13 th International Conference on Innovation and Research in Engineering Sciences
GEORGIAN INTERNATIONAL ACADEMY OF SCIENCES AND STUDIES
11 November 2022 -TBILISI GEORGIA
www.icires.ir
info@icires.ir

Renewable Energies and Carbon Footprint Mitigation in Seaports

Seyed Behbood Issa Zadeh
Universidad politécnica de Madrid, escuela técnica superior de ingenieros de caminos, canales y puertos,
Madrid, Spain.
behbood.issazadeh@alumnos.upm.es

Maria Dolores Esteban
Universidad politécnica de Madrid, escuela técnica superior de ingenieros de caminos, canales y puertos,
Madrid, Spain.
mariadolores.esteban@upm.es

Jose Santos López Gutiérrez
Universidad politécnica de Madrid, escuela técnica superior de ingenieros de caminos, canales y puertos,
Madrid, Spain.
josesantos.lopez@upm.es

Gonzalo Fernandez-Sanchez
Universidad Europea, civil engineering department,
Madrid, Spain
G.fernandez.sanchez@facultyue.es

***Abstract*— According to Objective 7 of sustainable development goals (SDGs) [1], preparing sustainable energy for all people to achieve the united vision of 2050 is vital. In addition, as per objective 13 [1], addressing world climate change reduction actions is an essential issue. Moving toward sustainable energy needs replacing fossil fuel energies with renewable energies. Less fossil fuel consumption led to less air pollution and consequently mitigated climate change; then, there is a solid relationship between the energy management system and utilizing renewable energy with the reduction of air pollution. In addition, a recent health board study shows that emissions from seaports and ships lead to, At the same time, 19000 annual lung cancer cases, while approximately 60,000 die every year from conditions caused by pollutants [2]. Based on the United Nations' annual review of maritime transport, the annual CO2 emissions from maritime transport are estimated to be 961 million tons of CO2eq [3]. Then paying attention to the reduction measures of seaports' carbon footprint (C.F) as critical maritime infrastructure is essential because the intensive energy consumption from primary sources has increased carbon emissions. Consequently, this study surveyed renewable energy use to mitigate seaports' carbon footprint.**

I. INTRODUCTION

The most polluted cities in the world are all coastal cities, which is stated by the fact that 70% of emissions from ships worldwide occur within 400 km of coastal areas. According to a recent health board study, emissions from seaports and vessels lead to about 19,000 annual lung cancer cases worldwide [2]. Carbon emissions from ships have increased gradually over time and are estimated at circa 2.7% of total CO2 emissions [3]. Moreover, seaport marine activities account for circa 3% of total carbon emissions worldwide [4], prompting several initiatives, including preparing wind farms and solar farms in ports or near them to supply sustainable energy and decarbonize their energy systems and make seaports greener. On the other hand, According to Objective 13 of sustainable development goals about climate change, addressing and identifying world climate change reduction actions are an essential issue, then ports as an intersection place of maritime transport with other types of transport play a crucial role in this issue. Likewise, one of the most significant environmental aspects of ports that contribute to the problem of climate change is the carbon dioxide emissions generated by port activities and created by fossil fuel consumption. [5] Also, one of the main objectives of sustainability is about energy issues and new systems and initiatives in energy generation, distribution, and consumption. An energy management system (EMS) is a new system in this field commonly used in all seaports [6], and renewable energies can play a significant role in energy generation.

Some international regulations issued by global communities, such as MARPOL (Maritime Pollution Regulation) Annex IV published by the International Maritime Organization in 2005 [6], World Ports Climate Initiative (WPCI) issued by the International Association of Ports and Harbours in 2008[7], a guideline for port authorities to create

Seyed Behbood Issa Zadeh