Climate change and reconstruction of Indonesia’s geographic basepoints: Reconfiguration of baselines and Indonesian Archipelagic Sea lanes

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Climate change and reconstruction of Indonesia's geographic basepoints: Reconfiguration of baselines and Indonesian Archipelagic Sea lanes

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ABSTRACT

Indonesia is a state that is very vulnerable to the impacts of climate change, one of which is sea level rise. Based on data from the International Panel of Climate Change (IPCC), sea level rises by an average of 2.5 mm every year. There are 92 outermost small islands of Indonesia that have the potential to sink due to rising sea levels. The existence of the small island is the point of withdrawal of the archipelagic baseline that connects one island to another. The impact of the sinking of the islands is a shift in the baseline and archipelagic sea lanes that will change the boundaries of Indonesia's maritime territorial sovereignty. Indonesia Government has deposited Government Regulation No. 37 of 2008 concerning the Basic Point of Coordinates for the Indonesian Archipelago to the United Nations Secretariat General. If there is a change or shift in the baseline withdrawal, Indonesia must reconstruct the baseline drawing which will also have an impact on changes in the Indonesian archipelagic sea lanes which are used as the determination of border areas with other states. In order to obtain clarity on territorial sovereignty regarding the reconfiguration of baselines, there are no clear guidelines, both in national and international law. The aim of this paper is to create a Geographic Basepoint Reconstruction Model of Indonesia by analyzing the outer islands of Indonesia that are sinking due to climate change using a Resource-Based Theory implementation in developing a Reconstruction Model for Indonesia's Geographic Baseline and Implementing baseline reconfiguration and Indonesian Archipelagic Sea Lane due to climate change.

1. Introduction

Climate change has an impact on sea level rise which can affect coastal areas [1,2]. According to the Intergovernmental Panel of Climate Change (IPCC), sea level rise is increasing due to melting ice in the Arctic and South Pole. The period 1970–1993 rose to 3.2 mm/year. The period 1993–2015 rose to 3.6 mm/year [3–6]. If the IPCC scenario is true, by looking at the geographical conditions of the outer islands of Indonesia, then as many as 83 islands are very prone to sinking due to rising sea levels [6–19]. The results of previous studies showed that there was an increase in the amount of sea rise in Indonesian waters from 1.3 mm/year to 1.8 mm/year in the last 25 years [9,10]. It have a big impact on the territory of Indonesia, because previous studies [11–15] have not analyzed the impact of sea level rise which results in unclear sea boundaries.

The loss or sinking of the outermost islands will affect the Indonesia's territory boundaries[16,17]. The impact of sea level rise causes territorial boundaries changes. The certainty and clarity of territorial boundaries is very fundamental for the administration of the state to carry out activities and conduct relations with other states that are closely related to the condition of defense and security of the sea area. In the perspective of defense and security, the state border is the frontier that supports the entry of many obstacles that can threaten the sovereignty of a state[18]. Therefore, maritime boundaries that are still a dispute between states should be resolved immediately to reduce crimes in the sea area[19–21]. In UNCLOS 1982 confirmed that in the determination the baseline was calculated from the outermost islands of Indonesia[22,23]. The absence of guidelines and models for the configuration of baselines, archipelagic sea lanes, and median lines, makes the results of this research something new and becomes a good contribution to Indonesia in safeguarding its national interests. The lack of certainty about the geographical basepoint due to the changing position of the outermost islands causes legal uncertainty over the boundaries of a state's maritime territory. This is intended to prevent

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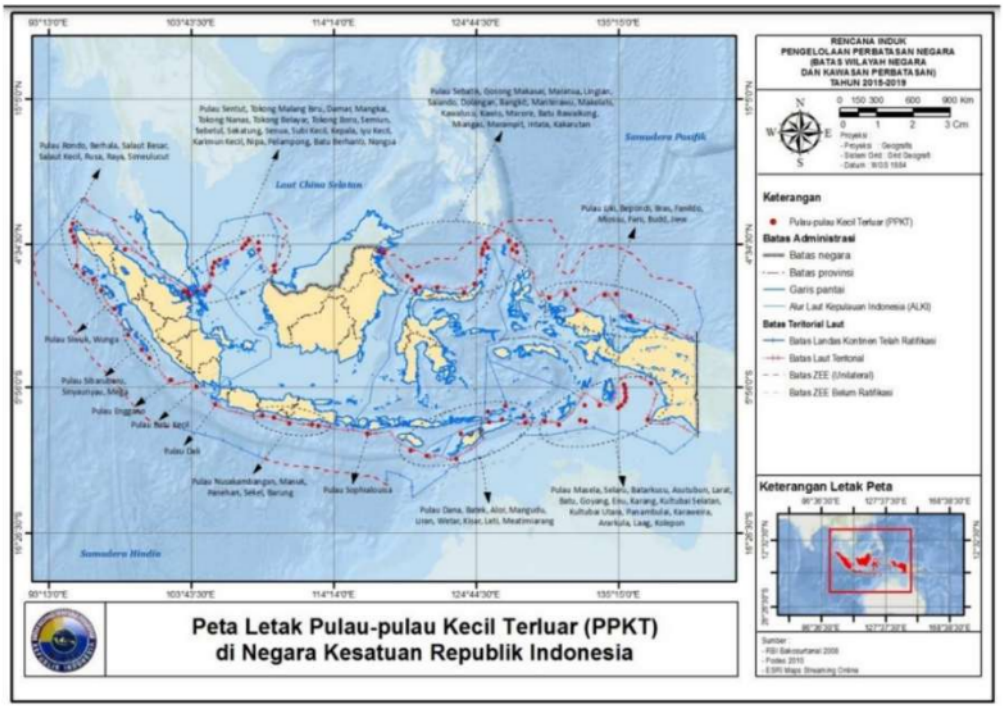


Fig. 1. Location of the Outermost Small Island of Indonesia.
Source: National Border Agency (2015).

disputes with other states and safeguard Indonesia's national interests. The archipelagic basepoint reconfiguration model generated through this research can not only be applied in Indonesia but also in other vulnerable states.

2. Material and methods

The research method used in this paper is the description and explanation method. Descriptive research is to present a complete picture of the problem that focuses on the 12 outermost small islands that are affected by sinking due to climate change. We will analyze the data obtained related to the 12 outermost small islands related to the current geographical conditions of the island and provide solutions to problems related to the basic point of determining the baseline of the islands due to climate change using the explanation method. Related to this research innovation is the preparation of Reconstruction using the strategy of drawing archipelagic baselines, finding archipelagic sea lanes due to climate change. This research is expected to provide theoretical and empirical evidence related to the development of strategies, determining the baseline, the Indonesian Archipelagic Sea Lane due to climate change with the aim of maintaining state sovereignty.

3. Theory

3.1. Baseline

Determination of the sea boundaries requires clarity of the coordinates and the basepoint of the outermost island which is used to draw the baseline of the sea area. Indonesia has legal provisions regarding the determination of the coordinates of the baselines, namely Government Regulation Number 37 of 2008 concerning the List of Geographical Coordinates of the Baseline Point of the Indonesian Archipelago (hereinafter referred to as PP No. 37 of 2008)[24,25]. In essence, the regime of an archipelagic state is an implementation of the principle of a straight baseline against an archipelagic state. [26–28] Based on UNCLOS 1982, the way to apply the principle of a straight baseline is to draw straight baselines from points on the outermost islands of a state. The ICJ's decision on the Anglo-Norwegian Fisheries Case stipulates that straight baselines are connected from the starting points at the tip of the outermost land or islands in the outermost position. [29–31] This decree means that straight baselines may be used to measure territorial waters if the condition of the coastal state requires a special regime because the coast is crooked or because of the proximity of the islands. The influence of this decision finally brought the concept of a coastal archipelago or coastal islands.

3.2. Median Line

The median line and equidistance line methods are one of the technical methods in delimiting sea boundaries. [32] Actually there is no difference in the use of the term median line or equidistance line, but based on some opinions it is said that the term median line is used in conditions of opposite state. On the other hand, the equidistance line is used by adjacent states. It appears that the use of the equidistance method depends on the baseline along the coast of each state concerned in the offshore areas that must be separated by borders.[33,34] Difficulties may arise here if one state uses a normal baseline, following the twists and turns of the coastline, and another uses a straight baseline system connecting the outermost islands, headlands and reefs. Although there are some differences in terms, they actually refer to the same mathematical geometric expression, namely the diameter obtained or determined by the equidistance method. The median line is the most widely applied method in state practice in determining their sea boundaries. [35] The position of the Median line must be at the same distance from the baselines of the two states. Baselines are measured from the nearest point on land, islands or reefs that are continuously

submerged.

3.3. Archipelagic Baseline

UNCLOS 1982 recognized the concept of an archipelagic state. Archipelagic state have an obligation to provide passage rights for foreign ships in archipelagic waters and the territorial sea.[36–38] The guarantee of the right of passage in archipelagic waters is a form of compensation for changing the status of archipelagic waters to become part of the sovereignty of the archipelagic state. The right of archipelagic sea lanes passage for foreign ships is exercised by passing through the archipelagic sea lanes determined by the archipelagic state. In determining the archipelagic sea lanes there are several factors to be considered, namely: First, the legal provisions. [39,40] Second, marine technical factors, such as hydrography, protection of the marine environment, mining zones, undersea cables and pipelines, dumping areas and mine disposal zones, and fishing areas. Third, the location or coordinates of the archipelagic sea lanes. Fourth, the number of archipelagic sea lanes.

4. Results and discussion

4.1. Position of the Outermost Islands of the Indonesian due to Climate Change

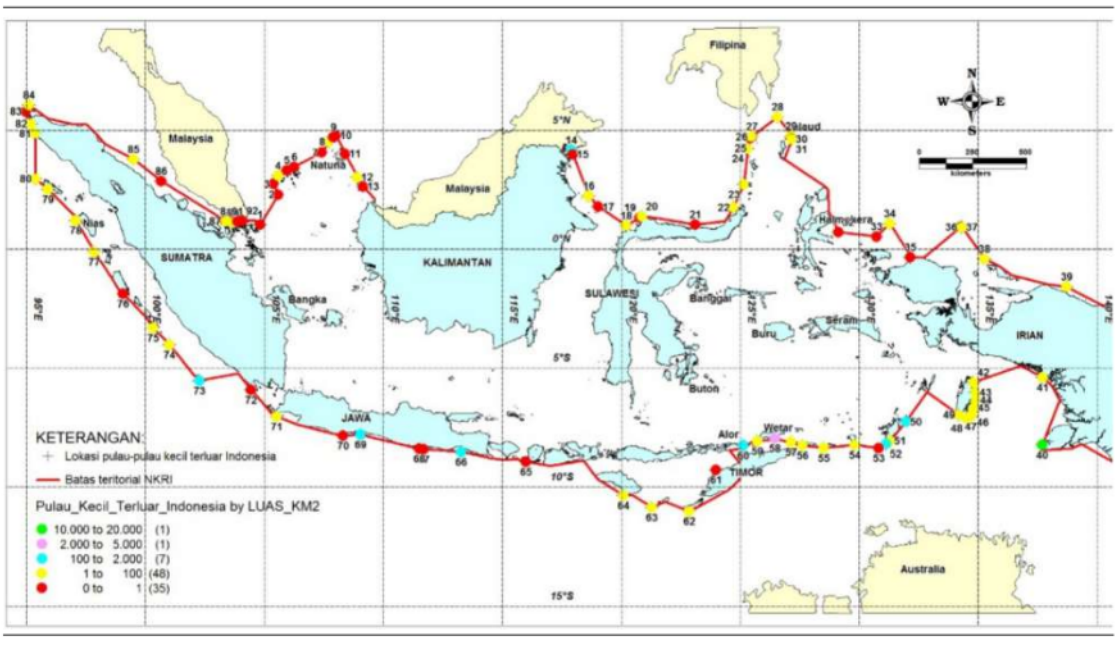
Small islands in Indonesia, especially islands on the border with neighboring countries, have strategic value, especially with regard to determining the basic point for determining Indonesian territorial waters. In addition, because of its location on the border with neighboring countries, the area becomes more strategic in terms of ideology, politics, economy, socio-culture, and defense and security. Currently, the number of outermost islands and small islands is 94 islands, while of the 94 islands, 12 islands that need special attention are affected by climate change.

The position of the outermost islands as a basepoint of archipelagic baselines automatically explains that the outermost islands are within the Indonesian sovereign territory as clearly stated in Article 4 of Law no. 6 of 1996 concerning Indonesian Waters, which stipulates as follows: The sovereignty of Indonesia in Indonesian waters includes the territorial sea, archipelagic waters, and inland waters as well as air space above as well as the seabed and the subsoil thereof. including the natural resources contained therein.

The potential for the sinking of the outermost small island as the basis for the withdrawal of the starting point will logically affect the state's territorial boundaries. The area of a small island is based on the size of the island, this limit changes from time to time. Article 1 paragraph b, Presidential Regulation of the Republic of Indonesia Number 78 of 2005 concerning Management of Outermost Small Islands, provides a definition of the outermost island with an area of less than or equal to 2000 km^2 which has basic points of geographical coordinates connecting archipelagic sea baselines in accordance with the international and national law. There are 12 islands of 92 outermost islands that must receive special attention because they are the determinants of the Basepoint. The islands are Rondo Island in Aceh; Simeulue Island in North Sumatra; Nipa Island and Sekatung Island in the Riau Archipelago; Marore Island, Marampit Island, and Miangas Island in North Sulawesi; Fani Island, Fanildo Island, and Bras Island in Papua; Dana Island and Batek Island in East Nusa Tenggara. The map of the outer islands of Indonesia is in Fig. 1.

According to the IPCC in AR5 (the 5th Assessment Report) about the sea level rise, Indonesia's coastline will retreat, for example the case on Miangas Island, Nipah Island. Of the 92 outermost small islands of Indonesia, some of them have extreme morphology (such as atolls which have formations above sea level with a vertical geometry ratio greater than horizontal). On the other hand, the island that has the smallest horizontal geometry is identical to the island that has the smallest area and is estimated to be lost first. Midai Island in Natuna Regency, Riau Islands Province has a height of 140 m which is estimated to be lost if every year the land is eroded by 20 cm. There are 83 islands (12 of the 92 outermost small islands) which are very prone to sinking due to sea level rise, thus it can be said that almost all of Indonesia's outermost small islands will be submerged.

Figure: Indonesia's Outermost Small Islands Are Prone to Sinking to Rising Sea Levels.



Based on the results of the basepoint survey that has been carried out, there are 193 basepoints located on the 92 outermost islands, the rest are on the outermost capes and in coastal areas. There are 13 of 92 islands that must be paid attention because they are the determinants of the basepoint. The islands are Rondo, Berhala, Nipa, Sekatun, Marore, Sebatik and Miangas, Fani, Fanildo, and Asubutun, Batek, Wetar. Further information can be seen in the table below.

Island	Province	Border State	Basepoint
Rondo island	Aceh	India	Basepoint No. TD.177- TD.177 A Distance TD.177A-TD.178 = 16.66 M
Berhala island	North sumatera	Malaysia	Basepoint No. TD.184 Distance TD.184-TD.185 = 89.42 M
Nipa island	Riau	Singapura	Basepoint No. TD.190 TD.190 A Distance TD.190A-TD.191 = 3.00 M
Sekatung island	Riau	Vietnam	Basepoint No. TD.030B TD.030D Distance TD.030D-TD.031 = 52.58 M
Marore island	North Sulawesi	Philippines	Basepoint No. TD.055 TD.055 A Distance TD.055A-TD.055B = 0.58 M
Miangas island	North Sulawesi	Philippines	Basepoint No. TD.056 TD.056 A Distance TD.056A-TD.057 A= 57.91 M
Fani island	Papua	Palau	Basepoint No. TD.066 TD.066 A Distance TD.066A-TD.070 = 99.81 M
Fanildo island	Papua	Palau	Basepoint No. TD.072
Sebatik island	North Kalimantan	Filipina	Basepoint No. TD.036 TD.036 A TD.036B Distance TD.036B-TD.037 = 12.22 M
Asubutun island	South East Maluku	Australia dan Timor Leste	Basepoint No. TD 0.105 C Distance TD 0.105 C TD.106 = 11.26 M
Wetar island	South East Maluku	Timor Leste	Basepoint No. TD.112 Distance TD.112-TD.112 A = 43.85 M

4.2. Baseline shifting due to sea level rise

The baseline shifting will have the effect of reducing the zone of marine territory. UNCLOS 1982 cannot respond effectively to changes that occur in the coastline, which will also affect the determination of the sea baseline to determine the start of a state's territorial sea. UNCLOS 1982 also does not provide regulations regarding baselines changes or shifts in coastlines, but only regulates how to measure and determine baselines depending on the natural conditions of each coastal state.

Rising sea levels may remove drying coral reefs that connect the outermost islands (land). Based on article 47 paragraph 4, it is stated that the baseline may not be drawn to and from low-tide elevations, unless a lighthouse or similar installation has been built on it permanently above sea level or if the low-tide elevation is located wholly or partly at a distance does not exceed the breadth of the territorial sea of the nearest island.

Although there is a statement that coastal states can replace baselines that have been lost due to rising sea levels to new baselines, they can follow the criteria stated in Article 7 of UNCLOS 1982 [41], which asserts that due to deltas and other natural conditions, the coastline becomes very unstable, which means that UNCLOS 1982 recognize that coastlines straight baselines may change due to sea level. Where there are deltas and other natural conditions the coastline is highly unstable, then appropriate points may be selected on the low water line that juts out into the sea and even if the low water line later retreats, the straight baselines will remain in effect until changed by the coastal State in accordance with the Convention. This confirms that UNCLOS 1982 correctly recognizes that coastlines at straight baselines can change due to sea level.

According to the Article 13(1) of UNCLOS 1982, elevation is a naturally formed land area surrounded and above sea level at low tide, but under sea level at high tide. In the event that a low-tide evaluation is located wholly or partly at a distance not exceeding the width of the territorial sea from the mainland or an island, the low-tide line at such an elevation may be used as a baseline for the purpose of measuring the breadth of the territorial sea.

It is therefore important to underline that the island regime differs from low tide elevation. An island is a naturally formed land area that is surrounded by water and which is above the water surface at high tide [42]. Another matter regarding baselines is low tide elevation, which is a naturally formed land area that is surrounded and above sea level at low tide, but is below sea level at high tide. In the event that a low-tide elevation lies wholly or partly at a distance not exceeding the width of the territorial sea from the mainland or an island, the low-tide line at such an elevation may be used as a baseline for the purpose of measuring the breadth of the territorial sea. Elevation is low tide and seen in calm seas at certain stages of high tide, but not at raise up high tide. When there are simultaneous low tides, the authorities in a country can produce charts indicating the area as draining at low water without having to identify each individual feature that stands above the low water level [43].

According to the Article 5 the is is the low-water line along the coast as marked on large-scale charts officially recognized by the Coastal State. The following are some of the outer islands that use normal baseline drawing.

a. Rondo Island borders with India using the Normal Baseline
b. Nipa Island borders with Singapore at TD 190-TD 190 A using the Normal baseline
c. Marore Island borders with the Philippines Base point No TD 055- TD 055 A using the Normal baseline
d. Miangas Island borders with the Philippines with Base Point No TD 056- TD 056 A using the Normal baseline.
e. Fani Island borders with Palau with the base point No TD 066 – TD 066 A using the Normal Baseline.
f. Fanildo Island borders with Palau with Base Point No TD 072 using the Normal baseline

However, this provision continues with 'straight baselines will remain effective until there is a change by the coastal state in accordance with the provisions of UNCLOS 1982. It gives the coastal state authority to determine the baseline, in accordance with Article 14 of UNCLOS 1982 that the coastal state can determine baseline is in accordance with its own natural conditions. These starting points form the baseline of the Indonesian archipelago.

In the UNCLOS 1982, it was emphasized that straight archipelagic baselines may not be drawn from and to low-tide elevations, unless lighthouses or similar installations have been built on them permanently above sea level or if the low-tide elevation is located wholly or partly at a distance, which does not exceed the breadth of territorial sea from the nearest island above sea level or except in the case of drawing a straight baseline to and from such an elevation which has obtained general international recognition [44].

a. Rondo Island which borders with India with Base Point TD 177 A – TD 178 using a straight baseline
b. Berhala Island which borders with Malaysia with Base Point TD 184 – TD 185 by using archipelagic baselines.
c. Nipa Island which borders with Singapore with Base Point TD 190 – TD 191 using archipelagic baselines.
d. Sekatung Island which borders with Vietnam with Basepoint TD 030B – TD 030 D, TD 030 D- TD 31 using the archipelagic baselines.

e. Marore Island which borders with the Philippines with a basepoint of TD 055 A – TD 055 B using the archipelagic baselines.
f. Miangas Island which borders with Philippines with the basepoint TD 056 A-TD 057 A using the archipelagic baselines.
g. Fani Island which borders with by Palau with the basepoint TD 066 A – TD 070 using the archipelagic baseline drawing.
h. Sebatik Island which borders with the Philippines with a base point of TD 036-TD 037 using the archipelagic baseline drawing.
i. Asubutun Island which borders with Australia and Timor Leste with Base Point TD 105 – 106 using archipelagic baselines (with the same baseline but erecting a lighthouse or permanent installation).

The coordinates of those Indonesia's baselines are expressed in geographic coordinates in the 1984 World Geodetic System datum (WGS'84)[45].

4.3. Baseline reconstruction

Based on data from the National Oceanic and Atmospheric Administration's National Centers for Environmental Information [46] stating that 2019 was the hottest temperature on record since 140 years ago, [47] scientists have also stated and proven that the melting of the icebergs in Greenland and Antarctica occurred significantly [48] with an average sea level rise of 2.74 mm/year in several states [49]. It will impact shift in the baseline. Baselines or coastlines as regulated in Article 5 of the United Nations Convention on the Law of the Sea 1982 (UNCLOS 1982) are the outermost boundaries of a state's territory which are intended to be the basepoint in measuring the state's sovereign sea boundaries and other maritime zones [50].

The phenomenon of sea level rise in the future can result in the loss of small islands or low-tide elevations because the existence of low-tide elevations itself is dependent on the tides of sea level, so that, in the event of a sea level rise, low-tide elevations can be not reappear even though the water is receding. In the decision of the Maritime Delimitation and Territorial Questions between Qatar and Bahrain (2001) it was emphasized that although the use of low-tide elevations is one way to draw baselines in customary international law, this does not justify the general assumption that low-tide elevations are equivalent to islands itself [51], except for the construction of permanent installations as stipulated in UNCLOS 1982.

The loss of the base point from the baseline implies the loss of the boundaries generated by that point which results in a shift of maritime boundaries and boundaries with neighboring states. There are several expert opinions that the implications of sea level rise on maritime boundaries will lead to renegotiation of maritime delimitation agreements based on the principle of equidistance to adapt to new geographical realities; re-evaluating the principles of justice and equality through international courts in resolving maritime boundaries [52].

The International Law Association (ILA) Committee on Baseline based on the interpretation of the International Law of the Sea Article 5 UNCLOS, considers that the argued low water line is a valid normal baseline and the chart itself is a legal document that determines the position of the baseline regardless of the physical shoreline [53].

The normal baseline is ambulatory, moving seaward to reflect coastal changes caused by accretion, land rise, and construction of man-made structures associated with port systems, coastal protection and land reclamation projects, and also landward to reflect changes caused by erosion and sea level rise. In extreme circumstances the latter category of alteration may result in total territorial loss and total loss resulting from baselines and maritime zones measured from those baselines. Existing normal baselines do not offer an adequate solution to this potentially serious problem [54].

The archipelagic state of Indonesia certainly does not want to lose the island as a determinant of the baseline so that Indonesia must require more efforts to maintain the island due to sea level rise. As long as a state has registered a coastal state's baseline with the Secretary General of the United Nations, the baseline registered at the states''s discretion is a fixed baseline.

Publishing the baseline chart of a coastal state is important and absolute to avoid the loss of a territory that can become a contested area between coastal states. Archipelagic Baseline is a permanent determination after being registered with the UN General Secretary. In theory, the state's baseline will not change as long as it has been deposited with the UN Secretary General. The Indonesian government has deposited PP No. 37 of 2008 concerning the basepoint of the coordinates of the Indonesian archipelago to the UN Secretariat General dated March 11, 2009 with Reference Number: M.Z.N.67.2009. LOS.

5. Conclusion

The impact of climate change is felt by many states, including Indonesia. One of the effects is rising sea levels. The geographical condition of Indonesia consists of small islands which are in the outermost of Indonesian territory. Such islands have a high risk of sinking due to rising sea levels. There are 83 islands of all outermost islands are very prone to sinking due to rising sea levels. Based on the geographical conditions of Indonesia, there will be a change in the baseline of Indonesia, especially in the outermost islands which have an area of less than 10 km^2. Through this condition, there will be a change in the geographical basepoint on Rondo Island, Berhala Island, Nipa Island, Sekatung Island, Marore Island, Fani Island and Fanildo Island where the baseline shift will have an impact on reducing the zone of marine territory. According to Article 20 (2), the baseline for measuring the breadth of the territorial sea shall give due publicity to such charts or lists of geographical coordinates and shall deposit a copy of each such chart or list with the Secretary-General of the United Nations. If one of the islands disappears or becomes an uninhabitable reef, the reef remains as a basepoint as long as there is no update of the geographical map of the archipelagic state.

Data Availability

Data will be made available on request.

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