International Journal of Environmental Studies and Researches (2022), 1 (1):88-97

Calculation of Total Load Emitted from the Different Ship at EL-Dekhela and Alexandria during a Period from 5 to 10 Years

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Abstract

Maritime sector and shipping generate impacts for the health and wealth of the Ocean. These include, marine pollution (from oil and ballast water) one of resource depletion (from energy consumption - shipping being heavily hooked into oil for propulsion), CO2 emissions, pollution, and global climate change, also as other damages resulting from operations, accidents, noise, etc. The man source of the pollution inside Alexandria Port is shipping. The air pollutants such as Sulphur Oxides (SOX), Nitrogen Oxides (NOX), Particulate matter (PM), Volatile Organic Compounds (VOC), and Ozone depleting substances (ODS) which impact on all ecosystem. The different composition of air pollutants, the dose and time of exposure and therefore the incontrovertible fact that humans are usually exposed to pollutant mixtures than to single substances, can cause diverse impacts on human health. Human health effects can range from nausea and difficulty in breathing or skin irritation, to cancer.When Ships stay to loading and discharging in Alexandria ports using its DG, s which called AE.The emissions of DG,s Depends on Fuel Type. This paper is prepared to Evaluate and find the ships total emissions load emitted from the ships during its period berthing in Alexandria port. Our study area is Alexandria Port, the Port of Alexandria is on the West of the Nile Delta between the Mediterranean and Mariut Lake in Alexandria.

Keywords: Alexandria ports, Marine pollution, Ships total emissions

Introduction

Maritime transport is the backbone of globalisation, supporting international trade and global interconnection, with over 80% of world merchandise trade by volume and nearly 70% by value estimated to be handled by sea **(Farkas *et al.*, 2021).**

Maritime Transport is the most common mode of transport in international trade. With more than 80 per cent of world cargo trade by volume being carried by sea, maritime transport remains the backbone supporting international trade and globalization (**Sirimanne et al., 2019**).

The ships can be in Sailing, manouvering or hoteling. During al shop phase producing types of emissions is calsefied by International Maritime Organisation (IMO) and SOLAS Regulations as MARPOL Annexes As shown in **Fig. 1 (Čampara *et al*., 2018)**.

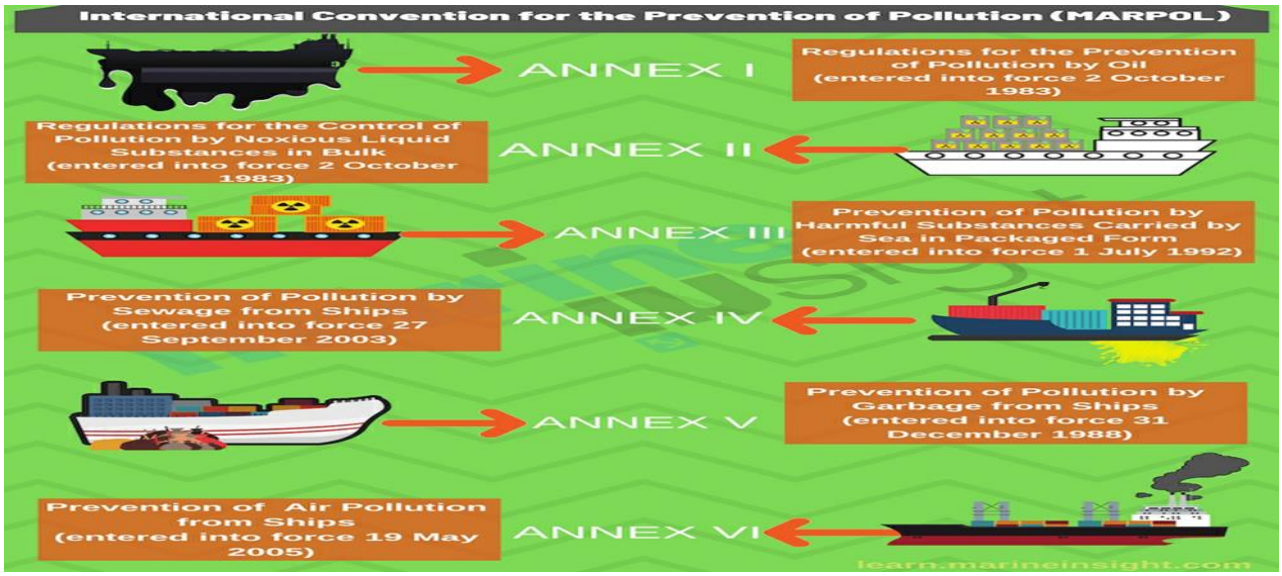

Fig. 1. MARPOL six technical Annexes**.**

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.

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 SOx, NOx and particulate matter. A chapter adopted in 2011 covers mandatory technical and operational energy efficiency measures aimed at reducing greenhouse gas emissions from ships **(Čampara *et al.*, 2018**).

To acheive the IMO and the United Nations 2030 Devolping Sustainable Goals in Alexandria Ports to Keep environmentally friendly therefore the resercher. International Maritime Organization (IMO) is that the UN specialized agency with responsibility for the security and security of shipping and therefore the prevention of marine pollution from ships.

- IMO is fully committed to successful implementation of 2030 Agenda and associated SDGs.

Fig. 2. The seventeen Sustainable Development Goals (SDGs)

- Most of the weather of the 2030 Agenda will only be realized with a sustainable transport sector supporting world trade and facilitating global economy.

- While SDG 14 is central to IMO, aspects of IMO's work are often linked to most of the individual SDGs As swon in **Fig. 2 (Christodoulou and Fernández, 2021).**

Ambitious climate policies, as well as economic development, education, technological progress and less resource-intensive lifestyles, are crucial elements for progress towards the UN Sustainable Development Goals (SDGs). However, using an inte-grated modelling framework covering 56 indicators or proxies across all 17 SDGs, we show that they are insufficient to reach the targets. An additional sustainable development package, including international climate finance, progressive redistribution of carbon pricing revenues, sufficient and healthy nutrition and improved access to modern energy, enables a more comprehen-sive sustainable development pathway. To quantify climate and SDG outcomes, showing that these interventions substantially boost progress towards many aspects of the UN Agenda 2030 and Shipping is the main cause of pollution in Alexandria Port. Sulphur oxides (SOX), nitrogen oxides (NOX), particulate matter (PM), volatile organic compounds (VOC), and ozone depleting substances (ODS) are examples of air pollutants that have an impact on all ecosystems, as shown in Fig. 3.

Fig. 3. Alexandria port pollution.

Significant reductions within the emissions of all air pollutants generated on board are possible through the appliance of an array of abatement technologies and other technical and operational measures The Ships During Loading and discharging Causes 6 sources of pollutions is regulated and controlled by IMO and SOLAS

Different air pollutants affect the Human health

1. Gaseous pollutants (e.g., SO2, NOx, CO, ozone, Volatile Organic Compounds).
2. Persistent organic pollutants (e.g., dioxins).
3. Heavy metals (e.g., lead, mercury).
4. Particulate Matter. Gaseous pollutants contribute to an excellent extent in composition variations of the atmosphere and are mainly thanks to combustion of fossil fuel.

Nitrogen oxides are emitted as NO, which rapidly reacts with ozone or radicals within the atmosphere forming NO2. the most anthropogenic sources are mobile and stationary combustion sources. Moreover, ozone within the lower atmospheric layers is made by a series of reactions involving NO2 and volatile organic compounds, a process initiated by sun light.

CO, on the opposite hand, may be a product of incomplete combustion. Its major source is marine transport too. While the anthropogenic SO2 results from the combustion of Sulphur-containing fossil fuels (principally coal and heavy oils) and therefore the smelting of Sulphur containing ores, volcanoes and oceans are its major natural sources. The latter contribute only ~2% of the entire emissions a serious class of compounds that fuel combustion and particularly combustion processes for energy production and road transport are the main source of emission are the so called volatile organic compounds (VOCs) **(Li *et al.*, 2020)**.

Ship Energy Sources

The ships always using its own Generators as an electrical power supply This generator are often (DG, TG and SG) TG&SG Always used during Sailing but in ports the ships using DG which using internal compaction engine MDO Fuel type as a pre mover.

Research problem

When Ships stay to loading and discharging in Alexandria ports using its DG, s which called AE The emissions Factors of DG,s Depends on Fuel Type as shown in **Fig. 4 (Rochyana *et al*., 2014).**

Table 1. Emission Engines in kWh.

Fuel Type	**SO_X (g/KWh)**	**NO_X (g/KWh)**	**CO_2 (g/KWh)**	**PM (g/KWh)**
Residual oil 3.5% Sulphur	13	9-12	580-630	1.5
Marine Diesel Oil, 0,5%S	2	8-11	580-630	0.25-0.5
Gasoil, 0,1% Sulphur	0.4	8-11	580-630	0.15-0.25
Natural Gas	0	2	430-480	0

This Emissions is Affected To quality of Alexandria City and Urban Area.

Fig. 4. Alexandria port.

Materials and Methods

Study Area

Alexandria Port the Port of Alexandria is on the West of the Nile Delta between the Mediterranean and Mariut Lake in Alexandria, Egypt and is considered the second most vital city and therefore the main port in Egypt. Alexandria port consists of two harbors (East and West) separated by a T-shaped peninsula. The East harbor is shallow and isn't navigable by large vessels. The West harbor is hoteling the commercial shipping. The harbor is made by two converging breakwater.

Objectives

- Assessment of the present situation of the ports of the intruder and Alexandria

- Inventory activities located within the ports of Dekhilah and
- Alexandria
- Synthesis of knowledge on the ships of the ports of Dekhilah and Alexandria
- Conduct a questionnaire and interviews to work out things 5.
- Assessing the present situation and making future recommendations.

Importance of the study

- The importance of the present study is often divided into two sorts of importance: the scientific importance and therefore the practical importance

Scientific importance

The scientific importance refers to the following

- The rare of the studies associated with air pollutions from the ship.
- Adding to the scientific Library a study which will benefit the incoming researchers.
- Setting a gaggle of equations for predicting differing types of pollution resulting from the ships.

Practical importance

- The practical importance of this research emerged from the importance of unpolluted environment.
- Determinate The visited Ships SEEDI.
- Determine the Approximately Fuel Amount ports need per annum.
- Open new global marketplace for Egypt Electricity.
- 1st step to converting Alexandria port to Green Port.
- Helping administrator for taking the proper decision consistent with the calculation of the pollution.

Regression Analysis are going to be used for generating a gaggle of equations getting to predict the relation between the ship horse power and therefore the different pollutants from the ship. Data are collected from the Alexandria port authority after the approval of the Environmental Studies and Research Institute affiliated to the university of Sadat city.

Alexandria port includes about 75berths in the port other than Maritime services berths anrd Received More than 3000 Shops per Year as shown in **Table 2.**

Table 2 . No. of ships Visted Alexandria from 2009 to 2020.

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Ships	4499	5731	4968	4728	4461	4485	4337	5262	4202	4162	4149	3861

The Ships in **Table 2.** is different types of ships as shown in **Table 3.**

Table 3. Indicated the details of the berths in Alexandria.

Alexandria Port			
Notes	**draft**	**Actual Length**	**Quay no.**
	m	**M**	
General Cargo	6.5	310	3/5-2/5-1/5
Maintenance /Launches	6.5	293	6-7-8
General Cargo	6.5	70	9
General Cargo	8	135	10
General Cargo	9	127	11
General Cargo	9	100	12
General Cargo	9	144	13
General Cargo	10	183	14
Passenger	12	798	24-22-20-18-16
General Cargo/RORO	10	330	26-25
RORO	12	300	28-27
General Cargo	10	341	37-36-35
General Cargo	10	114	38

Each ship with unique Number from IMO is called Imo No by using in ships Data base as **(https://www.marinetraffic.com/ar/ais/home/centerx:98.2/centery:5.6/zoom:10)** find the ship Auxaliry engine Spx. And using The load factor and emission factor calculate all emitted and find the Annual Total load of emissions from ships the using IBM SSP to create linear Regression Model for each poultant depends on ship power.

Conclusion

According to the results of the study, it is possible to predict the concentration of the different air pollutants through a group of regression models. The results were verified through using different examples to confirm the validity of these models. The

prediction of pollutants in the Alexandria port can be performed through the suggested regressions models if the horsepower of the ships is known.

For the climate change must be take decision to reduce the missions from the sheep home trump my style I found this above the normal limits which mentioned in environmental law in Egypt Environment low and world is going to mitigate the pollution effects by converting to Green port by stop ship emissions from ships by stopping all ships diesel generators and connected to Alexandria city Electric Grid using 6.6 KV Electric Supply (HVSC).

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