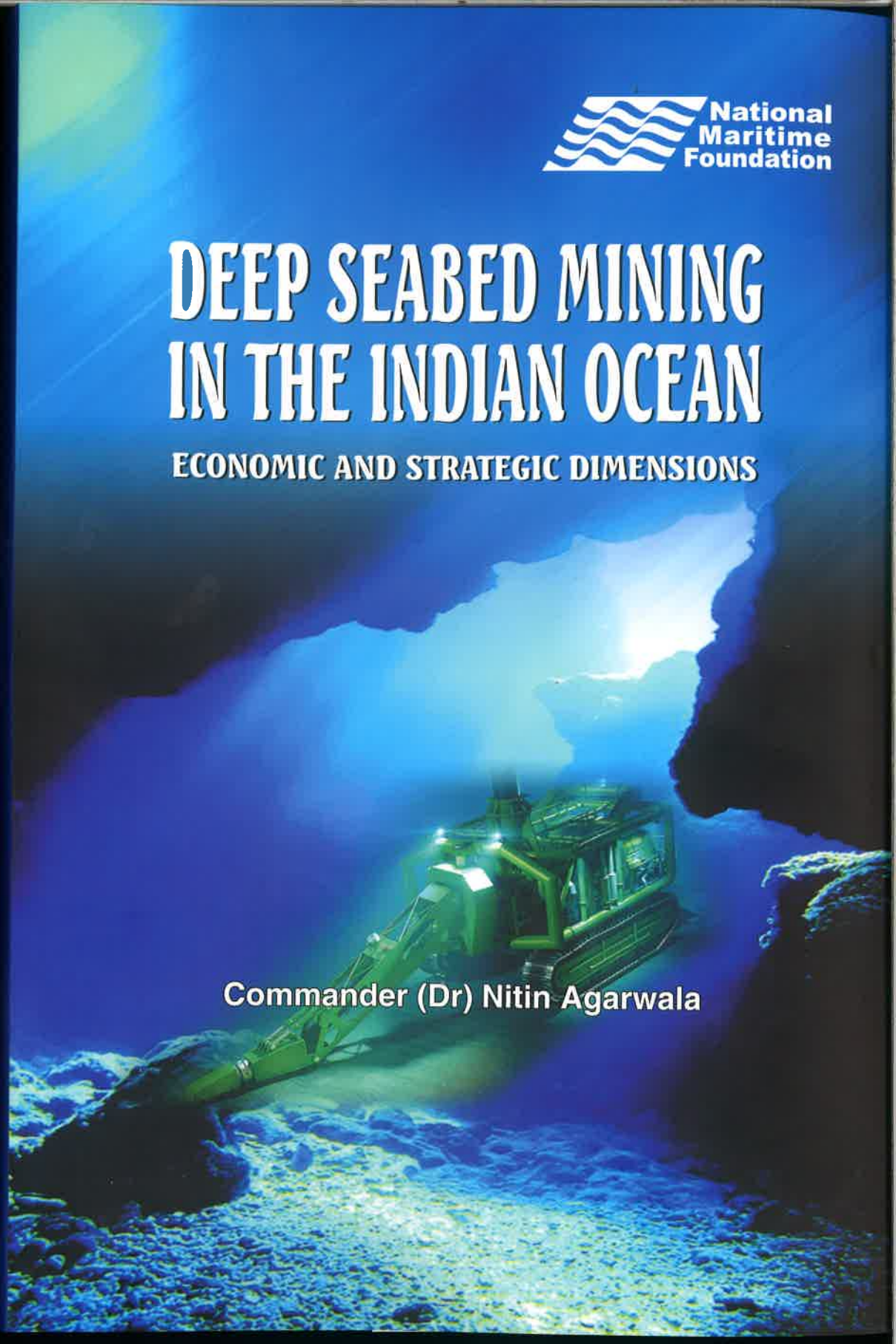
National Maritime Foundation

# DEEP SEABED MINING IN THE INDIAN OCEAN

## ECONOMIC AND STRATEGIC DIMENSIONS



Commander (Dr) Nitin Agarwala

## Maritime Operations Series

The National Maritime Foundation has commissioned the Maritime Operations series with a view to produce quality discourses on the various facets of naval operations. This day-to-day reference manual is designed to be a primer for the uninitiated as well as the seasonal veteran. Authored by qualified practitioners, the series is designed and written to portray the multi-dimensional nuances peculiar to the maritime domain in a simple and straight forward manner. Each subject in the series will provide an illuminating account of the journey of that discipline from its genesis to its present day 'avatar' – thus serving as an invaluable addition to the naval repository.

**Commander (Dr) Nitin Agarwala** was commissioned in the Indian Navy in 1993. The officer is an alumnus of the Indian Institute of Technology, New Delhi, the Indian Institute of Technology, Kharagpur, and the Cochin University of Science and Technology. He has a Bachelor, a Masters, and a Doctorate in 'Ocean Engineering and Naval Architecture' subjects. As a Naval Architect, he has experienced various facets of a warship as a user, designer, inspector, maintainer, and a policymaker.

The Commander has been a teaching and research faculty at the Department of Ship Technology, Cochin University of Science and Technology for over four years and is presently a Ph.D. examiner with the University. As a part-time Research Fellow under the Admiral AK Chatterji Research Fellowship he has researched on "Deep Seabed Mining" for 18 months before joining The National Maritime Foundation as a full-time Research Fellow in November 2017.

He has authored over 50 articles and papers for various technical conferences and journals both national and international. His research interests include Corrosion, Shipbuilding, Deep Seabed Natural Resource, Submarine Cables and Blue Economy.

He has been commended by the Chief of the Naval Staff, Indian Navy and the Flag Officer Commanding-in-chief, Southern Naval Command, Indian Navy for his outstanding performance. For his writings, he was awarded the HR Memorial Award 2016-17 by the Institute of Marine Engineers, India for the best technical paper published in Marine Engineers Review in 2016 and by the NACE Gateway India Section for the best technical paper in 'Marine Corrosion' during CORCON-2018.

His papers can be read at https://cusat.academia.edu/Nitinagarwala and he can be contacted at nitindu@yahoo.com

Demand for minerals and the economic growth of a nation are linked to each other. The greater the consumption of minerals, higher is the economic state of the nation. With the continued exploitation on land, the terrestrial minerals are becoming scarce and, if available, occur in areas used by agriculture, forest or housing. The resultant exploitation of these areas necessitates destroying the agricultural land, cutting pristine forests or displacing people. This has resulted in humanity to look at the oceans to meet their demand for minerals.

Though the mineral grade from the terrestrial mines is continually declining, there is a clear understanding that *physical scarcity and exhaustion of metals in the Earth's crust is unlikely*. This makes one wonder if mining from the ocean's seafloor (called deep seabed mining) is really a necessity! Can the present raw material demand not be met through efficient use and recycling! In reply, one realises that accelerating industrial development of countries like India and China is placing an increasing demand on the existing mineral supplies, thereby forcing countries to develop knowledge and expertise in deep seabed mining. Then, there is the ever prevalent strategic dimension that forces countries to bid for exploration rights in oceans such as the Indian Ocean.

The book looks at the need of minerals for humanity, how and what the oceans offer as minerals in general, the technological developments achieved and the insight into future technologies and designs in this field before finally focusing on the mineral wealth of the Indian Ocean. It eventually poses some tough questions that need answers if deep seabed mining is to become a success in the future. In addition, it discusses the efforts of the key players in this field operating in the Indian Ocean that has rejuvenated the deep seabed mining both *economically* and *strategically*.

Since, commercial profitability of marine minerals occurs only if the demand is greater than the supply, at times; the decision gets governed by strategic reasoning. Hence, the book aims to give an idea of the driving forces that guide such decision-making and the development of deep seabed mining.

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