بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / سامية زكى يوسف

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

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MONITORING AND MANAGEMENT OF PLASTIC MARINE LITTER IN EGYPTIAN NORTHERN COASTAL AREAS USING NEW TECHNIQUES

Submitted By

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B.Sc. In Civil Engineering, Faculty of Engineering, Ain Shams University, 2003
Diploma in Environmental Sciences, Faculty of Graduate Studies and Environmental Research, Ain Shams University, 2014
Master in Environmental Sciences, Faculty of Graduate Studies and Environmental Research, Ain Shams University, 2018

A Thesis Submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy Degree
In
Environmental Sciences

Department of Environmental Engineering Sciences
Faculty of Graduate Studies and Environmental Research
Ain Shams University

2022

APPROVAL SHEET

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ABSTRACT

Marine litter (ML) has recently become one of the most global prevalent pollution problems adversely affecting waterways. Litter makes its way into the water bodies as a result of disasters, accidents, mishandling, or oversight events. Minimizing the negative impacts of ML on marine ecosystems, biodiversity, human health, and the economy become a worldwide crucial need. However, an integrated system for monitoring and assessment of ML abundance in marine and coastal environments is still required to enhance existing policies and management practices.

This study aimed to examine an integrated science-based methodology for monitoring and assessment of macro-litter on the shoreline, and at the sea surface of El-Shatby beach, Alexandria Governorate as a pilot Egyptian Northern site. Quantitative measurements of ML were implemented using UNEP/MAP metadata through four years of beach-fieldwork surveys. ML quantities, materials, and main sources were identified to support the simulation of their possible fate and trajectory. Another monitoring technique was Optical spectral of Sentinel-2 (S2), and Planetscope (PS) images that were examined using a combination of different spectral bands with several indices, and verified by the pixel-value classification method of S2 images. Moreover, microwave remote sensing (SAR) was examined to add more information to the optical study. Exploring the vulnerability of coastal resources to ML using General National Oceanic and Atmospheric Administration Operational Oil Modeling Environment (GNOME) software was the additional target of this study. For simulating ML's possible trajectory hypothetical release of ML from El-Shatby beach was simulated using the GNOME model through three windage classes during wet and dry periods.

This study concluded that 72% of beach accumulated material was artificial polymers, and that variation in climatic conditions significantly influences trajectory and distribution patterns of ML under the forces of strong wind and rainfall. The most exposed sites to ML pollution were nearby public and private beaches, historical sites, Eastern and Western harbors, and Abu-Qir bay. Classification image was the most precise technique that reflects the real variety of different features, and the overall accuracy of plastics detection and identification using remote sensing techniques reached about 70-80%.

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LIST OF ABBREVIATIONS

Abandoned, lost, or otherwise discarded fishing gear	ALDFG
Area of Interest	AOI
Automated Water Extraction	AWEI
Dichlorodiphenyltrichloroethane	DDT
Driver/ Pressure/ State of Change/ Impact/ Response	DPSIR
Egyptian Environmental Affairs Agency	EEAA
Environmental Impact Assessments	EIA
European Space Agency	ESA
Extended Producer Responsibilities	EPR
Geographic Information Systems	GIS
General Authority for Fish Resources Development	GAFRD
General Authority of Remote Sensing	GARS
Global Programme of Action	GPA
Good Environmental Status	GES
Integrated coastal zone management	ICZM
Integrated monitoring and assessment programs	IMAP
Mediterranean Action Plan	MAP
Ministry of Agriculture and Land Reclamation	MALR
Ministry of Housing and New Communities	MHNC
Ministry of Water Resources and Irrigation	MWRI
Multispectral Instrument	MSI
Municipal Solid Waste	MSW
National Institute of Oceanography and Fisheries	NIOF
National Authority for Remote Sensing and Space Sciences	NARSS
NASA research Jet Propulsion Lab	JPL
Near Intra-Red	NIR
Normalize Difference Moisture	NDMI
Normalize Difference Water Index	NDWI
Normalize Difference Vegetation Index	NDVI
Non-Governmental Organizations	NGOs
Modified Normalized Difference Vegetation	MNDVI
Multispectral Instrument	MSI

LIST OF ABBREVIATIONS

Plastic Index	PI
Polychlorinated biphenyls	PCBs
Remote Sensing	RS
Reversed Normalized Difference Vegetation	RNDVI
Sea Level Rise	SLR
Shore Protection Authority	SPA
Strength – Weakness – Opportunities – Threats	SWOT
Simplified Ratio	SR
Ultraviolet	UV
United Nations Convention on Biological Diversity	UNCBD
United Nations Environmental Program	UNEP
Unmanned aerial vehicle	UAV
US Geology Survey Authority	USGS
Water Ratio	WRI