

Wave Energy Resource Evaluation: Unlocking the Power of the Ocean

California Wave Energy Resource Study

March 2003

Prepared by:

Asfaw Beyene, Ph.D.
Department of Mechanical Engineering
San Diego State University
San Diego CA 92182
Email: abeyene@rohan.sdsu.edu
Phone: (619) 594-6207
Fax: (619) 594-3549

and

James H. Wilson, Ph.D. (jhwilson@neptunesd.com)
Mr. Dean Wakeham; Ms. Josie Fabre; Ms. Debbie Builder
Neptune Sciences, Inc.
4250 Pacific Highway, Suite 219
San Diego, CA 92110
Phone: (619) 523-2023
Fax: (619) 523-0800

Submitted to:

Mr. David Navarro
California Energy Commission

As the world continues to search for sustainable sources of energy, the untapped power of the ocean's waves is gaining increasing attention. With the potential to harness vast amounts of renewable wave energy, the evaluation of wave energy resources plays a crucial role in unlocking this sustainable solution.

Understanding Wave Energy

Wave energy refers to the electrical power derived from the motion of ocean waves. Waves are generated by wind passing over the surface of the ocean, which causes the water to rise and fall. This continuous movement creates a tremendous source of energy that can be converted into electricity.



21st Century Maritime Silk Road: Wave Energy Resource Evaluation (Springer Oceanography)

by David Gilmartin(1st ed. 2020 Edition, Kindle Edition)

★★★★☆ 4.4 out of 5

Language : English

File size : 72038 KB

Text-to-Speech : Enabled

Screen Reader : Supported

Enhanced typesetting : Enabled

Word Wise : Enabled

Print length : 271 pages



The Need for Wave Energy Evaluation

Before wave energy can be effectively harnessed, it is essential to evaluate the potential of a particular location. Wave energy resource evaluation involves assessing the availability, intensity, and reliability of waves in a given area. This evaluation helps determine the viability of wave energy conversion and aids in the design of efficient wave energy devices.

Wave Energy Resource Assessment Methods

Several methods are employed to evaluate wave energy resources:

- **Measurements:** Measuring devices such as wave buoys and ocean sensors are deployed to collect data on wave height, period, and direction. This data is crucial in assessing the energy potential of an area.
- **Numerical Modelling:** Computer models are used to simulate wave behavior and predict wave conditions in different locations. These models take into account factors such as wind speed, ocean depth, and coastline characteristics.
- **Satellite Remote Sensing:** Advanced satellite technology can provide accurate information on wave parameters from space. This method enables the assessment of wave energy resources in remote or inaccessible areas.

Benefits of Wave Energy

Wave energy presents numerous advantages over other renewable energy sources:

- **Renewable and Clean:** Waves are a perpetually available resource, making wave energy a sustainable and clean source of power.
- **Predictability:** Waves are predictable and subject to natural rhythms, allowing for effective energy generation planning.
- **Potential for Large-scale Generation:** The estimated global potential for wave energy is vast, with coastal areas offering significant opportunities for large-scale wave farms.
- **Minimal Visual Impact:** Offshore wave energy devices are typically located out of sight, minimizing the visual impact on coastal landscapes.
- **Job Creation and Economic Growth:** The development of wave energy projects can create employment opportunities and foster economic growth in

coastal communities.

Challenges in Harnessing Wave Energy

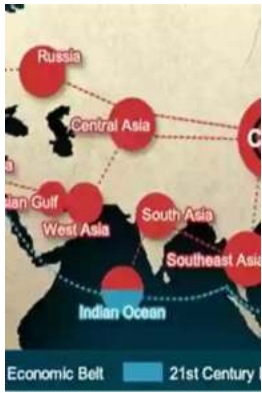
While the potential for wave energy is immense, several challenges need to be addressed:

- **Technology Development:** Developing efficient and cost-effective wave energy conversion technologies remains a significant hurdle.
- **Environmental Impact:** The deployment of wave energy devices may have ecological consequences, especially with regards to marine life and habitats.
- **Infrastructure and Grid Integration:** Establishing the necessary infrastructure and integrating wave energy into existing electrical grids pose technical and logistical challenges.
- **Investment and Financing:** Wave energy projects require substantial initial investments, making funding and financial support crucial for their successful implementation.

The Future of Wave Energy

Despite the challenges, ongoing research and advancements in wave energy technology continue to drive the development of sustainable solutions. As the negative impacts of conventional energy sources become increasingly apparent, the demand for renewable alternatives grows stronger.

Wave energy holds immense promise as a clean and reliable power source. Through comprehensive wave energy resource evaluation, we can unlock the full potential of the ocean's vast energy reserves. By investing in research, innovation, and collaborative efforts, we can pave the way for a greener and more sustainable future.



21st Century Maritime Silk Road: Wave Energy Resource Evaluation (Springer Oceanography)

by David Gilmartin(1st ed. 2020 Edition, Kindle Edition)

★★★★☆ 4.4 out of 5

Language : English
File size : 72038 KB
Text-to-Speech : Enabled
Screen Reader : Supported
Enhanced typesetting : Enabled
Word Wise : Enabled
Print length : 271 pages

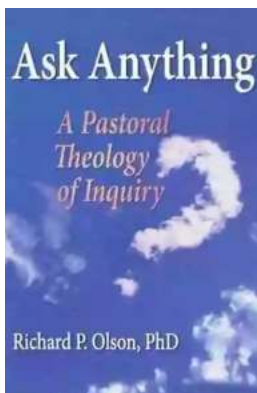


This book focuses on the evaluation of wave energy in the Maritime Silk Road. Firstly, it compares wave energy and other main energy sources, and then discusses the various disadvantages. It also presents the current research and the difficulties of wave energy evaluation, and systematically analyzes the climatic characteristics of the wave energy, including the temporal–spatial distribution and climatic trend of a series of key factors (e.g. wave power density, availability, richness, stability, energy direction, energy storage). It then describes the design of a short-term forecasting scheme and a long-term projection scheme of wave energy suitable for the Maritime Silk Road, to serve as a plan for the daily operation and long-term development of wave energy. Further, it highlights the wave energy analysis and decision-making in the context of the remote islands and reefs, using Sri Lanka is taken as a case study. Lastly, it presents the first wave energy resource dataset for the Maritime Silk Road.

This book is one of a series of publications on the 21st century Maritime Silk Road (shortened as “Maritime Silk Road”) that covers the characteristics of the marine environment and marine new energy, remote islands and reef

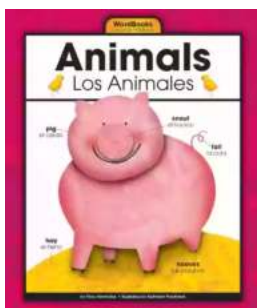
construction, climate change, early warning of wave disasters, legal escort, marine environment and energy big data construction, contributing to the safe and efficient construction of the Maritime Silk Road. It aims to improve our knowledge of the ocean, and so improve the capacity for marine construction, enhance the viability of remote islands and reefs, ease the energy crisis and protect the ecological environment and improve the quality of life of residents along the Maritime Silk Road, as well as to protect the rights, and interests of the countries and regions participating in the construction of the Maritime Silk Road.

This book is a valuable reference resource for decision-makers, researchers, and marine engineers working in the related fields.



The Secrets of Chaplaincy: Unveiling the Pastoral Theology of Inquiry Haworth

Chaplaincy is a field that encompasses deep empathy, understanding, and spirituality. It is a profession where individuals provide spiritual care and support to those in...



Animales Wordbooks: Libros de Palabras para los Amantes de los Animales

Si eres un amante de los animales como yo, entonces seguramente entenderás la fascinación que sentimos hacia estas increíbles criaturas. Ya sea que se trate de majestuosos...



Let's Learn Russian: Unlocking the Mysteries of the Cyrillic Script

Are you ready to embark on a linguistic adventure? Have you ever been curious about the beautiful Russian language? Look no further - this article is your...



The Incredible Adventures of Tap It Tad: Collins Big Cat Phonics For Letters And Sounds

Welcome to the enchanting world of phonics where learning to read becomes a captivating journey! In this article, we will explore the marvelous educational resource,...



Schoolla Escuela Wordbookslibros De Palabras - Unlocking the Power of Words!

Growing up, one of the most significant milestones in a child's life is learning how to read. It opens up a whole new world of possibilities, imagination, and knowledge. A...



15 Exciting Fun Facts About Canada for Curious Kids

Canada, the second-largest country in the world, is famous for its stunning landscapes, diverse wildlife, and friendly people. As children, it's essential to...



What Did He Say? Unraveling the Mystery Behind His Words

Have you ever found yourself struggling to understand what someone really meant when they said something? Communication can often be clouded with ambiguity, leaving us...



A Delicious Journey through Foodla Comida Wordbookslibros De Palabras

Welcome to the world of Foodla Comida Wordbookslibros De Palabras, where colorful illustrations and engaging words come together to create a delightful learning...