The Effectiveness the Law No 27/2007 as a Response to the Sea-Level Rise in Indonesia

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Abstract. As a State with more than 13.000 islands and approximately 81.000 km2 coastline, Indonesia will be highly affected by sea level rise. Sea level rise itself will not only bring effects on the environment, but also the animals and humans that are dependent on the sea environment. To name a few, it can cause the destructive erosion, floods, soil contamination, the increase of natural disaster, and the loss of the land territory. Hence, there needs to be an appropriate and effective response in dealing and to prevent sea level rise any further especially in Indonesia. Hence, there is also a need to paid attention to the contributing factors and other preventable factors, in order to identify the main issues, problems, and threats to then draft the needed regulation as a response, especially in the nationals level where the law is more enforcable to everyone under that State's jurisdiction. In Indonesia, one of the regulation in question is the Law No. 27/2007 on the Management of Coastal Areas and Isles. This writing will discuss the nature of sea level rise that is cause by climate change in Indonesia and analyze whether the Law No. 27/2007 is effective in responding to the sea level rise condition in Indonesia.

Keywords: Climate Change, Law No. 27/2007, Sea Level Rise

1 Introduction

Climate change's effect comes in many forms including sea level rise. Sea level rise itself can be caused and will cause change in a lot of things towards States affected by it, especially towards coastal line in a coastal State. The direct effect is the change in the marine environment that some times also comes with the change of the ecosystem in the sea (due to pollution or the excessive amount of carbon dioxide absorbed by the water), and it can also resulted in the change of the coastal State's baseline due to erotion or elevation of sea level [1]. This is particularly dangerous for a State surrounded with sea/water, especially States with small islands which makes their territory threatened by the effect of sea level rise.

The effect of sea level rise is also vary which depends on which aspect is being discussed. With regards to the effect towards the people living in the vulnerable areas, it is a lot more concerning due to the dependency of the area they lived in with their everyday lives, not only regarding their homes, but also their way to make a living. With the rich marine biodiversity in Indonesia's area, Indonesia's citizen that lives accross Indonesia's baseline and dependent on the explotation of the sea to make a living. Hence, there is more urgency for Indonesia to look very closely and draft the very best regulations towards the needed parties, as there will be a decrease caused by the changing of territory or in particular baseline, that will surely affect the people dependent on it.

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Indonesia has implemented Law No. 27/2007 on the Management of Coastal Areas and Small Islands effective since 17 July 2007. The scope of regulation of this Law broadly consists of three parts, that is planning, using, as well as monitoring and controlling resources of coastal areas and small island [2]. This Law aims to protect coastal areas and small island, create the harmonization and synergy between sectors of Government, and increase society's role in order to achieve prosperity [3]. In its implementation, coastal areas are deemed to extend to as far as 12 (twelve) miles of the sea measured from the coastal line [4]. However, there has yet been any law specifically related to climate change, moreover to address sea level rise adopted by Indonesian government.

2 Problem

Based on the issues explained in the introduction, this writing will discuss the problems of:

1. The significant implication of Sea Level Rise affects the small islands in area of Indonesia territory;
2. The Role of The Law No 27/ 2007 to solve the raise issue on beach protection zone/baseline: effective or insufficient?

3 Method

This writing used the research with doctrinal approach and the evidence in society. The doctrinal approach refers to the Law No. 27/2007 on the Management of Coastal Areas and Isles. It is used to analyze whether the Law in question is effective in responding to the condition of sea level rise and beach protection zone/baseline as a part of the effect of climate change in Indonesia.

4 Finding and Discussion

4.1 The implication of Sea Level Rise Towards the Vulnerable Areas

4.1.1 Contributing Factors of Sea Level Rise

In order to effectively address the issue of sea level rise, it requires an understanding to the factors that auses sea level rise in Indonesia an its effect. This will help identifying the right actions needed to response to sea level rise and to structure the right regulations related to it to make the needed actions enforcable. The factors are including but not limited to:

a) Natural Cause

Sea level rise is not an unprecedented situation before the effect of human activities becomes more threatening nowadays. There are natural causes to sea level rise that is unavoidable. Some of the natural causes are natural soil decrease, movement of the tectonic plates, changes of gravity, changes in water circulation or wind patterns, as well as compaction and unification of sediment [5].

b) Climate Change and Global Warming

Sea level rise was originally only occurred during certain season and due to seasonal weather. However it is not considered as dangerous as the effect it has is only temporary.

Climate change, or particularly the increase of temperature globally contributes significantly due to the melting of the glacier and causes the increase of sea level accross the world [6]. The conditions related to climate change that ultimately the biggest contributing factors to sea level rise is global warming and other effect of the greenhouse gasses. From the scientific point of view, thermal expansion is significantly concerning as the cause is not only to the area where there is thermal expension, but also impacted the sea level accross the world up to 45% [7]. The thermal expansion leads to the increase of temperature and melts glacier and polar ice, which then have a domino's effect towards the water vapor cycle and the rise of sea level [8]. This conditions arise as global warming which also causes climate change. is also causing expansion of temperature in sea water, the loss of ice land, and also mass exchange between fresh water/lan water, and oceans [7].

c) Human's Behaviours

With the dependency of the people on the explotiation of the sea and its biodiversity, there are a lot of activities both traditionally and modern that contributes to sea level rise, whether it is a direct or indirect cause. Those conditions are known as human induced sea level rise. For most part in the early days, activities that are contributing to sea level rise are mostly related to pollution and how it affects the marine environment and disrupt the course of water in nature. Nowadays, the effect are bigger, from annual mean surface of air temperature, the change in rainfall patterns and the amount of rainstroms that has become more frequent. The most important one is the economy activity which pollution excessively will increase the climate change and global warmint effect internationally.

d) The Slow Response Government to React and Adopt Effective Climate Change Law

In Indonesia, there has not been any specific regulations adopted by the government on the climate change as the main cause of sea level rise, nor regarding sea level rise itself. The existed rules from the adoption of international conventions Indonesia is a party to has been the mainly basis in the protection of State against sea level rise, especially if it causes the State to lose some parti of its teritorry. However, the development is slow and it is needed to regulate the needed protetion to take care of the problem in a structured way [9]. The appropriate and effective regulations is considered both a threat and a challenge that must be overcomed by the government to maximise the time spend in protecting its area in dealing with the sea level rise.

4.1.2 The condition of climate change and sea level rise in Indonesia

Until 2022, there has not been many research on the sea level rise across Indonesia. However, there are several data and study that may help in understanding and become more aware of the conition in Inonesia. The condition of sea level rise are usually seen based on the data of mean sea level (MSL) in a particular area, and it is shown in several area of Indonesia where the sea level rise is happening. There are some examples that will be elaborated below, that is the condition in Semarang, Tuban, and Jakarta to see the big picture of sea level rise in Indonesia.

Semarang

Table 1. Temperature in Semarang

Month/Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
January	27	27,2	27,4	26,3	27,4	28,7	27,6	2,6	27,8
February	27,3	27,5	27,9	26,8	27,3	27,7	27,4	27	28,1
March	27,3	27,6	28,2	27,6	27,6	28	28,1	27,9	27,8

Month/Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
April	27,8	28,7	28,5	28,4	27,8	29	28,3	29,1	28,7
May	28	28,6	28,7	29,2	28,6	29,4	28,7	29,1	28,8
June	27,9	27,9	28	28,8	28,2	28,6	28,4	28,6	28
July	27,8	27	27,7	28	27,8	28,7	28,3	27,7	27,6
August	27,8	27,4	27,7	27	27,9	28,7	28,3	28	2,8
September	28,2	28,3	27,9	28,4	28,6	28,7	29	28,8	28,5
October	29	29,2	28,5	29,5	29,7	28,5	29,3	29,6	29
November	28,2	28,8	28,8	28,9	29,6	28,4	27,9	29,3	30,1
December	28	27,9	28,1	27,9	28,3	28	27,8	28,5	28,9
Average	27,8	28,1	28,1	28,2	28,2	28,6	28,3	28,4	28,5

Table 2. MSL Average of Semarang in 2011-2019

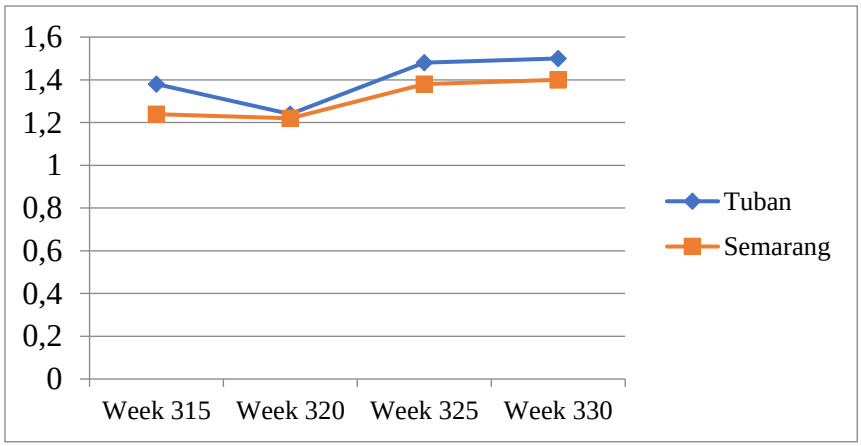
Month/Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
January	135,59	138,07	130,04	139,71	167,61	166,08	173,96	176,8	171,68
February	127,26	132,7	134,59	138,32	168,72	169,76	168,72	171,71	176,19
March	126,03	132,03	141,36	136,07	160,13	159,66	164,91	168,79	175,82
April	128,03	132,04	132,02	137,36	152,3	160,58	164,91	175,15	182,03
May	132,11	132,07	150,18	149,02	161,78	170,06	174,19	186,25	190,58
June	129,26	132,13	150,93	137,36	152,3	160,58	164,91	175,15	185,34
July	125,84	132,17	148,56	149,02	161,78	28,7	174,19	186,25	182,71
August	123,95	132,19	140,58	150,54	163,24	28,7	175,54	181,31	175,63
September	121	132,19	139,97	150,93	162,35	171,39	171,85	170,94	-
October	125,62	132,17	1377,8	147,91	160,78	171,39	172,89	173,72	-
November	123,96	132,14	138,46	133,45	164,97	172,15	173,83	176,79	-
December	131,09	132,11	142,02	126	163,51	173,37	179,59	177,11	-
Average	127,48	132,6	140,55	142,65	162,61	10,02	171,79	16,32	179,75

For a slightly more details in sea level rise condition, the study in 2019 published in 2022 provided with more factual data can be seen above. The data shown above also gives a little insight in the effect of global warming on an area especially with regards to sea level rise, this covers the land and water aspect. The study examine and analyze the effect of global warming by looking at some of the effect that may cause sea level rise, that is the temperature level both in land and sea of Semarang. The comparion from year to year shows an increasing temperature and the rise of the sea surface in Semarang [1].

Tuban

The study shown in graph 1 is using the *least square* method, hence not only describing the current situation but also scores prediction based on the calculation of the available data [10]. The study in 2011-2012 was conducted to see the current and predict future sea level rise in the Tuban area. The result of the study give the researcher on that study a conclusion that similar as Semarang, there is sea level rise and expected to increase in the coming years [11].

Graph 1. Current and predict future sea level rise in the Tuban area



Jakarta

The previous data allows the use of the previously gained and calculated data to be used as a prediction of sea level rise condition in the future. This is also used to predict the effect of sea level rise in Jakarta. NASA, a United States government agency that is responsible for science, technology, and capturing data from satelites, reported the use of lands in Jakarta for the last 30 years with other conditions that makes it worse for people to live in Jakarta. That fact, coupled with the rainy season that now has become unpredictable and also compared to previous study by Prof. Hasanudin Z.A., et. al will affect sea level rise by 0,8-1 meters by 2100. That same study also conclude now 14% of Jakarta's territory is below sea level and will get worse from soil decreasing in all area [12].

Other Areas

Based on the study by Kosasih Prijanta et. al in 2006, a group of scientist from ITB founds that the sea level rise in Indonesia's territory are as follows [13]:

- Jawa/Java: 16mm/year
- East Sea: 19mm/year
- Sulawesi: 19mm/year
- South China Sea: 17mm/year

4.1.3 Implication of Sea Level Rise to small islands

The above-mentioned conditions in Indonesia is merely a small picture of the sea level rise across the State. With thousands of Islands, the degrading and downsizing of the bigger islands are not the only concern the government have. With a lot of small islands under Indonesia's jurisdiction, the obligation to protect in to the best interest of both the State and the people comes along with having the territory. However, small islands are more vulnerable compared to the big ones. The same problem of decreasing area could happen to both big and small islands, both could be very dangerous and will affect the people that live there, but the time is not on the small islands side. The smaller the area is, the faster it will get affected by effect any dangerous conditions. It covers from natural disasters, wrongly managed area, and sea level rise.

The condition will be reflected in the consequences from the situation, where the islands became vulnerable where the coastline or baseline length is not an ordinary boundary, but may change according to the situation [14]. Another effect is the economy and social life of the people in the small islands. Those who are dependent on the marine environment for a living would need to constantly changing things around. The current conditions in small islands means that in every small islands when dealing in sea level rise also needs to considered and re-visit the concept of preparedness. The vulnerable condition are making the people on the islands in a little step back from others, limited resources and the constant threat needs to be followed with the right assistance in development, migration, emigration, and evacuation from the State as conducted by Canada, Germany, New Zealand towards small islands in an international levek such as Tuvali or Fiji [14], hence putting the bigger burden on the State who are still capable to handle the matter after learning from other practice.

4.2 The effectiveness of Law No 27/2007

4.2.1 Sea Level Rise as New Challenge and Issue to The Law No 27/2007

According to a report from the Intergovernmental Panel on Climate Change (IPCC, 2013), the coastal areas of Southeast Asia will experience a sea level rise of about 10 to 15 percent higher than the global average of sea level rise. As for the territory of Indonesia, the KKP Research and Development Center in 2014 predicted that there would be a sea level rise of 0.76 cm per year and it was predicted that in the next 25 years it would rise to 19 cm. This is surely a challenge for Indonesian Government since the current law does not specifically address the solution for this problem. Although Law No. 27/2007 does regulate mitigation for disaster in Chapter X, the law does not set out concrete steps to mitigate sea level rise. Article 59 merely describes disaster mitigation that can be carried out through structural/physical and/or non-structural/non-physical activities, in which provisions regarding disaster mitigation and damage to Coastal Areas and Small Islands are further regulated by Government Regulation [15].

4.2.2 Exist gap the current legislation in Indonesia in the area of addressing adaption due to sea level rise

While Law No 27/2007 serves as the umbrella to protect coastal areas and small island along with other laws and regulations, such as Law No. 6/1994 concerning Ratification of the United Nations Framework Convention on Climate Change, Presidential Regulation No. 61/2011 concerning National Action Plans for Reducing Greenhouse Gas Emissions, Presidential Decree No. 71/2011 concerning the Implementation of the National Greenhouse Gas Inventory, and document on the National Action Plan in Facing Climate Change issued by the State Ministry of the Environment in 2007, which can be used as guidelines in the preparation of the management of the coastal areas and small island towards climate change. Nevertheless, Indonesia currently does not have a specific law on climate change.

In 2013, the National Council on Climate Change (DNPI), following the perspective of the United Nations Framework Convention on Climate Change (UNFCCC), stated that there are two actions that can be taken to deal with climate change, namely [9]:

a) Mitigation, which is aimed at controlling the concentration of greenhouse gases (GHG) in the atmosphere that causes climate change. This includes the use of new technology and renewable energy to become more energy efficient.
b) Adaptation, which is aimed at enabling the community to adapt to various changes in nature caused by climate change. These efforts are directed to strengthen institutional capacities

and integrate climate change measures into development planning and ecosystem management practices.

Indonesia is still lacking in the latter part. Legislation plays an important role in providing a basis for climate change adaptation, but no clause governing adaptation has been codified. Adaptation is a far more complex legal problem than mitigation [16]. And as climate change advance, the true severity of adaptation's effects may become increasingly difficult to discern [17]. Adaption must contribute sustainably to "socially and environmentally sustainable development pathways, including both social justice and environmental integrity" [18].

4.2.3 The Law in Indonesia didn't cope with multilevel layers of government's administrations and interest in Indonesia's many islands and regions

Indonesian bureaucracy is known for its long and intricate process. The same goes for the management of coastal areas and small islands. The question is how to create an integrated management concept for coastal areas and small islands that is well adapted to the impacts of climate change by considering all sectors. Especially in dealing with sea level rise.

The government has done several methods to deal with sea level rise. However, most of it was mainly focused on a structural manner, such as building giant sea wall in Jakarta or developing infrastructure in East Kalimantan due to the relocation of the capital city. Meanwhile means such as maintaining mangrove ecosystem was done by the local governments. It was evinced that it lacks an integrated framework from the central government.

In accordance with Presidential Decree No. 78/2005, the management of the outermost small islands is carried out in an integrated manner by the central government and regional governments. The management of this outermost small island is coordinated by a coordination team chaired by the Coordinating Minister for Political, Legal and Security Affairs. The tasks are assisted by two working teams coordinated by the Minister of Marine Affairs and Fisheries [19].

In Government Regulation No. 62/2010, it is also stated that the central government has the authority to draw up a management plan for the outermost small islands. Furthermore, in supervising and controlling the use of the outermost small islands, the central government and regional governments in accordance with their respective authorities carry out monitoring, field observations, and/or evaluation of the planning and implementation. These outermost small islands constitute a Certain National Strategic Area (KSNT), which is an area related to the state sovereignty, environmental control, and/or world heritage sites, whose development is prioritized for the national interest. Utilization of the outermost small island can only be done for defense and security, public welfare, and environmental conservation. As for the environmental conservation, it is mandatory to obtain permission from the minister after receiving a recommendation from the governor and/or regent/mayor in accordance with their authority [20].

Meanwhile, according to the Law No. 27/2007, planning for the management of coastal areas and small islands consists of a strategic plan, zoning plan, management plan, and action plan for the management of coastal zone and small islands. The local government is obliged to prepare all these plans in accordance with their respective authorities, then submitted to the governor and the minister to be known and get feedback or suggestions [21]. In addition, Law No. 43/2008 stated that the central government and regional governments have the authority to regulate the management and utilization of state territories and border areas [22].

These laws and regulations show that multilevel layers of governments administrations concerning coastal areas and small island do exist. This needs to be considered by the Indonesian government, especially in overcoming challenges such as climate change adaptation measures.

Therefore, taking into account the climate change variables that are developing today, managing coastal areas and small island in Indonesia needs to integrate mitigation and adaptation measures to a specific legislation on climate change.

5 Conclusion

From the analysis above, it can be seen that climate change and sea level rise must be handled due to the global effect it causes. The effect of climate change and sea level rise is significant due to the direct effect it has on Indonesia's water and land as Indonesia is an archipelagic State.

It is also evidence that of the Law No. 27/2007 is inadequate for adapting to sea level rise in Indonesia and the government should adopted a specific law to address this issue. While national law will require far more than enacting new rules and regulations, it remains a vitally important mechanism. The domestic legal system can facilitate sufficient responses that can be addressed by the Government.

References

[1] Annisa Shalsabila, et. al., "Kajian Fluktuasi Muka Air Laut Sebagai Dampak dari Perubahan Iklim di Perairan Semarang", Indonesian Journal of Oceanography, Vol. 4, No. 1, 2022, p. 69.

[2] Law No. 27/2007 on the Management of Coastal Areas and Small Islands, Art. 1(1).

[3] Law No. 27/2007 on the Management of Coastal Areas and Small Islands, Art. 4.

[4] Law No. 27/2007 on the Management of Coastal Areas and Small Islands, Art. 2.

[5] Risa Vina Chrismiantari, Sorja Koesuma, Budi Legowo, "Analysis of Sea Level Rise by Using Satelite Altimetry Data of West Sumatra Waters in 2009-2019", Journal of Physics Conference Series, Vol. 1825, No. 1, 2021, p. 1

[6] Karlina Triana A'an Johan Wahyudi, "Sea Level Rise in Indonesia: The Driverssand the Combined Impacts from land Subsidence", ASEAN Journal on Science Technology for Development, Vol. 3, No. 3, 2020, p. 116.

[7] Anny Cazenave, Gonéri Le Cozannet, "Sea Level Risse and Its Coastal Impacts", Earth's Future, Vol. 2, no. 2, 2014, p. 19.

[8] Ruibin Zhang, et. al., "Another Imporant Factor of Rising Sea Level: Soil Erosion", Clean-Soil, Air, Water, Vol. 41, No. 2, 2013, p. 174.

[9] Diah Apriani Atika Sari, Siti Muslimah, "Kebijakan Pengelolaan Pulau-Pulau Kecil Terluar Indonesia dalam Menghadapi Perubahan Iklim Global", Yustisia, Vol. 9, 2014, p. 62

[10] Dwi Mulyani, "Prediction of New Student Numbers using Least Square Method", International Journal of Advanced Research in Artificial Intelligence, Vol. 4, No. 11, 2015, p. 30.

[11] Liyani, Kriyo Sambodho, Suntoyo, "Analisa Perubahan Garis Pantai Akibat Kenaikan Muka Air Laut di Kawasan Pesisir Kabupaten Tuban", Jurnal Teknik POMITS, Vol. 1, No. 1, 2012, p. 3.

[12] Tubagus Solihudin, Jakarta tenggelam, ya atau tidak? ... Ini Pandangan Peneliti Madya, 2021 <accessed from: https://kkp.go.id/brsdm/pusriskel/artikel/33238-jakarta-tenggelam-ya-atau-tidak-ini-pandangan-peneliti-madya-pusriskel >

[13] Diah Apriani Atika Sari, Siti Muslimah, p. 59; Prayuda Hartanto, Sella Lestari Nurmaulia, Kosasih Prijatna, "Steric and Eustatik Effect Contributions to Sea Level Change Based on Altimetry Satellite Argo and Grace Satellite ata within 1992-2012 Period (The Study Area: The Western Pacific Ocean), Indonesian Journal of Geospatial, Vol. 2, No. 1, 2013, p. 1.

[14] James Lewis,"The Vulnerability of Small Island States to Sea Level Rise", Disasters, Vol. 14, No. 3, 1990, p. 243.

[15] Law No. 27/2007 on the Management of Coastal Areas and Small Islands, Art. 59.

[16] Robin Kundis Craig, "Stationarity is Dead" - Long Live Transformation: Five Principles for Climate Change Adaptation Law, Vol. 34, 2010, p. 28.
[17] Matthew D. Zinn, Adapting to Climate Change: Environmental Law in a Warmer World, Ecology Law Quarterly, Vol. 34, No. 61, 2007, p. 89.
[18] Siri Eriksen, et. al., When Not Every Response to Climate Change Is a Good One: Identifying Principles for Sustainable Adaptation, Climate and Development, Vol. 3, No. 1, 2011, p. 8.
[19] Presidential Decree No. 78/2005.
[20] Government Regulation No. 62/2010.
[21] Law No. 27/2007.
[22] Law No. 43/2008.