Blue Carbon in National Policy to Reduce Greenhouse Gas Emissions

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Article Information

Abstract

Greenhouse Gas (GHG) emissions are the main cause of global warming and climate change. Indonesia as an archipelagic country experiences a significant negative impact as a result of climate change, such as sea level rise, sea water intrusion to the land, extreme weather, and rising sea and land temperatures. Tropical forests have been known as a major carbon emitter, but with the increasing rate of deforestation, it is necessary to find carbon sinks from ecosystems other than tropical forests. This study aimed to determine the extent to which blue carbon has been included in Indonesian Government policies, especially in the GHG inventory document and the Indonesian Nationally Determined Contribution (NDC) document, related to the Government of Indonesia's commitment in reducing GHG emissions. The research showed that blue carbon ecosystems, which include mangroves, seagrass beds, and other coastal ecosystems, have enormous carbon sequestration potential when compared to tropical forests, but unfortunately, the potential of blue carbon has not been maximally utilized in national policies related to GHG emission reduction. The existing policies have not been implemented optimally and some of them overlap. In the future, accurate data updating and mapping of the blue carbon ecosystem is needed so that it can become a reference in determining national policies on the use of blue carbon.

I. Introduction

The global climate change issue is still a problem of concern for academics and bureaucrats to find solutions immediately. The negative effects of climate change have been perceived in all parts of the world, and has many negative impacts on humans and the environment. Adverse effects of climate change can be extreme weather events, that is acute impacts that last a short time with a large destructive force, such as: floods, droughts, thunderstorms, typhoons. While the impacts that have a major influence on the survival of living things on a large scale and a longer period of time are chronic impacts of climate change, including: sea level rise, temperature rise, coral reef bleaching, ocean acidification, glacier shrinkage, and biodiversity loss. Indonesia as an archipelago with more than 70% of its territory is ocean, is an area that has a higher level of vulnerability to the effects of climate change.

According to a report from the Intergovernmental Panel on Climate Change (IPCC, 2007), since 1850, the world's highest temperature has been recorded in eleven of the last twelve years. From 1850 - 1899 to 2001 - 2005 there was an increase in average world temperatures around 0.76°C. Sea levels during the period 1961 to 2003 recorded an average increase of 1.8 mm per year. It is estimated that sea level rise will increase to around 4.2 mm per year until year 2080. The latest, according to a report from the American Meteorological Society (AMS), reports that 2018 is the fourth warmest year since the mid 1800s. Average surface temperature of 0.3 - 0.4 °C above the average temperature of 1981-2010. Sea surface temperature in 2018 rose to 0.33 ° +/− 0.05 ° C above the average temperature of 1981-2010. The sea level rise reached a new record in 2018, which is about 3.2 inches (8.1 cm) higher than the average in 1993. The average sea level rose about 1.2 inches (3.1 cm) per decade. (AMS, 2019).

In Indonesia, a study conducted by Kosasih Prijatna et al. (2006), from the ITB Geodetic Science group, shows the speed of sea level rise in several sea areas in Indonesia. The Java Sea waters rose an average of 15 millimeters per year, the East Sea and Sulawesi 19 mm and 16 mm per year, the South China Sea 17 mm per year. Lowland type islands are threatened with sinking due to rising sea levels. In Indonesia there are many islands of this type, including the Sumenep Islands, where the islands are threatened to disappear due to sea level rise.

As a comparison, according to the Indonesia Climate Change Sectoral Roadmap (ICCSR, 2010), the estimated increase in average temperature in Indonesia is around 0.8 - 1.0 °C in the period 2020 - 2050. While in 2070 - 2100, the average temperature in Indonesia it is estimated that it will increase by 2 - 3 °C for the islands of Java and Bali, and there is a possibility of higher temperature rises for Kalimantan and Sulawesi. While the highest average temperature rise is estimated on the island of Sumatra, which is around 4 °C. As a result of rising air temperatures, sea level temperatures also rise and sea level rises. Sea surface temperature in Indonesia is estimated to rise around 0.65 °C in 2030, 1.10 °C in 2050, 1.70 °C in 2050, and 2.15 °C in 2100. While sea level rise is estimated to be around 0, 6 to 0.8 cm per year, or will reach around 80 cm until 2100. Meanwhile, according to Bappenas, the projected increase in average surface temperatures throughout Indonesia due to GHGs for the period 2020-2050 is around 0.8-1 °C relative to last climate period in the 20th century (Bappenas, 2013).

The main cause of rising global temperatures is the increase in greenhouse gas (GHG) emissions worldwide. It is commonly known that tropical forests throughout the

world are considered to be the lungs of the world, where tropical forests absorb CO_2 and release O_2 into the air. But with the increasingly massive deforestation and conversion of forest land to settlements and industrial plants, the world's tropical forests are now turning to be one of the biggest contributors of carbon dioxide to the atmosphere.

Globally, greenhouse gas (GHG) emissions recorded a record high in 2019 The annual average CO2 concentration in the atmosphere is 409.8 ± 0.1 parts per million (ppm). This is an increase of 2.5 ± 0.1 ppm greater than in 2018 and it is the highest in the modern instrumental record. (AMS, 2020).

Under the SNC (Second National Communication) scenario, emissions levels in Indonesia are estimated to increase from 1.72 Gton CO_2e in 2000 to 2.95 Gton CO_2e in 2020. The calculation will be reviewed periodically using better methodologies, data and information. The increase in emissions, mostly caused by activities in the fields of forestry and peatlands, agriculture, energy, industry and transportation, and waste (RAN-GRK, 2011).

One of the efforts to reduce GHG is by conserving carbon sinks. In addition to tropical forests that are able to absorb carbon, many studies have explained that marine and coastal ecosystems, in the form of mangroves, seagrass beds, and tidal swamps, have the ability to absorb and store carbon emissions much better than tropical forest ecosystems on land. Mangrove forests, have the ability to store greenhouse gas (GHG) emissions five times more than terrestrial forests. Meanwhile, from research conducted by the Ministry of Maritime Affairs and Fisheries since the last five years, seagrass beds have the potential to absorb and store carbon at around 4.88 tons / ha / year. The total seagrass ecosystem in Indonesia is estimated to save 16.11 million tons of carbon / year. Meanwhile, for mangrove ecosystems, the average carbon sequestration and storage can reach 38.80 tons / ha / year. In total, the potential for carbon sequestration of mangrove ecosystems is 122.22 million tons / year (Ambari, 2017).

On 7-18 November 2016 in Morocco, the Conference of Parties United Nations Framework Convention on Climate Change was held, the 22nd UNFCCC Conference of Parties or also referred to as COP 22. The 22nd COP conference in Morocco discussed the important role of blue carbon as one of the contributions to the global carbon emissions reduction target. On this occasion, Indonesia conveyed the role of coastal and marine ecosystems in Indonesia's First Nationally Determined Contribution (NDC) in the mitigation of the land sector. In the upcoming NDC the role of Blue Carbon after going through comprehensive calculations and obtaining quantitative figures will be entered in stages in the upcoming NDC.

Although the issue of blue carbon is already extensively popular, in Indonesia, which has a huge potential for blue carbon, it has not been much discussed and developed as a major contributor to the absorption of greenhouse gas emissions in Indonesia. Instead, a fairly high rate of degradation and deforestation occurring to marine and coastal ecosystems, which causes a reduction in the potential for carbon emission absorption and a substantial release of carbon emissions as a result of deforestation. There is currently no national document specifically supporting policy makers to determine blue carbon policies such as there is no national blue carbon roadmap.

To address greenhouse gas emissions and climate change mitigation, the Government of Indonesia has issued a number of policies including the National Action Plan for

Reducing Greenhouse Gas Emissions (RAN-GRK) through Presidential Regulation No. 61 of 2011, and in 2017, the Government issued an Indonesian Maritime Policy through Presidential Regulation No. 16 of 2017. However, from these policies, it has not specifically discussed the management and development of blue carbon as part of climate change mitigation and adaptation campaigns. A policy that is more focused on utilizing blue carbon is needed to achieve the NDC target for Indonesia in 2030. In this research, we will discuss how far the Government of Indonesia has set policies related to the utilization of blue carbon in Indonesia, and the extent to which these policies can help Indonesia achieve its GHG emission reduction targets corresponding with Indonesia's national NDC document.

II. Research Methods

This study aims to conduct a review of policies related to greenhouse gas emission reductions and blue carbon engagement policies in the GHG emission reduction efforts currently applied in Indonesia. The scope of this research includes a review of national and international regulations related to GHG emission reduction efforts. This research is a legal research using secondary data types. Secondary data is data obtained from literatures, that is the applicable laws and regulations and other documents relating to this research. Literature materials used include conventions or the related international agreements and literatures in the form of books, journals, as well as other supporting materials including dictionary, encyclopedia and other materials that provide instructions about the materials used as previous data.

III. Research Result and Discussion

### A. Indonesia Commitment in the GHG Emission Reduction Campaign

An effort to reduce the effects of global warming is to reduce greenhouse gas emissions. The Indonesian government since 2009 has declared a statement of emission reduction commitments delivered by former President of the Republic of Indonesia, Susilo Bambang Yudhoyono, in his speech before the leaders of the country at the G-20 meeting in Pittsburgh, United States. At that time President SBY stated that Indonesia voluntarily committed to reduce greenhouse gas (GHG) emissions by 26 percent in 2020 from the Business as Usual (BaU) level with its own efforts and reached 41 percent if it received international support. As a follow up, in 2011 the commitment statement was outlined in the National Action Plan for Reducing Greenhouse Gas Emissions (RAN-GRK) through Presidential Regulation No. 61 of 2011. In addition, in Indonesia's first Nationally Determined Contribution (NDC) document in 2016, the Government Indonesia has even committed to reduce Greenhouse Gas (GHG) emissions by 29% by 2030 from the Business as Usual (BaU) level with its own efforts and reach 41% if it receives international support. The reduction in GHG emissions by 29% by BaU came from the forestry sector by 17.2 percent, the energy sector by 11 percent, the agricultural sector by 0.3 percent, the industrial sector by 0.10 percent, and the waste sector by 0.38 percent .

B. Blue Carbon for Reducing Greenhouse Gas Emissions

It is commonly known that tropical forests throughout the world are considered to be the lungs of the world, where tropical forests absorb CO_2 and release O_2 into the air. But with the increasingly massive deforestation and conversion of forest land to settlements and industrial plants, the world's tropical forests are now turning to be one of the biggest contributors of carbon dioxide to the atmosphere. Deforestation causes tropical forests to release CO_2 deposits that are in the leaves, stems, and roots. In total, tropical forests release 862 teragrams of carbon into the atmosphere each year, more than the exhaust gases produced by all cars in the United States in 2015. And absorb only 436 teragrams of carbon each year. Of the net loss of carbon to the atmosphere, 69 percent comes from degraded forests and the remainder from deforestation (Baccini et.al, 2017).

With less ability of tropical forests to absorb carbon emissions, and even turn become contributors to carbon emissions, it is necessary to look for other alternatives in efforts to absorb global carbon emissions to reduce greenhouse gas emissions. Many studies have shown that beside land forest, marine areas actually have enormous potential to absorb carbon emissions, even greater than the potential ability to absorb carbon emissions by tropical land forest. The concept of absorbing carbon emissions through marine vegetation is known as the concept of blue carbon. Blue carbon utilizes the presence of mangrove forests, seagrass beds, tidal swamps and coastal ecosystems.

This coastal vegetation is believed to be able to store carbon 100 times faster and more permanently per unit area when compared to land forest (Nellemann, C., et al, 2009). These coastal ecosystems absorb carbon dioxide (CO_2) gas from the atmosphere and ocean at a higher rate per unit area, compared to absorption from land forest (Figure 1). The carbon stores that accumulate in these systems are stored above ground in plant biomass (tree trunks, stems and leaves), below ground in plant biomass (root and rhizome systems), and in carbon-rich organic soils (McLeod E., et.al, 2011).
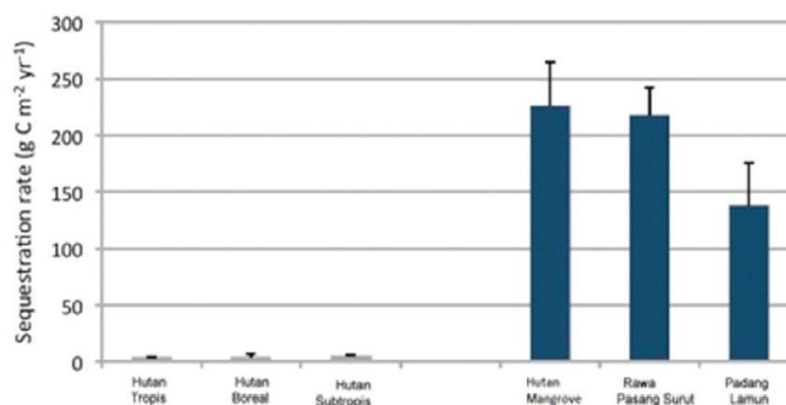
Figure 1. Annual average carbon sequestration rate for blue carbon habitats per unit area compared to land forest habitat (McLeod E., et.al, 2011)

Most of the carbon is stored underground in the soil ecosystem. Of all the coastal blue carbon stored in mangroves, tidal swamps and seagrass beds, 50 - 99% is underground. This carbon-rich soil can reach up to six meters underground, making it able to last for a very long time even for thousands of years (Barakalla&Megawanto, 2017).

However, as has happened in tropical forests as carbon sinks on land, when coastal ecosystems and vegetation are degraded, lost or converted to other land uses, the blue carbon ecosystem will also release very large amounts of CO_2 deposits. The coastal blue carbon ecosystem is one of the most threatened ecosystems on Earth, with around 340,000 to 980,000 hectares of this ecosystem being destroyed every year. It is estimated that up to 67% and at least 35% and 29% of the total global coverage of mangroves, tidal swamps, and seagrass beds, respectively, have been lost. Indonesia has lost more than a quarter of the area of mangrove forests in the last three decades from 4.20 million hectares in 1982 to 3.48 million hectares in 2017. If this continues at a steady rate, then 30-40% of tidal swamps, seagrass beds and almost all unprotected mangroves will disappear within the next 100 years. The level of loss of existing coastal ecosystems can cause 0.15 - 1.02 billion tons of CO_2 released annually. Although the total area of mangroves, tidal swamps, and seagrass beds globally is only 2 - 6% of the total area of tropical forests, degradation of this ecosystem causes 3 - 19% of carbon emissions from global deforestation (Barakalla&Megawanto, 2017). With the carbon storage potential greater then tropical forests, it needs serious government efforts and policies to rehabilitate blue carbon ecosystems while simultaneously halting the deforestation rate of blue carbon ecosystems so that they can significantly reduce greenhouse gas emissions.

According to data from the Ministry of Environment and Forestry, in 2015, Indonesia was a country with the largest mangrove ecosystem in the world with an area of around 3.49 million hectares or around 21% of the total mangrove ecosystem in the world. Of the total mangrove ecosystem, 1.67 million hectares (48%) are in good condition and the remaining 1.82 million hectares (52%) are in damaged condition. From the research of the Indonesian Blue Carbon Strategy Framework (IBCSF) notes, the average capacity of mangrove ecosystems for carbon sequestration and storage can reach 950 MgC ha-1. When calculated in total, the carbon sequestration potential of the mangrove ecosystem is more than 3 gigatons. When combined with the potential of seagrass ecosystems capable of absorbing and storing carbon around 119.5 MgC ha-1, the total potential for blue carbon storage in Indonesia is 3.4 gigatons or equivalent to 17 percent of global blue carbon stores.

According to national reference data from the Coordinating Ministry for Maritime Affairs, based on the results of mapping and geospatial information conducted by the Geospatial Information Agency and the Navy Hydro-Oceanography Center, the total area of Indonesian waters is around 6.4 million km2, of the total land area and Indonesian waters covering 8.3 million km2 (Kemenko Maritime, 2018). With the vision of the current government that

wants to make Indonesia the world's maritime axis, with such a vast sea and water area it is indeed fitting that Indonesia's marine development be made a development priority in Indonesia.

C. Blue Carbon in National Policies related to Greenhouse Gas Emissions

Until now, the Government of Indonesia has been working hard to increase efforts to reduce national GHG emissions. However, efforts related to blue carbon have not received the attention they should have given the enormous blue carbon potential for carbon sequestration other than tropical forests. Coastal ecosystems, especially mangroves, have not been used as calculation material for carbon sequestration and national GHG emission reduction efforts. This is partly because the exclusion of below ground carbon stock values causes the underestimate value of total carbon that is absorbed and stored by mangroves. This makes the role of mangrove forests in climate change mitigation and adaptation neglected because the size of mangrove forests is relatively small compared to tropical forests. So far, carbon accounting from the Indonesian forest sector only calculates tree stand biomass (above ground) which holds around 17% (159.1 Mg C ha-1) and 2% (16.7 Mg C ha-1) of the total forest carbon stock mangrove. Meanwhile, around 81% (774.7 Mg C ha-1) of the total mangrove forest stock (950.5 Mg C ha-1) contained in the ground (below ground) depth of 1 meter, was not included in the calculation (Fingerprint and Krisnawati, 2017). Whereas with mangrove area of 3.2 million hectares and seagrass beds of 3 million hectares, Indonesia has the potential to absorb carbon of 3.4 gigatons of carbon, or around 17% of carbon stocks worldwide (Hutahaean, 2017).

1. National Action Plan for Reducing Greenhouse Gas Emissions (RAN GRK)

Presidential Regulation No. 61 of 2011 concerning the National Action Plan for Reducing Greenhouse Gas Emissions (RAN GRK), explained the action plan activities and targets that will be carried out between the period 2010 to 2020 to reduce GHG emissions by 26% on their own efforts and reach 41% with international assist in 2020. RAN-GRK activities cover agriculture, forestry and peat fields, energy and transportation, industry, waste management, and other supporting activities. Among these fields, blue carbon has not been mentioned much about its important role, and there are only a few policies and action plans related to mangrove forest rehabilitation, which are listed in the action plan in the forestry and peat fields. One of the action plans in the forestry and peat fields is the implementation of forest and land rehabilitation, and forest reclamation in priority watersheds, with one of the targets being the rehabilitation of mangrove / coastal forests covering an area of 40,000 ha in 2010-2014 in all provinces except DIY. The indicative reduction in GHG emissions from this target is 1.47 million tons of CO_2e. Other than the action plan, there are no specific policies related to blue carbon in the RAN GRK document.

When compared with data from Forestry and Environment Ministry, where there are 1.82 million hectares of mangrove forests (52%) in damaged

condition, the rehabilitation planning of mangrove forests covering an area of 40,000 hectares is still very small amount. However, as stated earlier, the carbon sequestration potential of mangrove ecosystems is more than 3 gigatons of CO_2e. When combined with the potential of seagrass ecosystems capable of absorbing and storing carbon at around 119.5 MgC ha-1, the total blue carbon storage potential in Indonesia is 3.4 gigatons of CO_2e (IBCSF). This shows that the potential for carbon sequestration from the blue carbon ecosystem has not been maximally utilized in the action plans undertaken to reduce GHG emissions. In other words, in the RAN GRK document, blue carbon has not received more attention when it actually has a very large GHG emission absorption potential and can be very helpful in achieving the target of GHG emission absorption of 26% by 2020.

2. National Action Plan for Adaptation to Climate Change (RAN API)

This RAN API policy was issued by Bappenas in 2014, not specifically discussing GHG emission reduction, but rather discussing policies and action plans for climate change mitigation and adaptation. The strategies and action plans in the RAN API are divided into 5 (five) fields, namely Economic Resilience, Life System Resilience, Ecosystem Resilience, Special Area Resilience, and Support Systems. In the case of utilizing blue carbon, several action plans related to mangrove forest rehabilitation and mangrove forest management include Forest and Land Rehabilitation and Forest Reclamation in Priority Watershed with indicators of guaranteed rehabilitation of mangrove forests, peat, swamps and coastal borders on priority areas covering 10,000 hectares. In the RAN API, an action plan for maintaining and rehabilitating coastal and small islands ecosystems and resources (mangroves, wetlands and seagrass beds, estuaries, coral reefs, coastlines, continental exposure) will also be carried out. In addition, a priority program for Mangrove Forest Planning, Institutional Development and Evaluation will be carried out with indicators on the implementation of mangrove Forest and Land Rehabilitation Engineering Plan, mangrove forest management plans, the formation and functioning of regional mangrove working groups, and management of management evaluation information data. mangrove forest. Until now, some of these indicators have not been able to be implemented maximally because until now there has been no regional mangrove working group and there is no information data center available on mangroves and other blue carbon ecosystems.

3. First Nationally Determined Contribution (NDC)

Another policy related to GHG emission reduction is the Republic of Indonesia's First Nationally Determined Contribution (First NDC) document submitted to the UNFCCC in November 2016. In this NDC document, it is explained that after 2020, Indonesia plans to increase its target beyond current commitments. Referring to the latest study on GHG emission levels, Indonesia has set an unconditional target of 29% and a conditional target of up to 41% compared to the business as usual scenario in 2030.

However, in the NDC document, the role of blue carbon has not been specifically included in the calculation of mitigation and adaptation efforts to climate change. Mitigation efforts to be carried out in NDC documents originating from the land-based sector are mentioned by adopting a moratorium on primary forest clearing and prohibition of conversion from remaining forests with activities to reduce deforestation and forest degradation, restoration of ecosystem functions, and sustainable forest management including social forestry, where REDD + will be an important component of Indonesia's NDC targets in the land-based sector.

In the NDC document related to the low carbon strategy and climate resilience, it is mentioned that Indonesia plans to transform towards a low carbon economy and build food, water and energy security through increasing the following actions: Sustainable agriculture and plantations, integrated watershed management, Reducing deforestation and degradation forests, land conservation, utilization of degraded land for renewable energy, and improvement of energy efficiency and consumption patterns. In addition, to strengthen the resilience of ecosystems and landscapes will be carried out through the following actions: Ecosystem conservation and restoration, social forestry, protection of coastal areas, integrated watershed management, and climate resilient cities.

Based on the description above, the role of blue carbon for reducing GHG emissions in the NDC document has not been clearly stated. From the land and ecosystem sector, it is only mentioned that it is necessary to increase actions to reduce deforestation, conserve and restore ecosystems, and protect coastal areas. So, this NDC document has not been consider the role of blue carbon in absorbing carbon and reducing GHG emissions.

Previously, on 7-18 November 2016 in Morocco the Conference of Parties United Nations Framework Convention on Climate Change was held, the 22nd UNFCCC Conference of Parties or also referred to as COP 22. In the 22nd COP conference in Morocco this important role was discussed blue carbon as a contribution to the global carbon emissions reduction target. During the conference, the Blue Carbon Partnership was one of the events organized by the Australian Government as a coordinator in the International Partnership for Blue Carbon. On this occasion, to accommodate the important role of blue carbon in GHG emission reduction efforts, Indonesia conveyed the role of coastal and marine ecosystems in Indonesia's NDC has been integrated in mitigation of the land sector. In the upcoming NDC the role of blue carbon after going through comprehensive calculations and obtaining quantitative figures will be entered in stages in future NDCs. In the future, Indonesia needs a blue carbon roadmap as also recognized in the press release issued by the Indonesian delegation after attending the 22nd COP conference in Morocco.

As also stated in the NDC document, the NDC reflects the latest conditions in terms of data and information, analysis and future scenarios

by the Government of Indonesia. As a developing country, Indonesia will experience dynamic changes due to economic changes at the national and global levels. In this case, the NDC will be reviewed and adjusted, as needed, taking into account national conditions, capacities and capabilities as well as the provisions in the Paris Agreement. Therefore, the potential for blue carbon after proper calculations need to be included in the next NDC document.

4. Indonesia Maritime Policy

The Government of Indonesia has issued Presidential Regulation No. 16 of 2017 concerning Indonesian Maritime Policy, which includes the Indonesian National Maritime Policy Document and Indonesian Ocean Policy Action Plan for 2016 - 2019. This Presidential Regulation is expected to be a guideline for ministries/agencies and local governments in management of development in the marine sector.

In this Indonesian Maritime Policy, the blue carbon policy is briefly alluded to the third pillar, namely the sub-section of the Protection of the Marine Environment. It is said that Indonesia needs to look at the ability to absorb greenhouse gas emissions from coastal ecosystems so that emissions generated by activities on land can be reduced by Indonesia's blue carbon capabilities. To achieve this goal, one of the main programs is to strengthen management of watersheds, coastal, marine and small islands as well as strengthening the conservation of ecosystems, species, and genetics.

Programs with more measurable targets can be seen in the Indonesian Marine Policy Action Plan. Related to policies that are directly related to the concept of blue carbon, it can be seen in the third priority program cluster, namely, the cluster of Natural Resource Industries and Marine Services and Marine Environmental Management. In the explanation stated that the Government of Indonesia in accordance with its commitments in the World Ocean Conference (WCO) and the Coral Triangle Initiative (CTI) Summit in Manado in 2009, would set a target of 20 million hectares of marine conservation areas by 2020. Currently the conservation area of maritime is 17.3 million hectares.

There are several activities that will be carried out by the Government of Indonesia related to blue carbon, as stated in the Indonesian Ocean Policy Action Plan, including:

a. Increasing the effectiveness of the watershed conservation area management with a target of 35 areas (cumulative) until 2019

b. Increased population and protection of marine biodiversity with a target of 20 species (cumulative) until 2019

c. Establishment of mangrove areas managed as essential ecosystem areas with a target of 6 mangrove areas in 2 eco-regions (Sumatra and Java) in 2017

d. Establishment of Conservation Forest Management Unit in the marine and coastal areas with a target of 30 units by 2019

e. Increasing the area of marine and coastal conservation areas with a target of 3.5 million hectares by 2019

f. Increasing the number of areas that have been restored ecosystems (seagrass beaches, coral reefs and coastal vegetation) with a target of 2 priority areas in 2017

g. Rehabilitation of mangrove forests in forest areas with a target of 500 hectares in 2017

h. Rehabilitation and protection of coastal areas on the North Coast of Java with a target of 3.3 million mangroves (cumulative) by 2019

5. National Strategy for Mangrove Ecosystem Management

Considering the importance of mangrove ecosystems in Indonesia's blue carbon policy, the government through the Coordinating Ministry for Economic Affairs has also issued Coordinating Ministry for Economic Affairs regulation Number 4 of 2017 concerning Policies, Strategies, Programs, and Performance Indicators of National Mangrove Management. This regulation is a derivative of Presidential Regulation Number 73 of 2012 concerning the National Strategy for Mangrove Ecosystem Management. In Coordinating Ministry for Economic Affairs regulation Number 4 of 2017 the National Strategy for Mangrove Ecosystem Management (SNPEM) is listed which targets to stop the rate of damage to mangrove ecosystems and try to restore good mangrove ecosystem cover gradually to 3.49 million hectares in 2045, as shown in Table 1.

Table 1. Target Cover of Mangrove Ecosystems in Good Condition

Year	Mangrove Ecosystems in Good Condition (Million Hectares)
2017	1,69
2019	1,75
2024	1,95
2029	2,27
2034	2,69
2039	3,15
2044	3,47
2045	3,49

The National Strategy for Mangrove Ecosystem Management policies that will be applied include:

a. Control of utilization and conversion of mangrove ecosystems with the principle of sustainability (no net loss)

b. Improvement of the function of mangrove ecosystems in protecting biodiversity, protecting coastlines and coastal resources and increasing

products produced as a source of income for the country and the community

c. Mangrove ecosystem management as an integral part of integrated coastal area management and watershed management.

d. Political commitment and strong support from the Government, Regional Government and other related parties.

e. Coordination and cooperation between agencies and related parties vertically and horizontally to ensure the implementation of the National Strategy Policy for Mangrove Ecosystem Management.

f. Community-based mangrove ecosystem management by taking into account ecological, economic and socio-cultural values that aim to increase community income and support sustainable development.

g. Increasing the capacity of the Regional Government in carrying out the authority and obligations of mangrove ecosystem management in accordance with local conditions and aspirations.

h. Development of research, science and technology and information systems needed to strengthen the sustainable management of mangrove ecosystems.

i. Management of mangrove ecosystems through a partnership pattern between the government, regional government, the business world and the community with the support of institutions and the international community, as part of efforts to realize the global environmental commitment.

To implement policies above, the National Strategy for Mangrove Ecosystem Management also describes the strategies and targets to be achieved, which are divided into 4 (four) important values, namely ecological, socio-economic, institutional, and statutory regulations. Some of the main strategies to reduce the rate of damage to mangrove ecosystems include:

a. Speed up the legality of mangrove areas

b. Development of a mangrove management plan

c. Development of guidelines for mangrove ecosystem recovery

d. Inventory of potential and mapping of mangrove resources

e. Building a mangrove management information system

f. Strengthening the role of national/provincial Mangrove working groups

g. Formulation of guidelines for management of mangrove forests based on management units

h. Inventory of local wisdom in mangrove management

i. Increasing the role of central and regional institutions in increasing mangrove management capacity

j. Integration of mangrove management into development plans and spatial plans and / or zoning plans for coastal areas and small islands

k. Facilitate the preparation of provincial-level mangrove management strategies

6. National Medium Term Development Plan (Presidential Regulation No. 18/2020)

The most recent policy issued by the Government of Indonesia is Presidential Regulation Number 18/2020 concerning National Medium Term Development Plan Year 2020 - 2024. One of the national priorities contained in this National Medium Term Development Plan document is efforts to build the environment, increase disaster resilience and climate change. These national priorities are described into three groups of policies, namely: (1) improving the quality of the environment; (2) increasing disaster and climate change resilience; and (3) applying a low carbon development approach.

Low-carbon development focuses on low-emission development activities and reduces the overexploitation of natural resources. One of the main indicators used in the CRP is Emission Intensity which is defined as the amount of Greenhouse Gas (CO_2e) emissions per unit of economic output (billion rupiahs of GDP).

The targets for the low-carbon development policy group are a reduction in GHG emissions by 27.3 percent in 2024 and a reduction in GHG emission intensity by 31.6 percent in 2024. The target indicator related to blue carbon is a reduction in GHG emissions against the baseline in the coastal sector and marine areas of 7.3% and a cumulative 50,000 ha area of mangrove and coastal ecosystem restoration in 2024. Meanwhile, one of the strategies for realizing the direction of low carbon development policies in this National Medium Term Development Plan is Low Carbon Coastal and Marine which is implemented through Inventory and Coastal and Marine Ecosystem Rehabilitation.

From the explanation above, it can be concluded that the National Strategy for Mangrove Ecosystem Management document is one of the Government of Indonesia's regulations which completely and specifically regulates the strategy to reduce the rate of mangrove damage, and set targets for restoration of mangrove land that has been damaged until 2045 by 3.49 million hectares. Although it has not yet regulated other blue carbon ecosystems such as seagrass beds, tidal swamps, and other coastal ecosystems, if this national mangrove management strategy can be implemented properly and involves a serious commitment from the stakeholders involved, then Indonesia's target to reduce emissions GHG of 29% in 2030 will be achieved faster.

D. Blue Carbon Integration in the National GHG Emission Reduction Policy

From the above explanation of several Government of Indonesia policies related to blue carbon, several policies such as National Action Plan for Reducing Greenhouse Gas Emissions and NDC have not specifically addressed the issue of utilizing blue carbon for reducing GHG emissions. Meanwhile, in the National Action Plan for Adaptation to Climate Change and Indonesia Maritime Policy documents, the use of blue carbon has been alluded to but there seems to be no clear harmonization and synchronization between the two regulations, because the National Action Plan for Adaptation to Climate Change and Indonesia Maritime Policy documents still have their own targets for the preservation of mangrove ecosystems.

However, in the National Strategy for Mangrove Ecosystem Management document, there have been many detailed and clear arrangements regarding mangrove management and strategies to reduce the rate of mangrove damage. However, among the policies and strategies already explained in National Strategy for Mangrove Ecosystem Management, several strategies have not been fully implemented seriously, thereby reducing efforts to reduce the rate of mangrove damage.

Some of the focus of activities that have not been done well notably are inventory of potential and mapping of mangrove resources. In the 2020-2024 National Medium Term Development Plan, one of the strategies mentioned to be carried out is an inventory of coastal and marine ecosystems. To date, Indonesia does not have one data and one valid map of mangrove ecosystems. The latest data held is data from the Directorate General of River Watershed Protection and Protection Forest, Ministry of Environment and Forestry in 2015. Of course the data has changed a lot where most of the lost mangrove land is caused due to shifting of functions for aquaculture activities in coastal, where the percentage reached 48.6% (Barakalla in Ambari, 2017). Updating mangrove ecosystem data is absolutely necessary to calculate the potential and planning of mangrove management, and will be a reference for blue carbon policies to be taken.

Other mangrove management strategies that have not been optimally implemented are increasing the role of local governments in mangrove management. During this time, mangrove ecosystems on the coast are still threatened by development plans carried out by the regional and central government. To protect the mangrove ecosystem, the Regional Government needs to include the mangrove ecosystem conservation area in the Regional Regulation related to the spatial planning and zoning of the coastal area. The central government needs to issue regulations that instruct and require local governments to include mangrove ecosystem conservation for spatial planning or zoning of coastal areas in the area. Mangrove ecosystem conservation areas need to be clarified so that they are not used for other activities such as tourism, mining, aquaculture, industry, etc. so that the mangrove ecosystem can be

completely protected from destruction due to development activities. Strict regulations are needed by the Regional Government because it will be easier to monitor if the implementation of spatial or zoning regulations for the mangrove ecosystem is carried out by the Regional Government. This Regional Regulation will facilitate the effort related to mapping and preservation of mangrove ecosystems. In addition, the use of the National and Provincial Mangrove Working Groups also needs to be improved. This working group, which can consist of cross ministries or cross government, needs to work seriously to implement local regulations related to the mangrove ecosystem conservation.

If the inventory, mapping, and management of mangrove ecosystems can be carried out properly, then this will be a reference in calculating the potential of national blue carbon that can help reduce GHG emissions. At present, blue carbon has not been widely included in the components for national GHG inventories. Rehabilitation of mangrove forests is only slightly counted in the action plans in the forestry and peat fields. In addition, blue carbon has not been included in the calculation of GHG emission reductions in the NDC document. Therefore, in the future related to the updating of National Action Plan for Reducing Greenhouse Gas Emissions and NDC documents, blue carbon is very necessary to be included in the calculation because of the huge potential for carbon sequestration. The IPCC has also refined the GHG calculation reference by issuing a protocol for calculating emissions from wetlands, namely the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands. This protocol is a supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories which contain GHG inventory guidelines. In addition to peatlands, mangrove forests as coastal ecosystems are included in this part of the protocol specifically, namely in Chapter 4: Coastal Wetlands. (Sidik and Krisnawati, 2017). If blue carbon can be included in the national GHG inventory and in the NDC document, Indonesia will be very optimistic that it can achieve the GHG emission reduction target of 29% by 2030.

IV. Conclusion

Blue carbon ecosystems, which include mangroves, seagrass beds, and other coastal ecosystems, have enormous carbon sequestration potential when compared to tropical forests. But unfortunately, the potential of blue carbon has not been maximally utilized in national policies related to GHG emission reduction. Blue carbon has not been optimally calculated in the national GHG inventory and also has not been counted as a carbon sink in the NDC document. The blue carbon has not yet been calculated due in part to the policies of the Government of Indonesia which also have not focused on managing blue carbon as a carbon sink and reducing national GHG emissions. The existing policies have not been implemented optimally and some of them overlap and still have their own target indicators so that there seems to be no harmonization and synchronization of regulations. In the future, accurate data updating and mapping of the blue carbon

ecosystem is needed so that it can become a reference in determining national policies on the use of blue carbon. Therefore, the Government of Indonesia needs to include blue carbon as the basis for calculating carbon sequestration in the current National Action Plan for Reducing Greenhouse Gas Emissions and NDC documents to meet the optimistic target of reducing national GHG emissions.

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