, Toulon), Italy (Genova, La Spezia, Livorno)	26% / 56
Centre/North	France (Corsica), Italy (Cagliari, Catania, Palermo, Civitavecchia, Napoli, Venice, Trieste), Slovenia, Croatia, FR Yugoslavia, Albania	28% / 60
North-Oriental	Greece (Piraeus, Iraklion), Turkey (Istanbul, Izmir, Anatolian Peninsula)	16% / 34
Southeast	Syria, Israel (Haifa), Lebanon (Beirut), Cyprus (Famagusta, Limassol), Egypt (Port Said, Alexandria)	13% / 28
South-Central	Lyvia (Banghazi, Marsa al Burayqah, Tripoli, El Brega), Malta (La Valletta), Tunisia (oriental coast)	3% / 6
Southwest	Tunisia (Tunis), Algeria (Alger), Morocco (Ceuta, Mellilla, Algeciras)	14% / 30

The main TBTs sources are located in the North-Western and North-Central parts of the Mediterranean Sea, but the progressive development of commercial sea-trade also in the southern area of Mediterranean Basin, could raise the level of TBTs release in the Region especially near Harbour Areas.

Other releases are really difficult to be estimated, and there are not scientific study that can give baseline methodologies.

CONCLUSION

The analysis showed that harbours activities linked with goods movement, inter harbor movement of goods and passengers, logistic, energy and heat generation, has the most important impacts on the environment, and supporting energy efficiency program covering these activities will appear the more productive than operate in single SMEs sectors.

The harbor authorities represent in this case a relevant stakeholder because they control all data and could operate efficiently for all aspects highlighted.

On the basis of the results of the analysis, the project team will implement the web tool for harbor activities, suggesting sustainable solutions to produce lower impacts on the environment.

REFERENCES

OME (Observatoire Mediterraneen de l'Energie) "*Mediterranean Energy Perspectives",* 2008.

UNEP/MAP-Plan Bleu "*State of the Environment and Development in the Mediterranean*", UNEP/MAP-Plan Bleu, Athens, 2009.

UNEP/MAP-Plan Bleu *"Energy sector in the Mediterranean region, situation and prospective 2025"* Blue Plan Notes - Environment and Development in the Mediterranean, Athens, 2009.

UNEP/MAP-Plan Bleu *"Mediterranean Strategy for Sustainable Development follow-up: main indicators"* UNEP/MAP-Plan Bleu, Athens, 2009.

UNEP Chemicals *"Mediterranean Regional Report"* UNEP's Technology, Industry and Economic Division, Geneva, 2002