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**SUSTAINABLE PORT MANAGEMENT: CASE STUDY ON MARINAS
AND TRADE PORTS**

Master Thesis

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DECLARATION

I hereby declare that this master's thesis titled as "**Sustainable Port Management: Case Study on Marinas and Trade Ports**" has been written by myself in accordance with the academic rules and ethical conduct. I also declare that all materials benefited in this thesis consist of the mentioned resources in the reference list. I verify all these with my honour.

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ABSTRACT

Master's Thesis

Sustainable Port Management: Case Study on Marinas and Trade Ports

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Seaports are historic and commercial infrastructures and significant nodes in the logistics and transport chains that form the backbone of national and regional economies. However, ports are also sites of environmental pollution originating from land-based activities, ship movements and ports' own activities that impact the ecology. Sustainability is very important in ports for environment and future. Green projects, waste management, energy management, sustainable equipment management, social relations and job security constitutes the sustainability of ports.

Sustainable solutions are necessary for all types of port. Inland ports, container ports, fishing ports, dry ports, cruise ports, cargo ports and yacht marinas are types of ports. In this thesis, sustainability of two yacht marinas in Antalya, Turkey is investigated and they are compared with their similarities and differences from sustainability perspective. Qualitative case analysis is used as a research method. Research questions were asked and answers were taken from responsible, sophisticated marina personels.

Keywords: Sustainable Port Management, Marinas, Trade Ports, Sustainability.

ÖZET

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SÜRDÜRÜLEBİLİR LİMAN YÖNETİMİ: YAT LİMANLARINDA VE TİCARET LİMANLARINDA VAKA İNCELEMESİ

Küresel ısınma, doğal kaynakların sınırlılığı, iş kazaları, kötü sosyal etkiler, çevre kirliliğinin insan sağlığına, hayvan sağlığına ve doğaya olan kötü etkileri, diğer tüm işletmeleri olduğu gibi liman otoritelerini ve işletmecilerini de sürdürülebilir çözümler bulmaya itmektedir. Bu alan henüz oldukça az çalışılmış, geliştirilmeye açık bir alandır. Limanların sürdürülebilir liman işletmeciliği bakış açısıyla, çevresel ve sosyal etkileri dikkate alınarak titizlikle yeniden planlanmaları ve yönetilmeleri gerekmektedir.

Türkiye’de limanların sürdürülebilirliği üzerine çok az sayıda çalışma vardır. Sürdürülebilir liman yönetimine dair çalışmanın az oluşu bu araştırmanın önemini artırmaktadır. Bu yüzden bu çalışma ilk tespit çalışmalarından bir tanesidir. Öncelikle liman ve marinalardaki çevresel etki değerlendirilmesinin detaylı olarak yapılması ve limanların her yıl düzenli olarak sürdürülebilirlik analizleri yaparak süreç geliştirme çabası içinde olmaları gerekmektedir.

Tezin ilk kısmında limanlar üzerinde durulmuş ve sürdürülebilir yöntemler tartışılmıştır. İkinci kısımda yat limanlarına değinilmiş, yat limanlarındaki aktivitelerden bahsedilmiştir. Üçüncü ve son kısımda ise Antalya’daki iki yat limanında ve Bursa’da bir ticari limanda vaka analizine yer verilmiş, yat limanlarındaki ve ticari limanındaki sürdürülebilirliği ile ilgili gerçek örneklere yer verilmiştir. Bu kısa bakışla dahi, liman ve marinalarımızda henüz sürdürülebilir işletmecilik bakış açısının ana akım

yönetim yaklaşımı olarak benimsenmediği rahatlıkla söylenebilir. Bu alanda bilim adamlarının ve uygulamacıların birlikte çalışarak, daha önce tartışmaya açılmamış çevresel etki alanlarının ortaya çıkarılması ve geliştirilmesi için yatırım ve politikaların düzenlenmesi gerekmektedir. Limanlar sınırlarla çevrili kapalı işletmeler değildir, tam tersine dünya ticaretini ve dolayısıyla uygarlığı büyük ölçüde etkileyecek önemli etkileşim merkezleridir ve profesyonel sürdürülebilirlik yönetimi ihtiyacı duyarlar.

Anahtar Kelimeler: Sürdürülebilir Liman Yönetimi, Marinalar, Ticari Limanlar, Sürdürülebilirlik.



SUSTAINABLE PORT MANAGEMENT: CASE STUDY ON MARINAS AND TRADE PORTS

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ABBREVIATIONS

UNCTAD	United Nations Conference on Trade and Development
TCDD	Turkish State Railways
ISO	International Organization for Standardization
PIANC	The World Association for Waterborne Transport Infrastructure
MARPOL	International Convention for The Prevention of Pollution from Ships
WPCI	World Port Climate Initiative
ESI	Environmental Ship Index
IAPH	International Association of Ports and Harbors
ESPO	European Sea Port Organization
EMSA	European Maritime Safety Agency
OSPAR	Commission for The Protection of The Marine Environment of The North-East Atlantic
EPA	Environmental Protection Agency
CAAP	Clean Air Action Plan
NAFTA	The North American Free Trade Agreement
MHIDAS	Major Hazard Incident Data Service
COP	Code of Practice
ILO	International Labour Organisation
EMS	Environmental Management System

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INTRODUCTION

Ports are inevitable part of international trade and about 85% of global trade is transported via maritime transportation. Harbours have an important role in global trade. Also, ports are the places that produce air, noise, vibration, water pollution to environment. Moreover, ships and vehicles in the ports run by petroleum and it is a non-renewable resource. Accidents are another negative things in the ports. So, sustainable strategies should be developed for present and future of human health, environment and stakeholders that in relation with ports (Vujičić, Zrnić and Jerman, 2013:547). There have been enormous investments in port and maritime transportation for last 25 years because sea transportation is cheaper and safer than other transportation types. Volume of seaway transportation is rising %3 every year in the world. Sustainable methods, ways are needed for ports because of this increasing demand on ports too (Demiriz, 2010:3-4). There are different types of harbours in the world. Inland ports, container ports, fishing ports, dry ports, cruise ports, cargo ports and yacht marinas are some of them. Each type of port need green strategies for sustainability.

According to these descriptions, in the first part of the thesis, ports and maritime transportation are mentioned in detail. Different types of ports are discussed and information about them is given. Then, related information about ports and seaway transportation in Turkey. It is seen that ports have importance in international trade in Turkey as in all over the world. Situation analysis of ports in the world and sustainability are discussed in different regions of the world. Sustainability of ports in Europe, Asia, America, Mediterranean Sea is discussed separately. Sustainability in port management is analysed deeply with energy, equipment, waste, job security and social dimensions. Different sustainable strategies are discussed in this part. Finally, information about city and port relation is given and the first part is finished.

In the second part of the thesis is about yacht marinas as a type of port. Past, present and future of yacht marinas in the world and in Turkey are discussed. It is seen that yacht marinas have a big importance in tourism industry of Turkey. Information

about sustainability of yachts marinas is given in detail. Marina activities such as hull maintenance, boat cleaning, engine maintenance, bilge water discharging, fueling, yacht sewage, wastes, fish wastes are discussed, sustainable strategies are mentioned for yacht marina management.

In the third and last part, a case analysis is done about sustainability of two yacht marinas in Antalya, Turkey. Sustainability of two yacht marinas is investigated and their similarities, differences are compared. Qualitative case study has done with several research questions. Research questions are asked to most sophisticated personels in management and sustainability of the marinas. Answers are taken to the research questions and required photos are taken from the marinas. The last part of the thesis constitutes this case study.

CHAPTER 1

SUSTAINABLE PORT MANAGEMENT

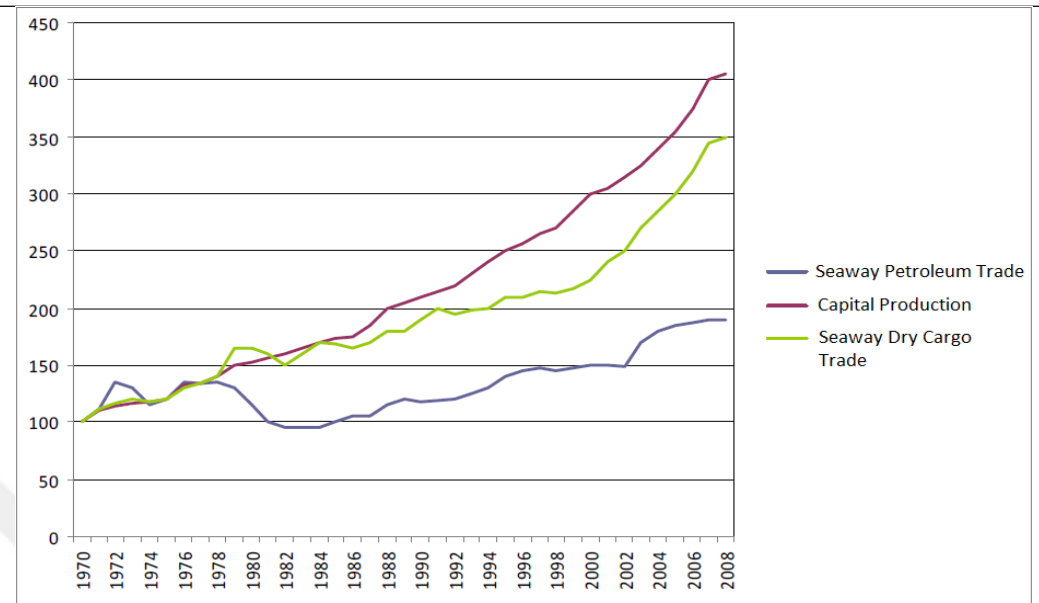
1.1. Ports in The World

Seaports are the places where there are facilities that ships anchor and roost also where there are lifting cranes and equipments to transfer goods from shore to ship, ship to ship or ship to shore. Ports can be used for transportation of products or passengers. The port can be a natural establishment or an artificial construction, which provides a place for the loading and unloading of cargo. They can be for large sea going ships and also for inland waterways such as rivers and lakes. The depth of the ports play a vital role in allowing various types and sizes of ships to enter, dock and anchor at the port.

Ports have an inevitable role in international commerce. Also, They are intermodal transportation points in logistics as well. They mostly connect sea transportation to road transportation and rail transportation. Ports are used in exportation and importation of goods over sea transportation (Alderton, 2013).

Increasing international trade volume and trade liberalization activities in the world for 20-30 years leveraged sea transportation as a cheaper way to transport goods internationally and intercontinentally (Graph 1). In this period of time, the percentage of sea transportation between other modes of transportation rised to 90/100. Because of the accumulation of profit with rising international trade and usage of sea transportation as a safer, cheaper way, there have been occured big investments in ports and seaway transportation for last 20-30 years. Also Seaway transportation volume is rising %3 percentage every year in the world (Demiriz, 2010:1).

Graph 1. World Seaway Trade and Economical Development (1970-2008)



Source: Chamber of Shipping, 2008 Sea Industry Report, Istanbul 2009:27

Merchant ships are the important part of international sea transportation. There are various types of ships like container ships, cargo ships, tankers, ro-ro ships and bulk carriers in international commerce for different product types. These gigantic ships provide the biggest percentage of transportation in the world. World merchant fleet constitutes 81.584 ships in 2013 (Table 1).

Table 1. World Fleet: Total Number of Ships, by Type and Size

Ship Type	Small ⁽¹⁾		Medium ⁽²⁾		Large ⁽³⁾		Very Large ⁽⁴⁾		Total	
General Cargo Ships	4,330	14.6%	11,670	31.8%	201	1.9%			16,201	19.9%
Specialized Cargo Ships	8	0.0%	201	0.5%	52	0.5%	2	0.0%	263	0.3%
Container Ships	16	0.1%	2,256	6.1%	1,584	15.4%	1,038	21.4%	4,894	6.0%
Ro-Ro Cargo Ships	33	0.1%	656	1.8%	605	5.9%	161	3.3%	1,455	1.8%
Bulk Carriers	318	1.1%	3,514	9.6%	4,981	48.3%	1,544	31.8%	10,357	12.7%
Oil and Chemical Tankers	1,772	6.0%	6,440	17.5%	2,301	22.3%	1,483	30.5%	11,996	14.7%
Gas Tankers	40	0.1%	1,034	2.8%	197	1.9%	346	7.1%	1,617	2.0%
Other Tankers	284	1.0%	475	1.3%	5	0.0%			764	0.9%
Passenger Ships	3,568	12.0%	2,476	6.7%	273	2.6%	146	3.0%	6,463	7.9%
Offshore Vessels	2,367	8.0%	4,847	13.2%	94	0.9%	132	2.7%	7,440	9.1%
Service Ships	2,325	7.8%	2,259	6.2%	24	0.2%	5	0.1%	4,613	5.7%
Tugs	14,621	49.3%	900	2.5%					15,521	19.0%
Total	29,682	100%	36,728	100%	10,317	100%	4,857	100%	81,584	100%

Source: Statistics From Equasis (<http://www.emsa.europa.eu/implementation-tasks/equasis-a-statistics/item/472.html>), 2013

There are so many big ports in the world. For example Shanghai Port in China has total cargo volume as 644.759 tons. The Second one is Sinhapore Port, the third one is Tianjin, and the fourth one is Rotterdam in Netherlands. As the largest exporter of goods moving on container services, Shanghai, China ranks as number one in the top global container ports (Table 2).

Table 2. World Port Rankings

WORLD PORT RANKINGS - 2012								
TOTAL CARGO VOLUME					CONTAINER TRAFFIC			
TONS, 000s					TEUs - Twenty-Foot Equivalent Units			
RANK	PORT	COUNTRY	TONS	MEASURE	RANK	PORT	COUNTRY	TEUS
1	Shanghai	China	644,759	metric tons	1	Shanghai	China	32,528,200
2	Singapore	Singapore	538,012	freight tons	2	Singapore	Singapore	31,649,400
3	Tianjin	China, PR of	477,000	metric tons	3	Hong Kong	China	23,118,000
4	Rotterdam	Netherlands	441,527	metric tons	4	Shenzhen	China	22,959,800
5	Guangzhou	China	438,000	metric tons	5	Busan	South Korea	17,022,969
6	Qingdao	China	407,340	metric tons	6	Ningbo	China	16,782,700
7	Ningbo	China	364,612	metric tons	7	Qingdao	China	14,609,470
8	Dalian	China	303,000	metric tons	8	Guangzhou	China	14,514,200
9	Busan	South Korea	298,689	revenue tons	9	Dubai Ports	United Arab Emirates	13,280,000
10	Port Hedland	Australia	288,443	metric tons	10	Tianjin	China	12,298,300
11	Hong Kong	China	269,282	metric tons	11	Rotterdam	Netherlands	11,865,916
12	Qinhuangdao	China	233,235	metric tons	12	Port Kelang	Malaysia	10,001,496
13	South Louisiana	United States	228,677	metric tons	13	Kaohsiung	Taiwan	9,781,221
14	Houston	United States	216,082	metric tons	14	Hamburg	Germany	8,889,477
15	Nagoya	Japan	202,556	freight tons	15	Antwerp	Belgium	8,635,169

Source: World Shipping Council(<http://www.worldshipping.org/>), 2012

Some trends in international port sector leveraged importance of ports in the world. Technological change, increasing seaborne commerce and international shipping, continuing integration of transport modes and services, deregulation and institutional reform in the port sector, growing private sector participation, emerging importance of strategic management are the trends that occurred in international port sector (Cheon, 2007:8-11).

1.1.1. Types of Ports

Ports can be classified from various perspectives. Management authority, ownership status and function of the port can be meaningful to categorize the ports. According to ownership classification, ports can be managed by public and private authorities (Roa, Pena, Amante and Goretti, 2013:1057-1058).

1.1.1.1 Port Types According to Management Authority

Harbours categorized into several types according to their tasks, sizes and locations. There are several types of ports in the world. The types of ports are seaports, inland ports, fishing ports, dry ports, cruise ports, cargo ports and yacht marina. Also there are several organizational modes for seaports, depending on the role that port authorities assume. These are usually labelled as landlord port, tool port and services port as the following (Trujillo and Nombela, 1999:12);

a. Landlord Port: In this model, port infrastructure is owned by the port authority, which is also in charge of its management. Meanwhile, remaining port services are provided by private firms that own the assets conforming to the port superstructure and all equipment required for service provision (cranes, vans, forklifts, etc). In general, this is the most common form of organization for large ports. Examples of this type of port organization are Buenos Aires in Argentina and Rotterdam in Netherlands.

b. Tool Port: Port authorities are the owners of infrastructure, they also own the superstructure (buildings, etc) and the equipment (cranes, etc). Private firms provide services by renting port assets, through concessions or licenses. Examples of this category are Antwerp in Belgium and Seattle in USA.

c. Services Port: Port authorities are responsible for the port as a whole. They own the infra- and superstructures, and they also hire employees to provide services directly. The port of Singapore is an example to illustrate this type of organization.

1.1.1.2. Port Types According to Functions

Different types of ports have different functions. While some ports are used for commerce of material products, some ports are used for tourism, transportation of people or fishing.

1.1.1.2.1. Seaports

Seaports are the most common type of port around the world. These are used for commercial shipping activities. These ports are built on a sea location and enable

the accommodation of both small and large vessels. Most of seaports are situated along the coastline and actively handle the ongoing cargo transactions. Special warehouses are also constructed to store the shipment, and to maintain the regular stocking. Also there are facilities like hotels, restaurants, port reception facilities, and restrooms in the port. A seaport can be further categorized as cargo port or cruise port (Merk and Dang, 2012).

1.1.1.2.2. Cargo Ports

As we can understand from the name, cargo ports functions according to the cargo it manages. The cargo ports involve many mechanical techniques to load or unload the shipment. Lifting cranes and variety of machines are used for loading and unloading activities in the port. A cargo port may be designed to deal with single, as well as multiple types of products. Items such as liquid fuels, chemicals, food grains, timber, machines and motorcars, are transported to various places. These ports are the most used ports in international commerce. Container terminals are a special form of cargo ports specialized on container shipment and warehousing. Container traffic has grown very rapidly over the last century. Container traffic remains as one of the most value added transportation type and a profitable distribution activity. Cargo ports functions as oil terminals as well. Crude oil, liquid gas and petroleum are between the major commodities handled by maritime traffic. Liquid and gas transportation takes about half of total transportation volume. Coal bulk terminals are another type of cargo ports. Dry bulk goods in maritime traffic is one quarter of total volume of minerals (coal, iron ore, etc.) and vegetables (grain, wood, edible foods, etc.). Dry bulk maritime transportation, even it is relatively less profitable than crude oil and container transportation, it faces lower entry cost to built a dry bulk terminal because it doesn't cost to construct infrastructure as much as container and liquid bulk terminals. Also, Iron bulk terminals, grain terminals are types of cargo ports too (Merk and Dang, 2012:9-25).

1.1.1.2.3. Cruise Ports

This type of port specializes in dealing with the activities of cruise ships, and provide the platform for the passengers to enter and disembark the cruises during the

journeys. Cruise ships in different sizes enter the ports and anchor for loading and unloading of passengers. A cruise port is also capable of providing the essential provisions and services required for a luxurious cruise voyage. Cruise industry is one of the most important, value added and growing part of leisure tourism. Cruise lines are seeking new ports and routes every year. The growth also contributes to the construction of larger ships. As the number of ships had increased and the size of ships had grown, new cruise terminals have been established and existing ports have served to growing numbers of visitors. As cruise tourism has grown, demand for terminal facilities has also expanded. Port cities which haven't terminals build facilities hoping to attract cruise ships (Klein, 2011:107).

1.1.1.2.4. Inland Ports

Inland ports are ports built on comparatively smaller water bodies such as rivers or lakes. They can either be used for cargo purpose or for passengers or for both cargos and passengers. Some of these inland ports can have access to the sea with the help of a canal system. Some of the inland ports can be also be specifically made for recreational purpose, allowing only small sized vessels or can be used just for ferrying people and fishing activities. These ports can create a more central distribution point. Inland ports can improve the movement of imports and exports, moving the time-consuming sorting and processing of containers inland, away from congested seaports (Harrison, McCray, Henk and Prozzi, 2002:1).

Inland ports attract attention because they can provide the means to optimize transportation related costs occurred in supply chain management. At inland ports, transportation capabilities in the form of access to the interstate highway system, air cargo operations or intermodal rail facilities are viewed as building blocks for businesses seeking a competitive advantage. Inland ports allow businesses the ability to choose the appropriate modal alternatives for their logistics needs (Harrison, McCray, Henk and Prozzi, 2002:2).

1.1.1.2.5. Dry Ports

Dry ports are defined as inland terminals that can be interconnected with a seaport via road or rail transportation facilities. They usually used as centers of multimodal logistics and can help to lessen the inevitable congestion at a nearby seaport. Its functions are quite similar to a seaport, with the only difference that is not situated near the coastline. A dry port consists of all the necessary machinery to handle the constant clearance of shipment, like proper cargo-instrumentations, rail sidings, storehouses, and even container yards. Transfer between transport modes takes places at a dry port. From road to rail or vice-versa; road or rail to inland water or vice-versa transportations are the various options. Dry ports are also likely to be the areas where large consignments are assembled or seperated into smaller loads for onward transit. Dry ports may deal with liquids in tankers, dry bulk cargos, non-conteinerized general cargo and mixed cargos. However, most commonly, dry ports are heavily geared towards handling unitized cargo (UNCTAD, 1991:2-3).

1.1.1.2.6. Fishing Ports

Fishing ports mainly donates to the commercial sphere as it participates in fishing industry. The existence of a fishing port entirely relies upon the availability of fishes in that region of the sea. A fishing port can be an inland port or a seaport. Small or big fisher ships uses this ports for fishing activities. There are not so much facilities in this type of ports. These are smaller than container ports or other type of commercial harbours (Scheffezyk, 2008:2).

Fising harbours serves to fishing fleets some services such as mooring, unloading of fish, supplies of fuel, water and store provisions, small vessel repairs and simple fish handling and transportation. A fishing port is a system combining infrastructure facilities, human resources and management concepts dedicated to the purpose of servicing the fishing fleet the requiremants of the fish industry and the development of the fisheries sector as a whole. The size of the fishing port in terms of inputs (infrastructure, human resources, management concept) causes gradual differences in terms of outputs (services to the fishing fleet, fish industry and fisheries sector). A fishing port is an integral part of the national fishing industry, an

important element in promoting the fish industry and an operational base for the viable and sustainable conduct of the fishing business (Scheffezyk, 2008:3).

1.1.1.2.7. Yacht Marinas

Yacht marinas are ports which are designed to roosting of regular or luxury yachts. These marinas are mostly situated near the coastline, so they are seaports. Yacht marinas have a big contribution to tourism because yacht tourism has a vital role especially in summer tourism in the world. Yacht marinas provide roosting, fuel, water and electricity supply and maintenance service to yachts. Also there are restaurants, restrooms, internet, clean water, electricity services for yacht owners in the port (Kuleyin, 2011:7-8).

1.1.2. Ports in Turkey

Navigation in Turkey has an old history bases on the haritage of Ottoman Empire before the Turkish Republic. Hence Anatolia is a peninsula covered with long coastal area from three side, navigation was one of the inevitable parts of life in Anatolia coasts. However, vital investments for modern harbours had just started about 1950s all over the Turkish coasts. The law about “harbour construction” which was issued in 1954 had triggered the development of national infrastructure of harbours in Turkey. According to the law, building quays, docks, jetties, harbours and maintenance of systems, equipments are transferred to the responsibility of Ministry of Public Works. Also, according to the law, after establishment of the harbours, administration of them was transferred to responsibiity of local municipalities and privite enterprises. This regulation gave a start to development of Turkish ports in passenger transportation and commerce in Turkey (TURKLIM, 2007).

International maritime transportation has an accelerated trend for years in Turkey because; Turkey is connecting Asia to Europe, located close to the countries which produce energy, has about 8.333 km coastal line and has enough railways and roadways for multimodal transportation. Turkey has great potential in terms of

intermodal transportation by owing its privileged geographical position between European, Central Asian and Middle Eastern countries. Nowadays after all these modernization years Turkey mostly use (88%) seaway transportation for international trade (Table 3). Total number of ports are 172 located along the coastline. With a glance to the ownership and operating rights, 22 ports are operated by government, 23 ports are operated by municipalities and 127 ports are operated by private companies. There are 7 railway connected ports in Turkey and 3 of them are operated by Turkish State Railways (TCDD). Almost 88% of goods exported and imported in Turkey have been transported by seaways in 2013 (Maritime Sector Report, 2013).

		Sea	Rail	Road	Air	Others
Exports	Jan 2015	6.167.506	60.976	3.981.745	2.072.605	32.836
	Feb 2015	6.129.889	51916	3.765.259	2.289.771	34.706
Imports	Jan 2015	9.931.405	71.844	2.477.620	1.586.896	2.568.181
	Feb 2015	10.160.510	106.264	2.706.565	1.476.039	2.477.806

Source: Turkish Statistical Institute Database, <http://www.tuik.gov.tr/>,2015

In the maritime transportation sector, Turkey's investment and policy priorities are structured by the objective of ensuring improvement in Turkish merchant fleet and increasing the performance of Turkish ports and cabotage. Policies are set about financial policy, safety and security, protection of the environment, maritime education and training and new maritime trade links.

Three hub-ports on the three side of the Anatolian peninsula namely Filyos Port on the Black Sea, Çandarlı Port on the Aegean Sea and the Mersin Container Port on the Mediterranean Sea, are planned in parallel to the developments in maritime transportation sector in the world and to meet the needs of Turkish maritime sector,

It is aimed that until 2023 one of the ports of Turkey would be between the top 10 ports in the world with respect to handling capacity. It is expected that, with the necessary investments, the total container handling capacity of all Turkish ports would be 32 Million TEU/year. In the cruise ship tourism it is projected that 15 million passengers will be hosted in 2023. To reach that objective 7 new cruise ship ports is planned to be built until 2023 (Country Report, 2011).

Turkey has more than 300 shore facilities as ports, wharves, marinas and fishing ports. Among these facilities, 175 ports and wharves serve to international transportation. The goal of Turkey is becoming a hub for transit cargos in the region because of its geo-political advantage. Also, there are several new port projects such as North Eagean Çandarlı Port which is projected as the biggest container port in Turkey and the tenth biggest container port in Europe, Filyos Port which will be in West Black Sea and Mersin Container Port (Martime Sector Report, 2014). There are so many important cargo handling ports in Turkey (Image 1).

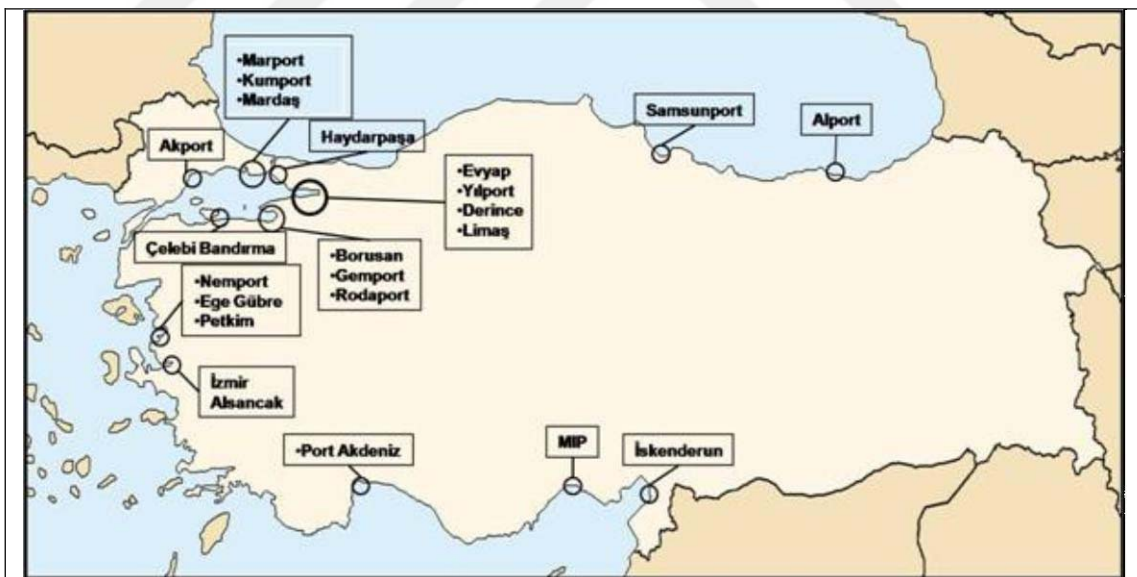


Image 1. Container Handling Ports in Turkey

Resource: TURKISH CHAMBER OF SHIPPING, Maritime Sector Report 2013

Turkish Ports have strategic position in the Eastern Mediterranean and Black Sea Shipping Lines and at the intersection point of East-West and North –South directional international transport corridors. The ports in Turkey have an

advantageous position to attract transshipment/transit cargos. Ports in Turkey are located such a layout that they can serve to variety of transportation networks within the Mediterranean sea and the connected oceans (Maritime Sector Report, 2013).

The Ministry of Finance of Turkey decreased the special consumption tax for fuel which is used for sea vessels, in order to decrease the usage of road transportation and increase the usage of maritime transportation in Dec. 31st, 2013. The discounted amount on special consumption tax had been estimated as 4.127.000.000 TL from 1.1.2014 to 9.10.2014 . 25% of this discounted amount has been used by private sector and 75% of the discount has been used by public sector. The percentage usage of the fuel that is excluded from special consumption tax was as following:

- % 2,7 : Commercial Yachts
- % 8,0 : Towing Boats and Service Performing Ships
- % 8,2 : Dry Cargo Vessels
- % 13,5 : Tankers
- % 26,0 : Fishing Vessels
- % 41,5 : Passenger Liners and Ferryboats (Maritime Sector Report, 2014)

1.2. Ports of The World and Sustainability

In pre-industrial communities before seventeenth century, navigation has been started in coastal cities. This maritime activities were based on fishing, warship and short distance voyages. In that time ships were run by muscle power and wind power, so everything could be called "environmentally friendly". However, industrial revolution in the middle of seventeenth century, changed the way of conducting maritime transportation. Production systems has changed radically. The traditional sources of energy has been changed with non-renewable, low cost sources like coal, gas and petroleum. Also the technology of vessels was changed inevitably. Steam engines, combustion engines and electricity encouraged the development and expansion of industrial activities. Use of technology in maritime sector and increased

trade between industrialized and other colonized territories triggered the development of maritime transportation as a cheaper, safer and greater carrying capacity way of transportation all around the world (Pesquera and Ruiz, 1996:2-8).

Increasing technological innovations in shipping like energy source, means of propulsion, shipbuilding technology and materials were the key factors that provide new infrastructures and services. These innovations started to create environmental problems of today. Ports are also sites of environmental pollution originating from land-based activities, ship movements and ports' own activities that impact the ecology around the port. Petroleum can be an example as a non-renewable energy which is used in the means of propulsion in the transportation vehicles and ships. Consequently, this kind of improvements required sustainable solutions for the environmental performance of ports. Economic growth and developments in the ports must be balanced with social progress and environmental protection (Hiranandani, 2014:3).

When we have a general glance at the ports on the world, we can see that there are some new regulations and criterias for sustainability like ISO 14001, Green Ports and Ecoports applications. Firstly, ISO 14001 is a group of management standards, which are applied to increase environmental performance in organizations. These Standards are issued with a view to assessing, organizing and reorganizing sustainable development in business organizations. Secondly, Green Ports is a certification which shows balance between environmental protection and economic demand arouse from ports. The certificate aims to provide new environmental solutions for ports and terminals globally. Finally, Ecoports is an integration of applications among two concepts which are classified as effective environmental management and port management. Ecoports is especially applied for ports located in Europe (Asari, Hoang, Jones and Hassani, 2014:8).

In addition to quality management systems there are also many organizations and platforms to organize and facilitate an efficient seaway transportation all around the world. As an example PIANC is the forum where professionals around the world join their forces to provide expert advice on cost-effective, reliable and sustainable infrastructures to facilitate the growth of waterborne transport. Established in 1885,

PIANC continues to be the leading partner for government and private sector in the design, development and maintenance of ports, waterways and coastal areas. As a non-political and non-profit organisation, PIANC brings together the best international experts on technical, economic and environmental issues pertaining to waterborne transport infrastructures. Members include national governments and public authorities, corporations and interested individuals (www.pianc.org, 2015).

In the last few years, there has been an increasing attention on accommodating the disabled or impeded passengers' needs at the port facilities. Under this scope, aiming at encouraging port facilities to take necessary measures, accommodating disabled and impeded passengers' needs, facilitating the services at the port and maintaining an equal level of service for the regular passengers free of charge, the "Unimpeded Seas Project" has been developed. The disabled friendly terminal numbers are limited to about %14 overall in Turkey, on completion of a study carried out. It is expected that with and within the new port projects, the rate of such terminals will increase. Recently, there are about 260 passenger vessels and their terminals under the scope of the project in Turkey. Any terminal or vessel which comply with the conditions stipulated by the ministry's administration will be rewarded as "Unimpeded Seas" certificate which will increase its national and international reputation (www.denizticareti.gov.tr, 2015).

The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marina environment by ships from operational or accidental causes. The MARPOL Convention was adopted on 2 November 1973 at IMO. The Protocol of 1978 was adopted in response to a spate of tanker accidents in 1976-1977. As the 1973 MARPOL Convention had not yet entered into force, the 1978 MARPOL Protocol absorbed the parent Convention. The combined instrument entered into force on 2 October 1983. In 1997, a Protocol was adopted to amend the Convention and a new Annex VI was added which entered into force on 19 May 2005. MARPOL has been updated by amendments through the years. The Convention includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six

technical Annexes. Special Areas with strict controls on operational discharges are included in most Annexes (www.imo.org, 2015).

Annex I Regulations for the Prevention of Pollution by Oil (entered into force 2 October 1983); Covers prevention of pollution by oil from operational measures as well as from accidental discharges; the 1992 amendments to Annex I made it mandatory for new oil tankers to have double hulls and brought in a phase-in schedule for existing tankers to fit double hulls, which was subsequently revised in 2001 and 2003.

Annex II Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (entered into force 2 October 1983); Details the discharge criteria and measures for the control of pollution by noxious liquid substances carried in bulk; some 250 substances were evaluated and included in the list appended to the Convention; the discharge of their residues is allowed only to reception facilities until certain concentrations and conditions (which vary with the category of substances) are complied with. In any case, no discharge of residues containing noxious substances is permitted within 12 miles of the nearest land.

Annex III Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (entered into force 1 July 1992); Contains general requirements for the issuing of detailed standards on packing, marking, labelling, documentation, stowage, quantity limitations, exceptions and notifications. For the purpose of this Annex, “harmful substances” are those substances which are identified as marine pollutants in the International Maritime Dangerous Goods Code (IMDG Code) or which meet the criteria in the Appendix of Annex III.

Annex IV Prevention of Pollution by Sewage from Ships (Entered Into Force 27 September 2003); Contains requirements to control pollution of the sea by sewage; the discharge of sewage into the sea is prohibited, except when the ship has in operation an approved sewage treatment plant or when the ship is discharging comminuted and disinfected sewage using an approved system at a distance of more than three nautical miles from the nearest land; sewage which is not comminuted or

disinfected has to be discharged at a distance of more than 12 nautical miles from the nearest land.

Annex V Prevention of Pollution by Garbage from Ships (Entered Into Force 31 December 1988); Deals with different types of garbage and specifies the distances from land and the manner in which they may be disposed of; the most important feature of the Annex is the complete ban imposed on the disposal into the sea of all forms of plastics.

Annex VI Prevention of Air Pollution from Ships (Entered Into Force 19 May 2005); Sets limits on sulphur oxide and nitrogen oxide emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances; designated emission control areas set more stringent standards for SO_x, NO_x and particulate matter. A chapter adopted in 2011 covers mandatory technical and operational energy efficiency measures aimed at reducing greenhouse gas emissions from ships (www.imo.org, 2015).

Fifty-five of the world's key ports, acknowledging their unique capacity as key hubs in global supply chains, have come together in a commitment to reduce their greenhouse gas emissions while continuing their role as transportation and economic centers. The world's key ports have committed themselves to reduce greenhouse gas emissions (GHG) while continuing their role as transportation and economic centres. This commitment is called the World Ports Climate Initiative (WPCI). They do this through influencing the sustainability of supply chains, taking into account local circumstances and varying port management structures. They also cooperate with ships in support of measures to reduce emissions to air from ships (wpci.iaphworldports.org, 2015).

One of the projects within WPCI is the development of an Environmental Ship Index (ESI). The Environmental Ship Index identifies seagoing ships that perform better in reducing air emissions than required by the current emission standards of the International Maritime Organization. The ESI evaluates the amount of nitrogen oxide (NO_x), sulphur oxide (SO_x) that is released by a ship and includes a reporting scheme on the greenhouse gas emission of the ship. The ESI is a good

indication of the environmental performance of ocean going vessels and will assist in identifying cleaner ships from the emission standart (wpci.iaphworldports.org, 2015).

The index is intended to be used by ports to reward ships when they participate in the ESI and will promote clean ships, but can also be used by shippers and ship owners as their own promotional instrument. It should be noted that while ESI will provide a total score, the rewards can either be based on that total or on each of its constituent parts separately. The program is completely voluntary and WPCI hopes that the global port community will assume its role in improving the maritime and port environment. Finally all stakeholders in maritime transport can use the ESI as a means to improve their environmental performance and as an instrument to reach their sustainability goals (wpci.iaphworldports.org, 2015).

Another platform, International Association of Ports and Harbors (IAPH), issues a tool box which is about air quality and greenhouse gas emissions. The aim of the Tool Box is to provide harbors, both members and non members of the IAPH, access to the tools needed to start the planning process for addressing port-related air quality and climate change issues. Tool Box provides information on air and climate issues and their relationship to port and maritime activities. It describes strategies to reduce emissions and guidance on how to develop a Clean Air Program and a Climate Protection Plan. Strategies such as repowering older engines, applying effective technologies for efficiency and emission control, and using alternative and cleaner fuels in maritime operations will dramatically reduce air pollution and greenhouse gas emissions. Undertaking such bold strategies will improve local air quality, safeguard public health, and protect ports and the planet from the effects of climate change (wpci.iaphworldports.org, 2015).

1.2.1. Ports of Europe & Sustainability

European Sea Port Organization (ESPO) issues some criterias for environmental protection which could be conducted by European ports. Ecoports certification is one the most important of these offers. ESPO analyses and regulates the environmental situation of ports in Europe since 1996. According to ESPO, European port's top environmental priorities are air quality, garbage/port waste,

energy consumption, noise, ship waste, relationship with local community, dredging, operations, dust, port development and finally water quality. Table 4 demonstrates the varying rank of sustainability priorities of European ports between 1996 and 2013 (www.espo.be, 2015).

ESPO provides assistance to ports in tackling the identified environmental priorities with the document of green guide. ESPO Green Guide introduces innovative framework for exemplifying, enabling, encouraging, engaging and enforcing environmental sustainability. This framework is applied to five environmental priorities which are air quality, energy conservation, climate change, noise, waste and water management (ESPO Green Guide, 2012).

Table 4. Evolution of Environmental Priorities Over Time (1996-2013)

	1996	2004	2009	2013
1	Port Development (water)	Garbage / Port waste	Noise	Air quality
2	Water quality	Dredging: operations	Air quality	Garbage/ Port waste
3	Dredging disposal	Dredging disposal	Garbage / Port waste	Energy Consumption
4	Dredging: operations	Dust	Dredging: operations	Noise
5	Dust	Noise	Dredging: disposal	Ship waste
6	Port Development (land)	Air quality	Relationship with local community	Relationship with local community
7	Contaminated land	Hazardous cargo	Energy consumption	Dredging: operations
8	Habitat loss / degradation	Bunkering	Dust	Dust
9	Traffic volume	Port Development (land)	Port Development (water)	Port development (land)
10	Industrial effluent	Ship discharge (bilge)	Port Development (land)	Water quality

Source: (European Sea Port Organization, https://www.researchgate.net/figure/265216678_fig1_Figure-1-ESPO-Top-10-environmental-priorities-of-the-European-port-sector-over-time-4, 2015)

European legislators have adopted policy responses in order to reduce the environmental pressures on marine and coastal ecosystems. In 2008, the European Union issued the Marine Strategy Framework Directive to conserve and protect the marine environment. The environmental component of its marine water strategy has been set in the Integrated Maritime Policy (Boteler and Coastal, 2014). In addition to European policies, international agreements made by International Maritime Organisation regulate the environmental performance of ships, as shipping vessels

are mobile sailing through the international oceans and sea, regulations on pollution cannot be based on national boundaries. Moreover, regional conventions (i.e. Helsinki Convention, Oslo Paris Convention, Barcelona Convention, Black Sea Convention) focusing on European marine regions also work to protect marine environments and support sustainable activities. Ecosystem based management is a key element of EU marine policy, and entails considering both ecological and anthropogenic dynamics within an ecosystem. Linking socio-economic pressures with ecosystem dynamics is also a goal of the research and reports of the European Environment Agency within the work of the European Topic Centre on Inland, Coastal and Marine waters and European Topic Centre for Spatial Information Analysis (Boteler and Coastal, 2014).

The European Maritime Safety Agency is another EU's agencies based in Lisbon working for sustainability. The Agency provides technical assistance and support to the European Commission and Member States in the development and implementation of EU legislation on maritime safety, pollution by ships and maritime security. It has also been given operational tasks in the field of oil pollution response, vessel monitoring and in long range identification and tracking of vessels (<http://www.cleanairactionplan.org>, 2015). Currently, the Agency has 9 units, under 3 departments:

- Department A: Corporate Services
(Human Resources; Legal and Financial Affairs; Operations Support)
- Department B: Safety and Standards
(Visits and Inspections; Ship Safety; Marine Environment & Port State Control)
- Department C: Operations
(Integrated maritime services; vessel reporting services; earth observation services; and pollution response services)

EMSA undertakes a number of mainly preventive, but also reactive tasks, in certain key areas in order to meet its objectives. Firstly, the Agency has been tasked with assisting the Commission in monitoring the implementation of EU

legislation relating, among others, to ship construction and planned maintenance, ship inspection and the reception of ship waste in EU ports, certification of marine equipment, ship security, the training of seafarers in non-EU countries and Port State Control. Secondly, the Agency operates, maintains and develops maritime information capabilities at EU level. Significant examples are the SafeSeaNet vessel tracking system, to enable the EU-wide tracking of vessels and their cargoes; and the EU LRIT Cooperative Data Centre, to ensure the identification and tracking of EU flagged ships worldwide (<http://www.cleanairactionplan.org>, 2015). In parallel, a marine pollution preparedness, detection and response capability has been established, including a European network of stand-by oil spill response vessels as well as a European satellite oil spill monitoring and vessel detection service (CleanSeaNet), both with the aim of contributing to an effective system for protecting EU coasts and waters from pollution by ships.

Finally, the Agency provides technical and scientific advice to the Commission in the field of maritime safety and prevention of pollution by ships in the continuous process of evaluating the effectiveness of the measures in place, and in the updating and development of new legislation. It also provides support to, and facilitates cooperation between, the Member States and disseminates best practices. As a body of the European Union, the Agency sits at the heart of the EU maritime safety network and collaborates with many industry stakeholders and public bodies, in close cooperation with the Commission and the Member States (<http://www.cleanairactionplan.org>, 2015).

Moreover, OSPAR is another convention about protection of the marine environment of the North-East Atlantic. OSPAR is the mechanism by which fifteen Governments of the western coasts and catchments of Europe, together with the European Union, cooperate to protect the marine environment of the North-East Atlantic. It started in 1972 with the Oslo Convention against dumping. It was broadened to cover land-based sources and the offshore industry by the Paris Convention of 1974. The Convention was open for signature at the Ministerial meeting of the Oslo and Paris Commissions in Paris on 22 September 1992. These two conventions were unified, up-dated and extended by the 1992 OSPAR

Convention. It was adopted together with a final declaration and an action plan. The Convention has been signed and ratified by all of the contracting parties to the original Oslo or Paris Conventions (Belgium, Denmark, the European Union, Finland, France, Germany, Iceland, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom of Great Britain and Northern Ireland) and by Luxembourg and Switzerland (<http://www.ospar.org/>, 2015). Contained within the OSPAR Convention, there are a series of Annexes which deal with the following specific areas:

- Annex I: Prevention and elimination of pollution from land-based sources;
- Annex II: Prevention and elimination of pollution by dumping or incineration;
- Annex III: Prevention and elimination of pollution from offshore sources; and
- Annex IV: Assessment of the quality of the marine environment.

1.2.2. Ports of USA & Sustainability

The U.S. Marine Transportation System is clearly one of the greatest national assets of USA. It has the continuing leadership in international trade and it is an engine of economic growth at domestic market. There is growing concern, however, that existing American Marine Transportation System may not be able to meet the anticipated growth in international commerce and the many challenges associated with that growth, like financing badly, needed new infrastructure improvements across the different modes of transportation and dealing with environmental concerns in an emerging “green” society. Air quality is a problem in U.S West Coast. Options for reducing mission include using alternative fuels and emission reducing technologies for large vessels, employing shore-side electricity which is called “cold ironing” for ships in port and replacing or upgrading cargo handling equipment in ports and the dray trucks that move freight into and out of them (U.S. Maritime Administration, 2009).

Ships, trucks, trains, and cargo-handling equipment emit nitrogen oxide (NO_x), diesel particulate matter (PM) and other pollutants. NO_x is a key contributor to smog and ozone formation, while diesel PM contains unhealthy air contaminants. As cargo volumes continue to increase, ports, industry and local, state, and Federal government agencies must determine how to best minimize these pollutants and reduce their harmful effect on the environment and community. Authorities have developed a Clean Air Action Plan aimed at reducing emissions for each of these sources. The plan eliminates older, less clean diesel trucks by helping to finance a new generation of clean or retrofitted vehicles and equipping all major container cargo and cruise ship terminals with shore-side electricity so that vessels at berth can shut down their dieselpowered auxiliary engines. The plan also calls for reducing ship speeds when entering or leaving the harbor, using low-sulfur fuels, and other emission-reduction measures and technologies. Some estimates project that implementation of this plan would cut PM pollution by 47 percent, NO_x emissions by more than 45 percent, and sulfur oxides by 52 percent (U.S. Maritime Administration, 2009).

United States Environmental Protection Agency (EPA) provides some programs for sustainability of ports in USA. EPA efforts in the area of sustainability practices and approaches include labeling green products and promoting green chemistry and engineering, managing materials rather than creating waste, using green infrastructure to manage storm water runoff, and supporting the sustainable design of communities. EPA offers funding for diesel emission reduction programs. Clean Ports USA is the sustainability program for ports. Clean Ports USA, part of the U.S. Environmental Protection Agency (EPA)'s National Clean Diesel Campaign (NCDC), partners with ports and fleet owners, as well as national, state, and local entities, to reduce diesel emissions through the use of verified emission control technologies and innovative operational strategies (www3.epa.gov, 2015).

One of environmental certification used in USA and Canada is called Green Marine Program. Green Marine is a voluntary marine industry initiative with the goal of achieving levels of environmental performance that exceed regulatory requirements in areas such as air/land/water emissions. The cost of Green Marine's

annual membership dues varies according to a participant's size of operations and type of activity namely as; a ship owner, port, terminal, seaway corporation or shipyard. Every company must adhere to Green Marine's guiding principles. It addresses key environmental issues through its 11 performance indicators which are aquatic invasive species, cargo residues, community impact, dry bulk handling and storage, environmental leadership, garbage management, greenhouse gas emissions, oily water, pollutant air emission nox, pollutant air emission sox&pm, prevention of spills and leakages. In addition to respecting laws and applicable regulations, every company that joins Green Marine agrees the followings (<http://www.green-marine.org/>, 2015);

- a. Demonstrate corporate leadership in the search for best environmental practices in accordance with a sustainable development approach.
- b. Carry out its activities in a responsible manner with a view to minimizing its environmental impacts.
- c. Aim for continuous improvement of its environmental performance.
- d. Develop and promote voluntary protection measures.
- e. Integrate sustainable development practices that are economically and technically achievable.
- f. Collaborate with governments and citizen groups in the progressive implementation of the action plans arising from the Green Marine Environmental Program.

On November 20 in 2006, the ports of Long Beach and Los Angeles took an unprecedented joint action to improve air quality in the South Coast Air Basin by adopting the San Pedro Bay Ports Clean Air Action Plan (CAAP), a sweeping plan aimed at significantly reducing the health risks posed by air pollution from port-related ships, trains, trucks, terminal equipment and harbor craft. The CAAP was developed with the cooperation and participation of the South Coast Air Quality

Management District, California Air Resources Board and U.S. Environmental Protection Agency (<http://www.cleanairactionplan.org/>, 2015).

The CAAP was a landmark air quality plan that established the most comprehensive, far-reaching strategy for reducing port-related air pollution and related health risks, while allowing port development, and the job creation and economic activity associated with that development, to continue. The plan ushered in a slew of anti-air pollution strategies including the ports' Clean Trucks Programs, vessel pollution reduction programs, and advanced new technology, such as the world's first hybrid tugboat (<http://www.cleanairactionplan.org/>, 2015).

1.2.3. Ports of Asia & Sustainability

The countries especially in North-East Asia have a large population that is more than double of combined population of NAFTA and EU. Intraregional trade among Japan, the Republic of Korea and China shown a positive pattern. Sea transportation has a key role in facilitating the movement of goods and people in Asia. Main routes in shipping are between Japan, China and the Republic of Korea (United Nations, 2005).

In Asia ISO 14001 standard requirements are the main drivers of sustainability in Asean Ports. The ISO 14000 family of standards provides practical tools for companies and organizations of all kinds looking to manage their environmental responsibilities. It maps out a framework that a company or organization can follow to set up an effective environmental management system. It can be used by any organization regardless of its activity or sector. Also, cold ironing is used in Hong Kong which refers to shutting down auxiliary engines on ships while in port and connecting to electrical power supplied at the dock. (Millar, 2010:17-24).

Singapore port has launched a green port programme to encourage ocean-going vessels at Singapore to reduce the emission of pollutants by giving a 15 per cent concession in port dues. Shanghai port Administration Centre published a report on the environmental protection of Shanghai port, and indicated that the Shanghai Municipal port Administration Bureau is responsible for the supervision and

management functions of the environmental protection and pollution management of the port (Feng, 2012:2-14).

In short, most port authorities like Shanghai, Hong Kong, Singapore, Kaohsiung and international organizations like Pacific Ports Clean Air Collaborative, International Association Of Ports And Harbours have come up with six green port performance indicators: speed reduction after landfall, cold ironing, using electrically powered equipment, encouraging the use of low-sulphur fuel, a willingness to reuse recyclable resources, and encouraging public transport mode development (Lirn, Wu and Chen, 2013:433).

1.2.4. Ports in Mediterranean Sea & Sustainability

The intensification of maritime traffic in the Mediterranean is good for overall world business, as water transport is energy-efficient, it can even allow for more environmentally friendly transport of cargo and people. Activity at busy ports create air, water and noise pollution that is bad for the environment and the quality of life in the areas around the ports. The Managing the Environmental Sustainability of Ports for a Durable Development Project (MEPS) works to reduce air, water and noise pollution in Mediterranean ports, through a combination of efforts aimed at technical, administrative and communication solutions. In details, the project proposes, on the short term, to:

- a. Reduce pollution sources in ports and nearby urban areas;
- b. Define methodologies, technologies and procedures adaptable to different port contexts and transferable in Mediterranean context;
- c. Reinforce competences of public-decision makers and local administrators, particularly regarding the communication between people in charge of management and planning of port and nearby urban areas;
- d. Guarantee environmental, economical and social sustainability in every expected actions, outputs and results. That permits to reach the port sustainability target;

- e. To retrain degraded and unhealthy port areas and to give back to citizens, tourists and workers an healthier and usable environment and, on the long term, to:
- f. Create a long lasting cooperation network, that in a first time involves partners and then other Mediterranean ports interesting in sustainable development of their areas, infrastructures and procedures.
- g. Formulate legislative tools giving the starting point for the creation of a common law for Mediterranean ports. In this way best-practice exchange and collaboration between research institutions around the development of sustainable approach and technologies in port ambit will be favourite.
- h. Create certification processes for procedures and tools that allow objectively to value the sustainability of ports and the authority of persons in charge of their installation, management and maintenance (www.mesp.org, 2015)

1.3. Sustainability in Port Management

Although sea transportation may be globally considered as one of the most environmentally innocuous forms of transport, the magnitude of its activity – large ports, large vessels – makes port activity subject to special precautions to ensure that it adheres to sustainable development conditions (Peris-Mora, Orejas, Subirats, Ibáñez and Alvarez, 2005:1649). The intensification of maritime traffic, both in terms of goods and passengers, needs to be accompanied by an environmentally sustainable management of port areas so to reduce harmful consequences for local populations. Harbour operations create environmental impact because of logistics, traffic congestion load/unload phases of bulk carriers and energy supply. Increasing environmental awareness creates new challenges for the development of ports. International and national legislations for new ports or extensions of ports are increasingly based on strict regulations aiming at creating designs with minimized environmental impact and sustainable operations in the long term (Quaranta, Coppola, Fantauzzi and Battistelli, 2012:445-449). Precautions for sustainability can be divided into 5 categories as energy usage, waste management, equipment management, social affairs and job security.

1.3.1. Energy Usage & Efficiency

The natural resources of fossil fuels, such as oil and natural gas are dwindling increasingly because of the rapidly growing energy consumption of our modern society. Energy consumption in port terminals can be a significant overhead cost for terminal operators. The cost of energy and the associated emissions are often viewed as a fixed condition that the terminal manager has little control over. Diesel is typically used to fuel mobile equipment, while electricity is purchased to power cranes, reefers, electrically powered mobile vehicles, lighting and buildings. Great economic, environmental and social impacts are generated by the massive use of diesel oil for developing non-stop operatives at ports (Hippinen and Federley, 2014:12-13) .

As Table 4 shows the priority rank of energy consumption in Europe ports.. Its rank is seventh in 2009 and thirteenth in 2013. Energy consumption and efficiency can be seen as a rising topics for the port industry. This amount of change clearly reflects the new political priorities on energy efficiency and precautions for climate change.

Table 5. The 17 Best Practices with The Highest Ranking in The Climeport Project.

DESCRIPTION OF BEST PRACTICE (BP)	EVALUATION CRITERIA								Total BP rank
	1.- The BP reduces significantly the CO2 emissions	2.- The complexity degree of the required knowledge for the BP implementation is appropriate / affordable	3.- The local availability of resources/supply for the BP implementation is appropriate	4.- The port has the needed capacity (technical and human) to implement the BP	5.- The economical investment for the BP implementation is appropriate / affordable	6.- The investment payback of the BP implementation is appropriate	7.- The current normative does not introduce barriers for the BP implementation	8.- The current port organization does not introduce barriers for the BP implementation	
Emission reductions in fleet vehicles in Port Authorities	5,00	5,00	4,67	4,67	3,67	4,00	4,67	4,33	4,22
Electric Consumptions Monitoring	4,33	4,67	4,67	4,33	4,00	4,00	4,67	4,67	4,21
Vessels Speed reduction entering in the port	4,33	3,89	4,33	4,22	4,33	4,33	3,67	2,89	4,13
Improving in the consumption of exterior lighting of roads, yards and docks	4,67	4,33	4,33	4,33	4,00	4,00	4,33	3,67	4,11
Optimisation of indoor lighting systems in buildings	4,11	4,33	4,33	4,33	4,33	4,11	3,67	3,67	4,06
Energy Efficiency Renewable in Sanitary Water Production	3,83	4,33	4,67	4,17	4,17	3,67	4,83	4,67	4,04
Improvements in energy management of concessionaries companies.	4,33	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,02
Reduction of machinery fuel consumption	4,00	4,00	5,00	4,00	4,00	4,00	4,00	2,00	3,92
Environmental R&D in Port	3,67	4,00	4,00	4,00	4,00	3,67	3,67	3,67	3,74
Establishment of a gardening model for the optimization of the capture and sequestration of CO2 in the Green System of the Port of algeciras Bay	3,33	3,67	3,67	3,67	4,00	3,33	4,33	4,33	3,67
Clean Fuels usage for Port Mechanisation	4,67	4,33	4,33	4,33	3,00	3,67	3,67	2,33	3,64
Installation of transformers in accordance with the standard HD 428.1 S1.	4,00	4,50	4,00	4,00	3,00	3,50	4,00	4,00	3,63
Installation of Wind Energy in port facilities	4,33	4,33	3,67	3,67	3,33	3,33	4,00	4,00	3,59
Installation of Photovoltaic Energy in administrative buildings of APBA	4,00	4,33	4,67	4,33	4,00	3,00	3,67	4,67	3,50
On shore power supply (OPS)	4,67	4,00	3,33	3,33	3,33	3,00	3,67	3,33	3,32
Economy Software for optimised fuel compsumption for Harbour Mobile Crane	3,89	3,33	3,33	2,78	2,44	3,33	3,67	3,33	3,28
Use the thermal inertia in industrial cooling facilities	4,00	5,00	3,00	4,00	3,00	3,00	3,00	4,00	3,21

Source : Climeport, Methodology Assessment Handbook, September 30, 2014

The Climeport project proposes the assessment of different methodologies in order to combat global climate change. The project takes place in several countries in the Mediterranean region. The project aims to develop and implement solutions in order to mitigate climate change by means of actions in maritime and inland transport, energy saving and efficiency, implementing the world port climate declarations, and designing an environmental indicators system as a footprint based on CO2 emission levels. In the Climeport project 30 good practices for reducing the greenhouse gas emissions and carbon footprints of ports were identified and tested. Table 5 lists the 17 highest ranked practices. Several of these practises are similar to those identified in this study as good practices that can improve the energy efficiency of ports. With the utilization of an Energy Management Program, these cost and emissions can be minimized. An initial reduction of 10 percent in energy cost and emission is typical with minimal capital investment, plus payback in less than two years and more than 15 percent return on investment. It is possible to use the same amount of energy but at a much lower cost. For example, the specification of energy-efficient Light Emitting Diode (LED) floodlights into container and bulk handling equipment dramatically reduces energy consumption and moves terminal operators closer to global goals of long-term sustainability and profitability (Graffney, 2011:10).

The Energy Management Plan should also increase understanding of where, when, and how energy is used. This is the energy assessment part, which provides the baseline of energy consumption and cost by each piece of equipment or system, as applicable. The purchasing policy and overhaul-versus-repair policy are an integral and cost-effective part of the energy management plan. Having a set of requirements that provide efficiency guidance is a cost-effective way of ensuring energy efficient equipment replaces older, inefficient equipment. Examples of efficiency requirements might be that all electricity-consuming equipment purchased must be energy star rated; all motors purchased must be of premium efficiency, and so on. The most cost-effective time to upgrade with energy efficient equipment is when equipment requires major maintenance or undergoes failure (Graffney, 2011:11).

Operational policies and changing corporate culture is often a significant hurdle to overcome but is typically one of the most cost-effective ways to reduce energy costs and emissions. Worker support and input is critical to a successful Energy Management Program. The majority of the workers support a good Energy Management Program that is realistic and does not put an extra-large burden on the employees. Once they know that energy costs and emission reduction is important to the corporation, and are given the tools and training to foster the Energy Management Program, the employees will continually improve the program (Graffney, 2011:12).

Also there is a project about energy efficiency of ports. Green EFFORTS, "Green and Effective Operations at Terminals and in Ports", is a collaborative research project, co-funded by the European Commission under the Seventh Framework Programme. Its goal is to investigate the current energy mix in ports and terminals while identifying activities which account for real energy savings, and investigating the range of regenerative energy sources which could be adapted to port and terminal environments, with the knowledge and project achievements transferred to stakeholders in the maritime sector through dissemination activities. For the purposes of this study, there are several aspects of operation that affect the energy efficiency of a port as the following (www.green-efforts.eu, 2015):

- Energy monitoring and management systems
- Lighting technologies and lighting control
- Building and warehouse energy efficiency
- Energy use and operation of the machines and vehicles
- Shore-to-ship power systems
- Co-operation between different actors at the port

1.3.2. Waste Management

Important contributors of marine pollution come from land based sources, generally ship and port wastes caused by shipping and marine activities. Large ports are the major source of pollution because of discharges of waste, bilge washing and the use of toxic chemicals and paints (Stoyanov, Kozarev and Ilieva, 1998:185). Waste management is a very important area of port sustainability management. The most considerable goal of waste management plans and actions is to decrease and eliminate dumping wastes illegally to the sea environment. Unfortunately, waste handling and illegal dumping take place in many ports around the world because of inefficient waste management operations, lack of control, inefficient recovery systems and inefficient information flow. European Council Directive and Convention for the Prevention of Pollution from Ships provide an international framework on management of ship and port wastes. Port wastes can be classified as hazardous or non-hazardous, according to their origin, content and properties. Although the discharge of both types follows quite similar management processes, they are subject to different ways of disposal and recovery. Some wastes are not hazardous such as glass, paper, plastic, scrap wood, brochures, coffee filters, magazines, newspapers, scrap metals, shrink wrap, aluminium cans, cardboard, metal, pallets, plastic bottles, wood dunnage. These wastes can be subject of successful alternative management and recycling methods. On the other hand, some wastes are hazardous. Ship generated hazardous waste can be (Palantzas, Papachristou and Vafaki, 2008:1-2):

- Oily waste (e.g. bilge water, sludges, used lubricating oil, dirty ballast water, oily tank washings, fuel residues),
- Noxious liquid substances (e.g. dirty polluted ballast water, cargo residues containing noxious liquid substances, tank washings),
- Sewage (e.g. waste from WC scuppers and toilets, drainage from medical premises),
- Cargo-associated waste (e.g. tattered sacks containing hazardous cargo),
- Maintenance waste (e.g. incineration ash, scraped paint, oily rags, batteries, electrical equipment empty barrels, oil filters),

- Waste coming from the cleaning of ship exhausts.

On the dry side, ports comprise activities and operations from personal to industrial level, so various types of hazardous waste can be generated such as (Palantzas, Papachristou and Vafaki, 2008:3-4);

- Contaminated dredged material : Construction works and dredging may be subject to hazardous waste management.
- Packaging containing residues of hazardous material : Such packaging can be generated from building, ground, offices and equipment maintenance (e.g. pesticides, herbicides, fertilizers, surfactants, detergents, insecticides, white spirits, cartridges, varnishes, resins, paints) and workshops (carpenter's shop, machine shop, vehicle and equipment maintenance) where machinery maintenance/repair activities take place (e.g. coolants, solvents, adhesives, oils, hydraulic fluids, brake fluids, greases).
- Asbestos : Asbestos can be found in several places in a port: roof sheets and slates, lagging on boiler and central heating, boiler flue, interior walls, gaskets.
- PCBs: Polychlorinated Biphenyls can be found as dielectric fluids in port electrical equipment such as transformers, capacitors, heat transfer and hydraulic systems.
- Waste electrical and electronic equipment: IT and telecommunications equipment (e.g. personal computers, printers, facsimile), lighting equipment (e.g. fluorescent lamps, high intensity discharge lamps), equipment used in various workshops, are some of the electrical and electronic equipment used in ports (offices, vehicles workshops, warehouses, machine shop, carpenter's shop, headlamps, dome lamps).
- Batteries and accumulators: Can be generated from offices/personnel uses (e.g. calculators, watches, radios, clocks, cameras) and maintenance/repair of vehicles and work machinery (e.g. auxiliary cars, forklifts, straddle carriers).
- Waste oils: Oily wastes are a common element in port maintenance activities related to vehicles, equipment and work machinery, as they are needed to

allow engines and mechanisms to function: hydraulic oils, engine, gear and lubricating oils, insulating and heat transmission oils.

- Wastes from human health care: In some ports there are healthcare premises, where medical waste can be produced. Disposal of this waste is an environmental concern, as many medical wastes are classified as infectious or bio hazardous and could potentially lead to the spread of infectious disease.
- Hazardous cargo remnants: Leaks of bulk or dry cargo on quays during handling and storage activities is a daily element in port areas.
- Waste water: Waterfront drainage, which may carry contaminated silt/sand, oils, minor hazardous cargo spills, storm water run-off from contaminated land or storage areas and untreated sewage discharges, are the main port land-based sources of waste water.
- Oil / Noxious substances spills: During handling of cargo, fuelling and other port activities, accidents and incidents can occur involving the spill of oil products or/and noxious substances on quays or sea surface. Appropriate spill response procedures must be provided while adequate supplies of spill response means and equipment must be maintained in accessible port locations.
- Other hazardous waste: Any material contaminated with oil or other hazardous substance, like oily rags, oil filters, contaminated barrels etc, which cannot be classified on the above-mentioned categories.

The European Council Directive on port reception facilities for ship generated waste and cargo residues was adopted on 27th November 2000 and member states required to bring into force legislation to implement it by 28th December 2002. Depending on the size and business of the port, this can cover a range of ship-generated wastes and cargo residues including various types of oily waste, chemical waste and garbage (Carpenter and Macgill, 2003). Moreover, the International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. The Council Directive pursues the same aim as the MARPOL 73/78 Convention on the prevention of pollution by ships, which all the EU Member States have signed. However, in contrast to the

Convention, which regulates discharges by ships at sea, the Directive focuses on ship operations in Community ports and addresses in detail the legal, financial and practical responsibilities of the different operators involved in delivery of waste and residues in ports (Journal of European Communities, 2000). The main features of the Directive are (Palabiyik and Altunbas, 2004:2):

- Each community port shall have a waste management and handling plan. Plans must be checked and assessed by the Member States and approved by them at least every three years;

- Each community port shall ensure that there are adequate waste reception facilities for vessels normally calling at a port. Member States must ensure that port collection facilities are provided which meet the needs of the ships using them without causing abnormal delays. These facilities must be tailored to the size of the port and to the categories of ship calling there;

- All ships calling at a port must land their ship generated waste unless they have enough storage capacity for the waste to be delivered at a subsequent port;

- Ports must establish cost recovery systems to encourage the delivery of waste on land and discourage dumping at sea. All ships calling at a Member State port will bear a significant part of the cost (which the Commission interprets as meaning at least 30%), whether they use the facilities or not. These cost recovery systems comprise a built-in, fixed element and, possibly, a variable element according to the amount and type of waste actually delivered. The cost of the port reception facilities shall be covered through the collection of fees from ships. The amount and the basis on which the fees have been calculated should be made clear for the port users;

- The fees should be fair, transparent, non-discriminatory and reflect the costs of the facilities and services made available.

- Ships may be inspected. The choice of those to be inspected will focus mainly on ships which have not complied with the notification requirement and those suspected of not having delivered their waste.

International Organization For Standardization (ISO) issued a standard for waste management in ports. ISO 16304:2013 applies to the management of ship generated waste regulated by MARPOL that is discharged at ports and terminals. It covers principles and issues that should be considered in the development of a port waste management plan, its implementation and port reception facilities operations. The procedures to operate the port reception facilities and the development of a port waste management plan are closely linked and therefore are integrated into ISO 16304:2013. ISO 16304:2013 addresses the principles and issues that should be considered in (www.iso.org, 2015):

- a. The development of a port waste management strategy;
- b. The design and operation of port reception facilities;
- c. Port waste management plan development, implementation and compliance;
- d. Port reception facilities management and accountability.

In conclusion, a waste management plan is necessary in ports. The following elements should be addressed in the port waste management plans (Palabiyik and Altunbas, 2004:4-5):

- A summary of relevant legislation and official regulations for delivery;
- Identification of a person who responsible for the implementation of the port waste management plan;
- An assessment of the need for port reception facilities meeting the need of the ships normally visiting
 - the port;
- Examining the types and amounts of waste and cargo residues delivered in the port;

- A description of the treatment equipment and processes in the port;
- A description of the type and capacity of port reception facilities;
- A detailed description of the procedures for the reception and collection of ship generated waste and cargo residues;
- A description of how the ship generated waste and cargo residues are disposed of;
- A description of methods of recording use of the port reception facilities;
- A description of methods of recording amounts of ship generated waste and cargo residues received in the reception facilities;
- Description of the charging system;
- Procedures for reporting inadequacies of port reception facilities;
- Procedures for consulting with port users, waste contractors, terminal operators and other interested parties in the city management context.

In addition the plans include:

- Reference to proper delivery of ship generated waste and cargo residues;
- Location of port reception facilities shown on the diagram, and map of the port;
- Information on the groups of ship generated waste and cargo residues, which can not be disposed into the sea and which have to be delivered to the port reception facilities;
- A description of the waste sorting system;
- List of ship generated waste and cargo residues dealt with in the port;
- List of contact persons, the operators and the services offered;
- Description of procedures for waste delivery;
- Description of charging system;
- Procedures for reporting inadequacies of port reception facilities

1.3.3. Equipment Management

With a view to meeting customers' requirements and adapting to the changing market, producers of port equipment try to provide more automated and sustainable solutions containing future oriented options. There are lots of equipments that are used in many activities like ship loading and discharging, quayside to stackyard/warehouse transportation, storage and distribution of containers, intermodal/trimodal transshipment, bulk and general cargo handling. In loading, discharging and transportation, new types of cranes and vessels are produced and used. They are more efficient and environmentally friendly. New Euro 5 technology diesel motors are used. Also equipments which are run by electricity are used in port activities too (Vujicic, Zrnica and Jerman, 2013).

Emissions in ports come from several different sources. The main pollutants at ports are vessels, harbour craft, cargo-handling equipment and trains and heavy vehicles within or near the port. Most common in cargo handling equipment fleets are utility tractor rigs, followed by forklifts, handlers and gantry cranes. The two most common machines found at the container terminals, the rubber tired gantry crane and the utility tractor rig. The cranes are powered by a diesel generator set, consisting of a diesel engine coupled with an alternator. Utilizing this type of power system on a rubber tired gantry crane allows the crane to move independently throughout the container terminal as required by daily port operation. The freedom of movement and the high peak power demand for the hoist motor consume a large amount of fuel and emit significant amounts of green house gases. Utility tractor rigs are heavy-duty offroad single cab trucks designed for moving cargo containers. In each use of a crane or handler, the container is ferried around the yard using a utility tractor rig. So, utility tractor rigs are the most influential category of equipment in terms of fuel consumption and air emissions (Vujicic, Zrnica and Jerman, 2013:548).

Today, a variety of systems and technologies are available to reduce fuel consumption and emissions, and improve overall efficiency both for the rubber tired gantry crane and the utility tractor rig. New systems for rubber tired gantry crane include technologies such as variable-speed generators, flywheel energy storage, hybrid RTGs with regenerative braking and super or ultra-capacitor technology and

electrified ‘zero emission’ cranes. In the past, electrified rubber tired gantry cranes were often avoided due to complicated electric power cable arrays, reduced movability and limited flexibility. Recently, electrified rubber tired gantry cranes’s disadvantages have been overcome with the cable reel and most recently with a drive-in conductor bar solution with a collector trolley that automatically engages and disengages. For 90% of operating time, electrified rubber tired gantry cranes use only electricity and use their diesel engines for the remaining 10% of time, during block changes and maintenance. The manufacturers of electrified rubber tired gantry cranes promise a massive potential for CO2 reduction. Also, for utility tractor rigs, the most common solutions tested at container terminals make use of alternative fuel options (LPG, CNG and biodiesel), hybrid (diesel-electric and dieselhydraulic) and electric drives, often regarded as ‘zero emission’ utility tractor rigs. The major issue of idling is efficiently resolved with hybrid and electric utility tractor rigs, where no energy is used during stops, reducing both exhaust emissions and noise pollution (Vujicic, Zrnica and Jerman, 2013:548-549).

Moreover, ships produce harmful fumes, noise and vibration when berthed at the port. It affects the whole environment; the health of port workers, onboard personnel, and the inhabitants of port cities. While a ship is berthing its auxiliary engines are used for lighting, heating, hot water, fans, engines, etc. These operations consume diesel or heavy oil and generate exhaust fumes and noise. The solution is “cold ironing”, also called “shore-side power”. “Cold ironing” means supplying vessels with electricity from the shore during their stay in port enabling their auxiliary engines to be shut down and not use fuels to run necessary operations. The electrical power needed to keep running emergency equipment, cooling, heating, lighting and any other equipment is provided by a shore based generator or even directly from the port city’s power grid. The actual term comes from the act of turning off all internal combustion engines and as a result “the vessel is going cold”. It first came into use when a range of vessels were equipped with fired iron clad engines; while these vessels were at berth there was no need of feeding the fire production steam, used for propulsion, so engines would lower their external temperature eventually going cold (Theodoros, 2012:8).

Considering financial and economical aspects, it is important to underline that cold ironing is most effective and convenient for those vessels that call frequently at the same port and operate on dedicated routes, and for those that consume huge amounts of power and emit high levels of air pollutants when berthed. Cold ironing is a key element of the Clean Air Action Plan in ports.

The main benefits generated by the application of cold ironing are positive social and environmental influences. Firstly, if this innovative technology is implemented properly, it can contribute to air quality improvement. The use of cold ironing could lead to a significant reduction in CO₂ emissions. Cold ironing system, because of the higher efficiency and the “limiting emissions facilities” in lower plants, permits to save more than 30% of CO₂ emissions and more than 95% of nitrogen oxide and particulate. It has been demonstrated that, in 10 hours of stop of a cruise ship, its emissions drop from 72.2 to 50.1 tonnes of CO₂, from 1.47 to 0.04 tonnes of nitrogen oxide, and from 1.23 to 0.04 tonnes of sulphur oxide. This system also allows to reduce noise pollution. Other positive impacts are better onboard comfort while in port, green profiling for ship owners and customers, and also reduced lifecycle cost by reduced fuel consumption and maintenance cost (Arduino, Murillo and Ferrari, 2011).

Choosing the right equipments for cold ironing concept is important. The world’s leader here is the port of Göteborg, Sweden, which first introduced this concept. (Journal of Baltic Transport, 2008) Many ports in Europe and USA use this innovation in their ports (Table 5).

Table 6. Cold-Ironing Installations in Europe and USA.

	Connection voltage (kV)	Frequency (Hz)
<i>European ports</i>		
Goteborg (Sweden)	0.4 6.6 10	50
Stockholm (Sweden)	0.4 0.69	50
Helsingborg (Sweden)	0.4 0.44	50
Piteå (Sweden)	6	50
Antwerpen (Belgium)	6.6	50/60
Zeebrugge (Belgium)	6.6	50
Lubeck (Germany)	6	50
Kotka (Finland)	6.6	50
Oulu (Finland)	6.6	50
Kemi (Finland)	6.6	50
<i>USA ports</i>		
Los Angeles	0.44 6.6	60
Seattle	6.6	60
Washington	11	60
Pittsburg (California)	0.44	60
Juneau (Alaska)	6.6 11	60

Source: Quaranta, Coppola, Fantauzzi and Battistelli, 2012:949

1.3.4. Social Affairs

Ports have relationships with government, local municipalities, local people and customers. Ports' relation with the society surrounds is very important because they are stakeholders of the ports. Various stakeholders are considered as the main actors which motivate ports to incorporate sustainability factors into their operations. Public policy stakeholders and community stakeholders are the main stakeholders for sustainability. Public policy stakeholders are government departments responsible for transportation and economic affairs, environmental departments and special planning authorities. Community stakeholders are civil society organizations, the general public, the press and the other non-market players.

The higher the level of coordination and integration between the stakeholders of port, the higher the sustainability for the port. Organizational interlinkages among port and stakeholders provide ports with access to critical resources such as technology, markets, capital and knowledge. The evaluation of stakeholder management capability, effective stakeholder communication and consultation, stakeholder involvement in port related decisions, durability and stability of stakeholder relations, stakeholder satisfaction and commitment in stakeholder relations

management activities may provide the achievement of port sustainability (Sakar and Cetin, 2012).

Promotion and communication of the port has an important role in its relationship quality with its society. The port may have a bad reputation because of congestion problems, bad hinterland connections, severe union actions, a less tolerant customs administration and bad environmental effects. However, with a good promotion activity, people can be aware of the port's positive specialities such as a safe and deepnautical access, modern handling gear and a highly productive labour force. Clients and potential clients have to be told that circumstances have changed in the port. So, promotion can be defined as communication among the port and different target groups in order to inform them and influence their attitudes and behaviour towards the port.

There are different types of promotion tools that port management can use. These tools are advertising, direct mailing, international shipping exhibitions, organizing port days, personal selling/direct business trips, representatives, domestic networking, domestic fairs, school visits, organizing conferences, speaking in conference and international press days etc (Bernald, 1995):

- a. Advertising : Objectives of advertising are enlarging the general reputation of the port, open the way for sales, improving the image of the port, increasing the recognition of the port and highlighting the quality elements of the port.
- b. Direct mailing : Direct mailing brings the port closer to the identified potential client.
- c. International shipping exhibitions : The exhibition has the advantage that targeted people can be met in one week and possibility of presenting the port and its services in an optimum manner by means of pictures, movies and models occurs.
- d. Organizing port days : The presentation can be made up of a general introduction on the port and some other speakers can highlight the strong points of the port in the commercial, nautical and technical field.

- e. Personal selling- direct business trips : It has a goal that contracts are deepened and hopefully result in signing a contract. A solid contract can be perfect when there is a mutual understanding by both parties.
- f. Representatives : Some markets need more attention than others. Representatives can be appointed in these markets.
- g. Domestic networking : Special attention can be given to regional development organizations, regional and national investment consultants, chamber of commerce, financial organizations and banks, commercial departments of foreign embassies, national Ministry of Foreign Affairs and of Economic Affairs, consultancy offices for international trade and investments, employer and economic organizations, city and provincial administration.
- h. Domestic fairs : When such a fair is organized in the port's region or town, this can be a perfect tool to influence public opinion. Where a seaport is conceived as a tax consuming governmental institution, polluting environment, ect., a positive image can be created by explaining the direct effects of the development of the seaport on; employment, diversification of the industrial pattern, increase of international trade and prosperity for the region.
- i. School visits : To secure the future of the port, it is necessary to focus attention on the youth. On the other hand, instead of going to visit school, the students from the school can also visit the port. At first sight this may seem like a time consuming activity with no commercial result, however in the long run it can have one. A well structured introduction by someone from the commercial department gives a personal touch to the visit of the young people. The introduction can be followed by a video film or afterwards a visit to the facilities which can include a visit to a ship. A questionnaire can be prepared by the teacher in the classroom and filled in on the spot. With a programme such as this the student will never forget the port.
- j. Organizing conferences : It provides an important promotion for the port and an opportunity to meet people from business sector for a

couple of days. The major advantage is that decision makers come to visit the port.

- k. Speaker at a conference : A speaker at an international conference is another interesting tool for reaching the international community. Besides the international audience there will be other speakers, key managers or government people who can open doors to new markets.
- l. International press day : Well organized and regular meetings with press are essential. A positive article by a reputed Professional journalist in the industry can have a far more effective impact than a whole advertising campaign.

1.3.5. Job Security

Lots of accidents occur in ports. Given the properties of some substances that pass through ports such as chemical products, hydrocarbons, fertilisers and the operations that are carried out on them like loading and unloading, storage, transport, the possibilities of there being an accident are inevitable. There are periodic fires, explosions and toxic releases, with possible consequences of an impact on the environment, alarm among the society and financial losses. According to Major Hazard Incident Data Service (MHIDAS), there were record of 471 accidents for 4 years from 2000 to 2004 in 95 countries. Many accidents begin with a release. Releases are the most common type of accident, appearing in 51% of cases. In second place appear fires, with a rate of 29%, then explosions with 17%. In last place, with a very low percentage compared with the other types, gas clouds occurred with 3%. The principal origin of accidents in ports is transport, with 56.5% of cases. Then, with lower but very similar percentages (around 13%) come accidents in loading/ unloading operations, in storage facilities and in process plants. If the accidents classified as being of warehouse origin are added to those that occurred in storage, that gives 15.5% for this origin, moving it up into second place. All accidents that occurred in moving ships while entering or leaving the port and in lorries or trains entering or leaving port facilities. 43.6% of accidents in ports are caused by an impact or collision between ships or between a ship and dry land,

vehicle collisions, etc. Mechanical failures, external events and human factors, together make up more than 50%. Accidents caused by human factors make contribution of 15.9% (Darbra and Casal, 2004).

There are regulations that apply to all industries because many of the hazards will be the same. But some industries do have specific pieces of legislation. International Labour Organization issues lots of code of practice relating to security in ports. The Governing Body of the ILO at its 286th Session in March 2003, and the Maritime Safety Committee of the International Maritime Organization at its 77th Session in May-June 2003, established a working group of interested parties to draft a code of practice relating to security in ports. The Governing Body of the ILO also agreed that the output of this working group should be formalized at a meeting of experts to be held in 2003 and adopted at that meeting. The working group consisted of representatives from employers, workers and governments along with other organizations with a proper interest in the development of the subject. A draft text was circulated to member States for comments in October 2003, before the meeting of experts, and those comments were collated and summarized for the experts in December 2003 (ILO, 2003).

This code of practice is not a legally binding instrument and is not intended to replace national laws and regulations. It is not intended to affect the fundamental principles and rights of workers provided by ILO instruments or the facilitation of workers' organizations' access to ports, terminals and vessels. It will assist in the identification of the roles and responsibilities of governments, employers and workers. The code of practice provides lots of advantages to ports as the following (ILO, 2003):

- a. The objective of this code of practice on security in ports is to enable governments, employers, workers and other stakeholders to reduce the risk to ports from the threat posed by unlawful acts. The code of practice (COP) provides a guidance framework to develop and implement a port security strategy appropriate to identified threats to security.

- b. The COP on security in ports is part of an integrated approach to port-related security, safety and health issues where security fits into existing health and safety guidance documents.
- c. This COP is intended to promote a common approach to port security among member States.
- d. This COP is intended to be compatible with the provisions of International Convention for the Safety of Life at Sea (SOLAS), the International Ship and Port Facility Security Code (ISPS Code) and resolutions adopted by the 2002 SOLAS Conference. Where terms used in this COP differ from those contained in the ISPS Code, they are specified.
- e. This COP is not intended to replace the ISPS Code. It extends the consideration of port security beyond the area of the port facility into the whole port.
- f. The measures proposed within this COP will apply to the entire port, including port facilities, as defined in the ISPS Code; however, they should not replace the security measures in place within the port facility. The port security assessment and port security plan should take into account the security measures in place within the port facilities, paying specific attention to the relationship between each port facility and the rest of the port.
- g. This COP provides a method of identifying potential weaknesses in a port's security and outline security roles, tasks and measures to deter, detect and respond to unlawful acts against ports serving international traffic and maritime operations by:
 - Recommending that a security assessment is carried out by an appropriate authority in each port.
 - Recommending that a port security advisory committee be formed.
 - Recommending that a security plan be produced covering the issues identified in the assessment and identifying appropriate security measures to be implemented.

- Applying security guidelines to all areas and functions of the port, and those working in, having business with and requiring access to the port or transiting through the port. This includes port workers and other port personnel, seafarers, passengers and passengers' baggage, cargo, material and stores, vehicles and equipment originating from within and outside the port area.
 - Promoting security awareness in the port and the training of personnel appropriate to their roles and responsibilities.
 - Maximizing the effectiveness of security measures through systematic drills, exercises, tests and audits of security procedures to identify and correct non-compliance, failures and weaknesses.
- h. The port security guidelines in this COP may also form a basis for security in domestic ports and maritime operations. 2 Meetings/MESSHP-COP-2003-09-0337-1-EN.Doc/v9
 - i. The COP should be aligned with member States' security and safety strategies. Nothing in this document is intended to prejudice the rights or obligations of States under international law or to compromise the responsibility of national and local security organizations or other authorities and agencies to protect the safety and rights of people, property and operations within their area of jurisdiction.
 - j. This COP is not intended to affect the fundamental principles and rights of workers provided by ILO instruments or the facilitation of workers' organizations' access to ports, terminals and vessels.
 - k. This COP does not affect obligations to comply with applicable national laws, regulations and rules.

1.4. Port and City Relationship

City and port relationship has been effected by internal and external factors since 1960s. These factors are particularly the revolution in shipping industry, the design of port infrastructure and the changes to world transport systems. Ports are

becoming a knot between the international production and the global distribution networks, and the cores of regional development as globalisation deepens and expands. The concept of port as a logistic place implies a new port-city relationship, in which the port functions are not limited with port area but it captures the whole transport and distribution chain giving more added value to the city (Lopes, 2002:1).

Ports creates many advantages and disadvantages for cities. The ports have important impact on the urban development. They contribute the city development through the trade development and creating value and employment opportunities. On the other hand, the pollution caused by port create environment problems. The relations between the port and the port city are dynamic and complex. Even if there have been conflicts between the urban authorities and the port, the development of port always created new opportunities for the port city.

Lots of cities in the world, especially the greatest, had a close relation and integration with their port, the economic wellbeing of many of them being bound with port dynamics. Ports has purpose to maximize their impact on the local, regional and national economy, by creating incomes, the adding value and working places.

Also, There are some problems in the relations of port and port city. The main problems among the port and the port-city are the need of land for port extension and the pollution caused by the port. The most important problem is the permanent need of the ports for extension therefore to increase the land surface. The actual need of the port extension explained through the increasing container traffic, the increasing ship size and the need to grow the safe and security of the port-city inhabitants. Pollution can be noise, bilge water, wastes, fume, dust and vibration in the port (Popescu and Mendadil, 2011).

The technical revolution in the maritime activities in the last century has contributed the transformation of port and city as different entities. The port/city interface has taken the form of an active urban expansion over the port territory by developing cultural activities such as thematic parks, sailing ports, artistic markets, university buildings, public spaces such as parks, specific productive sites such as

technological and science parks, high specialised services such as media locations, multinational centers and residence.

Old ports are located in dense urban areas where the port growth is resisted by saturated road system, increased level of mobility and motorisation in the city. On the regional level, the lack of good sites to locate new ports by natural or territorial conditions -problems of accessibility, not enough water depth, lack of adequate services or infrastructure networks-, implies the concentration of different cargos and different infrastructure requirements in few harbours, which affects the efficient functioning of the port system. The lack of space is a challenge for the city and port management with a view to avoiding constraints to the competitiveness of the port as well as to the regional development itself (Lopes, 2002:2-11).

CHAPTER 2

YACHT MARINAS

Yachts had firstly been used for speed and sport in Netherlands in 16. and 17. centuries while Dutches had the most powerful naval force, maritime transportation, trade and fishing fleets (Johnson, 1989; 10). Dutches were using fast ships while following and hunting sea rovers at that time. These fast ships were called "yaght" which means hunter to describe their funnction. Than these hunter ships have started to called yachts. The desire to arrive first to the port after completing job created yacht races. Later, yachting became a sport. Dutches gave speedboats to queen of England as a gift, than English sailors started to produce yachts which facilitated yachting to spread to all over the world (Dinçer, 1987; 19).

Yachts are any of various relatively small, streamlined sailing or motor-driven vessels used for pleasure cruises or racing. Yacht marinas are small harbours for providing maintenance, repairment, waste management, wintering services to yachts; providing electricity, water, fuel oil, phone, internet to the yachts and providing restaurant, hotel and shopping services to yacht owners (Ercanik, 2003).

The countries who saw the importance of yacht tourism as a profitable sector started to build yacht marinas in a large scale. Yacht marina investments are expensive investments which is mainly supported by states by incentives as cheap credits and long term rights. The yachting for sport and hobby is supported by yacht renting offices because buying a yacht generally is an expensive investment. Yacht marinas are the most important substructure for yacht tourism. There are the demands of a yacht owner from a yacht marina (Ercanik, 2003);

- Security:
 - Blocking natural problems with jetties,
 - Entrerence control of the marina,
 - Security personnel for 24 hours in the marina.

- Basic Needs:
 - Water and electricity services,
 - Fax, telex, telephone, post services,
 - Petroleum supply service,
 - Slip, maintenance and repairment services.

- Others:
 - Agency activities,
 - Food and beverage services,
 - Fun ans sport facilities,
 - Accommodation facilities.

The services that yacht marinas supply are not different than the yacht owners demands. There are the various services that yacht marinas supply;

- Accommodation services: In the yacht marinas, there are small motels for accommodation of yacht owners. Also, security, bathroom, cleaning, toilet, lavatory, posting, fax and internet services are available in the yacht marinas.

- Maintenance services: There are lifting cranes in the marinas to carry the yachts to land. Than repairment, maintenance, painting services are supplied in the yacht marinas.
- Shopping services: There are grocery stores, yacht equipment shop, duty-free shop and gas station in the yacht marinas.
- Restaurant services: There are cafes and restaurants which sale food and beverages to yacht owners in the yacht marinas.
- Sport services: There are places for some sports like table tennis and ect. in the yacht marinas.
- Fun services: Night clubs, bars and game stations and casinos are part of yacht marinas.
- Yacht renting and selling services: People can easily find offices to rent or buy a yacht in the yacht marinas.
- Other services: Canalization, bilge water discharging, waste discharging, fire, medicine, lifeguard, warehouse, bank, cargo, passport services are available in the yacht marinas.

2.1. Yacht Marinas in Turkey

Turkey having a wonderful eoraphic position in Mediterranean Sea, with its protected bays, good climate, rich culture and environmental resources is an ideal destination for yacht tourism. Because of these geographical and social charming of Turkey specialities of Turkey, yachting infrastruacture is developing consistently on the coasts. Yacht tourism in Turkey has come up with the increase of domestic and especially foreign demand in the second half of 1980's. The most important accelerator of yachting in Turkey is the appropriate structure of Aegean and Mediterranean coasts for yacht tourism. In addition world yachters especially from Mediterranean region and other regionsbegun to prefer Turkey marinas in terms of hygiene, intensity and marina citizen habits (Karanci, Guler, Ergin and Yalciner, 2010).

There are 19.000 yacht marinas in the world and 5.000 of them are in Europe. There are 380 yacht marinas in Italy which has 6.500 km coastline, 96 yacht marinas

in Spain which has 4.964 km coastline and 42 yacht marinas that are registered to the Ministry of Tourism in Turkey which has 8.333 km coastline. There are 19.000 yacht marinas around the world and only about 5.000 of them are in Europe. The 46 yacht marinas in Turkey have 25.199 units of yacht capacity (Turkish Maritime Industry Report, 2014:196-200).

Some important yacht marinas in Turkey are as the following;

- In Marmara Region: Güzelce Marina, Marina İstanbul, West İstanbul Marina, Ataköy Marina, Setur Kalamış&Fenerbahçe, Marintürk İstanbul City Port, Setur Yalova Marina.
- In Aegean Region: Setur Ayvalık Marina, Levent Marina, Setur Altinyunus Marina, IC Çesme Marina, Port Alaçatı Marina, Teos Marina, Setur Kuşadası Marina, D-Marin Didim, Palmarina Bodrum, D-Marin Turgutreis, Milta Bodrum Marina, Aganlar Marina, Yat Lift, Marti Marina, Netsel Marmaris Marina, Albatros Marina, Marmaris Marina, My Marina Yacht Club, Marintürk Gocek Exclusive, Marin Türk Gocek Village Port, D-Marin Göcek, Ecesaray Marina, Ege Yacht, Port Iasos Marina, Gökova Ören Marina, Marmaris Club Marina, Club Marina Göcek, Skopea Marina.
- In Mediterranean and Cyprus Region: Setur Kaş Marina, Setur Finike Marina, Kemer Türkiz Marina, Setur Antalya Marina, Çelebi Marina, Alanya Marina, Mersin Marina, Kapraz Gate Marina, Girne Delta Marina (Turkish Maritime Industry Report, 2014:206-201).

In last years, maritime tourism is getting greater and with this developing trend of maritime tourism, demand for yacht tourism is rising too. So, in order to satisfy the rising demand for yacht tourism, old marinas should be modernized and new marinas should be constructed. Ministry of Culture and Tourism is responsible for planning and construction of new yacht marinas in Turkey (Yacht Marina Administration In Turkey, 2012).

Total yacht capacity of marinas which includes non-professional small marinas is 15.725 in 2010. 11.075 of them are in sea and 4.650 of them are on land

(Table 1). The capacity numbers of yacht marinas are not same in different sources like in the previous paragraph and in this paragraph but they are close to each others.

Table 7. Capacities of Marinas and Berthing Facilities in Turkey

Province	No	Marina	Sea	Land
Antalya	1	Kaleiçi Marina	65	0
	2	Çelebi Marina	235	300
	3	Setur Finike Marina	300	150
	4	Kemer Türkiz Marina	240	140
	5	Kaş Marina	450	150
Aydın	6	D-Marin Didim	580	600
	7	Setur Kuşadası Marina	350	175
Muğla	8	Ece Saray Marina	400	0
	9	Fethiye Municipality Marina	150	0
	11	My Marina Berthing Place	75	0
	12	Göcek Municipality Marina	150	0
	13	Port Göcek	385	150
	14	Skopea Marina	67	0
	15	Göcek Club Marina	205	0
	16	Marina Turk Göcek Village Port	185	240
	17	Marina Turk Exclusive	100	0
	18	Bodrum Milta Marina	455	50
	19	Bodrum Belediye Marina	300	0
	20	D-Marin Turgutreis	550	100
	22	Port Bodrum Yalıkavak	350	100
	23	Yat Lift	0	100
	24	Ağanlar	0	200
	26	Albatros Marina	150	240
	27	Netsel Marmaris Marina	676	120
	28	Martı Marina	350	100
	29	Marmaris Yacht Marina	460	575
Izmir	31	Levent Izmir Marina	70	60
	32	Setur Altinyunus Çeşme Marina	180	60
	33	Alaçatı Marina	250	70
	34	Dalyanköy Berthing Place	100	0
	35	İC Çeşme Marina	400	100
	36	Sığacık Marina	400	200
	37	Old Foça Berthing Place	75	0
Istanbul	38	Kumburgaz Güzelce Marina	250	100
	39	B. Çekmece Marina	150	0
	40	Ataköy Marina	700	100
	41	Kalamış and Fenerbahçe Marina	1,010	220
	42	Atabay Marina	0	100
Balıkesir	43	Ayvalık Setur Marina	200	150
Çanakkale	44	Çanakkale Marina	65	0
TOTAL			11,075	4,650

Source: DLHI. (2010). Coastal Tourism Structures Master Plan Study. Ankara

The demand of the services of marinas is different depending on the season of the year. During the summer period, the traffic of leisure crafts increases resulting in higher demand for stay at marinas and ports. On the contrary, during the winter period the demand for shelter increases in order for vessels to be repaired and maintained. The cost of some of the services mentioned above in Turkish marinas are lower than the corresponding ones of the North-western Mediterranean, although their high-quality specifications. The prices of the Turkish marinas are %30 lower

than the prices of marinas of Greeks, and they are 40-60 lower than North-western Mediterranean and the prices are as same as of former Yugoslavia. However, some of the low-cost Greek marinas offer lower prices than the organized marinas in Turkey (Sariisik, Turkay and Akova, 2011).

2.2. Yacht Marinas from Sustainability Perspective

Yacht marinas host to many yachts and provide some services for them. While providing these services, the marinas create environmental problems too. Bilge water discharging and annihilation, waste exists from maintenance and painting of the yachts are some of activities that require sustainable sollutions. Marina authorities should use environmental management plans(EMP) in order to realize both business and environmental benefits at the marina. Some examples of EMP benefits include www3.epa.gov, 2015):

- Improved environmental performance,
- Prevention of pollution and conervation of resources,
- Reduced environmental risks,
- Attracting new and more customers,
- Increased efficiency, more effective work proceures and reduced operational costs,
- Enhanced employee moral and awareness of environmental issues,
- Enhanced positive image with public and regulators,
- Help in getting recognition for good practices like “clean marina” awards in states with those programs.

Clean marinas are proving attractive to more responsible boating customers, may operate more profitably, and can help protect the boating environment. Not every marina can realize all these benefits, but most can come close. A marina should have an environmental policy as part of its business plan. An environmental policy is a statement of a marina business’s commitment to protect the environment, comply with regulations and improve practices. It shows taht managing environmental issues is a high priority for your business. The policy should begin with a statement of marine business’s commitment to environmental management. This should include a

commitment to preventing pollution and to continuously improving environmental performance (www3.epa.gov, 2015). Variety of routine activities can cause pollution. Marinas, like most other businesses, can generate important amounts of nonpoint source pollution through a variety of activities, including hull repair, engine maintenance and fueling. For instance, paints, solvents, oil and gasoline and other hazardous materials generated through boat operation and maintenance are toxic to humans and marine life. Also, trash which can easily be blown off docks and boats and into the water is unsightly and can be harmful to marine animals that become swallow these materials. Because of the close proximity of marinas to the shore, the chance that these contaminants will reach the water is rised.

There are some standards for ports according to International Standards Organization. The ISO 9000 family addresses various aspects of quality management and contains some of ISO's best known standards. The standards provide guidance and tools for companies and organizations who want to ensure that their products and services consistently meet customer's requirements, and that quality is consistently improved. ISO 9001 standard is based on a number of quality management principles including a strong customer focus, the motivation and implication of top management, the process approach and continual improvement, so this is very importns for sustainability of ports (<http://www.iso.org>, 2015).

The International Standards Organization (ISO) has introduced a new standard to help organizations, and in particular small- and medium-sized enterprises (SMEs) such as marinas, to use a phased approach to implement an Environmental Management System (EMS).

Today, organizations increasingly take into account environmental management requirements in their activities. However, even if they can see the benefits, implementing an EMS is not always an easy task.

It will now be made easier by ISO 14005:2010, Environmental management systems – Guidelines for the phased implementation of an environmental management system, including the use of environmental performance evaluation.

The purpose of this standard is to provide guidance for organizations on the phased development, implementation, maintenance and improvement of an environmental management system in order to meet the requirements of ISO 14001, which provides the requirements for an EMS. ISO 14005 also includes advice on the integration and use of environmental performance evaluation techniques.

This International Standard is applicable to any organization, regardless of its level of development, its activities, or its location.

A phased approach offers several advantages:

- Users can readily evaluate how the time and money put into an EMS provides a return
- They can see how environmental improvements help reduce costs, improve their community relations, assist them in demonstrating compliance with legal and other requirements, and help them live up to customer expectations
- They can track the benefits of their EMS while they implement their system step-by-step, adding or expanding elements as they provide value to the organization
- They can focus on the issues that are critical for them, their customers or supply chain.

An EMS meeting the requirements of ISO 14001:2004 is a management tool enabling an organization of any size or type to:

- Identify and control the environmental impact of its activities, products or services
- Continually improve its environmental performance
- Implement a systematic approach to setting environmental objectives, to achieving these and to demonstrating that they have been achieved
- Ensure legal compliance.

Although accredited certification of conformity to ISO 14001 is not a requirement of ISO 14005 or of ISO 14001, many organizations choose to seek accredited certification as an independent confirmation that their EMS meets the requirements of ISO 14001. The ISO Survey of Certifications 2009 showed that up to the end of December 2009, more than 220,000 ISO 14001:2004 accredited certificates had been issued in 159 countries and economies (Heron and Jujū, 2012).

Also, OHSAS 18001 is used for job security and health certification. OHSAS 18001 is an Occupational Health and Safety Assessment Series for health and safety management systems. Its goal is to help an organization to control occupational health and safety risks. It was developed in response to widespread demand for a recognized standard against which to be certified and assessed. OHSAS 18001 was created by number of worlds leading national standards badies, certification badies and specialist consultancies. The OHSAS specification is applicable to any organisation that wishes to (www.ohsas-18001-occupational-health-and-safety.com, 2015):

- a. Establish an occupational health and safety management system to eliminate or minimiza risk to employees and other interested parties who ma be exposed to occupational health and safety risks associated with its activities,
- b. Demonstrate such conformance to others,
- c. Implement, maintain and continually improve an occupational health and safety management system,
- d. Make a self determination and decleration of conformance with this OHSAS specipication

According to a protocol which was signed in 16.12.2014 and between Turkish Standard Enstitute and Directorate General of Merchant Marina, Turkish Ministry of Transport, Maritime Affairs and Communications started “Green Port/ Eko Port Project”. With this protocol 4 main criterias are offered together to ports. These 4 criterias are ISO 9001 Quality Management certification, ISO 14001 Environmental Management System certification, OHSAS 18001 Occupational Health and Safety Assessment Series certification and Green Port/ Eko Port Sectoral Criteria

certification. The ports which can get all of these certification get the certificate of Green Port / Eko Port (Official Website of TSE).

2.2.1. Marina Activities and Potential Impacts to The Marina Environment

Yacht marinas collect pollutants of all types. It is important to have basic knowledge of pollutants and their impacts on the environment in order to understand why sustainable solutions are necessary.

Impacts from pollutants on marine life range from direct poisoning through ingestion of pollutants to indirect habitat degradation through pollution that produces poor water quality and creates coastal waters uninhabitable by marine organisms. The types of pollutants that are produced by individual facilities depend on the activities that occur there. Hull maintenance, boat cleaning, gas and oil from engine maintenance, bilge water, fueling, boat sewage, solid waste, fish waste are the main pollution creators.

2.2.1.1. Hull Maintenance

Hull paints contain metals like pesticides, copper, tin and volatile or organic compounds, all of which are toxic to marine life. Also, solvents and paints release volatile and organic compounds into the air, that are harmful to human life when inhaled. Hull scraping and sanding creates paint chips and dust that can be washed off-side during the rain events. Hull painting can expose fresh paint to marine organisms. Shellfish are vulnerable to these pollutants because paint chips sink through the water column and settle in the sediments where clams, oysters and mussels live and feed. The pollutants can be built up in the animal tissue without being fatal to the specific individuals. On the other hand, when the other animals consume the shellfish they may be affected. Later, the pollutant works its way up the food chain impacting both animals and humans. Long term exposure to certain compounds can produce cancers and abnormal cell development (Epsilon Associates, 2001).

There are some sustainable hull maintenance ways for marina authorities as the following:

- a. Employees should not work on the hull near the water or on the mudflats at low tide,
- b. Employees should not clean the yachts' bottom when it is in the water because toxic paint may be removed,
- c. Employees should use a dust-free sander or wet sander if possible. It will reduce clean up time and is more enjoyable to use because the employees won't be breathing in paint dust. They should ask marina professional if the dust-free sanders are provided through the marina,
- d. If the employees do not use a dust-free sander, they should use tarps and filter cloth to help collect scraps,
- e. Employees should keep the work area clean,
- f. Employees should let emptied paint cans and brushes dry before disposing them,
- g. Employees should share their leftover paint with a friend or marina staff rather than throwing it away. They should dispose of old paint at a household hazardous waste facility in the municipality, or check with their marina professional,
- h. Employees should ask if their facility has a collection area for boat maintenance waste from boaters. If not, they should take home and dispose of as household hazardous waste,
- i. Employees should use water-based paints and solvents. They can find them at most stores that sell marine paints (MCMG, 2001).

Also, there are some best management practices for hull scraping, sanding, and washing. Employing the following best management practices will minimize the potential for pollutants associated with hull paint to reach coastal waters.

- a. Activities that should be restricted to designated areas include abrasive blasting, pressure washing, hull scraping and sanding, and hull painting. Maintenance work such as painting, scraping, and hull cleaning should be done on land, not at marina slips or moorings.
- b. Maintenance areas should be designed and equipped to minimize the spread of pollutants by containing all waste and wastewater generated

from hull maintenance activities for proper treatment and disposal; and covering the containment areas to prevent rainwater from entering these areas.

- c. Discharge of pressure washwater to coastal waters, the ground, or a sewer system is illegal without a permit. Pressure washwater must be collected for pretreatment prior to reuse, permitted discharge, or disposal. Recycle washwater for reuse.
- d. Where practical, conduct vessel maintenance indoors or under temporarily covered areas where the rain cannot cause runoff.
- e. At a minimum, always move each boat inland to the approved work area before scraping or power washing the hull. Do not allow anyone to perform hull maintenance activities on the launch ramp area or in the lift well.
- f. Removal of seaweed and other marine growth on the bottom of boat hulls by divers must be prohibited. This practice is sometimes carried out by owners of sail boats before races in regattas to enhance boat speed. Cleaning of seaweed also removes anti-foulant paint and associated pollutants.
- g. Choose dustless sanders as a best management practice. Dustless vacuum sanders are one of the best ways to control paint dust before it can become a pollutant. Added advantages include keeping a clean workplace, reducing health risks to workers, and reducing clean-up costs and time.
- h. Use tarps and/or filter cloth to catch scrapings and other debris produced during maintenance work. They are inexpensive and low-technology methods to collect debris before it can be washed into coastal waters by stormwater. Have these items available to rent or sell to customers who do their own boat maintenance.
- i. Clean up the designated work area after scraping and painting. Leaving areas cluttered and messy will cause spills and allow pollutants to be tracked outside the work area (Epsilon Associates, 2001).

Painting is a type of maintenance in marinas. There are some best management practices for painting as the following too.

- a. Restrict mixing of paints, solvents, and reducers, as well as the painting itself, to designated areas that are located on a hard surface and isolated from the weather.
- b. Prohibit spray painting on the water. Sprayed paint can be difficult to control. Paint can be inadvertently sprayed into the water and expose marine life to toxic chemicals.
- c. Treat paint spills like oil spills. Clean up immediately with absorbent materials, paper, and/or rags. Since liquid paints are classified as hazardous material, dispose of paint brushes and paint properly.
- d. Make certain that all painting materials are used strictly according to manufacturers' instructions.
- e. Promote use of spray guns that are high volume, low pressure. These spray guns direct more paint onto the intended surface and as a result, less paint gets into the air.
- f. Use brushes and rollers where possible. Spray gun physically agitate the paint during application, which releases more of the chemical compounds into the air. Traditional applications reduce air emissions.
- g. Use water-based paints wherever possible. Water-based paints are environmentally-preferable because they use small amounts of volatile organic compounds solvents.
- h. Provide information to customers who work on their boats at the marina about the potential harm caused by uncontrolled release of paint products. Visible signs, clauses in customer contracts, fact sheets, and tips in mailings are all good ways to communicate this information.
- i. Train your employees to be on the lookout for hull maintenance activities by Do-It-Yourselfers that may be harmful to the coastal environment (Epsilon Associates, 2001).

2.2.1.2. Boat Cleaning

Soaps include ammonia, chlorine and phosphates that can be harmful when ingested. To much use of soaps and solvents can effect badly marine life. The

biggest impact occurs in surface waters where small creatures at the bottom of the food chain is most abundant.

Cleaning agent chemicals can also produce cumulative impacts. Excess nutrients like phosphates and nitrates become available at the lower concentrations and accelerate the growth of plants. This breaks the natural balance in coastal waters and lead to excessive plant growth and decrease in dissolved oxygen.

There are some sustainable ways for boat cleaning as the following:

- a. Employees should minimize the need for soaps and solvents by washing boat frequently with a coarse cloth and some water,
- b. If washing with water does not work, employees should try natural cleaners, such as lime juice, borax, and baking soda.
- c. When employees need to use detergents, always use biodegradable, non-toxic, phosphate-free soaps, and keep the caps on bottles when cleaning to avoid spills. Biodegradable soaps are comprised of natural compounds that breakdown more rapidly in the environment. Even these soaps can negatively affect marine life so employees should always use as little as possible.
- d. The employees should try cleaning teak with a mild soap and abrasive pad, nylon brush, or bronze wool.
- e. The employees shouldn't use cleaning solvents on your boat when it is in the water.

2.2.1.3. Gas and Oil from Engine Maintenance, Bilge Water, Fueling

Oil and anti-freeze are polycyclic aromatic hydrocarbons, a family of chemicals that can cause abnormal cell development and cancer. Oil also contains other chemicals components, such as zinc and sulfur, at toxic levels. Solvents are comprised of carbon compounds that are also toxic.

Oil and fuel float if spilled on water. Bilge water gather oil, Grease and other type of pollutants from engine, the washing down of the yacht deck and leaky fuel lines. When gasoline gets into the bilge water, a hazardous condition can emerge that can lead to gas combustion and an expansion. Because bilge water is sometimes being collected and discharged to coastal waters where the fuel and oil components harm the birds and small animals in the water.

Spilling oil or gasoline during fueling the yacht is a common source of marine pollution. Small drip spills occur regularly and can cause small impacts on the local marine environment. It requires only a small amount of gasoline or oil to cover a large area of water. For example, a single pint of oil released onto the water can cover one acre of water surface area (Epsilon Associates, 2001).

There are sustainable ways for engine maintenance and repair as the following (Tasmania, 2009):

- a. Employees should use a drip tray or groundsheet under the engine to collect oil, grease, solvents or detergents,
- b. They should keep adequate supplies of rags and other absorbent materials for cleaning up small fuel and oil spills,
- c. They should clean engine parts in a properly designated wash bath or over catch pans located in a covered, sealed and bunded area that is graded to a collection pit or sump,
- d. Where possible, They should clean engine parts with a brush rather than with solvents or aqueous degreasers such as alkaline or caustic soda,
- e. They should use water-based or biodegradable strippers, cleaners or degreasers wherever possible,
- f. They should use a funnel when pouring fuel into drums or tanks or use hand pumps to remove fuel from drums,
- g. They should drain oil filters before disposal and never place any containers or boats containing residual oil, fuel or other fluids in industrial waste bins unless they have been drained and wiped clean,
- h. Finally, the employees should use bilge pump/separation services at the facility.

Dumping oily bilge water directly into the water can harm marine life, and is illegal. The following best management practices help to minimize the impacts of oil and other pollution that often results from bilge water discharge (Epsilon Associates, 2001);

- a. Require as part of the environmental contract, or by other appropriate means, that untreated bilge water not be discharged within the marina perimeter. Provide customers with options for proper discharge either by making oil absorbent pads available or by providing services for pumping out bilge water. Encourage them to do the right thing with bilge water.
- b. Make Oil Absorbent Pads Available. Oil absorbent pads absorb oil while repelling water. They are an effective means for collecting oil that leaks into your bilge, and thereby preventing the discharge of oily water. Oil booms can be used in larger boats. Pads should be replaced several times a season and more often if the engine and engine lines are leaky. Make sure your customers who use oil absorbent pads know where they may be properly disposed of at the marina. If oil can be squeezed out of the pad, it must be disposed of as hazardous waste.
- c. Consider purchasing a vacuum pump system to remove bilge water for your customers. A vacuum system removes all of the bilge water and pumps it into drums for off-site treatment and disposal. The drums should be stored in a hazardous waste storage area prior to pick-up. Providing this service will ensure that boaters can comply with the law. It may also generate revenue for the marina.
- d. Make bilge water pumping a requirement for all vessels hauled out at your marina. Include a charge for this service, which is incorporated into the haulout fee.
- e. Sell and install bilge oil filters. These filters clean bilge water on the boat prior to it being discharged overboard. The filter cartridge system is built into the bilge pump system for convenience and efficiency.
- f. Use a portable oil/water separator to treat oily bilge water and contaminated fuel. These systems treat bilge water on-site by directly pumping it through the separator, which removes petroleum products and

sediments. The treated water can then be discharged into coastal waters. The oily water that is removed must be disposed of as hazardous waste.

- g. Promote the installation of oil/water separators in bilges. If your facility is equipped, consider adding separator installation to your list of services. Otherwise, contact local boatyards and find out where these services can be provided. If you discover that your customers are particularly interested in the service, you may be able to receive a commission from the boatyard.
- h. Inform boaters about the negative effects of bilge water discharge. Direct them to solutions for managing bilge water.
- i. Train employees to be on the lookout for bilge water discharge by boaters. Discuss with your staff an effective way to deal with customers who are discharging bilge water. Some boaters may not know that it is an illegal act

Fueling boats is an essential service to boaters and an important revenue generator for many marinas. Marinas with fueling services must evaluate all aspects of their operation, including fuel station design, delivery, and dispensation, to ensure that their facility complies with fire, safety and environmental laws. There are best management practices for fueling in marinas as the following (Epsilon Associates, 2001);

- a. It is necessary to develop a Spill Prevention Control and Countermeasures Plan (SPCC) for all facilities that provide above ground oil/fuel storage capacity in excess of 1,320 gallons or one above ground container of oil with a capacity of more than 660 gallons or underground storage capacity in excess of 42,000 gallons.
- b. It is necessary to keep records of all training sessions for spill response, pumpout use, and other marina pollution prevention procedures.
- c. It is necessary to design boat-fueling stations with spill containment areas so that spills cannot be released to the water.
- d. It is necessary to locate fueling stations where they are protected from passing boat wake waves that may cause unstable conditions for fueling.

- e. It is necessary to install personal watercraft (PWC) floats at fuel docks to raise PWCs from the water and provide a more stable setting for fueling.
- f. It is necessary to secure and lock fueling stations and oil tanks during non-servicing hours.
- g. It is necessary to install automatic back pressure shut off nozzles on fuel pump discharge hoses to prevent overflow spills.
- h. It is necessary to remove fuel nozzle triggers that are used to hold the nozzle open without being held if automatic shut-offs are not used. Nozzles can be purchased through the fuel companies that service the pumps. Prohibit the use of cans or other items to prop the trigger open, especially on large boats with big fuel tanks.
- i. It is necessary to install fuel nozzles that redirect blow-back into vessels' fuel tanks or vapor control nozzles to capture fumes. Blow-back is when fuel comes back out of the fuel vent when the tank fills up. Also consult the fuel pump service provider for more information.
- j. It is necessary to train all appropriate staff annually in the implementation of a spill response plan. Document the training. Also, review fueling procedure practices with staff and customers to reduce all small drips and spills. Include information about fueling in the spill response plan.
- k. It is necessary to be sure that a member of your staff is always on-hand when fuel is delivered so that the marina staff can be sure that fuel delivery is conducted without incident.
- l. It is necessary to locate a small locker with spill response equipment near the delivery area so that the personnel can quickly react to a spill. Also post a telephone number to report a spill

2.2.1.4. Yacht Sewage

Sewage is defined as human body wastes and the wastes from toilets or receptacles intended to receive or retain body wastes. It is also known as black water. In contrast, gray water is galley, bath, and shower water. Untreated sewage in a body of water can come from various sources including faulty residential, municipal, or

marina septic treatment systems, or direct discharges from shoreside facilities and boats (Good Mate, 2001). Raw sewage contains pathogens and water-borne disease which can make people ill. Yacht holding tanks and marina rest rooms are the sources of raw sewage. Sewage and animal wastes contain nutrients that in large volumes, can disrupt the natural chemical balance in water via decreasing oxygen levels.

The problem of discharge and storage of waste waters from vessels has been regulated by international rules and regulations as well as national regulations in maritime countries. The most important international regulation pertaining to the problem of sea pollution from vessels is the *International Convention for the Prevention of Pollution from Ships*, brought by International Maritime Organization. The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes.

The MARPOL Convention was adopted on 2 November 1973 at IMO. The Protocol of 1978 was adopted in response to a spate of tanker accidents in 1976-1977. The Convention comprises of a number of Annexes and Annex IV contains provisions regulating prevention and supervision of marine pollution by sewage waste waters from ships. Annex IV to the Convention refers to (Kobuevic and Kurtela 2011):

- a) prohibiting or limiting discharge,
- b) issuance of certificates and inspections,
- c) equipment and supervision of discharge,
- d) shore reception facilities.

2.2.1.5. Solid Waste

Like all human activities, marinas and yachts produce wastes. Trash and other solid wastes may be harmful to humans and wildlife. Some kind of plastics like nylon fishing line, plastic six-pack holders may be ingested or entangle seabirds and

fish. Also, big pieces of floating trash like boards, can be hazardous to yachts and can cause damage in collisions. Most of the problems with solid wastes are aesthetic. Floating paper cups and cigarette butts in the water are detract from the beauty of sea and from people's enjoyment of their boating experience.

Solid waste from boat cleaning, maintenance, and repair might contain harmful substances such as antifoulant paint chips or solvents used to clean or polish metal or wood parts. Solid waste from general activities and marina use, such as plastic bags, cups, cigarette butts, and food containers, also pollutes surface waters and degrades the habitats of aquatic animals and plants.

Providing sufficient waste receptacles, separating wastes into classes of recyclables, and preventing litter are all accepted practices today and are part of customer service and environmentally friendly management at any public establishment. Marinas generate solid waste through boat maintenance, parties and small social gatherings on boats, restaurants, commercial activity at the marina, and the day-to-day operation of the facility

If adequate trash and solid waste disposal facilities are not available, solid waste is more likely to end up in surface waters or scattered on the marina grounds, from which it might be blown or washed into surface waters. Marina patrons and employees are more likely to properly dispose of solid waste if given adequate opportunity and disposal facilities. The best management practices for solid waste are the following (MCMG, 2001):

- a. Encourage marina patrons to avoid doing any hull maintenance while their boats are in the water
- b. Place trash receptacles in convenient locations for marina patrons. Covered dumpsters and trash cans are ideal.
- c. Provide trash receptacles at boat launch sites
- d. Provide facilities for collecting recyclable materials
- e. Encourage fishing line collection and recycling or disposal.
- f. Provide boaters with trash bags.
- g. Require patrons to clean up pet wastes

2.2.1.6. Fish Waste

Dumping of large quantities of fish wastes in the marina waters can pollute the marina and harm marine life. Bacteria naturally colonize the waste and break it down. So, decomposing fish parts can deplete the oxygen in confined water especially in summer days. This triggers production of bacteria. This can create low oxygen zones in marine life (Epsilon Associates, 2001).

The Best management practices for fish waste are as the following (MCMG,2001):

- a. Clean fish offshore where the fish are caught and discard of the fish waste at sea.
- b. Install fish cleaning stations at the marina and at boat launch sites.
- c. Compost fish waste where appropriate.
- d. Freeze fish parts and reuse them as bait or chum on the next fishing trip.
- e. Encourage catch and release fishing, which does not kill the fish and produces no fish waste.

2.2.2. Incentives for Pollution Prevention at Marinas

There are some incentives for pollution prevention at marinas. Preventing pollution instead of creating it, marinas provide better conditions like less money spending, compliance with the law, attract new customers, have good public image.

2.2.2.1. Pollution Cost Money

By preventing pollution instead of creating it, marinas reduce costs for waste disposal, cut material costs, and improve safety both for employees and customers. If you provide waste recycling and collection facilities and educate yacht owners about best management practices when using and disposing of hazardous materials at the marina, the marina will be cleaner and marina authorities will spend less time and money cleaning up spills and wastes left by the yachts.

2.2.2.2. Compliance with The Law

Marina authorities must comply with numerous hazardous waste control and oil spill response laws. A marina may be liable for significant remediation costs, if hazardous waste contamination occurs. Lenders may require sellers to perform extensive hazardous waste assessments, if a property is being sold and contamination is a possibility. It's easier and less expensive to employ pollution prevention measures before contamination becomes a problem.

2.2.2.3. Attract More Customers

Clean marinas attract more customers. A clean marina increases the pleasure of yachting experiences, and reinforces the public image that yachting is clean and fun. Establishing environmental policies promotes good management practices by staff and customers. Being clean effects customers' preferences.

2.2.2.4. A Good Public Opinion

The best way to promote and establish the perception of marinas and boaters as responsible, careful stewards of water quality is to become proactive. Marinas should take steps to protect water quality. Also, they should let close community know that the marina cares about the environment and that the marina is actively doing something about environments (Washington State Department of Ecology, 2009).

CHAPTER 3

CASE STUDY ON MARINAS AND TRADE PORTS

The thesis includes a case analysis which is about sustainability of two yacht marinas in Antalya, Turkey and a trade port in Bursa, Turkey. The sustainability of these three yacht marinas had investigated.

Qualitative case study had used as a research method in the thesis. Some questions had asked to managers, photos had took from the marinas and the port and some documents had took related to sustainability. However, Confidential information about the marinas and the port couldn't taken. Because the port authorities were so busy in each time, reseach questions was able to asked only general manager, technical manager in T Marina and technical manager in S Marina Antalya. Even interviewes has done with a little people, they were the most responsible and knowldgeable managers in the marinas. In the R port which was rekated to trade interviews has done with all the responsable managers.

3.1. Research Methods

There are four types of data collection methods in social sciences. These are survey research, experimental research, case research and interpretive research. Also, there are two types of data analysis which are qualitative and quantitative data analysis. Quantitative methods are divided in to two part which are descriptive statistics and inferential statistics. In this thesis, case study method is used as a data collection method and qualitative method is used as a data analysis method.

3.1.1. Case Study Method

Case research, also called case study, is a method of intensively studying a phenomenon over time within its natural setting in one or a few sites. Multiple methods of data collection, such as interviews, observations, prerecorded documents are used in case study. Conducting a case research can be divided in to 9 parts.

- I. Define research questions: Case research must start with defining research questions that are theoretically and practically interesting and identifying some intuitive expectations about possible answers.
- II. Select case sites: The researcher should use a process of theoretical sampling to identify case sites. Care should be taken to ensure that the selected sites fit the nature of research questions, minimize variance due to firm size, industry effect and so on. For example, the researcher should select firms of similar size and industry in order to examine how some firm innovate better than others.
- III. Create instrument and protocols: The researcher should prepare a list of questions. The questions may be open ended or close ended or a combination of both. The interview protocol must be strictly followed. Order of the questions must not be changed or any question must not be skipped during the interview process. Additional sources of data, such as internal documents and memorandums, annual reports, financial statements, newspaper articles, and direct observations should be sought to supplement and validate interview data.
- IV. Select respondents: Select interview respondents at different organizational levels, departments and positions in order to obtain different perspectives on phenomenon of interest. Interviewees must be selected based on their knowledge, their ability and willingness to answer the researcher's questions accurately and not based on convenience or access.
- V. Start data collection: It is usually a good idea to electronically record interviews for future reference; however it must only be done with interviewee's consent. The interviewer should take notes to capture important comments or critical observations, behavioral responses.

After each interview is completed, the entire interview should be transcribed to a text document for analysis.

- VI. Conduct within-case data analysis: Data analysis may follow or overlap with data collection. Overlapping data collection and analysis provide the advantage of adjusting the data collection process based on themes emerging from data analysis. In within-case analysis, the researcher should examine emergent concepts separately at each case site and patterns between these concepts to generate an initial theory of the problem of interest.
- VII. Conduct cross-case analysis: Multi case research requires cross-case analysis as the second stage of data analysis. The researcher should look for similar concepts and patterns between different cases. Such patterns may be used for validating the initial theory or for refining it to develop a more inclusive and generalizable theory.
- VIII. Build and test hypotheses: Based on emergent concepts and themes that are generalizable across case sites, tentative hypotheses are constructed. Also the researcher should compare the emergent constructs and hypotheses with those reported in the prior literature to make a case for their internal validity and generalizability.
- IX. Write case research report: In the report, the researcher should describe very clearly the detailed process used for sampling, data collection, data analysis, and hypotheses development. So, Readers can independently assess the reasonableness, strength and consistency that the findings are not biased by the researcher's preconceptions (Bhattacharjee, 2012).

3.3. Research Questions

In the case study, the field study was conducted in three different ports, which two of them are marina port and one of them is a trade port handling both bulk and container shipments. The researcher used a semi-structured questionnaire to get the details related to sustainable applications and infrastructure within the ports. Research questions are derived from the printed sustainability reports of various large ports and marinas all around the world. The research questions are organized in three groups as the management office information, technical Office information and personel Office information. Each category deserves different managers to answer and provide clues, materials and documents related to the sustainability performance of the port. The question are as the following;

3.3.1. Management Office Information

- I. What kind of technologies are used for providing sustainability?
- II. What kind of projects are there for enlargement of the port?
- III. What kind of projects are there in order to satisfy future demand in the port area?
- IV. What kind of infrastructure projects are there for the port?
- V. Does the port have ISO 9001, ISO 14001 and OHSAS 18001 quality criterias?
- VI. Does the port have waste management plan?
- VII. Does the port have emergency action plan?
- VIII. How is the port's relationship with stakeholders like local people, Yacht Tourism Association, Sea Tourism Association, Local Municipality and so on?
- IX. Is there a cooperation of the port with any civil organization for keeping the sea clean?
- X. Has the port ever got any penalty about the sea pollution?
- XI. Do the port management emphasis on sustainability issues while buying new equipment and materials for the port operations?

3.3.2. Technical Office

- I. How is the ports' energy consumption pattern and amounts of consumption?
- II. Are there renewable energy usage in the port? What kind of renewable energy is used?
- III. Are there natural gas usage in the port?
- IV. Do the port management use electrical vessels in the port?
- V. Do the port management use sea water for any purpose in the port?
- VI. Does the port have any risk to influence the habitat and the communities' health in and around the port area?
- VII. Are there water filtering systems, oil filtering systems and other type of filtering systems in the port?
- VIII. What kind of pollution are there existing in the port like noise, dust, fume, vibration?
- IX. Do the port management different boxes/containers for each type of waste, garbage, residuals?
- X. Does the port have waste oil declaration form and waste oil analyse report?
- XI. Does the port have analyses of water pollution periodically?
- XII. Is LED lighting used in the port for energy efficiency?
- XIII. Do the port management use environmental friendly new yacht/vessel maintenance and carriage equipments?

3.3.3. Personel Office

- I. What kind of educations are given to employees about job security?
- II. Do the port management organize pleasure surveys for employees?
- III. What kind of job securities are taken for employees in the port?
- IV. What kind of campaigns and social responsibility projects do the port management run about public relations?

3.4. Case Analysis of Two Yacht Marinas in Antalya/Turkey and a Trade Port in Bursa/Turkey

The research questions in S Marina were answered by technical chief officer of the marina. There was not an general manager in charge there at that time, when the field study was held. Also, the technical chief officer was the most sophisticated and responsible person in the port at that period. The interview had been done for two days within different times of the day depending on the officers's schedule. In the first interview, questions were answered by the officer in the office and in the second part, the questions were continued and than photos were taken in and around port area. Later, the technical chief sent the available and wanted documents related to the sustainability performance of the port by e-mail. On the other hand, in T Marina, interviews occurred in 3 different days. The interview was done with the general manager of the marina. Each time the general manager was busy and broke the interview. However in the third one, he was able to answer the research questions. Also, some of the required documents have taken with his permission. Technical manager only helped to take photos in the marina because he was new in his job and didn't have enough knowledge about the port operations. In R port, general manager, vice general manager, operation manager and personnel manager helped for the interviews.

3.4.1. Outcomes of Case Analysis in S Marina, T Marina and R Port

Comparative outcomes of the case analysis in both two yacht marinas and the trade port are as the following with the order of research questions. S Marina is a member of a marina chain which belongs to a holding company. T Marina belongs to a smaller group company. R port which is used for bulk cargo and container cargo trade belongs to a corporation.

3.4.1.1. Management Office Analysis

Technologies for Providing Sustainability

In Kemer T Marina, there is wi-fi internet connection but managers are planning to use centralized internet networking in the marina. Also, computerized

electricity and water system is used in T Marina. With this systems, yacht owners load money to special cards and use clean water and electricity by using the cards that they have already loaded money. This system makes easy the payment and operation of bills of water and electricity for yacht owners. Yacht owners uses their cards to get electricity and water for their yachts and pay their invoice at the same time. This creates an effective and efficient way for sustainability of the port service by providing speed and information flow.

In Antalya S Marina, a similar system is used for bilge water for discharging by cards. Blue card system is used for bilge water discharge (Image 2). Blue card is a system used for digital follow up of marina motor vehicles' waste water and bilge water.



Image 2. Blue Card System for Bilge Water Discharging

Blue card users are responsible to show their cards to the inspector in charge, during inspection. Waste reception period is easier and faster with blue card, compared to the printed waste notification/ transfer forms. The data is kept online in a safer media

and is easier to access. Waste notification can be completed in a few seconds for both the blue card owners and the waste reception facilities operator.

The Ministry of Environment and Urbanization is the main responsible body of regulations, management and inspection of Blue Card system. Blue Card can be obtained from marinas, ports and fishing ports, that are also waste reception points. Blue Card users are the owners of the marina motor vehicles defined in the Blue Card Circular.

Inspection of the Blue Card is done by Ministry of Environment and Urbanization, Coast Guard Commandership, Port Authorities. Also Kemer T Marina is planning to use blue card technology in a close future.

In R Port, an automation software is used for container follow up in port operations. Also, there are maintenance and repair systems with a periodic defect follow up system in the port. Finally, port authorities are trying to find new solutions and innovations for operating and handling various types of cargo efficiently and effectively.

Projects for Future Demand

T marina is planning to enlarge the marina with a new jetty. The new jetty will envelop all other jetties, be bigger and the capacity of yachts on the sea will increase. Moreover, S marina is planning to use a new lifting crane while taking the yachts from sea and putting to land. In this way, the crane will be able to emplace the yachts on the land closer to each other. So, the yachts on the land will occupy fewer space. Both these two projects in S and T Marinas create new places to increase yacht capacity. So, both marinas will be able to satisfy future increasing demand by these new technologies.

Also, S Marina has a deepening project for bigger yachts. Some of the marina place in sea will be excavated and be deeper. So, bigger yachts will use this place in the future.

In R Port, there are new investments periodically according to necessities. When the tonnage of shipments as iron, steel etc. had exceeded a determined level, a new lifting crane was bought. For cereals, three new steel-construction tents were built to use as a warehouse. A new bonded warehouse has been built for future demand as well. The place which is rented from the state was built for enlargement of the port, new closed warehouse construction which is 40000 square meters will be finished in 2016.

Standarts ; ISO 9001, ISO 14001 and OHSAS 18001 Quality Criterias

In S Marina, educations for ISO 9001 and ISO 14001 are taken but the port has not certificated yet. S Marina also has a doctor in the workplace. In T Marina these certificates have not taken yet and there is no plans and actions for the accreditation of the port.

Even these quality criterias have not been accomplished, both marinas have blue flags awarded by The Foundation for Environmental Education. Marinas are awarded the Blue Flag based on compliance with 24 criteria in four main performance areas covering the following:

- 1) Environmental Education and Information
- 2) Water Quality
- 3) Environmental Management
- 4) Safety and Services

All Blue Flags are awarded for one season at a time. If the criteria are not fulfilled during the season or the conditions change, the Blue Flag may be withdrawn from the port.

In order to have a blue flag, marinas must have these criterias (<http://ec.europa.eu/ourcoast/download.cfm?fileID=1018>, 200);

1) Environmental Education and Information

- Information relating to local eco-systems and environmental phenomena must be available to marina users.
- A code of conduct that reflects appropriate laws governing the use of the marina and surrounding areas must be displayed at the marina.
- Information about the Blue Flag Marina Programme and/or the Blue Flag Marina Criteria must be displayed in the marina.
- The marina is responsible for offering at least three environmental education activities to the users and staff of the marina.
- The Blue Flag for boat owners is offered through the marina.

2) Water Quality

- The water in the marina must be visually clean without any evidence of pollution (oil, litter, sewage, etc).

3) Environmental Management

- A marina management committee should be established to be in charge of instituting environmental management systems and conducting regular environmental audits of the marina facility.
- The marina must have an environmental policy and an environmental plan. The plan should include references to water management, waste and energy consumption, health and safety issues, and the use of environmentally-friendly products wherever possible.
- Adequate, properly identified, segregated containers must be in place for the storage of hazardous wastes. The wastes must be handled by a licensed contractor and disposed of at a licensed facility for hazardous wastes.
- The marina must have facilities for receiving recyclable waste

materials (bottles, cans, paper, plastic, organic material, etc).

- Bilge water pumping facilities should be present at the marina.
- Toilet pumping facilities must be present in the marina.
- All buildings and equipment must be properly maintained and in compliance with national legislation. The marina must be well integrated into the surrounding natural and built environment.
- Adequate, clean and clearly signposted sanitary facilities must be in place and provide washing facilities and drinking water. Sewage disposal is controlled and directed to a licensed sewage treatment.
- If the marina has boat repairing and washing areas, no pollution must enter the sewage system, marina land, water or natural surroundings.
- Sustainable transportation should be promoted.
- Parking/driving is not permitted in the marina unless in designated areas.

4) Safety and Services

- Adequate and clearly signposted lifesaving, first-aid and fire-fighting equipment must be present. Equipment must be approved by national authorities.
- Emergency plans in case of pollution, fire or other accidents must be produced.
- Safety precautions and information must be posted at the marina.
- Electricity and water is available at the berths, installations must be approved according to national legislation.
- Wheelchair access and accessibility features should be in place.

- A map indicating the location of the different facilities must be clearly posted at the marina.

Moreover, both Marinas have 5 golden anchors awarded by the Yacht Harbour Associations. The Gold Anchor award scheme has been auditing marinas throughout the world for over 25 years and it is well known as a credible measure of the marina quality. Any rated marina will have been subject to a series of rigorous tests, including (http://www.royalcareersatsea.com/pages/gold_anchor_standards, 2015)

The Marina Audit: A comprehensive set of criteria which is checked and surveyed by a marina expert. This audit counts for 85% of the Gold Anchor score, but if the marina does not meet the basic industry standards it cannot achieve any Gold Anchors.

Shops: A series of 3 shops test the marinas approach to customer services and the first impressions that it offers. The results of this test counts for 10% of the Gold Anchor score.

Berth Holders Questionnaires: Existing berth holders at a Gold Anchor marina are surveyed for their experiences of the facilities and customer services. This represents 5% of the final Gold Anchor score.

All Gold Anchor marinas meet the industry standards, where higher ratings denote more facilities and a greater focus on customer services.

The R port has ISO 9001:2008 Quality Management System and OHSAS 18001:2007 Job Health And Security Management System. Also, port authorities are trying to prepare the necessities to get ISO 14001 certification, but they do not have yet.

Waste Management Plan

Both marinas have waste management plans. As it can be seen the example of waste declaration form in the Image 3, each garbage or waste is inspected by the



Image 4. Emergency Action Sign in S Marina

Also, T Marina has emergency action plan which is pendant on the wall of mass hall (Image 5). There is a written document on the wall that missions are assigned to the persons in an emergency situation.

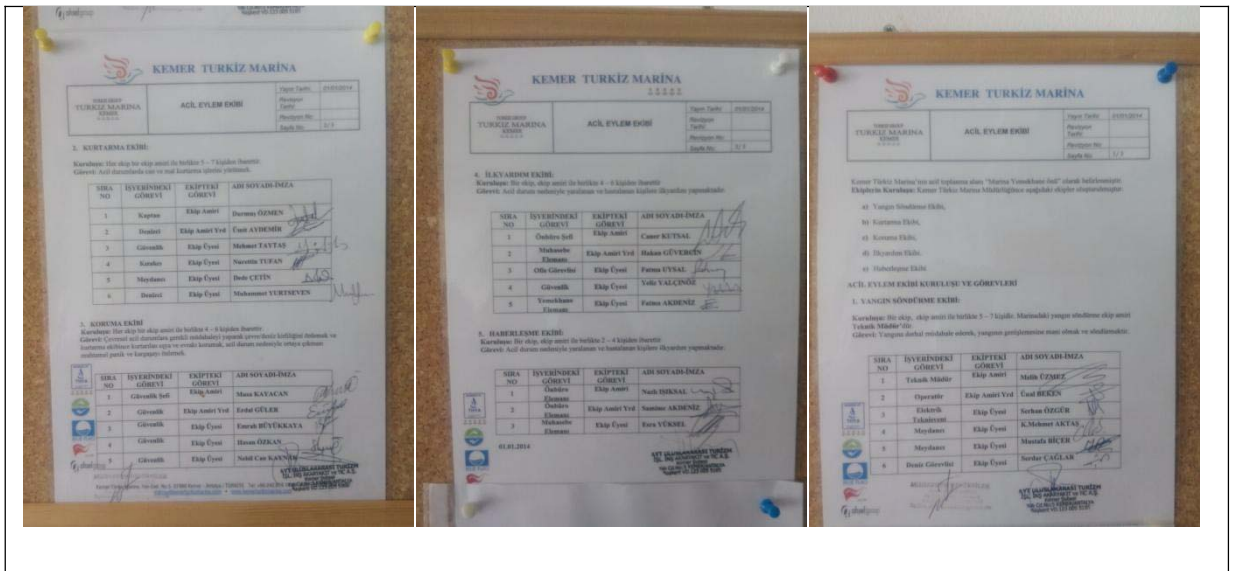


Image 5. Emergency Action Plan of T Marina

Relationship with Stakeholders Like Local People, Yacht Tourism Association, Sea Tourism Association, Local Municipality and Cooperation with Any Civil Organization for Keeping the Sea Clean.

Both two yacht marinas have good relationships with local municipalities. Public ships which are Governorship's, municipality's and police's ships are roosting in the S Marina. So, S marinas' management relation with public offices can be catagorized as good. Also in T Marina, Seabus project is supported and provided with the municipality. The seabus is used for transportation of people between Kemer and Antalya everyday. Ships for transportation of seabus project roots in T Marina.

T and S Marinas are members of environmental associations and associations about their field of operation. Both marinas are members of Yacht Tourism Association, Sea Tourism Association, Foundation of Environmental Education, Yacht Harbour Association and Turmepea (Image 6).



Image 6. Emblems of Organisations Related to Yachting and Environment

The Foundation for Environmental Education is a non-government, non-profit organisation promoting sustainable development through environmental education (<http://www.fee.global/>, 2015).

The Yacht Harbour Association is established to develop the marina industry. They help boat users find good quality marinas and help marina businesses improve their services and operate to high, modern standards (<http://www.tyha.co.uk/>, 2015).

Turkish Marine Environment Protection Association (TURMEPA)'s mission is to contribute to the preservation of seas and coasts as a national priority and to

create a country that has reached sustainable development goals for future generations (<http://www.turmepa.org.tr/>, 2015).

Yacht Tourism Association's mission is to make yacht industry professional in Turkey and improve its quality as much as european standarts.

Sea Tourism Association's mission is to provide solidarity between enterprises who work in sea tourism and make investment in this sector, doing social and technical research and developmant activities about sea tourism industry (<http://www.denizturizmbirligi.org.tr/>, 2015).

In R port, there is not a membership to any civil organization for keeping the sea clean. They do not have voluntary cooperation or social responsibility vision on this issue.

Penalty About The Sea Pollution

Both yacht marinas have never got any penalty because of sea pollution yet. However, some of yachts can get penalty individually. Marina authority is not responsible for the yacht's pollution out of the marina jetty. Yacht owners have the responsibility for these type of particular pollutions.

Emphasis on Sustainability While Buying New Equipment and Material

In T Marina, while buying new equipment, the port is giving importance to sustainability issues. New model 20 fire tubs are bought for fire. For the sea cleanliness, chemical detergents are not used; only organic detergents are used in cleaning processes of yachts and buildings. This issue was not determined in S Marina. In R port, there are 4 big lifting cranes and 3 of them are running by electricity (Image 7). The management prefers to invest to energy efficient vehicles for handling.

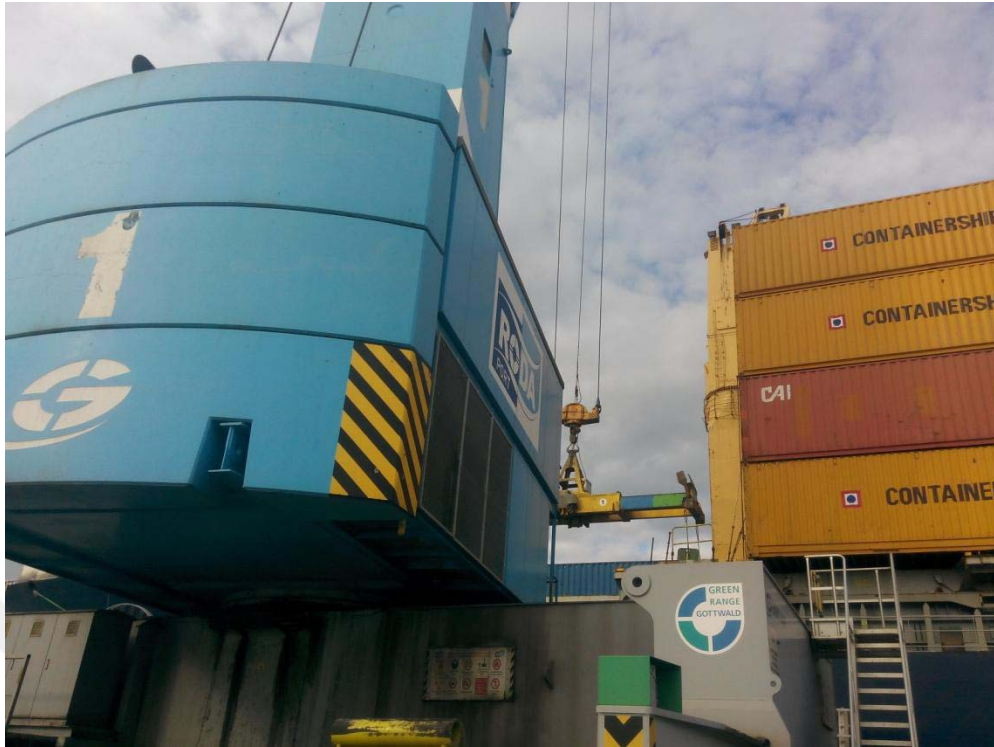


Image 7. An Crane Running by Electricity in R Port.

3.4.1.2. Technical Office Analysis

Most of the sustainability reporting determinants and applications can be seen about technical issues on the ports; as energy usage both in operations and the vessels, waste management techniques, handling and shipment operations efficiency etc. So, technical office is one of the key units of sustainability management which deserves a detailed analysis.

Energy Consumption

Energy consumption in the marinas change in winter and in summer. For example, in S Marina average electricity consumption for a month is 64000 kW in winter and 100000 kW for an average month in summer. Also, in T Marina average electricity consumption for a month is 70000 kW in winter and 175000 kW for an average month in summer. This difference occurs because yachts are used in summer

means more operations for management and air conditioners are used more for hot summer days.

In R port, energy consumption changes in winter and summer related to heating also, it changes according to the congestion of operations. The average electricity consumption is between 260.000 – 290.000 kW in summer and 300.000 – 350000 kW in winter. Total electricity consumption for a year is 3.300.000 kW. Natural gas consumption is same and about 2100 cubic meters for 5 months which are May, June, July, August and September. In these months only tea room consumes natural gas. In the other months the natural gas consumption is between 7000 – 11000 cubic meters which is used heating too. Total natural gas usage for a year is 70.000 cubic meters. Diesel usage is change according to the congestion of port operations apperantly. The amount of usage is between 25.000 – 11.200 litres for a month. Total diesel usage for a year is 817.000 litres.

Renewable Energy Usage in The Port

In K Turkiz Marina, solar energy is used as a renewable energy. Water for some mangement buildings is heated by sun light (Image 8). The only way to use renewable energy is this for now. However, S Marina doesn't use any type of renewable energy for any purpose. There is no photovoltaic usage of sun energy in

both marinas. In R port, there is not any renewable energy usage in the port.



Image 8. Solar Energy Station For Water Heating In T Marina

Natural Gas Usage in The Port

Both S Marina and T Marina use natural gas for heating the buildings and water for buildings (Image 9).



Image 9. Natural Gas Facilities in T Marina

R Port uses natural gas for heating and cooking (Image 10).



Image 10. Natural Gas Pipe Line in R Port

Electrical Vessels in The Port

Both T Marina and S Marina use electrical cars in the marina yard. T Marina uses chargeable electrical bicycles for transportation of personnel in the marina. Also, S Marina uses chargeable electrical golf cars for transportation in the marina (Image 11). There are 3 cranes which are running by electricity in the R port.



Image 11. Chargeble Electrical Golf Cars in S Marina

Sea Water Usage for any Purpose in The Port

In S Marina, sea water is not used for any purpose. On the other hand, sea water is used in fire fight with two different systems in T Marina. The first system is portable fire poms around the marina yard. These poms are used to absorbing sea water and spraying in a fire situation (Image 12).



Image 12. Portable Fire Pump in T Marina

The second system is to use sea water is the pressurized sea water system in T Marina. Sea water is absorbed by pumps and wait in pressurized tubs for a fire. Than, this pressurized sea water is used via the fire pipes around the marina yard (Image 13). There is not any sea water usage in the R port.



Image 13. Sea Water Pipe and Pressurized Sea Water System

Water Filtering Systems, Oil Filtering Systems and Other Type of Filtering Systems

Both Setur Marina and Turkiz Marina use oil filtering systems. Waste oil which is in the bilge water is filtered after the bilge water is discharged from yachts. There are machines and tanks for waste oil filterization (Image 10). The waste oil is not sent to canalization in order not to destroy canalization piping system. Oil residuals can destroy the canalization system. Waste from yachts is taken and than it is sent to licenced eradication facility by licenced vechiles.



Image 14. Waste Oil Filters in S and T Marinas

Also, S Marina uses a filtering system for yacht washing water. Yachts on the ground are cleaned with pressurized water. After this process, toxic paint waste and dried sea fossil wastes are ocured. The dirty water which was used in cleaning process is filtered with a special filtering machine and can be used for next time (Image 15). This filtering system creates efficiency in usage of water. More yachts can be washed with less water.



Image 15. Yacht Washing Water Filtering System

Another filtering system which is used in S Marina is the system that filter the clean water while coming from the municipal network and it filters the excess lime. After filtering the excess lime, the filtered clean water is sent to yatches and the buildings.

The final filtering system in Setur Marina is that there is a dust filter in a hangar which is used for painting of the yachts. The hangar has a dust filter which is locking dust to come in the hangar and blocking paint to go out of the hangar. T marina hasn't filtering systems of these kinds.

In R port, there is water filtering system in the port, in order to prevent from biological and chemical effects. In every four months it is reported to Ministry of Environment and City Office.

Pollution Existing in The Port Like Noise, Dust, Fume, Vibration

Dust, noise and fume exist in both marinas. Fume exist because of yacht's and lifting crane's exhausts. Also noise exist because of yacht's motors, lifting crane's motor which is used to carry the yachts from sea to ground or from gound to sea. Also, pressurized water machines which are used while washing the yacht's underside create noise. Source of dust in marina is sanding of yachts mostly. However, wet sanding and a tent to block the dust is used in S Marina. However there is not a source of vibration in both marinas. In R port dust, noise and fume measurements are done periodically. Also, emission measurement is done by the port management. Veils are used to prevent cereal dust to fall into sea while forwarding (Image 16).



Image 16. A Veil for Dust in R Port

Usage of Different Boxes for Each Type of Waste, Garbage

Both marinas uses different boxes and containers for different type of wastes. There are different boxes for thinner disposing, paint disposing, roller disposing, used batteries, glass, plastic, paper and aluminium in T Marina (Image 17). However, solid waste boxes in S Marina are not differentiated like in T Marina.



Image 17. Differentiated Boxes and Containers for Solid Wastes in Turkiz Marina

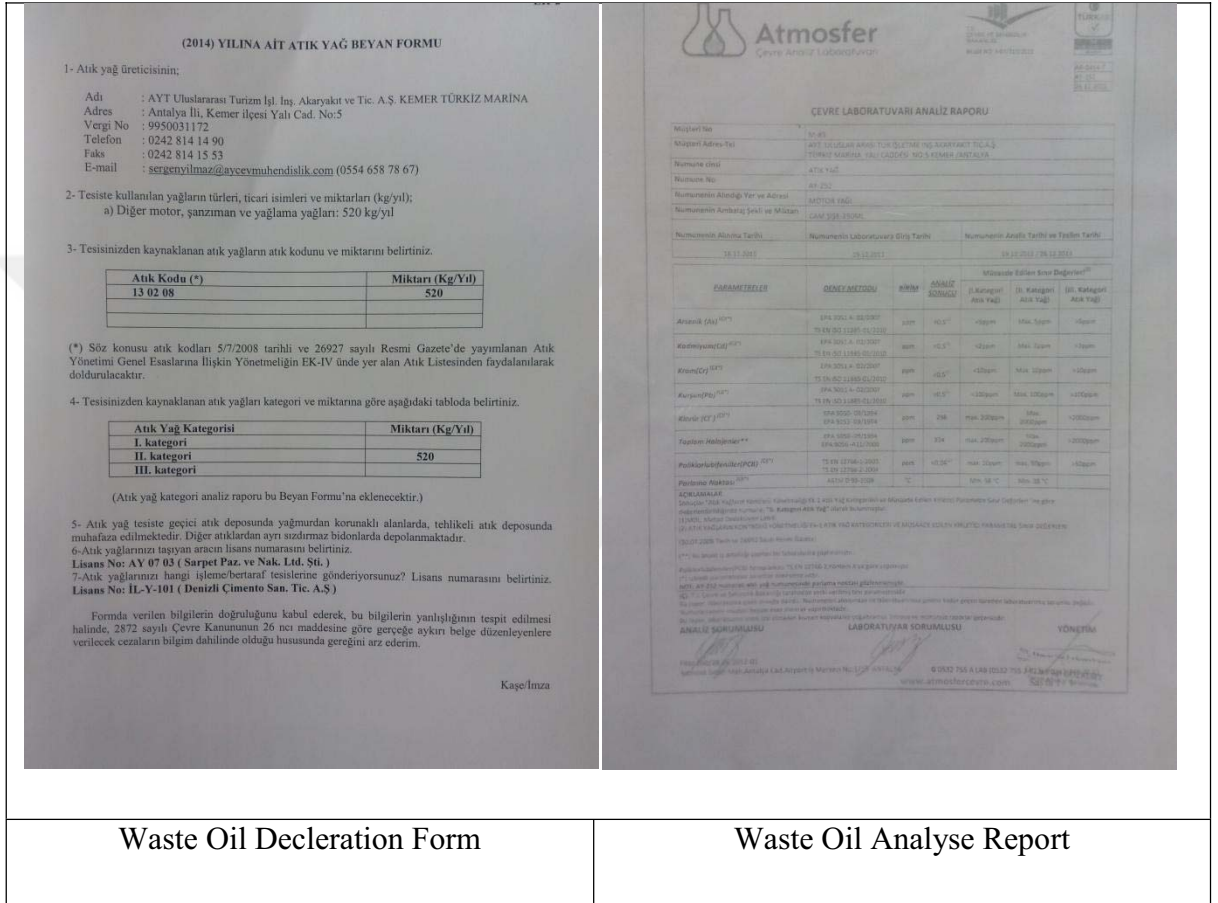
In R port, domestic waste is collected in undangerous waste place and sent to Gemlik Municipality to dispose. Than it is sent to recycling units by the Municipality. Package wastes are collected and sent for recycling. Battery accumulator wastes are collected and sent to recycling or to the firm which the port had bought them. Waste oil is sent to recycling, annihilation or IZAYDAS (Izmit Waste and Residual Purification, Firing and Valuation Cooperation). Dangerous wastes like purification soggy, lamps and contaminated things are sent to aside of facility. Electronical waste is collected and sent recycling firms. Excavation waste is sent to the dumping ground. Waste water is sent to sea after chemical and biological purification made. Waste tires are sent to LARDER (Tire Industrialists Association). Wastes of the ships are divided to two categories as dangerous and undangerous first (Image 18). Undangerous waste sent to dumping ground, than dangerous wastes are annihilated.



Image 18. Waste Boxes in R Port

Waste Oil Declaration Form and Waste Oil Analyse Report

Both yacht marinas have waste oil declaration forms and waste oil analyse reports (Image 19).



Waste Oil Declaration Form

Waste Oil Analyse Report

Image 19. Waste Oil Declertion Form and Waste Oil Analyse Report of T Marina

The R port has waste oil declaration form which is done annually, but they did not supply the form to the rearher. Waste oil analyse is done reguarly in 4 or 5 months period.

LED Lighting Used in The Port for Energy Efficiency

T Marina uses LED lights for efficiency and sustainability in some buildings of the port. There are many LED lights around the yard of marina (Image 20). Setur has not started to use LED lights yet, but Setur authorities have a project to buy 500 units of led lights and use them in a close future.



Image 20. LED Light Technology in T Marina

LED lights contain no toxic materials and are 100% recyclable. Long operational life time acts as a multiplier and helps achieve even more energy efficiency. A low-voltage power supply is sufficient for LED illumination. LED lights brighten up immediately and when powered on. LED are ideal for operation under cold and low outdoor temperature settings. Also, LED lights can switched off and on frequently and without affecting the LED's lifetime or light emission (Graffney, 2011:10).

In the R port, because the lighting system is on too high, projector lamps are used. So there is not led lighting usage. The technical staff defines the led lighting as insufficient for the lighting needs of the large port as they tried it before (Image 21).



Image 21. Projector Lighting System in R Port

3.4.1.3. Personel Office Analysis

The Educations Given to Employees About Job Security & Job Security Precautions Taken for Employees in The Port

Educations for ISO 9001 and ISO 14001 are provided to staff in S Marina but not certificated yet as mentioned before. In both marinas job security educations, fire fighting educations and educations for working at high places must be given regularly according to Ministry of Labour And Social Security criterias (Image 22). There is an outsourced job security company for this purpose in each marina. There is a stable doctor in S marina.

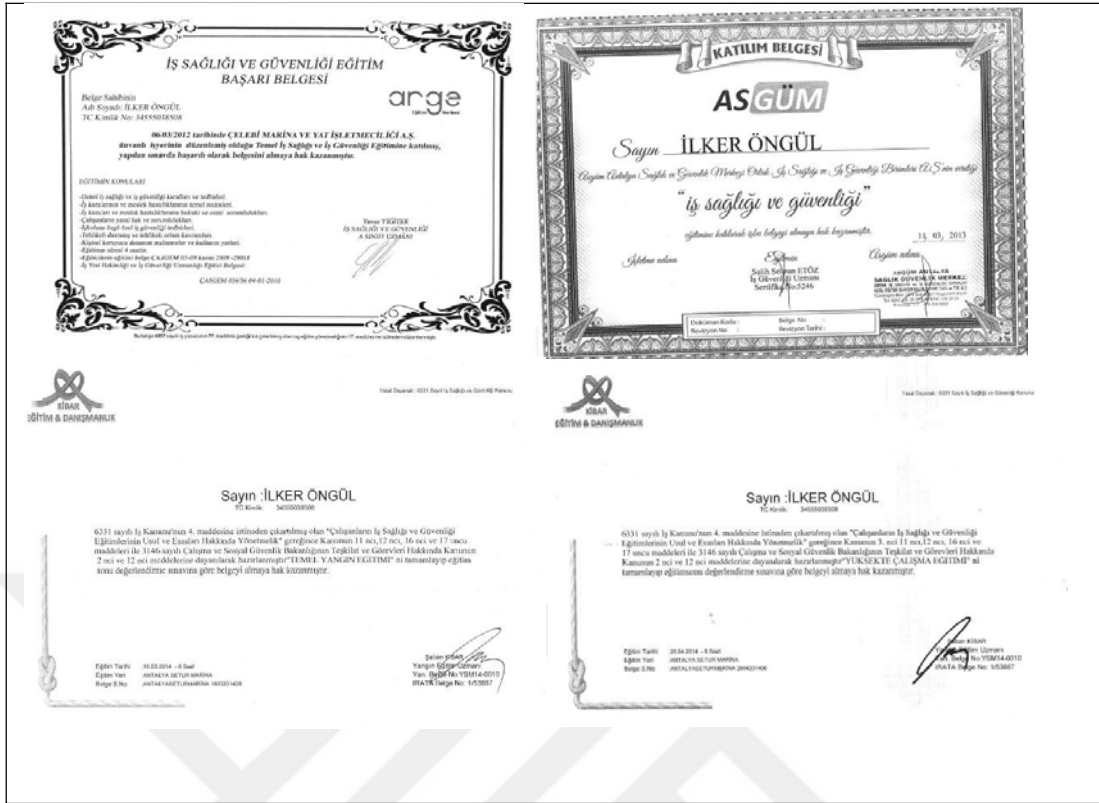


Image 22. Job Security and Fire Education Certificates for Setur Marina

In the R port, when a new vehicle and equipment are bought, responsible engineers of the selling firm give education both teorically and practically to use them. Both ISO 9001 and OHSAS 18001 educations have taken by the staff. Port authorities join all available congress, meetings and semposiums periodically and share their experience with other port members. An A class job security specialist comes to the port each week and control the port. A C class job security specialist works each day in the port and prepares job security reports monthly. The report is evaluated by management and troubles are examined, required precautions are provided by the management. Certificated emergency teams are always ready for emergency situations with periodic practices. When an outsourcing firm has a job in the port, they even got necessary security education and than they enter the port to do the required job. Personnel who work at high places have educations to work high places. Personnel who have a job accident get education by the job security specialist before starting the following job. A doctor works in the port and each new personel is controlled before the job by the doctor. There are decided secure places and paths in the port and guests can get around only in this places. There are 30 certicated

personnel who have knowledge about providing first aid. So there are 1 certificated first aid personnel for each 8 personnel in the port. Lots of security singboards are located in the port (Image 23).



Image 23. Security Singboard in R Port

Job Satisfaction Surveys for Employees

In T Marina, each month an employee is selected according to his/her performance and awarded with a quarter gold coin. Also surveys are done regularly each month. However, in S Marina there is not an awarding system like that.

In R port, a worker representative joins the managerial meetings and there are several declaration forms and boxes around the port. Workers can notice their satisfaction or problems to the management with these forms.

Campaigns About Public Relation

T Marina joins all exhibitions related to yachts and yachts tourism. Marina authorities inform people about what they do in exhibitions. Also, S Marina joins expositions with its central office too. Because Antalya S Marina is only one branch office of S Marinas which belongs to the one of the largest holding in Turkey. Also, both marinas have websites which are designed to inform potential customers and public about the marina. Moreover, there are lots of traffic signs that show the place of marinas in local territories. So, people can come to marina and get around there for fun easily.

Although being a large trade port, the R Port did not take place too much position in the territory social life but they only planted a memorial forest on the region.

So S Marina is Better Than Others on Sustainability Issues (Table 8).

	T Marina	S Marina	R Port
<i>Blue Flag</i>	*	*	-
<i>Recycling</i>	-	*	-
<i>Education&Job Security</i>	-	*	*
<i>Renevabe Energy</i>	-	*	-
<i>Public Relation</i>	*	*	*
<i>Equipmant Management</i>	*	-	*

Table 8. The Importance That T&S Marinas and R Port Give on Sustainability Issue

CONCLUSION

Sustainability could be defined as an ability or capacity of something to be maintained or to sustain itself. It's about taking what we need to live now, without jeopardising the potential for people in the future to meet their needs (Pesquera and Ruiz, 1996:2-8). Global warming, scarcity of natural resources, threat of environmental pollution to human health, animal health and ecology, job accidents, bad social effects drive port managers to find sustainable solutions for their daily operations.

Sustainability management perspective is an increasing trend in the world. Green practices are the main goals of all industries. Ports in all over the world have sustainable projects and green initiatives following this very important an inevitable trend. Even in Europe, America, Asia and all around the world, sustainable management strategies are innovated and used in port operations and management.

Permission could not be taken to enter and do the case study in big commercial ports in Antalya. So, the case study about sustainability was done in two different yacht marinas because yacht marinas are another type of ports. One case study was conducted in a trade port in Bursa region as they permit the researcher to analyse the port. Differences and similarities of sustainable practices are investigated in two yacht marinas which are Antalya S Marina and T Marina. Both of the marinas are in Antalya, Turkey.

As a result of the research and the field studies in ports, there are some clues and dimensions related to sustainability port management in Turkey. There are different findings for different port types analysed. The most important outcome for marinas is; marinas can be called better in their sustainability performance in Turkey. Both marinas gave importance to green practices for sustainability which of course must be improved to more sustainable levels. The reason could be nature of the marina management business serving to an elite and conscious consumer all around the world. There is still improvement needed areas for Turkish marinas especially in energy efficiency, renewable energy usage, blue card etc. technologies for operation efficiency and control. There is no carbon compensation vision or applications in the marinas.

Trade ports (container and bulk shipment ports) are huge operation areas. There are many performance areas to work on sustainability issues in these huge organizations as energy efficiency (cold ironing etc.), renewable energy usage, waste management, land usage, social and environmental effects of these large ports and job security issues.

This topic has not been discussed and worked on enough before; so it provides an open research area for international researchers. Ports, which are the doors of trade and manufacturing today in the modern word, must be planned and managed with the view of economic, environmental and social effects.

There are few studies about port sustainability in Turkey as well. This scarcity of studies on sustainable port management increases the importance of this research. As it is one of the first studies on the area, it is thought that this thesis will be enlightening to understand the sustainability of the ports and provide a contribution to the existing literature.

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Photos From T Marina

