Tuijin Jishu/Journal of Propulsion Technology
ISSN:1001-4055
Vol. 44 No. 2 (2023)

Seagrass Ecosystem and its Regulations in Indonesia

Gunawan Widjaja

Faculty of Law,Universitas17 Agustus 1945 Jakarta, Indonesia

Abstract:

As an archipelagic state, Indonesia consists of islands surrounded by water. Seagrass beds are part of a unique water and land ecosystem in Indonesia. Just recently, the 1st of March has been designated as world seagrass day. This study aims to describe and explain the conditions, regulations, and environmental protection arrangements for seagrass beds in Indonesia. This research is normative legal research using secondary data. An analysis is conducted through a descriptive-explanatory approach to explain the regulations of seagrass beds in Indonesia, the environmental protection arrangements for seagrass beds in Indonesia, and their current conditions. Findings and discussion prove that Indonesia has been giving attention to the development of seawater ecology and environmental protection. For seagrass beds, the Government of the Republic of Indonesia through the State Minister has issued a regulation that covers the determination of healthy seagrass beds. However, the implementation is not as expected. Until recently many research studies have shown that in general, the seagrass beds in Indonesian water are not healthy, only covering a certain area. Even in a conservation sea area, the coverage of seagrass is less than healthy. It cannot be seen from the perspective that Indonesia mostly consists of water than land.

Keywords: *seagrass, seagrass beds, ecosystem, environment, legal protection, Indonesia*

I. Introduction

In general, every living creature, including plants, needs an environment to be able to live. Ecosystems form a living environment that is appropriate for each living being in relation to other living beings and with all the inanimate objects that make up that ecosystem. In a suitable ecosystem, all living things in the ecosystem will continue to be in balance. Disruption to one part of the ecosystem, including living things, will damage the ecosystem, to the point of forming a new balance.

In simple terms, ecosystems can be divided into land, water, and air ecosystems, by not ruling out the possibility of ecosystems that they may involve only a single ecosystem, two or even three ecosystems that co-exist at the same time. One of the ecosystems that covers the land and ocean is the seagrass bed ecosystem.

Indonesia is known as one of the biggest archipelagic states in the world. As an archipelagic state, the Indonesian island is surrounded by water. Almost 62% of the territory of the Republic of Indonesia is the waters, which reaches 6.32 million km2. As a country with water dominated, Indonesia needs to maintain the waters environment, especially those that cover the area of land and water.

Seagrass bed is chosen because March 1st, 2023 has been marked as World Seagrass Day. It was declared by the United Nations General Assembly in May 2022 proposed by Sri Lanka to emphasize the importance ofconserving the marine habitat (Morrison, 2023). This study intends to describe the laws and regulations of seagrass bed ecosystems in Indonesia and their current conditions based on the available regulation.

II. Research Method

This research is normative legal research with a descriptive-explanatory approach. As a legal study, this study uses secondary data. The secondary data used is the primary source of law, which consists of applicable laws and regulations. In addition, secondary legal sources are also used, which are the opinions of experts in writings in journals, opinions submitted in scientific meetings, or opinions stored in certain literature and other scientific documents. As a reinforcement, this research also uses tertiary legal sources in the form of dictionaries, encyclopedias, and various kinds of non-legal references that are thought to be useful to support and provide a more comprehensive explanation in this research.

The analysis is carried out with a qualitative approach. This approach is used with the aim to provide a better understanding of the ecosystem and regulation of seagrass beds in Indonesia. The results of the study with an analytical descriptive explanatory approach shall produce a complete picture of the purpose of this study.

III. Literature Review

Seagrass Ecosystem

Seagrass beds can be found from the Artic continent to Africa and New Zealand. There are 58 kinds of seagrass all over the world. Of those kinds, 16 from 7 genera can be found in Southeast Asia. Based on verification by Indonesian Seagrass Wali Data Team LIPI, the seagrass beds area are about 292 thousand hectares, which is the biggest in Southeast Asia (Rimbakita.com, 2023)

Seagrass Regulation and Protection In Indonesia

Preliminary research found that the terms seagrass beds in Indonesian laws and regulations can be found in the definition of "Coastal and Small Islands Resources" in Article 1 Point 4 of "Law Number 27 of 2007 concerning Management of Coastal Areas and Small Islands" as amended by "Law Number 1 of 2014 concerning Amendments to Law Number 27 of 2007 concerning Management of Coastal Areas and Small Islands"(Law of Management of Coastal Areas and Small Islands). The law defines:

"Coastal and Small Islands Resourcesare biological resources, non-biological resources; artificial resources, and environmental services; biological resources including fish, coral reefs, **seagrass beds**, mangroves, and other marine biotas; non-biological resources include sand, seawater, seabed minerals; Artificial resources include marine infrastructure related to marine affairs and fisheries, and environmental services in the form of natural beauty, seabed surface for underwater installations related to marine affairs and fisheries as well as ocean wave energy contained in the Coastal Zone."

However, the Law of Management of Coastal Areas and Small Islands was then amended by "Law Number 6 of 2023 concerning the Stipulation of Government Regulations in Lieu of Law Number 2 of 2022 concerning Job Creation Become Law" (Job Creation Law 2023). According to the Job Creation Law 2023:

"Coastal Resources and Small Islands are biological resources including fish, coral reefs, **seagrass beds**, mangroves, and other marine biotas; non-biological resources include sand, seawater, seabed minerals; Artificial resources include marine infrastructure related to marine affairs and fisheries, and environmental services in the form of natural beauty, seabed surface for underwater installations related to marine affairs and fisheries as well as ocean wave energy contained in the Coastal Zone."

The literature review further finds that seagrass protection regulation can be found in the "State Minister of Environment Decree Number 200 of 2004 Concerning Standard Criteria for Damage and Guidelines for Determining the Status of Seagrass Beds" (State Minister Environment Decree on Seagrass). From the part of reference quoted from the State Minister Environment Decree on Seagrass, it can be seen that the issuance of the Decree is based on two laws and one government regulation, i.e.:

1. "Law Number 5 of 1990 concerning Source Conservation Biological Forces and Their Ecosystems";
2. "Law Number 23 of 1997 concerning Management Environment";

3. "Government Regulation Number 19 of 1999 concerning Control of Marine Pollution and/or Destruction."

Until today, the Law of Environment Management has been replaced and the new law has also been amended several times. Below are new laws and their further amendment:

1. "Law Number 32 of 2009 concerning Environmental Protection and Management", which was amended by:
2. "Law Number 11 of 2020 concerning Job Creation"; which was replaced by:
3. "Government Regulation in Lieu of Law Number 2 of 2022 concerning Job Creation"; and
4. "Law Number 6 of 2023 concerning Stipulation of Government Regulations in Lieu of Law Number 2 of 2022 Concerning Job Creation Become Law"(Job Creation Law 2023).

Accordingly, following the amendment of the Law of Environment Protection and Environment, the Government Regulation on Marine Pollution Control was also replaced by the "Government Regulation Number 22 of 2021 concerning the Implementationof Environment Protection and Management"(Government Regulation on Implementation of Environment Protection and Management).

Based on the consideration mentioned in the State Minister Environment Decree on Seagrass, seagrass beds are natural resources that have various functions as a habitat for growth, breeding, forage, and shelter for marine life, dampers sea waves, coastal protection from erosion and catchers sediment, therefore it is necessary to maintain its sustainability. To further understand and protect against the damage of seagrass beds, caused by human activity, it requires determining the standard criteria of damageto the seagrass beds. Seagrass beds are defined as"seagrass beds formed by one type of seagrass (single vegetation) and or more than 1 type of seagrass (mixed vegetation)"; and the Standard Criteria for Seagrass Damage is"the size of the limit of physical change and or live accessible seagrass beds".Standard Criteria for Seagrass Damage is "a measure of the limit of physical and/or biological changes in seagrass meadows that can be tolerated"; dan"the Standard Criteria for Seagrass Damage is the size of the limit of physical and/or biological changes in seagrass beds that can be tolerated".

In simple, the Standard Criteria for Seagrass Damage is a way to determine the status of Seagrass Beds. It is based on the use of the Transect Plot method.Standard Criteria for Damage and Guidelines for Determining the Status of Seagrass Beds can be reviewed for at least 5 years. Seagrass status means"the level of seagrass condition at a certain location in a certain time which is assessed based on standard criteria for seagrass damage using a percentage of coverage area."

According to the State Minister Environment Decree on Seagrass,the Standard Criteria for Seagrass damage and status are determined based on the percentage of the damaged area and the area of living seagrass cover as set out in Annexes I and II to the State Minister Environment Decree on Seagrass. Annex I determined the level of damage based on the percentage area of damage. If the area of damageis more than 50% then the level of damage is considered high, and if the damaged area reached 30%-49.9% the level of damage reached is moderate. Meanwhile, the low damage level occurred when the area of damage in less than 29%. Annex II determinedthe Status of the seagrass bed. It is considered healthy or good when the area covered by the seagrass bed is more than 60%. It is called less healthy if the covered area of the seagrass bed is between 30%-59.9%. The condition is deemed as poor when the covered area is less than 29.9%. The less healthy and poor conditions, in general, are called damaged.

The measurement method used in the State Minister Environment Decree on Seagrassto determine the condition of seagrass beds is a Transect method and an Example Plot (Transect Plot). Transect Method is "a method of sampling examples of a population community with an example tile approach that is on a drawn line passing through the territory of the ecosystem".The Transect Plot method is "a method of sampling the population of a community with an example plot approach that is on a line drawn through the ecosystem area".

Further analysis showed that the determination of the standard criteria for seagrass damage can be referred to Government Regulation on Implementation of Environment Protection and Management which replaced the Government Regulation on Marine Pollution Control. According to Article 231 (1) of the Government

Regulation on Implementation of Environment Protection and Management, the Minister determines the standard criteria for damage to the Marine ecosystem. Based on Article 231 (2) of Government Regulation on Implementation of Environment Protection and Management: "the standard criteria for damage to the Marine ecosystem includes a. …; b. standard criteria for seagrass damage; … and d. …". The provisions mentioned in the Government Regulation on Implementation of Environment Protection and Management can be traced back to the Law of Environment Protection and Management. According to Article 21 (1) of the Law of Environment Protection and Management, regarding the standard criteria for environmental damage, it is stated that "to determine whether environmental damage occurs, standard criteria for environmental damage are determined". Article 21 paragraph (3) of the Law of Environment and Management further determines that "the standard criteria for ecosystem damage include: a. …; e. standard criteria for seagrass damage; and/or h. …".

Seagrass Bed Condition In Indonesia According To The State Minister Of Environment Decree Of The Republic Of Indonesia Number 200 Of 2004

There has been no single research or study that has reviewed the healthiness of seagrass beds in Indonesian waters. Indonesian Oceanography Research Centre (PusatRisetOseanografi-BRIN (PRO-BRIN)) stated that until 2022, only 16%-35% of Indonesian seagrass beds covering an area of 293,464 ha have been studied. In 2017, according to Dirhamsyah, the Head of Oceanography CentreLIPI (14 Juli 2017) as quoted from Greeners.co (2017) that only 5% of seagrass beds are healthy, which can be found in waters surrounding Biak, Papua. However, in some conservation areas such as Wakatobiwaters dan Lombok waters, the seagrass beds are found less healthy.

Below are the results of the research and studies that ever been conducted in Indonesian waters that calculate the seagrass bed coverage based on the State Minister Environment Decree on Seagrass to determine the healthiness of the seagrass beds.

1. The seagrass bed in Indonesian western waters conditions is 43% good, 50% moderate, and 7% poor from a total area of 284,660 ha (Supriyadi et. al., 2018);
2. the seagrass beds coverage in Malang Rapat waters, Bintan is between 51% to 75% (Adi et al., 2019);
3. the seagrass beds found in SenggarangBesar waters, Kepulauan Riauwiththe coverage of the seagrass bed is 77.29%, are considered as healthy (Fajeri et al., 2020).
4. the seagrass beds coverage in Panjang Island waters which consists of Panjang Island and Lima Island is poor (≤ 29,9%) (Harjuna et al., 2020);
5. the seagrass beds in Lovina are considered good (60%)(Wigdati et al., 2021);
6. the seagrass bedecosystems in TelukAwur waters Jepara are less healthy with only 41,48% coverage (Monita et al., 2021).
7. the seagrass beds in the Taman NasionalBaluran waters, Situbondo in general are healthy with a coverage percentage of 61%-62%. However, in some areas, the coverage only reaches 37%-54% which is considered less healthy(Sutadi et al., 2021).
8. the seagrass beds condition in Kelapa Island, KabupatenBima, Provinsi Nusa Tenggara Barat waters can be considered less healthy with only 52,31% coverage (Marliana et al., 2021);
9. the seagrass beds in Desa Ponto waters condition are less healthy with a density coverage of only 36,82% (Lahope, 2022);
10. the conditions of the seagrass beds in KecamatanSapeken waters are less healthy (50%) and poor in KecamatanSeuluh waters (22%) (Alif, et al., 2022).;
11. the seagrass beds that live in waters near DesaMokupaKecamatanTombaririKabupatenMinahasaare considered less healthy (30- 59,9%) (Lasut, et. al., 2023); and
12. In Gili sulat waters the seagrass coverage is 70,84%, which made them healthy (Ihwani, 2023)

Conclusion

From the above findings and discussions, it can be said that seagrass bed protection has been long noticed by the Government of the Republic of Indonesia. The State Minister of Environment in 2004 has issued its Decree of the State Minister of Environment of the Republic of Indonesia Number 200 of 2004 concerning Standard Criteria for Damage and Guidelines for Determining the Status of Seagrass Beds, to determine the healthiness conditions of the seagrass beds all over Indonesia. However, as an archipelagic state with more than 60% of its area consisting of water, it is not easy for the Government of the Republic of Indonesia to keep and maintain everything in its water healthy. As can be read from the above findings, even less than 50% of the watery area has ever been explored and for seagrass beds, the area is even smaller. The efforts of recent research and studies commencing in 2017 until now have shown very significant progress from scholars and the government to enhance the healthiness of seagrass bed ecosystems.

References

Books, articles, the internet

[1] Ellsya P. Lahope, Deislie R.H. Kumampung, Calvyn F.A. Sondak, Janny D. Kusen, VeibeWarouw, Christin I.F. Kondoy. (2022). Seagrass beds Condition in Ponto Village Waters, Wori District, North Minahasa Regency." *JurnalPesisirdanLautTropis*, 10 (3): 143-150

[2] F.Fajeri, F. Lestari, dan S. Susiana. 2020. Gastropod association in seagrass ecosystems SenggarangBesar waters, Riau Islands, Indonesia. *Akuatikisle: JurnalAkuakultur, PesisirdanPulau-Pulau Kecil*, 4(2): 53-58

[3] Gavin Morrsion, (2023). "World Seagrass Day 2023 – PeerJ Highlights Collection and IABO Hub Call For Papers. published February 28, 2023, updated April 24, 2023, https://peerj.com/blog/post/115284887062/world-seagrass-day-2023/#:~:text=March%201st%202023%20marks%20the,of%20this%20important%20marine%20habitat. accessed on 31 May 2023

[4] R. A.Harjuna, I. Riniatsih, dan C.A. Suryono. 2020. Kondisi Padang Lamun di PulauPanjangdanPulau Lima, Banten. Journal of Tropical Marine Science., 3(2): 89-93.

[5] https://rimbakita.com/padang-lamun/#:~:text=Area%20lamun%20merupakan%20tempat%20perlindungan,ikan%20karang%20(coral%20fishes) accessed on 31 May 2023

[6] https://ugm.ac.id/id/berita/22880-ugm-dorong-riset-ketersediaan-data-padang-lamun-indonesia/ accessed on 31 May 2023

[7] https://www.greeners.co/berita/tutupan-padang-lamun-indonesia-40-persen/ accessed on 31 May 2023

[8] Indarto Happy Supriyadi, MarindahYuliaIswari&Suyarso. (2018). "Preliminary Study of The Condition of Seagrass Meadow in The Waters of Eastern Indonesia." *J. Segara*, 14 (3), Desember 2018: 169-177

[9] Indarto Happy Supriyadi, MarindahYuliaIswari&Suyarso. (2018). "Preliminary Study of the Condition of Seagrass Meadow In The Waters Of Eastern Indonesia." *J. Segara* 14 (3), Desember 2018: 169-177

[10] I.Marliana, H. Ahyadi, D.A. Candri, I. S. Rohyani, S.A.R.Tarigan, P. S. Trilestari, dan S. P. Astuti. 2021. EstimasiSimpananKarbondan Status Kesehatan Padang Lamun di PulauKelapaKabupatenBima. *Bioscientist: JurnalIlmiahBiologi*., 9(1): 72-85.

[11] Monita, D., H. Endrawati, dan I. Riniatsih. 2021. BioekologiLamun di PerairanTelukAwur, Jepara, Jawa Tengah. *Journal of Marine Research*, 10(2), 165- 174.

[12] Nicole T. Lasut, Sandra O. Tilaar, Calvyn F. A. Sondak, Royke M. Rampengan, Chatrien A. L. Sinjal, Unstain N. W. J. Rembet (2023). "Study of Seagrass Beds Condition Nearby Waters in Mokupa Village, Tombariri District, Minahasa Regency (KajianKondisi Padang Lamun di PerairanSekitarDesaMokupaKecamatanTombaririKabupatenMinahasa)." *JurnalIlmiahPlatax*, 11:(2), July-December 2023: 311-321

[13] NisaRiskaAlif, Insafitri, WahyuAndiNugraha. (2022). "Seagrass Ecological Quality Index at Different Locations In Madura." *Juvenil*, 3(4), 159-166

[14] SuhaeriIhwani, Agil Al Idrus, I GdeMertha. (2023) "Conditions of Seagrass Ecosystems in GiliSulat Waters, Sambelia District, East Lombok Regency in 2022." *JurnalBiologiTropis*, 23 (2): 191 – 197, DOI: http://dx.doi.org/10.29303/jbt.v23i2.4785

[15] S.Sutadi, L. Sulistyowati, dan E. Sriwiyono. 2021. "AnalisisHubunganAtributEkologiLamundenganKualitasPerairan di Taman NasionalBaluran, KabupatenSitubondo."*Scientific Journal of Reflection: Economic, Accounting, Management, and Business*, 4(2): 391-401.

[16] Tansley - an overview | ScienceDirect Topics (2023) accessed on 30 January 2023

[17] WahyuAdi, Aditya HikmatNugraha, Yehiel Hendry Dasmasela, AgusRamli, Calvyn Fredrik Aldus Sondak, NurulDhewaniMirahSjafrie. (2019). "StrukturKomunitasLamun Di Malang Rapat, Bintan." *JurnalEnggano*, 4 (2) September 2019: 148-159, DOI: https://doi.org/10.31186/jenggano.4.2.

[18] Wigdati, N., G.I. Setiabudi, E.E. Ampou, I.N. Surana. 2021. Kondisi Padang Lamun di Bali Utara BerdasarkanJumlahSpesies, Jumlah Alga, danPersentaseTutupan. JFMR (Journal of Fisheries and Marine Research)., 5(2): 452-458

Laws and regulations

[19] Law Number 5 of 1990 concerning Source Conservation Biological Forces and Their Ecosystems (the State Gazette Republic of Indonesia Year 1990 Number 49, Supplement to the Gazette State of the Republic of Indonesia Number 3419)

[20] Law Number 23 of 1997 concerning Management Environment (State Gazette of the Republic of Indonesia Year 1997 Number 68, Supplement to the State Gazette of the Republic of Indonesia No. 3699)

[21] Law Number 27 of 2007 concerning Management of Coastal Areas and Small Islands (State Gazette of the Republic of Indonesia of 2007 Number 84, Supplement to the State Gazette of the Republic of Indonesia Number 4739)

[22] Law Number 32 of 2009 concerning Environmental Protection and Management (State Gazette of the Republic of Indonesia Year 2009 Number 140, Supplement State Gazette of the Republic of Indonesia Number 5059)

[23] Law Number 1 of 2014 concerning Amendments to Laws Law Number 27 of 2007 concerning Management of Coastal Areas and Small Islands (State Gazette of the Republic of Indonesia Year 2014 Number 2, Supplement to State Gazette of the Republic of Indonesia Number 5490)

[24] Law Number 11 of 2020 concerning Job Creation (State Gazette of the Republic of Indonesia Year 2O20 Number 245, Supplement to the Government Gazette Republic of Indonesia Number 6573)

[25] Law Number 6 of 2023 concerning Stipulation of Government Regulations in Lieu of Laws Number 2 of 2022 concerning Job Creation Become Law (State Gazette of the Republic Indonesia Year 2023 Number 41, Supplement to the Gazette State of the Republic of Indonesia Number 6856)

[26] Government Regulation in Lieu of Law Number 2 of 2022 concerning Job Creation (State Gazette of the Republic Indonesia Year 2022 Number 238, Supplement to the Gazette State of the Republic of Indonesia Number 6841)

[27] Government Regulation Number 19 of 1999 concerning Control of Marine Pollution and/or Destruction (Gazette State of the Republic of Indonesia in 1999 Number 32, Supplement State Gazette of the Republic of Indonesia Number 3816)

[28] Government Regulation Number 22 of 2021 concerning the Implementation of Environment Protection and Management (Gazette State of the Republic of Indonesia in 2021 Number 32, Supplement State Gazette of the Republic of Indonesia Number 6634)

[29] State Minister of Environment Decree Number 200 of 2004 concerning Standard Criteria for Damage and Guidelines for Determining the Status of Seagrass Beds