
Ship Waste Management in the Port of Patra, Greece

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Abstract – The port of Patra’s in Greece, is one of the most important ports of the European Union; it is also one of the largest passenger ports in the Eastern Mediterranean basin, which manages many passengers and vehicles annually for international destinations. The operation of the port has affected the coastal zone due to the fact that ports produce, receive and handle a large volume of various types of waste each year and is considered by the port authorities as one of the most important environmental issues to be addressed. This document explores the management and disposal options for ship waste generated and the associated impact of waste on the port of Patra’s. The provisions of the Plan apply to all ships approaching the port area and the sea anchorage of the port. Data on ship traffic and the quantity and characteristics of waste by contractors for the disposal of the ship's waste generated were provided by the Port Authority. The measures to be applied are laid down in the International Convention for the Prevention of Pollution (Annex IV to MARPOL 73/78 – Prevention of pollution from sewage from ships). This Convention concerns the protection of the marine environment by ships as a result of the operation of maritime accidents. It is intended to deal with pollution from oil leaks, liquid and bulk harmful substances or even in packaged form, as well as waste water, waste and air pollutants from the ship or other marine incinerator gases. In this paper the purpose is to analyse the log data on the quantity and type of waste produced as well as information on waste management and storage. In conclusion, measures should be implemented with regard to documentation and operational control, monitoring and measurement. Recycling methods should be made more economically attractive and if reduced fees could be negotiated. Port authorities are advised to work on self-financing program to reduce and recover costs and increase revenue.

Keywords – Ship-Generated Waste, Cargo Residues, Waste Management, Recycling, Marpol, Sewage.

I. INTRODUCTION

Patra is a coastal city in southwestern Greece. The port of Patra’s is geographically well located as the starting point of Ionian Motorway, and it is going to be the tank of evolution for international transport in Southern Balkans and by extent to the countries of Adriatic. The new port of Patra’s is characterized as category “A” in European Union which includes all port of international importance. It is also the third large Greek passenger port after the port of Piraeus and Igoumenitsa. The port of Patra’s is the gateway of our country to Europe and is one of the most modern ports in the Mediterranean, offering modern port infrastructure, a modern cruise terminal, quality-integrated hospitality services and hygiene and safety standards. The ferries run daily from Italy (Bari, Venice and Ancona) and from Patra and Igoumenitsa. The Port of Patra’s accounts for about half of the total passenger traffic abroad throughout the country that is handled by ships. There are also connections to the Ionian Islands (Patra, Paxos and Antipaxos). It is significantly contributes in the local economy, creating with the directly dependent businesses 2,504 jobs, 1,013 direct jobs with revenue 12.2 million Euros and 1,491 indirect jobs with revenue approximately 9.2 million Euros. According to ELSTAT (Hellenic Statistical Authority), the port and the businesses combined with it, contribute 3.74% of the total local employment and

1.48% of the total revenue generates, while along with the directly dependent businesses, it has a turnover of 64.3 million Euros. It also has two sections, the southern Port and the northern Port.

The operation of the port impacted the coastal zone [1] Ports generate, receive and handle a large volume of different kinds of waste every year and these wastes are viewed by many port authorities as one of the most important environmental issues with which they are faced [2-3]. The ship-port interface is recognized as being of critical importance in reducing illegal discharges of ship-generated waste and cargo residues to the sea by managing the availability and use of port waste reception facilities. The scope of this study is the quantification and classification of wastes generated in the port area from the ships, the critical examination of the environmental management of the port as regarding the waste of the ships and the improvement of the waste plan. The Port will hold overall responsibility for the waste handling in the port (collection and treatment of waste and compliance with national regulations). If the operational waste handling is contracted (outsourced) to an external waste operator it is the obligation of the port to ensure, that the waste operator will comply with existing regulations, terms of reference and other important issues specified in his contract with the port.

II. CHARACTERISTICS OF THE PORT

2. Description of the Ports

The new port was inaugurated in January 2009. The North (old port) extends from the northern border of the pier of Agios Nikolaos to the North Pier of land area of approximately 106,474.67 square meters with quays No. 9, 10, 11, 12, 13, 14, 15, 16, 17 and 18 with a total length of 1,655.50 meters. They are equipped with water supply network, 60t bollards, bumpers and E / M network channel. The quays have (7) ship mooring ramps of which (4) serve stern mooring and (3) side mooring. There is a 12 m long floating pier for the service of seaplanes and (17) mooring operations (Remetza) for the service of 25-35 boats meters. You will also find a windbreak with a total length of 1.565,00 meters, including Building Facilities - Sheds - Warehouses - Wards such as Passenger Station, Waterfront Passenger Station and Offices, “Ferry Car” Office Building, Port Shed, Open Gate Shed No. 7, Offshore Buildings, 3 Sheds, Tide Scanner, Checkpoints and Surveillance Area. There are E / M Installations of Substation, External Electrical Networks of Lighting and Weak Currents, Water Supply and Irrigation network and Rainwater drainage network. There is also an asphalt network of internal road construction and connection to the local road network, landscaped area and areas for the movement-parking of cars and trucks. Moreover, included is the southern watershed of the North (old) port, which extends between Gounari pier and Agios Nikolaos pier with an area of approximately 5,740 square meters, with quays No. 1,2,3 and 4 with a total length of 688.00 meters, equipped with water supply network, 60t bollards, bumpers and (1) ship mooring ramp. Also comprises ground floor buildings, warehouses of the Central Port Authority of Patra and a lodge of tide recordings. The Patra’s Port Authority has facilities, machinery and personnel in the North Port that serve the cargo handling. Furthermore it has outdoor storage for general cargo storage. The customs service function allows the movement of imported and exported goods.



Fig. 1. The North Port.

The southern port extends from the river Glafkos to the south to the stream Diakoniaris to the north, with an area of approximately 456,241.88 square meters, with the guides A, B, C, D, E with a total length of 1,292.98 meters, equipped with water supply network, 50t and 100t bollards, bumpers and elastic scales and E / M network channel. The existing quays A, B, C, D have (19) ship mooring ramps of which (14) serve stern mooring, (5) side mooring.

There is a leeward breakwater with a total length of 1429.56 meters, equipped with superstructure plate, bumper wall, bolts 50t and (2) metal lamp support spikes. Also included are ten (10) building complexes such as, Terminal, Port Services Building, Substation, Kiosk - Refreshment Building, Overhead Tank, Fire Station Building, Fire Station Shed, North Terminal B1, South Terminal B2 and Refreshment. There are E / M Installations of Substation, External Electricity Networks of Lighting and weak currents, E / M installations and Water Supply and Irrigation network, installation and Fire network and installation of external Sewerage network.

There is an asphalt network of Internal Road Construction and connection to the local road network, Rainwater Sewerage network of the road construction and the land zone, Landscaped area around the building facilities and Areas of Transportation - Parking of Public Transport, Public Transport.



Fig. 2. The Southern Port.

The port focuses on passenger traffic, through ferry connections to domestic and foreign destinations, while goods transported mainly by trucks.

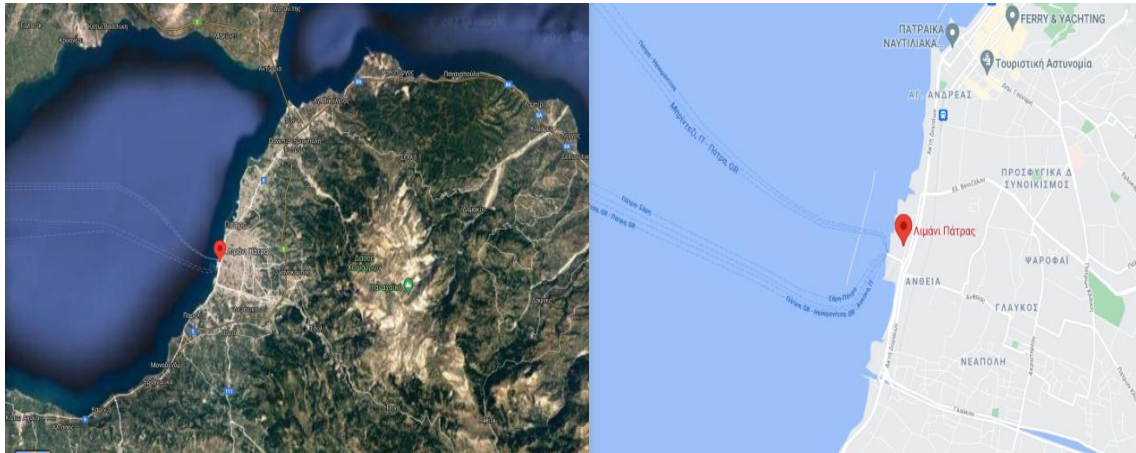


Fig. 3. The port of the Patra.

2.1. Port Traffic

The marine traffic of the port provided on the Fig. 2 shows the number of dockings per ship destination in the years 2009-2019. In 2019 a total of 2.511 dockings were registered at the Port, with a 35% percentage was attributed to passenger/car ferries international routes and a percentage of 60% to the passenger/car domestic lines.

In the years 2009-2019 in average 662.518 passengers travel for abroad and in domestic routes (Table 1) [4].

Table 1. Number of dockings in international and domestic lines at the port of Patra.

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Ship Traffic | | | | | | | | | | | |
| Domestic Lines | 4.903 | 4.364 | 3.588 | 3.034 | 3.244 | 3.228 | 3.156 | 1.427 | 1.439 | 1.442 | 2.189 |
| International Lines | 1.370 | 1.310 | 1.308 | 1.118 | 656 | - | 162 | 198 | 55 | 290 | 320 |
| Cruise | | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 2 |
| Passenger Traffic | | | | | | | | | | | |
| Domestic Lines | 981.288 | 879.314 | 748.029 | 508.827 | 541.719 | 555.453 | 481.462 | 458.329 | 500.099 | 486.163 | 484.501 |
| International Lines | 450.987 | 425.503 | 413.202 | 339.590 | 182.272 | - | 70.739 | 118.662 | 21.250 | 156.868 | 142.638 |
| Cruise | | 1.059 | 2.287 | 374 | 1.278 | 745 | 1.090 | 743 | 952 | 1.647 | 1.219 |
| Car Traffic | | | | | | | | | | | |
| International Car traffic | 171.698 | 151.223 | 135.925 | 89.555 | 100.902 | 102.161 | 98.119 | 100.831 | 112.688 | 113.356 | 100.487 |
| Domestic Car Traffic | 73.017 | 65.227 | 64.031 | 55.653 | 27.753 | - | 14.538 | 22.176 | 3.258 | 26.834 | 27.742 |
| International Trucks | 251.429 | 224.866 | 197.709 | 175.957 | 181.465 | 180.565 | 119.744 | 118.827 | 117.038 | 116.902 | 118.532 |
| Domestic Trucks | 15.086 | 15.085 | 12.632 | 10.166 | 3.695 | - | 1.197 | 480 | 344 | 2.615 | 2.307 |

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|-------------------------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| International Motorbike | 10.514 | 15.094 | 8.287 | 4.951 | 5.458 | 5.905 | 5.306 | 5.549 | 6.611 | 6.270 | 6.267 |
| Domestic Motorbike | 8.125 | 8.133 | 7.959 | 6.000 | 3.911 | - | 1.694 | 2.366 | 98 | 2.254 | 2.343 |
| Container | | | | | | | | | | 1.489 | 8.485 |

The ships which are mainly Ro-Ro passengers are categorized by their destination and have different engine details. Those are moving towards abroad have slow speed diesel (SSD) main engine with power from 11,768-67,290 kW and gross tonnage from 17,991-38,825 grt. While those of coastal navigation have medium (MSD) or High speed Diesel (HSD) engine from 1,203-8,100 kW power and gross tonnage from 811-3,042 grt.

2.1. Methodology

The methodology consisted of data collection by cooperation by local authorities, contractors of waste management and stakeholders. The data included vessel characteristics, vessel traffic and amounts delivered by ships the last years. Data for the collection of the waste stream from the ships are given by the contractors while are responsible for the waste management.

2.1.1. Requirements for Plans for Production and Management of Disposals in Ports

The structure and content of the Plan should be in line with the specifications set out in HR 8111.1/41/2009. Please note that the procedures for receiving, collecting, storing, processing applied are governed by the principles of sound environmental management as formulated through the certified PERS Environmental Management System (Port Environmental Review System) as well as the certified Quality & Environmental Management System in accordance with the requirements of International Quality Standards and Environment.

2.2. Port-Reception Facilities

Waste disposal by ships at sea is a more important source of pollution than accidental spillage. Much of the oil that enters the marine environment is ship’s waste. In spite of some recent reduction, ships continue to discharge at sea, both legally and illegally [5]. The International Convention for the Prevention of the Pollution from Ships (MARPOL 73/78) signed by the vast majority of maritime nations, specifies which sorts of waste may be disposed of at the sea (mainly sanitary waste and natural products) and for which pumping is forbidden. The Ports generate, receive and handle a large volume of different kinds of waste every year and these wastes are viewed by many port authorities as one of the most important environmental issues with which they are faced. The facilities must handle a wide range of generated waste, including chemical waste, oily waste, sewage and garbage. These reception facilities must be adequate to meet the needs of ships using the port, without causing undue delay for ships [6].

The most important categories of ships waste for which the disposal is regulated are oil and other engine residues (Annex I) and household waste (Annex V), sewage and waste water (Annex IV). Annex V (household) and Annex IV (sewage and waste water) waste is related to the size of the crew includes domestic waste, solid waste in large packaging and ship cargo residues plastic, domestic waste, maintenance waste such as soot, machinery deposits, scrapped paint. Annex I consists mainly of sludge an engine residue, and bilge water [7]. The amount of the ship produces varies with the engine capacity, the type of oil used, and the quality of the

engine. Both sludge and bilge water need to be pumped out.

2.3. Waste management: Port of Patra

Waste management is the collection, transport, processing or disposal, managing and monitoring of waste materials. The term usually relates to materials produced by human activity, and the process is generally undertaken to reduce their effect on health, and the environment. The most considerable purpose of waste management plans and reception facilities is to reduce and eliminate dumping wastes illegally into the sea environment. Many examples have already demonstrated that unsatisfactory waste handling and/or even illegal dumping takes place in many ports around the world due to inefficient waste management operations, lack of control, recovery systems and inefficient information flow. The International Convention for the Prevention of Pollution from Ships, MARPOL 73/78, and European Council Directive provide an international framework on management of ship and port wastes.

Waste Categories according to MARPOL 73/78.

| MARPOL 73/78 Annex | Waste Categories | Waste to be delivered |
|--------------------|---------------------------------|---|
| I | Mineral oils | <ul style="list-style-type: none"> • Freshwaters of water collectors • Oil engineering waste • Ships • Bilge water, • Fuel residues • Residues (sludges) • Used lubricating oils and • Cargo residues, • Cargo tank washes, • Unclean sea water, etc. |
| II | Harmful liquids bulk substances | Categories X,Y & Z and other substances such as these classified in the IBC Code |
| III | Packaged harmful substances | Packaged harmful substances |
| IV | Sewage | Waste water to be discharged as well as some treated waste water to be discharged |
| V | Waste (Solid waste) | <p style="text-align: center;">Waste includes:</p> <ul style="list-style-type: none"> A. Plastics B. Food residues C. Food waste D. Edible oils /cooking oil E. Ash and incineration residues F. Operating waste G. Animal carcasses/Animal by-products H. Fish equipment/tools |

| MARPOL 73/78 Annex | Waste Categories | Waste to be delivered |
|--------------------|--|---|
| | | <p>I. Waste electrical and electronic Equipment</p> <p>I. Cargo residues (harmful to the marine environment-WEME)</p> <p>Ia. Cargo residues (harmful to the marine environment- non-WEME)</p> |
| VI | waste related to Atmospheric pollution | Substances that destroy the ozone layer and equipment containing such substances Residues from exhaust gas cleaning |

Waste management planning and its implementation is an important economic, environmental, technical and administrative issue for national and international agendas. As in the case of ports, port waste management planning and its implications form a rapidly growing subject of interest in the city management context. Because ports are sources of considerable volumes of valuable wastes, one of the main subjects of local authorities dealing with urban sustainable development matters is ship and port waste management. National statutes, regulations and directives must also be aligned with regard to the strategies for the integrated sustainable waste management of ship and port wastes. A strategy, within the legal framework, should be designed to ensure measures providing financial and operational incentives and enabling economical and environmentally successful implementation of port waste management plans. However, many ports have not met related standards yet. Ship and port waste management refers to the waste generated on board and by activities in the port area. The port waste management manual describes the waste streams, handling routines and provide clear instructions for the port users. Mainly, the ports are the responsible for developing and implementing their port waste management manuals and plans (PWMM and PWMP). The effectiveness of these depends on port management resources and procedures. According to the International Convention Marpol 73/78 for the Prevention of the Pollution from Ships which is adopted by the Directive EU 2000/59 in European level and placed in force in the Greek Law with Decree Law 3418/07/2002. European Ports are obliged to develop and operate waste reception facilities for receiving wastes generating from ships which are approaching them [6]. These reception facilities must be adequate to meet the need of ships using the port without causing unique delay of the ships. The Port Authority, is responsible for the running of Port and has developed an environmental policy which supports “sustainable” developed for both our business and the environment. Port Authority has transferred to external companies the reception, management and final disposal of wastes from ships visit the port, as a contract work. The most common type of facility of every category of waste is the use of contractors to collect and dispose the wastes. Types and volumes of waste collected by contractors are listed in Table 2 and Table 3 and are shown under their MARPOL Annexes. The reception facilities are used from the half of the ships of coastal navigation and from ships which travel to Italy and they have defined the port as their final destination.

Table 2. Deliveries of liquid petroleum waste.

| | 2013 | | 2014 | | 2015 | |
|----------|-----------------|---------------|-----------------|---------------|-----------------|---------------|
| | Delivery Number | Quantity (m3) | Delivery Number | Quantity (m3) | Delivery Number | Quantity (m3) |
| January | 45 | 810,93 | 39 | 812,60 | 38 | 737,10 |
| February | 40 | 732,78 | 38 | 751,30 | 37 | 750,20 |
| March | 42 | 847,12 | 47 | 798,90 | 38 | 782,30 |

| | 2013 | | 2014 | | 2015 | |
|--------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | Delivery Number | Quantity (m3) | Delivery Number | Quantity (m3) | Delivery Number | Quantity (m3) |
| April | 42 | 750,28 | 34 | 701,50 | 36 | 687,50 |
| May | 38 | 764,37 | 48 | 905,70 | 32 | 630,10 |
| June | 37 | 709,95 | 38 | 765,30 | 45 | 925,50 |
| July | 50 | 914,70 | 42 | 917,00 | 45 | 848,50 |
| August | 41 | 859,40 | 39 | 765,20 | 38 | 744,60 |
| September | 38 | 761,56 | 41 | 847,80 | 54 | 1.054,40 |
| October | 45 | 841,13 | 37 | 796,30 | 50 | 997,10 |
| November | 37 | 703,75 | 43 | 811,90 | 45 | 927,00 |
| December | 35 | 638,30 | 38 | 636,00 | 45 | 909,10 |
| Total | 490 | 9.334,27 | 484 | 9.509,50 | 503 | 9.993,40 |

Table 3. Deliveries of solid waste.

| | 2010 | | 2011 | | 2012 | |
|--------------|-----------------|-------------------|-----------------|---------------|-----------------|-------------------|
| | Delivery Number | Quantity (m3) | Delivery Number | Quantity (m3) | Delivery Number | Quantity (m3) |
| January | 120 | 1.474,06 | 116 | 1.305,505 | 104 | 1.204,240 |
| February | 119 | 1.405,75 | 119 | 1.209,011 | 121 | 1.202,204 |
| March | 137 | 1.786,94 | 132 | 1.223,120 | 143 | 1.460,423 |
| April | 147 | 1.779,470 | 112 | 1.267,280 | 125 | 1.427,661 |
| May | 145 | 1.794,090 | 142 | 1.385,694 | 136 | 1.599,595 |
| June | 150 | 2.013,010 | 140 | 1.506,822 | 136 | 1.727,160 |
| July | 191 | 2.982,050 | 155 | 2.262,460 | 149 | 2.535,260 |
| August | 206 | 3.320,333 | 168 | 3.104,037 | 170 | 3.023,072 |
| September | 188 | 2.411,865 | 143 | 1.970,350 | 166 | 2.381,700 |
| October | 158 | 1.841,586 | 129 | 1.580,020 | 130 | 1.820,435 |
| November | 123 | 1.460,460 | 120 | 1.378,540 | 109 | 1.420,840 |
| December | 100 | 1.175,600 | 94 | 1.177,480 | 106 | 1.321,300 |
| Total | 1784 | 23.675.481 | 1.570 | 19.370 | 1.595 | 21.123,900 |

2.4. Wastewaters

Patra Port Authority S.A is a major contractor for the disposal of ship generated liquid waste. The quantities show a serious decline in the collection of Annex I waste at 2010 in order of 22% and 50% for oil sludge, bilge and used lubricants respectively in relation with the previous year. Annex IV sewage are not delivered in years 2010 and 2011. This may be attributed to systems biological treatment with which the new ships are equipped. The IMO (2004b) also sets out conditions under which vessels are allowed to discharge sewage wastes at sea,

rather than into reception facilities. Such discharges can be made at least three nautical miles from the nearest land where a vessel uses an approved sewage treatment plant. Vessels can also discharge non-comminuted (not reduced to small particles) and disinfected sewage wastes outside the 12-mile limit. Although not yet a legal requirement that ports provide Annex IV waste facilities, 28 out of 71 ports indicated that such facilities were available and these included waste bins on the quayside, roadside tankers for pumping out waste, and direct connections to local sewage works. For the estimation of oil waste fuel consumption, the power of the main engine, the hours per day of operation and the density of oil. It is considered that oily waste production depends on the type of fuel. In particular it consists of a fraction 3% of the daily heavy fuel consumption or 1% of the marine diesel oil's production [2, 5].

2.4.1. *Solid Waste*

Patra Port Authority S.A. is responsible for the collection and disposal of solid wastes (Annex V). Annex V facilities does not operate a system to segregate and recycle waste. Much of this waste is currently bagged and placed in skips or bins which are then emptied by contractor.

The contractor has settled in the port 30 bins of 15, 00 L each for the collection of domestic lines solid waste. It is estimated that the bins are emptied 3 times per week for the winter period and 6-7 times per summer. The solid waste of the international lines are collected on board and carried to a track which is equipped with compressor. There is very little information available at the current time on the actual volumes of waste generated on ships and how much of this waste could be recycled in ports. The amount of collected waste are carried to the nearest landfill site in the region “Xerolaka”, 10 km at the east of Patra, where is disposed.

It will be beneficial to know about how many ships are equipped with an on board incinerator in which both sludge and household waste can be burned or if they have compressor for diminishing volume of solid waste. According to the literature that each person generates 1 kg of solid waste daily [2] and 3 kg/day per crew member, so that a ship with 10 crew members produces roughly 35 kilos of waste per day [5].

2.4.2. *Establishing Consultation among Stakeholders*

Establishing a flexible and continuous communication framework between Port Authority, Municipality of Patra, owners of ship companies and local stake holders is deemed crucial for ensuring the adequacy of all management practices. In addition public opinion will have a strong motivation for taking action for safety at sea and preserving marine environment and port areas. It also would be beneficial for Port Authority to keep a record of complaints from all the stakeholders. There is information on web for two illegal discharges from ships in the coastal zone in the last three years and a lot of incidents of minor oil or sewage pollution with unknown origin in coastal waters [8].

2.4.3. *Charging System in the Port*

The contract system is applicable which is the more beneficial in the ports where there are regular visits of the ships as is the case in the P.I. Under this system, a contract is negotiated between the owner of the ship which have registered the P.I as home port use and the operators of reception facilities in the port where the ships regularly visits. There are various contractual terms including volume and type of waste, frequency of use of facilities and fee payment. As a result because ships have contractually agreed to dispose of waste in the specific

port, and agreed costs in advance, administration is minimized, as is the need for monitoring of that particular ship. Illegal dumping will be minimized as payment for delivery of waste is fixed, whether facilities are used or not, so there is no financial incentive to dump waste. Port authority of Patra receives a percentage of 15% of the invoiced by the external contractor services. The main advantage of the contract system is that it enables the vessels owner to budget disposal costs over a fixed period, while port is guaranteed a certain yearly income over the same period [9]. The disadvantage is that in common with Direct Cost Recovery, there will be little incentive to introduce waste reduction methods, at least at the beginning of the contractual period. As contracts came up for renewal, however such methods may become more economically attractive if reduced fee rates could be negotiated or if the vessel is likely to exceed the maximum amount of waste that it has contracted to dispose of in the period of the contract.

2.4.4. Contingency Plan

The authorized companies providing the reception facilities services Waste within the area will have an approved emergency response plan (CONTINGENCY PLAN) in place in the event of an emergency pollution caused during the receipt of liquid or solid or hazardous residues or due to an accident, damage or damage to its means.

These plans will be in accordance with the provisions of P.D. 11/2002 (Government Gazette 6 A), and will include at least the following:

- Tables of emergency personnel teams with the respective responsibilities of each person.
- Means of communication used.
- Emergency pollution response instruments and machinery used.
- Emergency response action plan for each case Pollution.

III. CONCLUSION AND SUGGESTIONS

All solid were being land filled because the wastes were not segregated and the amount of recyclable/reusable wastes was not estimated. Total solid waste amounts for any waste type were remarkable in comparison to the overall waste generated from the municipality of Patra. It will be beneficial to know about how many ships are equipped with an onboard incinerator in which both sludge and household waste can be burned or if they have compressor for diminishing volume of solid waste. They have to be implemented measures in regarding documentation and operational control, monitoring and measurement and corrected measures. Recycling methods may become more economically attractive if reduced fee rates could be negotiated. It is recommended that the Port Authorities need to work on self-financing schemes to reduce and recover expenditure and to increase revenues [9-11]. The Patra Port Authority have to work with all interested parties to ensure that provision of port waste reception facilities are adequate for all vessels using the port. Good facilities at the right price can only be provided if there is a full and constructive dialogue between Port Authority S.A and port users as to what facilities should be provided to meet their normal needs for disposing of Consultation will be undertaken using methods such as letters, emails questionnaires about the type and the quantities of waste for regular timing intervals. Furthermore communities should be motivated to participate fully in the public awareness campaign on the importing proper waste management for health and wellbeing.

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