

RESEARCH ARTICLE



Stakeholder Perceptions of the Impact of Artificial Reef Deployment: A Case Study of the Indonesian Coral Reef Garden (ICRG) in Nusa Dua, Bali

Article Info:

Received 7 June 2024

Revised 5 September 2024

Accepted 6 September 2024

Corresponding Author:

Yulius

Research Center for Conservation of Marine and Inland Water Resources, National Research and Innovation Agency

E-mail: yuli058@brin.go.id

© 2024 Yulius et al. This is an open-access article distributed under the terms of the Creative Commons Attribution (CC BY) license, allowing unrestricted use, distribution, and reproduction in any medium, provided proper credit is given to the original authors.



Yulius^a, Camellia K. Tito^b, Muhammad Ramdhan^c, Dini Purbani^a, Taslim Arifin^a, Nur A.R. Setyawidati^d, Luh P A Savitri C Kusuma^d, dan Anninda Sabina^e

^aResearch Center for Conservation of Marine and Inland Water Resources, National Research and Innovation Agency, Cibinong 16319, West Java, Indonesia

^bResearch Center for Oceanography, National Research and Innovation Agency, Jakarta 14430, Jakarta, Indonesia

^cResearch Center for Geoinformatics, National Research and Innovation Agency, Bandung 40135, West Java, Indonesia

^dMaritime and Fisheries Training Center, Human Resource Development and Extension Agency, Jakarta 14430, Jakarta Indonesia

^eDepartment of Marine Science and Technology, Faculty of Fisheries and Marine Sciences, IPB University, Bogor 16680, West Java, Indonesia

Abstract

This research examines the challenges of coral reef conservation in Bali, a critical hub for marine tourism. Despite the island's global significance, efforts to preserve its coral reefs have been insufficient, leading to the launch of the 2020 Integrated Coral Reef Rehabilitation and Management Program (ICRG). Supported by National Economic Recovery (PEN) funds, the ICRG has focused on deploying artificial reefs in the waters of Nusa Dua. However, only 74.3 hectares of the potential 204 hectares of restoration areas have been addressed, underscoring the need for more intensive conservation efforts. Data collection involved the distribution of closed questionnaires to key stakeholders, including government bodies, academic institutions, tourists, and coral reef conservation organizations. The data was analyzed using both descriptive statistics and thematic analysis to gauge stakeholder awareness, perceptions, and willingness to contribute to conservation efforts. The analysis revealed that 69% of respondents have a comprehensive understanding of the ecological, economic, and social functions of coral reefs. Furthermore, 92% of respondents expressed a willingness to contribute to coral reef preservation, either through labor or financial means. Financial contributions ranged from Rp. 25,000 to Rp. 150,000, with 30% of respondents willing to allocate up to 5% of their annual income to conservation initiatives. These findings highlight a strong stakeholder commitment to coral reef conservation in Bali and emphasize the necessity for ongoing public engagement and support. The research suggests that integrating local customary laws into conservation strategies and enhancing public involvement could significantly bolster the long-term sustainability of coral reef restoration efforts in Bali, thereby preserving the island's marine tourism appeal and ecological integrity.

Keywords: Bali Island, Coral Garden, Coral reefs, Marine Eco-tourism, Nusa Dua

1. Introduction

Indonesia's natural resources and ecosystem services possess significant potential, both on land and at sea, particularly for tourism purposes. The development of tourism areas must be directed towards a comprehensive and well-planned approach to optimize benefits for the community [1]. One specific sector of tourism is marine eco-education tourism. This ecologically-based educational tourism involves recreational activities around coastal areas such as swimming, surfing, sunbathing, diving, snorkelling, walking, or running along the beach, appreciating the coastal environment with an educational component [2]. The development of marine eco-education tourism is distinct from mass tourism, being more vulnerable to damage and having very limited space for visitors. Similar to other forms of tourism, it also has visitor limitations. As an archipelagic country, marine eco-education tourism plays an important role in the national economy, provided it is managed effectively to maintain environmental quality and attract tourists [3]. Indonesia is situated at the centre

of the world's coral triangle and possesses the longest coastline that needs protection [4], which serves as an additional attraction for eco-education tourism in Indonesia. However, 35.15% of the coral reef cover along the Indonesian coast is in degraded condition [5]. The degradation of coral reefs, caused by uncontrolled activities of coastal residents, leads to the loss of production, genetic, and conservation values [6]. One governmental effort to address this issue is the rehabilitation and enrichment of coastal habitats by developing artificial reefs. The impacts of developing these artificial reefs include attracting tourists, increasing fishery production, functioning as marine parks, protecting the coastline, and providing facilities for aquaculture.

Bali Island, recognized as a premier marine tourism destination in Indonesia, possesses significant potential for underwater beauty, particularly in its coral reefs. However, according to the Bali Marine and Fisheries Agency, only 55% of the coral reef area in Bali is in good condition, whereas 30% is in fair condition, and the remaining reefs are in poor condition [7]. The rapid development of tourism in Bali has resulted in considerable environmental degradation of the coastal ecosystem. This is also evident in the coral reefs in the waters of Nusa Dua, Bali, where currently only 15-20% of the original coral reefs remain [8]. In 2016, the Nusa Dua Reef Foundation (NDRF) and Reef Check Indonesia conducted surveys on the coral condition at Samuh Beach, Nusa Dua, and observed widespread bleaching in most of the surveyed areas [5]. Additionally, some corals exhibited signs of stress, leading to bleaching and subsequent mortality. The sea temperature during this period reached 30-31 degrees Celsius, which contributed to the stress and bleaching of some hard corals. This phenomenon is also observed at several other dive sites in Bali, attributed to the increase in global temperature.

Geomorphological observations in the Samuh Beach area of Nusa Dua, Bali, reveal that the predominant coral type is a fringing reef characterized by spurs and grooves formation. According to the classification of hard coral habitats, the area is dominated by Scleractinian corals, accounting for approximately 40-60%, and soft coral, constituting around 60%, with *Sacrophyton sp.* and *Xenia sp.* being the dominant species. The reef flat area is primarily dominated by seagrass beds consisting of species such as *Enhalus acoroides*, *Syringodium sp.* and *Thalassodendron*. The coral transplantation phase involves a conservation strategy utilizing layered iron structures known as Mars Coral Spider or MARRS (Mars Accelerated Coral Reef Rehabilitation System). This system facilitates the attachment of juvenile corals to bridge the gaps between the remaining natural corals. It is designed to stabilize the coral reefs, mitigate coral rubble, and provide a substrate for habitat recovery and the natural enhancement of coral biodiversity over time.

Several corals generally transplanted onto these artificial reef structures include various Scleractinia (reef-building hard corals) such as *Acropora*, *Montipora*, *Pocillopora*, *Stylophora* and *Galaxea*. All transplanted corals are cultivated specimens sourced from Bali and its surrounding areas [9]. Efforts to restore coastal ecosystems in Bali are stringent, including prohibitions on fish poisoning and coral mining for construction metals, which have left a swath of destroyed coral fragments along the tidal area. Sedimentation also poses a significant threat to coral health, as corals can be smothered by sand movement caused by currents and waves. Natural coral recruitment is extremely challenging, with few surviving corals scattered unevenly due to extensive damage, high levels of natural disturbances, and anthropogenic activities.

Coral reef restoration necessitates a period of 3-5 years to manifest significant impacts [9]. The designated restoration sites in Nusa Dua include The St. Regis Bali Resort and Sofitel Bali Nusa Dua [9]. This research was conducted in the Gili Matra Marine Tourism Park (TWP), West Nusa Tenggara, between September and November 2016. The study utilized both secondary and primary data. Secondary data encompassed demographic statistics, production figures, the number of fishing households, tourism data, and information related to the potential of marine and fishery resources in TWP Gili Matra. These data were sourced from local administrative offices, the Central Bureau of Statistics (BPS), the Department of Marine and Fisheries (KP), the Ministry of Marine Affairs and Fisheries (KKP), the Department of Tourism, and scientific publications from research institutions and universities.

As part of coral reef rehabilitation efforts in Bali, the central government launched the Indonesia Coral Reef Garden (ICRG) program, integrated into the National Economic Recovery (PEN) initiative, as a response to the impacts of the COVID-19 pandemic. The Indonesia Coral Reef Garden (ICRG) program was implemented across five locations: Nusa Dua, Serangan, Sanur, Pandawa Beach, and Buleleng [10]. The total restored area covered 74.4 hectares out of a potential 204 hectares, with a budget of IDR 111.32 billion. The initiative involved over 10.172 workers from the service sector and coastal businesses, directly benefiting the local economy. The program not only focuses on rehabilitating coastal ecosystems and coral reefs but also aims to stimulate the local economy, create jobs, provide educational opportunities, and offer alternative marine tourism attractions in Bali with an eco-education concept.

During the International Monetary Fund (IMF) – World Bank Group (WBG) Annual Meeting held in Nusa Dua, Bali, from October 8-14, 2018, a coral planting event was conducted in front of the Sofitel Bali Nusa Dua Beach Resort. The objective of the event at Nusa Dua Coral Garden was to rehabilitate degraded coral reef ecosystems and provide economic benefits through fisheries, tourism, education, and research [9]. The coral transplantation model employed was based on the “Artificial Reef Spider” structure, resembling a spider. Corals were affixed to layered iron structures designed to stabilize the coral reefs. The restoration process began with a Habitat Mapping Stage. Before coral planting, habitat monitoring and mapping activities were conducted on the coral reef ecosystem in the Samuh Beach area of Nusa Dua.

Coral reefs offer substantial and diverse benefits, both direct and indirect, including serving as habitats for fish and other marine organisms, supporting marine tourism, and more. Therefore, the Nusa Dua Coral Garden has the potential to become both a marine tourism destination and a coral education centre. Coral damage in Nusa Dua has been extensive due to destructive fishing practices involving potassium cyanide and natural disasters such as global warming and large waves [11]. In light of these circumstances, this research will focus on Nusa Dua, Bali, where coral reef coverage has diminished to 15-20%. The program to restore coral reef ecosystems is both timely and necessary, considering the slow growth rate of coral reefs (1-2 cm per year). The primary target for coral reef conservation efforts is the younger generation. The Scholar Reef Nusa Dua Program engages young people as agents of change for coral reef conservation [12]. Consequently, as a contribution to coastal and marine spatial planning, this study aims to provide recommendations for the utilization of artificial reefs for sustainable marine eco-education tourism in the waters surrounding Bali Island. The primary objective of this research is to evaluate the ecological impact of artificial reef placement in the waters of Nusa Dua, Bali, by analysing changes in local environmental conditions and assessing how these structures contribute to the restoration and sustainability of coral reef ecosystems in the region.

2. Materials and Methods

2.1. Time and Location

This study was conducted from May 26-29, 2020, in the ICRG Nusa Dua area, Badung Regency, Bali Province (Figure 1). Data collection utilized in-depth interviews and closed questionnaires distributed to respondents. The respondents included key stakeholders involved in marine tourism activities in Bali, such as representatives from the central government, local government, academia, tourists, and organizations engaged in coral reef conservation.



Figure 1. Study Area of ICRG in Nusa Dua, Bali.

Nusa Dua is a region within Badung Regency, located in the southern part of Bali. Badung Regency covers an area of 418.52 km² and is administratively divided into six districts, 16 urban villages, and 46 rural villages [13]. Nusa Dua is within the South Kuta District, which covers an area of 105.46 km² and consists of six urban/rural villages [14]. This district is situated at the southernmost tip of Bali, with most of its boundaries adjacent to water bodies. The northern boundary of South Kuta District borders Kuta District, while the southern, eastern, and western boundaries are bordered by the Indian Ocean.

2.2. Data Collection

The data collection method used was a survey technique, which involved sampling and direct interviews with respondents to identify the potential and socio-economic conditions related to resource utilization. Surveys were also used to determine the total value contained within a particular area. The primary data collection instrument used in this study was a questionnaire, defined as a research tool consisting of a list of questions designed to obtain information from respondents [15]. The sampling technique used was random sampling. However, to minimize undesirable outliers, specific criteria were applied. Respondents were required to be 15 years old or above, capable of communicating effectively, and expected to provide honest and accurate responses. The sample size for this study consisted of 13 respondents, including 2 civil servants, 2 tourism business operators, 1 fisherman, 3 NGO representatives, 1 academician, and 4 tourists. The respondents were tourists visiting Nusa Dua Beach and fishermen operating around the Nusa Dua Marine Protected Area (TWP Nusa Dua).

3. Results and Discussion

Respondent characteristics such as age, occupation, and experience significantly shape their perceptions of coral reef conservation. Older respondents may value long-term environmental benefits more, while younger ones might focus on innovative, future-oriented approaches. Occupation also plays a role; tourism business operators likely see conservation as vital to their livelihood, while fishermen may prioritize the potential increase in fishery production. NGO representatives, on the other hand, might emphasize the broader ecological importance of coral reefs due to their professional commitment to sustainability. Experience further influences perceptions, with more experienced individuals having a deeper understanding of the complexities of reef restoration, while those with less experience might focus more on immediate, visible outcomes. These diverse perspectives underscore the need for conservation programs that address the specific concerns and motivations of different stakeholder groups. Respondent characteristics of this research were age, occupation, and years of experience. The number of respondents in this pre-survey

activity totalled 13 individuals, with the majority (53%) being aged 45-60 years. Local tourists residing in Denpasar and its surroundings constituted 30% of the respondents. Additionally, 23% of the respondents were representatives from NGOs. Other respondents included civil servants, tourism business operators, fishermen, and academics. The pre-survey results indicated that a significant portion of the respondents (53%) had over 10 years of experience in their respective professions. The detailed characteristics of the respondents in this pre-survey are presented in Figure 2.

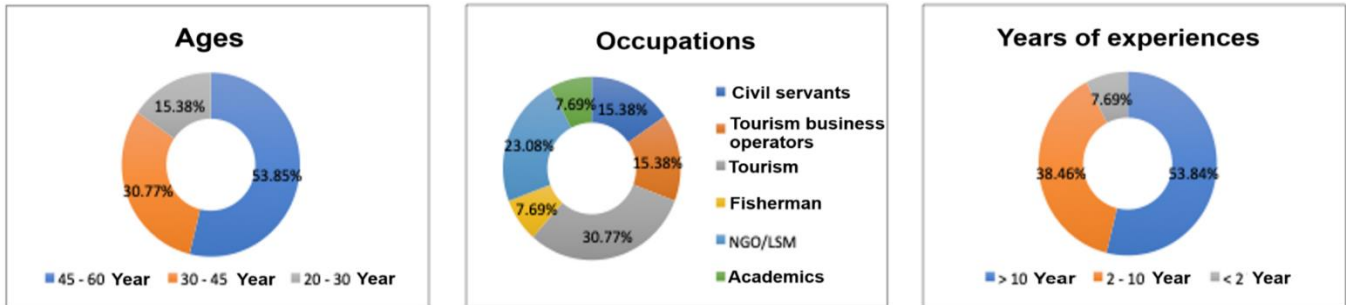


Figure 2. Characteristics of respondents

The respondent’s perception regarding to coral reefs encompasses knowledge of their ecological, economic, and social function as well as the benefits of coral reefs, their willingness to conserve them, and the percentage of income they are willing to contribute to coral reef conservation in the ICRG Nusa Dua area, Bali. Based on the analysis result, the majority of respondents (69%) are knowledgeable about the ecological, economic, and social function of coral reefs (Figure 2). This is consistent with the number of respondents (69%) who are also aware of the significant benefits of coral reefs to marine ecosystems. Nearly all respondents (92%) express their willingness to protect coral reefs by contributing either labor or a certain amount of money. Some respondents are inclined to contribute financially, with 30% willing to donate twenty-five thousand rupiahs, another 30% willing to contribute fifty thousand rupiahs, and a smaller fraction (7%) willing to donate one hundred fifty thousand rupiahs. Additionally, 30% of respondents express their readiness to contribute 5% of their annual income towards coral reef conservation, while other respondent’s willingness varies, ranging from 1% to 6% (Figure 3).

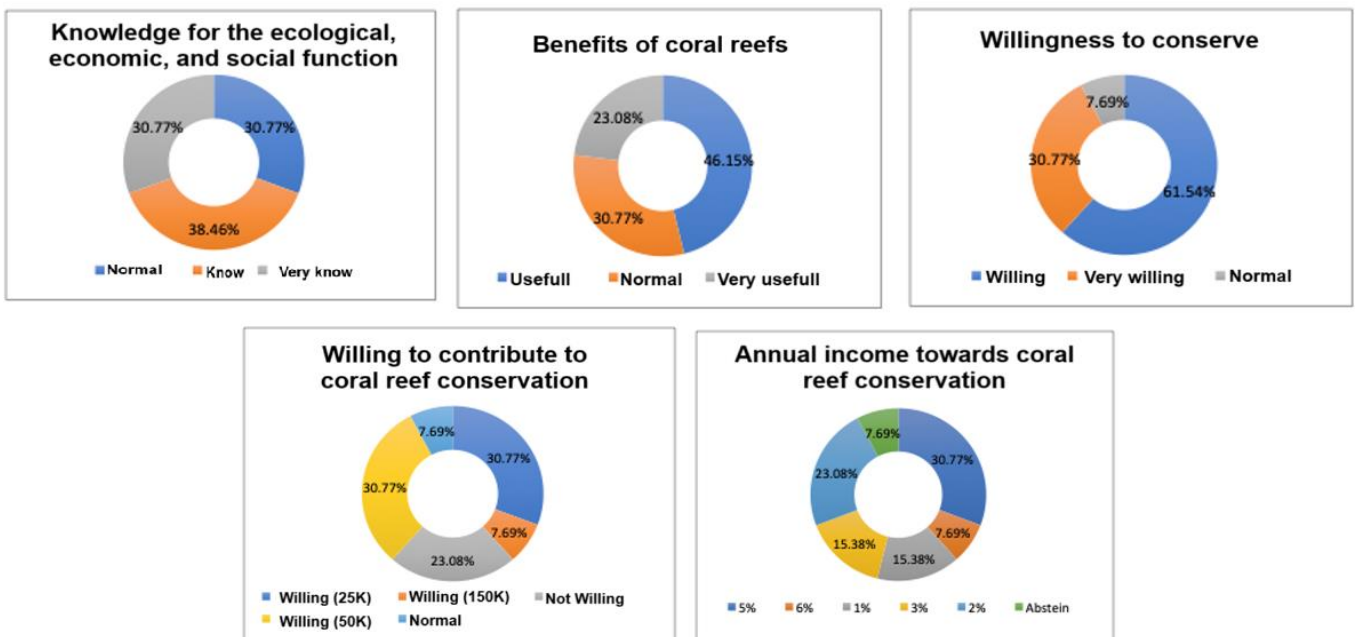


Figure 3. Perception of Respondents

Among the 13 respondents, only four had direct involvement in the submersion activities of artificial reefs, specifically at the Kuta waters, Bon Dalem Village (Tejakula District, Buleleng Regency), and Sanur Waters. The artificial reefs rehabilitation efforts at Kuta Beach in 2003 were initiated by the River Basin Authority, Ministry of Public Works. Conversely, the submersion activities in Bon Dalem Village were initiated by a community fishing group in 2011. In 2020, utilizing funds from the National Economic Recovery (PEN) initiative, the Coordinating Ministry for Maritime Affairs implemented the Indonesian Coral Reef Graden (ICRG) program. This labor-intensive program focused on coastal ecosystem rehabilitation through coral reef restoration at five sites: Nusa Dua, Pandawa, Sanur, Serangan, and Buleleng.

3.1. Ecological Impacts

Ecological monitoring results indicated juvenile coral recruitment following the submersion of artificial reefs. Research around the coral garden area identified 25 colonies of natural coral recruits from seven genera and six species, with *Pocillopora damicornis* being the most frequently observed species with 16 colonies [16]. The recruited coral colonies ranged in size from 1.5 to 9 cm, exhibiting varying conditions from healthy to partially dead with algae growth. Currently, the coral reef condition is still poor and does not show a significant recruitment rate. The low recruitment rate, despite the presence of adult coral colonies in the coral garden, can be attributed to factors such as sedimentation [17], coral planula abundance, and substrate suitability [18].

Monitoring results indicated that water conditions remained relatively stable and unchanged before and after the artificial reef submersion activities. Observations by [19] showed that the hydrological conditions of these waters were still within the tolerance limits set by the Indonesian Minister of Environment Decree No. 51 of 2004 concerning Marine Water Quality Standards. Recent studies measuring sea surface temperature, salinity, pH, DO, and clarity indicate that the water quality of Nusa Dua conforms to the marine water quality standards required for coral growth, as stipulated by the Indonesian Minister of Environment [20].

3.2. Economic Impacts

Economically, there has been an increase in income and changes in employment types among the local population around the artificial reef submersion sites. The direct impact of this program includes the disbursement of wages amounting to Rp 7.35 billion to 1,999 individuals for the construction, placement, and arrangement of structures over three months. Wage disbursement was accompanied by detailed wage slips verified by supervisors from the worker's attendance reports. The indirect economic impact of this program can be measured by the economic multiplier effect. According to the Bali Province 2016 input-output table, the construction sector's output multiplier is Rp 1,4152, meaning that every Rp 1 increase in the construction sector will boost Bali's economy by Rp 1,4152 [21,22]. The indirect economic impact was felt by the communities around Sanur and the project sites, with priority given to local vendors for goods and services procurement. This included materials and equipment, tents and facilities, vehicles/transportation, boats, diving, and underwater construction equipment, and heavy machinery. The PEN program also prioritized local SMEs (Small and Medium Enterprises) to support community economic recovery during the pandemic [23].

3.3. Social Perceptions

Socially, the environmental awareness has been an increase, particularly regarding coral reef conservation and waste management. Additionally, there has been an improvement in the socialization and monitoring of artificial coral reef growth. From an institutional and regulatory perspective, certain rules derived from local and central government regulations, local wisdom, and traditional laws governing coral reef utilization and management have been implemented.

4. Conclusions

This research aimed to assess the impact of artificial reef placement on coral reef restoration in the waters of Nusa Dua, Bali, and to evaluate stakeholder perceptions and their implications for conservation efforts. The findings reveal a strong consensus among stakeholders on the significance of artificial reefs, with 69% demonstrating a comprehensive understanding of coral reefs' ecological, economic, and social functions. Notably, 92% expressed a willingness to contribute to conservation efforts, either financially or through labor, highlighting a deep commitment to preserving these vital marine ecosystems. However, the study also underscores the need for intensified and sustained conservation actions, as only a fraction of the potential restoration area has been addressed. These results align with the research objectives by demonstrating the critical role of stakeholder involvement and the ongoing necessity for effective and scalable conservation strategies to ensure the long-term success and sustainability of coral reef restoration initiatives in Bali.

Author Contributions

YS, CKT, MR, DP: Conceptualization, Methodology, Software, Investigation, Writing - Review & Editing; **TA, NARS, LPASCK:** Writing - Review & Editing, Supervision; **AS:** Writing - Review & Editing.

Conflicts of interest

The authors declare no conflicts of interest.

Acknowledgements

The author expresses gratitude to those who participated the researches during data collection, colleagues from the Marine Research Center of the Ministry of Marine Affairs and Fisheries (KKP), colleagues from the Oceanography Research Center of the Indonesian Institute of Sciences (LIPI), Directorate of Marine Services of the Ministry of Marine Affairs and Fisheries (KKP), Center of Socio-Economic Research of the Ministry of Marine Affairs and Fisheries (KKP), Directorate of Sustainable Tourism Development of the Ministry of Tourism and Creative Economy (Kemenparekraf), the Provincial Government of Bali, and ITDC Nusa Dua Bali.

References

1. Charlier, R.H.; Christian, P.; De Meyer, C.P. Tourism and the Coastal Zone: The Case of Belgium. *Journal Ocean and Coastal Management*. **1992**, *2*, 231–240.
2. Dahuri, R. *Pengelolaan Sumberdaya Wilayah Pesisir Secara Terpadu*; Penerbit Pradnya Paramita: Jakarta, 2001; ISBN 979408381X.
3. Silva, C.P.; Alves, F.; Rocha, R. The Management of Beach Carrying Capacity: The Case of Northern Portugal. *Journal of Coastal Research (Proceedings of the 9th International Coastal Symposium)*. **2007**, *SI 50*, 135–139.
4. ICCTF Selamat Hari Segitiga Terumbu Karang 2020 Available online: <https://www.icctf.or.id/selamat-hari-segitiga-terumbu-karang/> (accessed on Feb 15, 2024).
5. Giyanto; Abrar, M.; Hadi, T.A.; Budiyanto, A.; Hafizt, M.; Salatolohy, A.; Iswari, M.Y. *Status Terumbu Karang Indonesia*. 2017; COREMAP-CTI, Pusat Penelitian Oseanografi – LIPI: Jakarta, 2017; ISBN: 978-602-6664-09-9.
6. Hartati, S.T. Rehabilitasi Wilayah Pesisir Melalui Pengembangan Terumbu Buatan. *Jurnal Bawal*. **2008**, *2*, 35–43, doi:<http://dx.doi.org/10.15578/bawal.2.1.2008.35-43>.
7. Hanya 55% Terumbu Karang Di Bali Berkualitas Baik 2018 Available online: <https://bali.bisnis.com/read/20181029/537/854154/hanya-55-terumbu-karang-di-bali-berkualitas-baik/> (accessed on Feb 15, 2024).
8. Hadi, T.A.; Giyanto; Prayudha, B.; Hafizt, M.; Budiyanto, A.; Suharsono Status Terumbu Karang Indonesia 2018; Puslit Oseanografi – LIPI: Jakarta, 2018; ISBN: -.

9. Putri, P. I. D. .; Sudiarta, I. K. .; Prasetijo, R. .; Prasetya, I.N.D. Indonesia Coral Reef Garden Sanur Bali: Pemulihan Ekonomi Nasional Melalui Restorasi Terumbu Karang. *IJCSL*. **2023**, 7, 168-177. doi: 10.23887/ijcsl.v7i2.56525.
10. KKP Sebut Kebun Terumbu Karang Di Bali Kini Jadi Spot Wisata Selam 2021 Available online: <https://www.tempo.co/ekonomi/kkp-sebut-kebun-terumbu-karang-di-bali-kini-jadi-spot-wisata-selam--543793> (accessed on Feb 15, 2024).
11. Merawat Terumbu Karang Di Nusa Dua Bali 2021 Available online: <https://kumparan.com/kumparannews/foto-merawat-terumbu-karang-di-nusa-dua-bali-1vsLT9rfl2j> (accessed on Feb 15, 2024).
12. Rehabilitasi Terumbu Karang Seluas 204 Hektar Di Perairan Nusa Dua Begini Kata Menko Luhut 2021 Available online: <https://bali.tribunnews.com/2020/08/19/rehabilitasi-terumbu-karang-seluas-204-hektar-di-perairan-nusa-dua-begini-kata-menko-luhut> (accessed on Feb 15, 2024).
13. BPS Kabupaten Badung Kabupaten Badung Dalam Angka 2021; BPS Kabupaten Badung, 2021; ISSN: 978-602-6995-41-4.
14. BPS Kabupaten Badung Kecamatan Kuta Selatan Dalam Angka 2020; BPS Kabupaten Badung, 2021; ISSN: 2087-6270.
15. Suparmoko, M. Pedoman Penilaian Ekonomi Sumber Daya Alam Dan Lingkungan (Konsep Dan Metode Perhitungan); First Edition.; BPFE: Yogyakarta, 2009; ISBN: 9795034278.
16. Sitompul, K.R.M.; Subagio, J.N.; Yuni, L.P.E.K. Rekrutmen Karang Alami Scleractinia Di Sekitar Coral Garden Nusa Dua Reef Foundation, Nusa Dua, Bali. *SIMBIOSIS*. **2023**, XI, 160–173.
17. Febrian, S.; Efendi Kajian Rekrutmen Karang Batu Pada Zona Inti Dan Zona Pemanfaatan Di Pulau Air Kawasan Konservasi Taman Wisata Perairan (TWP) Pulau Pieh Dan Laut Di Sekitarnya. In the Prosiding Hasil-Hasil Penelitian Mahasiswa; 2015; Vol. 8, pp. 1–13.
18. Sitompul, K.R.M.; Subagio, J.N.; Yuni, L.P.E.K. Rekrutmen Karang Alami Scleractinia Di Sekitar Coral Garden Nusa Dua Reef Foundation, Nusa Dua, Bali. *SIMBIOSIS*. **2023**, XI, 160–173.
19. Rahman As-Syakur, A.; Wiyanto, D.B.; Studi, P.; Kelautan, I.; Kelautan, F.; Perikanan, D. Study Of Hidrological Condition For Artificial Reef Location in Tanjung Benoa Bali. *Jurnal Kelautan Univ. Trunojoyo Madura*. **2016**, 9, 85-92. doi: 10.21107/jk.v9i1.1293
20. Rajabson, M.H.S.; Rachmayani, R.; Sarasvati, P.N. Kesesuaian Kondisi Oseanografi Dalam Mendukung Ekosistem Terumbu Karang Di Pantai Mengiat, Nusa Dua Bali. *Journal of Character and Environment*. **2023**, 1, 12–18.
21. Dewi, I.G.A.A.Y.; Purba, I.B.G.I.W. Implementasi Kebijakan Stimulus Perekonomian Sebagai Countercyclical Dalam Upaya Menyelamatkan Pelaku Pariwisata Terdampak Covid-19 Di Kabupaten Badung. *Journal of Contemporary Public Administration (JCPA)*. **2022**, 2, 30–34.
22. Gultom, I.S.; Anggoro, T.D.; Adhitya, R.B. Implementasi Program Indonesia Coral Reef Garden Bali (ICRG BALI). *Jurnal Ilmiah Administrasi Publik (JIAP)*. **2022**, 8, 145–149.
23. Putri, P.I.D.; Sudiarta, I.K.; Prasetijo, R.; Prasetya, I.N.D. Indonesia Coral Reef Garden Sanur Bali: Pemulihan Ekonomi Nasional Melalui Restorasi Terumbu Karang. *International Journal of Community Service Learning*. **2023**, 7, 168–177. doi: 10.23887/ijcsl.v7i2.56525.