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Measuring sustainability performance of coastal waters resources management (Case Study: Nusa Tenggara Barat Province, Indonesia)

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Abstract

Management of coastal waters resources a complex activity and complicated. The implementation is passed on to the provincial government pursuant to the Law of the Republic of Indonesia Number 23/2014 on Regional Government. The objective of the study is to assess the results of coastal waters resource management conducted by the parties, and take place during October 2016-May 2017 in Nusa Tenggara Barat Province. The research approach is multi-dimensional scaling (MDS), and the methods isdescriptive dependent survey. Analysis of sustainability status of management using Rapcosmile Method (6 dimensions).The sustainability values of management dimensions are relatively low (22.00-55.56%), and the management status ranges from "not sustainable" to "quite sustainable". The status indicates: (a) weaknesses in the process of planning, implementation, monitoring and evaluation programs, (b) the implementation took place on its own, (c) the limited budgets of coastal development, and (d) the capacity of the parties that involved in each stage of the coastal management process. Improving the sustainability status of the management requires Governor intervention. Its main intervention is to establish an institution of coastal resources management. The institution is at least members of bureaucrats, technocrats, entrepreneurs, and coastal communities.

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Introduction

The Indonesian nation has placed the management of coastal, marine and small island coastal resources as a very important part in the life of the nation and the life of the state. The importance of coastal waters resources management in Indonesia is marked by the enactment of the Law of the Republic of Indonesia Number 27/2017 on Management of Coastal Areas and Small Islands. While the authority and responsibility of coastal management and small islands is a mandate from the Law of the Republic of Indonesia Number 23/2014 on Regional Government.

Management of coastal waters is an inherent part of integrated coastal zone management (ICZM). ICZM is a process of planning, utilizing, monitoring, controlling, upgrading coastal and marine resources across sectors, between the Government (Central) and Local Government, between terrestrial and marine ecosystems, and between science and management to raise the level of community welfare (SS RI, 2007; SS RI, 2014).

The management of coastal areas becomes very important because among others: (i) marine areas are common property, (ii) potentially causing horizontal/social conflict in the utilization of marine areas, (iii) the occurrence of destruction and degradation of maritime and fishery sectors, (iv) the sea as the border of sovereignty, defense and security of the Unitary State of the Republic of Indonesia, and (v) has high economic potential for the welfare of society. In guarding such interests, it is now commanded by the Provincial Government, and the Governor acts as the supreme commander. One of the regional governments that are very responsive and concerned about the management of coastal and marine areas and resources is the Government of Nusa Tenggara Barat Province (NTB).One year after the enactment of the Law of the Republic of Indonesia. 27/2017 on Management of Coastal Areas and Small Islands, NTB issued Provincial Regulation of the Nusa Tenggara Barat Province Number 2/2008 on Management of Coastal Areas and Small Islands (RS NTB, 2008).

So far, the parties (coastal communities, bureaucrats, technocrats, businessmen, and indigenous peoples) throughout NTB have conducted coastal waters resources in various actions. The management is more dominated by the utilization of biological resources and non-biological waters. The high responsibility of the parties in NTB towards the safety of ecosystems and resources coastal waters is characterized by the birth of several local regulations relating to coastal resources management.

Problems arising from the management of coastal waters resources by the parties include is the absence of management evaluation results after implementing all policies related to coastal management. Another problem is not yet knowing the status of sustainability of coastal waters resource management that has been implemented so far. This study aims to: (a) assess the results of management of coastal waters resources and (b) to know the status of sustainability of its management.

Materials and methods

Location and time of study

This research activity took place on the coastal waters of NTB Province i.e. sea waters in the span of 0-12 nautical miles wide, including strait waters and bay waters (Fig. 1). Data compilation was conducted from October 2016 to May 2017.

Methods of data collection

This study uses descriptive dependent survey method that aims to collect data/information, as well as explain the extent. Collected data is divided into primary data and secondary data. Data compilation techniques through interviews, observation, and documentation. The data are related to coastal resources and ecosystems and their utilization include human resources (fishermen, coastal communities), resources (biological, non-biological), ecosystems (coral reefs, mangroves, seagrasses), and their uses (fisheries, shipping, mining, tourism). Also collected regional regulations relating to the management of coastal waters ecosystems and their resources.

Method of data analysis

Analysis of existing conditions

Data analysis using quantitative analysis which aims to obtain status, level or class of each object/attribute under study. Some attributes that require quantitative analysis through statistical and mathematical tests are fish resources (abundance, sustainable potential, utilization rate, utilization status, biomass trend), important value index (mangrove, seagrass, coral reefs), diversity and conditions/status (mangroves, seagrass, coral reefs), and conservation categories (species, ecosystems). The data is used to analyze the current condition that aims to determine the characteristics and status of all the resources contained in the research location.

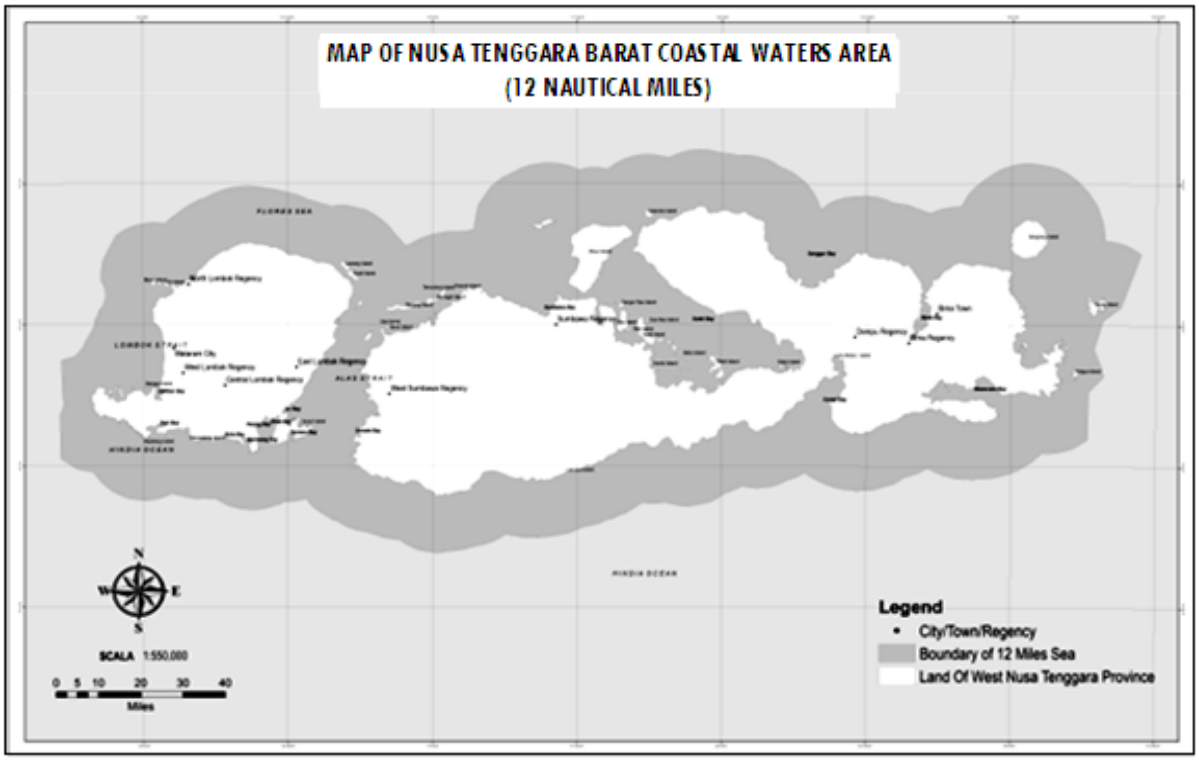

Fig. 1. Map of research location in coastal waters of NTB.

Analysis of management sustainability

The results of the analysis will be combined using Rapcosmile (Rapid Appraisal for Coastal and Small Islands) modified and developed from Rapfish (Patricia and Tony, 2004; Muhammad, 2013; Rusmin, 2015) and Rap jellyfish (Evron *et al*., 2015).

This analysis aims to evaluate the sustainability status of coastal waters resource management in multi-dimensional management activities. Tjahjo *et al.* (2005) states, the description of fishery resource management in certain water areas can be assessed quickly and accurately by using Rapfish method.

The dimensions in Rapfish concern the sustainability attributes of ecology, economics, technology, social, and ethics (Daniel and Tony, 2000; Tony and David, 2001; Ahmad and Susi, 2002; Patricia and Tony, 2004; Muhammad, 2013; Rusmin, 2015). Meanwhile, the management dimensions that used by Evron(2015) and Evron *et al.* (2015a) consists of bio-ecology, economics, technology, social, and ethical/legal. Rapfish and Rap jelllyfsih methods consist of 5 (five) dimensions of management. While Rapcosmile methods developed into 6 (six) management dimensions consisting of biology (6 attributes), ecology (14 attributes), economics (10 attributes), technology (10 attributes), social/institutional (12 attributes), and and ethics/regulation (11 attributes).

The types of analyzes in Rapcosmile in this study consist of: (a) RAP Analysis showing sustainability values, deviation (stress), and determination (R Square), and (b) Leverage Analysis shows the value of each attribute. The main purpose is to know the sustainability value of management and the sensitive attributes that determine the management. The application of Rapfish in this analysis follows the procedure described by Jackie *et al.* (2000) (Fig. 2). Rapfish is based on ordination techniques that puts something in order of measured attributes using Multidimensional Scaling (MDS). MDS is software for measuring similarities, and the result is an image or "map" (Michael *et al.*, 2014). MDS can be used to determine the position of an object based on similarity or inequality by using multivariate statistical analysis that can be functioned as multiple variables. Young and Hamer (1994) states that MDS is a data analysis technique that displays geometric images based on similarity or lack of similarity, based on euclide spacing.

The sustainability status of management is assessed by comparative methods using standards from Susilo (2003) and Suyitman *et al.* (2009). The status of sustainability is divided into 4 (four) levels: Not Sustainable (0-25%), Less Sustainable (> 25-50%), Quite Sustainable (> 50-75%), and Sustainable (> 75-100%). In this assessment analysis included the social/institutional dimension because one important factor of management is the organization/institution as the main stakeholder.

The results of this sustainability analysis are expressed in the sustainability index of coastal waters resource management activities. This sustainability index describes the sustainability status of coastal waters resource management activities under study based on the conditions under study (2016) and one year earlier (2015). The value of the sustainability index in each dimension is determined by embedding the weight value on each dimension which is the result of the calculation on the basis of available data or sourced from the analysis.

Results

The management of coastal waters resources around the world has been going on for so long. The statement can be agreed with the same perception that the management paradigm as a process of protection, preservation and utilization of the resource. The results of coastal waters resource management processes in this study illustrate the management status of resources of coral reef, mangrove, sea grass, fish, iron sand, oil and gas.

Table 1. Regression statistics.

No.	Dimension of Management	Stress (%)	R Square (%)
1	Biology	13.91	92.89
2	Ecology	12.90	95.51
3	Economics	13.15	94.58
4	Technology	13.70	95.25
5	Social/Institutional	13.24	95.47
6	Ethical/Regulation	13.47	93.74

Stakeholders and communities in NTB Province, jointly or individually, consciously or unconsciously, have undertaken coastal water resources management in various forms and ways. Currently, we do not know the process of coastal waters resources management that has been done by these stakeholders.

What can be known at this time is only the result of the management process, as the following will be briefly described. The results have been recorded in several documents from the Marine Affairs and Fisheries Agency of West Nusa Tenggara Province (MAFA NTB) which are published in limited by 2015 and 2016.

Analysis of Resources Status

Potential of coastal waters resources

NTB province with coastline along 2,333 km, with wide area of 49,312.19 km² divided into land area of 20,153.15 km² (40,87%) and coastal waters area 29,159.04 km² (Fig. 1) Sumbawa Island is the largest island that has an area of 15,414.50 km²(MAFA NTB, 2016), or 76.49% compared to land area, or 31.26% compared to the area of NTB Province. While the mainland area of Lombok Island reached 4,738.70 km², or 33.51% compared to land area, and 9.61% compared to the area of NTB (MAFA NTB, 2016).

Table 2. Sustainability index values and status.

No.	Dimension of management	Sustainability value (%)	Sustainability status
1	Biology	22.00	Not Sustainable
2	Ecology	54.34	Quite Sustainable
3	Economics	49.98	Less Sustainable
4	Technology	55.56	Less Sustainable
5	Social/Institutional	52.88	Quite Sustainable
6	Ethical/Regulation	29.51	Quite Sustainable

The NTB region consists of Lombok Island and Sumbawa Island along with 278 other islands, of which 18 small islands are populated Islands (MAFA NTB, 2015). Only Sumbawa Island and Lombok Island are not small island categories, while other islands are small island category (>10.00-2,000 km²) and tiny island (>0-10 km²). The whole island spreads from the waters of the Lombok Strait in the west, the Flores Sea in the north, the Sape Strait in the east, to the Indian Ocean in the south of the province.

Based on the draft document of Regional Regulation of Zoning Plan for Coastal Zone and Small Islands of NTB Province *in* MAFA NTB (2016), the definition of coastal waters is a sea bordering with land covering waters as far as 12nautical miles measured from coastline at the time of highest tidal sea, beaches and islands, estuaries, bays, shallow waters, swamps, and lagoons. While coastal and small island resources are biological resources (fish, coral reefs, sea grass, mangroves, seaweed, other marine biota), non-biological resources (sand, seawater, marine mineral resources), artificial resources (marine infrastructure related to marine and fisheries), and environmental services (natural beauty, underwater surface where underwater installations are linked to marine and fisheries, ocean wave energy in coastal).

According to MAFA NTB (2016), the potential of marine biological resources consists of coral reef ecosystem (37,104.00 hectares), sea grass beds (9,379 hectares), and mangrove forests (12,144.30 hectares). While potential waters for marine aquaculture activities more than 50,000 hectares. Based on data of fishery production of NTB Province sourced from MAFA NTB (2016), fish stock resources in coastal waters of NTB is estimated to be approximately 428,670.00 tons/year.

Ecosystems of coral reef

Coral reef ecosystems in coastal waters of Lombok Island and Sumbawa Island are 10,841.30 hectares (29.22%) and 26,235.70 hectares (70.78%) respectively (MAFA NTB, 2015). Sumbawa Regency has the widest coral reef ecosystem that is 10,856.00 hectares (29.26%), more extensive than coral reefs in the coastal waters of Lombok Island. Coral reefs in Bima Regency covering 8,858.50 hectares (23.87%) and East Lombok Regency area of 4,494.90 hectares (12.11%). For the district level, Labuhan Badas is the most extensive coral reef is 2,709.3 hectares. The widest coral reef distribution is Saleh Bay which is 5,319.50 hectares (30.59%), and the narrowest one is the distribution of coral reef ecosystem in Senggigi (159.40 hectares) and Gili Matra (236.25 hectares) (MAFA NTB, 2016).

Table 3. Sensitive attributes.

Dimension	Sensitive Attribute		Score
Biology	1)	Trend Biomass	10.89
	2)	Utilization Status of Fish Resources	7.20
	3)	Catch per Unit Effort/CPUE	7.05
Ecology	1)	Wide of Sea grass Bed	4.37
	2)	Density of Sea grass Species	3.86
	3)	Wide of Coral Reef	2.79
Economics	1)	Sex Ratio	8.61
	2)	Dependency Ratio	6.66
	3)	Sectoral Contribution to GDP	5.29
	4)	Level of Young People	4.73
Technology	1)	Size of Fishing Vessel	4.31
	2)	Fish Processing Before Sale	3.68
	3)	Side Effects of Fishing Gear	2.71
Social/ Institutional	1)	Typology of Fisherman	5.02
	2)	Fisherman's Experience (fishing)	4.02
	3)	Conservation Area Management Unit	3,91
	4)	Fisherman Education Level	3.39
Ethics/ Regulation	1)	Tourism Management Plan	9.14
	2)	Action Plan for Coastal Management	7.30
	3)	Transport Management Plan	7.05
	4)	Coastal Area Management Plan	7.05

Ecosystems of mangrove forest

MAFA NTB (2016) informed that the area of mangrove forest ecosystem has narrowed since 1993. In 2015, mangrove forest in NTB is 12,144.30 hectares, which means shrinkage area of 37,029.70 hectares (75.30%) compared to 1993 area of 49,174.00 hectares (MAFA NTB, 2016). The longest mangrove ecosystem is located in Sumbawa Regency (134,095 meters), and the shortest in Central Lombok Regency (1,591 meters).

The mangrove ecosystem is also found in small Islands along 203,415 meters which is divided into small islands around Lombok Island along 31,109 meters and around 172,306 meters Sumbawa Island.

The mangrove ecosystem only lives in 15 small islands of 278 islands in NTB (MAFA NTB, 2015). Human activities cause the decrease of mangrove ecosystem area in NTB Province. Humans exploit the ecosystem and mangrove habitat to meet some of the necessities of life. Mangrove has been utilized for expansion of shrimp/fish ponds, housing, and fuel to replace kerosene function.

The analysis results show that important value index (IVI) of mangrove ecosystem for dominant species in each region is 73,35-300.00%. IVI value 300% for type of *Sonneratia alba* in Kuta-Awang area and surrounding area (2 locations) and Lunyuk area (1 location). His status is "broken" to "good", but dominant "good". Overall, the density and closure are "Very Solid" (4,551-4,552 ind/hectare), and the average closing rate is 59.08% (MAFA NTB, 2016).

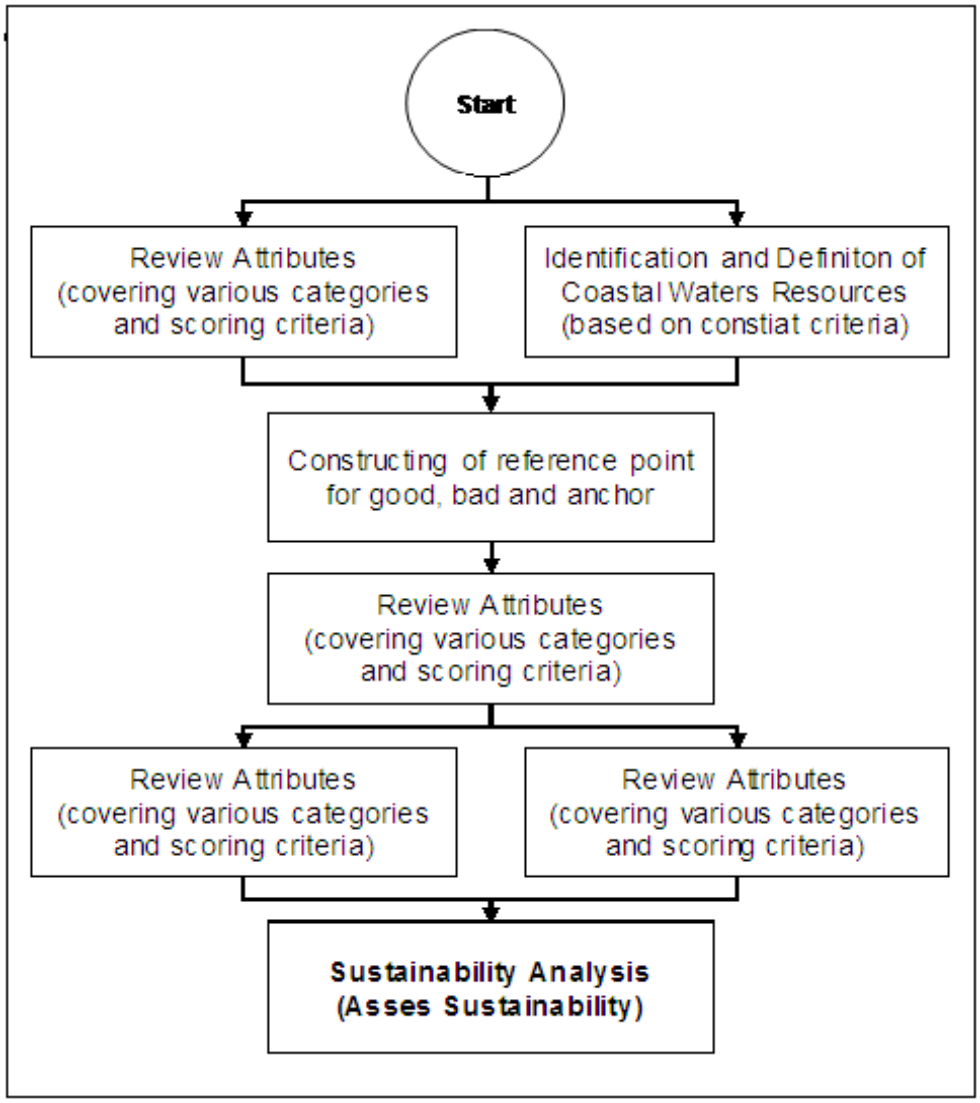

Fig. 2. Elements of the Rapcosmile application process.

Ecosystems of sea grass bed

Sea grass ecosystem in NTB coastal waters amounts to 11 species of 9,379 hectares (MAFA NTB, 2015).Based on the study it is known that sea grass is found to live in all coastal waters of NTB, except in coastal waters of Mataram City and Bima City. While the largest expanse of sea grass beds in Saleh Bay (1,680.0 hectares), and the narrowest at Bima Bay (2.00 hectares) (MAFA NTB, 2015). In the meantime, sea grass closing value ranges from 10.00-77.15%.The largest sea grass cover status is found in Sanggar Bay and its surroundings is 74.3% with "Rich" status.

Closing of sea grass which status "Poor" that is in area of Senggigi and its surroundings with cover from 18,70% until 28,80%.

Fish resources

The coastal waters of the province of NTB are potential habitat for various important economical fish species. In this study, fish resources were classified as pelagic fish (surface), demersal fish, and critical/endangered species. Overall, the number of fish resources that live and breed in the coastal waters of NTB reaches more than 80 species.

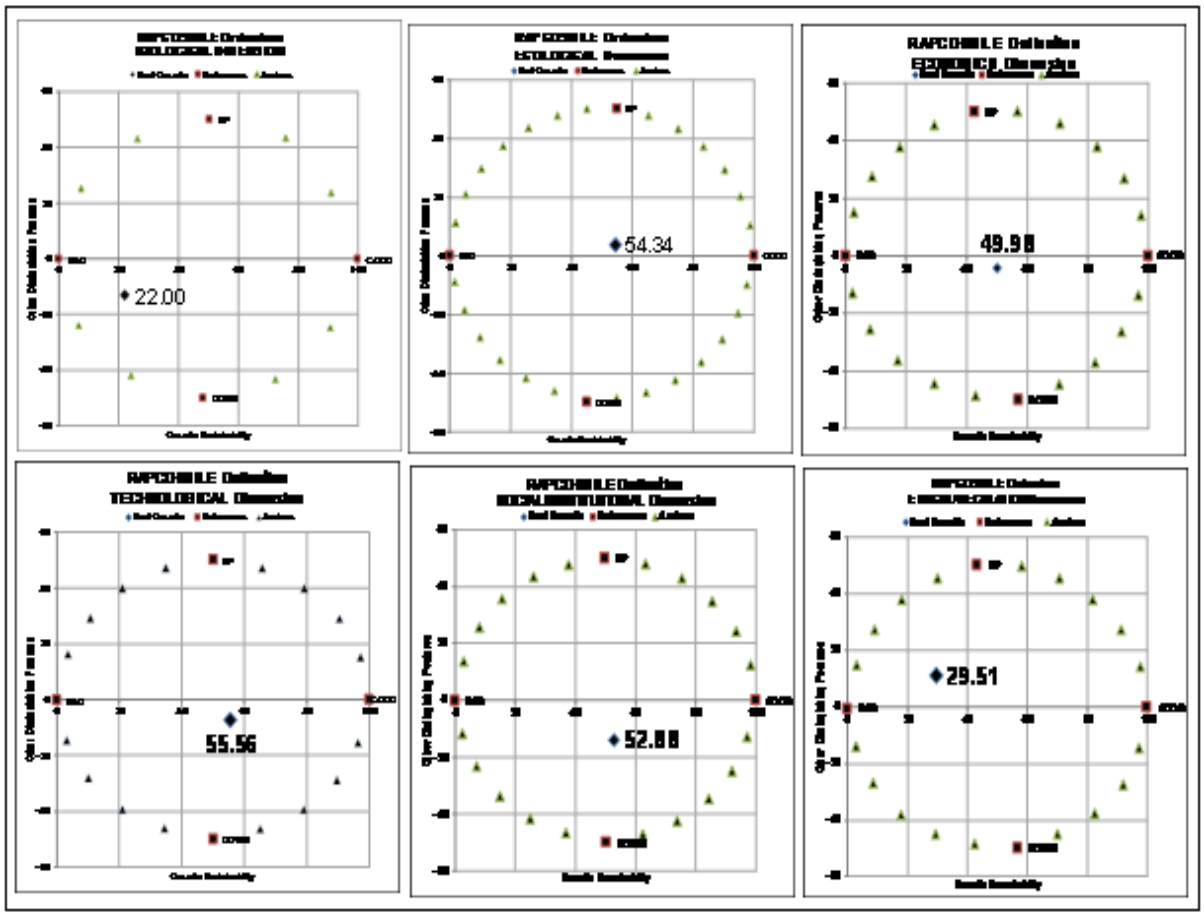

Fig. 3. Sustainability value from RAP analysis.

The coastal waters of NTB have a wealth of pelagic fish resources of at least 37 species. Some of them are classified as economically important fish such as tuna (albacore, big eyes, blue tail, yellow tail, skipjack), mackerel tuna and bloated. Potential groups of pelagic fish are spread across the coastal waters of NTB Province, including Indian Ocean, Flores Sea, Lombok Strait, Alas Strait, Sape Strait, Ekas Bay, Awang Bay, Saleh Bay, Cempi Bay, Bima Bay and Waworada Bay. In 2016, fishery resources most caught by fishermen are edible jellyfish, tuna, mackerel tuna, anchovies and skipjack.

Demersal fish resources can be grouped into bottom fish species, hard-skinned animals, reef fish, and other fish. This demersal fish inhabits the entire coastal waters with sand, mud, coral, seagrass, and coral reefs. The types of demersal fish living in coastal waters of NTB numbered from 54 species, consisting of basic fish group (30 species), hard-skinned species (14 species), reef fish (7 species), and other aquatic animals (3 species). The species of reef fish are grouper, red snapper (Epinephelinae), snapper (Lutjanidae), Mullidae, Theadfin, Carangidae. Priacanthidae, Lethrinidae, and lobster. Some of the most widely caught fish are crabs, white shrimp, grouper, and red snapper.

Edible jellyfish is one of the many fishery commodities in NTB that contribute greatly to the economies of coastal communities. informed, there was blooming edible jellyfish in the waters of Saleh Bay in 2014 which is allegedly caused by several factors namely hydrological system of bay, rain (rainy days, rainfall), yields of medusivore, and the extension of the ponds area Evron *et al.* (2015b). While the exploitation status of jellyfish fisheries in the Saleh Bay region in 2013 classified as "Fully Exploited" namely the stock of jellyfish resource hasexploited close to the value of Y_{MSY} (Evron *et al.*, 2015a).

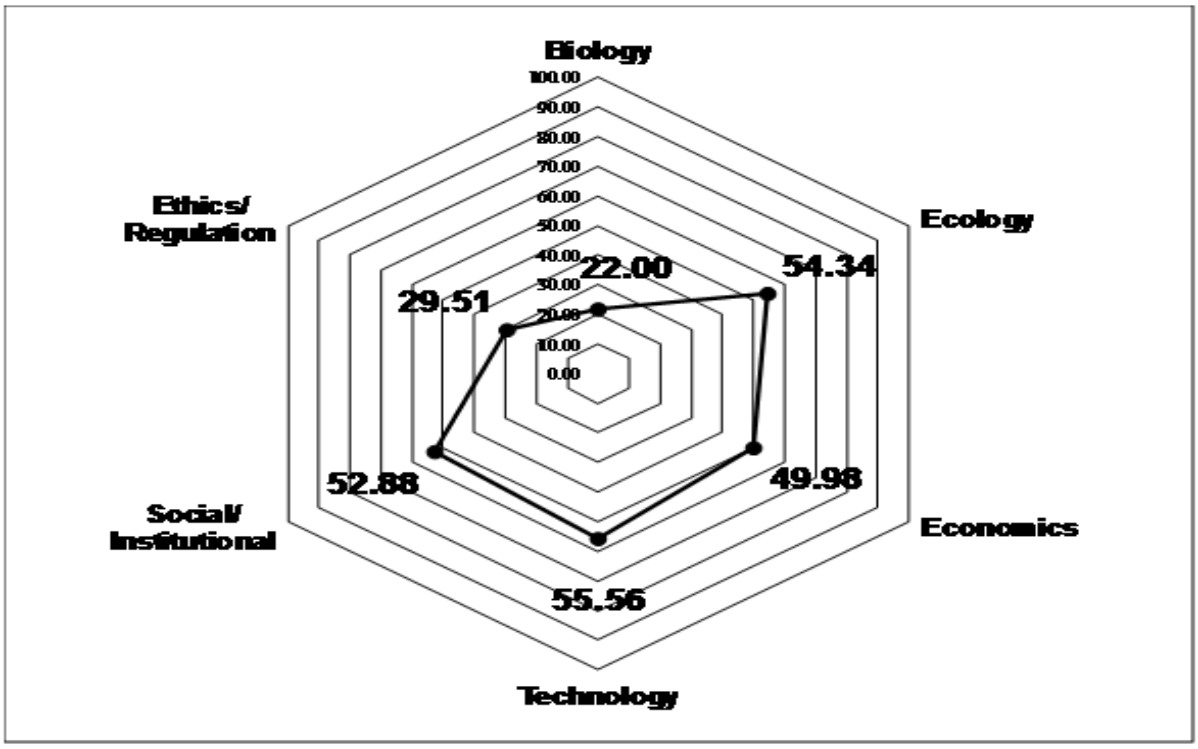

Fig. 4. Spider diagram (%).

The estimate of sustainable potentials (MSY) of fishery resources in NTB Province uses data on the number of fishing gear and fishery production volume for 5 years in the period 2012-2016 (MAFA NTB, 2016).The result is obtained MSY estimation of 213.162,98 tons of fish per year, the number of fishing equipment most operated is 17.110 units/year and its productivity is maximum 8.90 tons/unit/year. Compared to 2015 production of 170,166.16 tons of fish, the status of utilization rate (79.83%) is "fully exploited".

Endangered fish species

The marine ecosystems of Bali-Nusa Tenggara (Lesser Sunda) are known as migratory corridors of marine biodiversity belonging to endangered species, such as turtles, whales, dolphins, and dugongs. While the flow of migration and swimming area of turtle resources include the Lombok Strait, Flores Sea, Alas Strait, and Indian Ocean. According to MAFA NTB (2015), more than sevenspecies of fish belonging to the precarious species in the coastal waters of NTB are: (a) turtle group (*Chelonia mydas*, *Eretmochelys imbricata*, *Caretta caretta*, *Dermochelys coriacea*), (b) protected marine mammal groups (whales, dolphins/Dolphiniidae, dugong/*Dugong dugong*), and (c) protected shark and protected rays.

The whales have migratory habitats and grooves in the waters of the Lombok Strait, the Flores Sea of the Indian Ocean, and the Bima Bay. Dolphins are often seen in the waters around Medang Island and Moyo Island, Saleh Bay, and the Alas Strait. While dugong can be found in the southwest waters of Saleh Bay, Cape of Menangis and Alas Strait. Manta ray *(Manta birostris)*, which is one of the largest fish species, is found in the waters around Gili Trawangan and Gili Meno (Lombok Strait).

Hammerhead sharks *(Sphyrna lewini)* in NTB waters are found in the waters around Sofia Island Lousia (local name is Gili Sepatang) as is often seen by scuba divers (MAFA NTB, 2015).MAFA NTB (2016) informed, the whale shark *(Rhincodon typus)* is found in the waters around the Tanjung Luar (Alas Strait) and the Saleh Bay (southwest side).

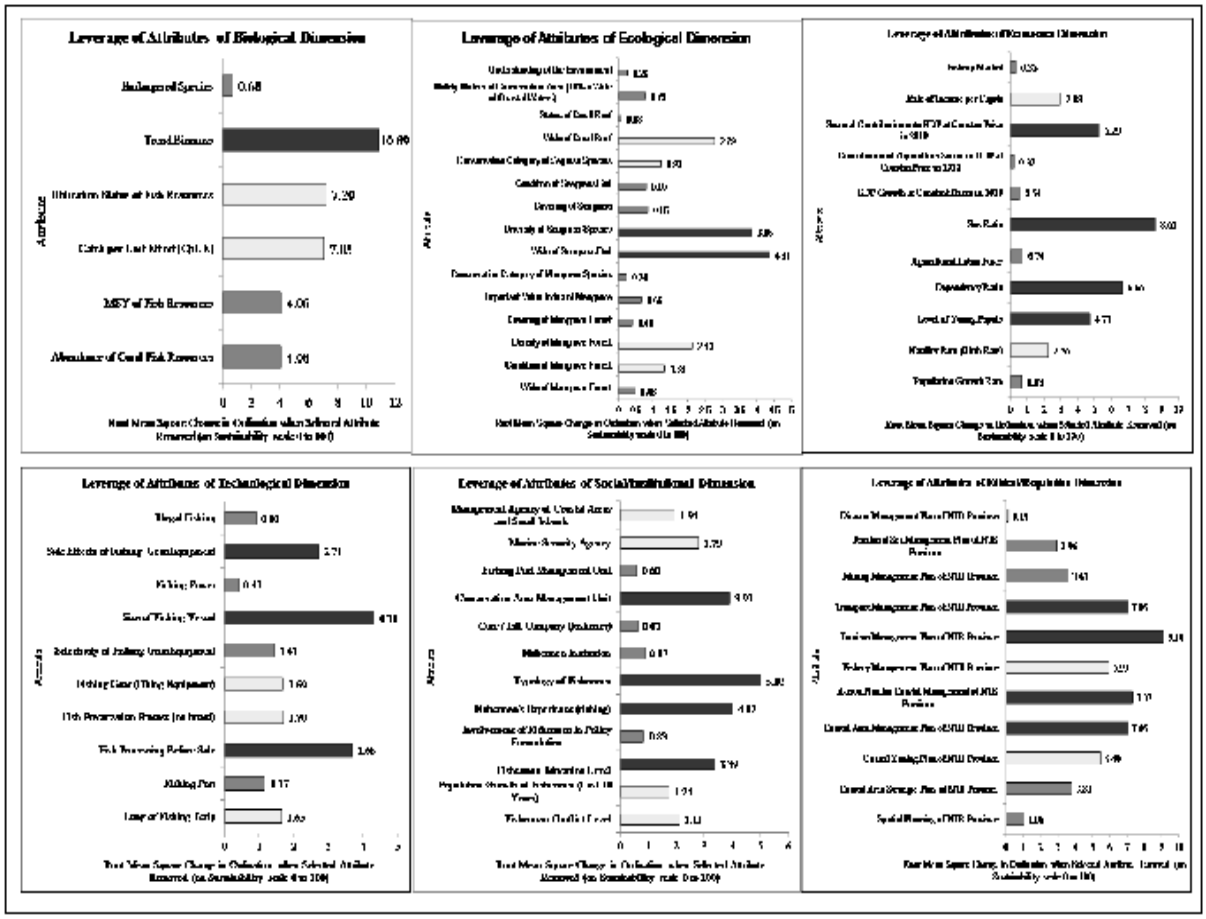

Fig. 5. The sensitive attributes from leverage analysis.

Ferruginous Sand Resources

The coastal waters of NTB contain deposits of ferruginous and sea sand resources scattered throughout the region. According to the Agency of Mining and Energy of NTB Province (2012) *in* MAFA NTB (2016), the availability of iron sand resources is spread over several beaches in Lombok and Sumbawa Island. Total deposits in 2010 totaled 17,064.23 tons spread over 29.34 hectares, and the largest reserves in Bima Regency (14,038.83 tons). Deposits of ferruginous potential in NTB of 19,757 tons, spread over five districts. Most deposits in Sumbawa Regency, reaching 14,246 tons (72.11%).

Oil and gas resources

Oil and gas or hydrocarbon potentials in Indonesia are commonly found in tertiary sedimentary basins. The basin is divided into the front arc basin and the back arc basin. The waters of Lombok Island have a front arc basin in the southern waters that are incorporated with the western waters of Island of Sumatra to the southern waters of Java Island and Bali Island. Based on the Indonesia Sediment Basin Map (Geological Agency, 2009), in Indonesia's marine waters there are 128 sedimentary basins, and in NTB there are 4 (four) sedimentary basins. The sediment basin in NTB is entirely tertiary-aged. Based on the classification according to the tectonic order, sedimentary basins in the NTB region consist of 2 (two) back arcs namely the Bali-North Lombok Basin and the North Flores Basin; and 2 (two) basins of the Bali-Lombok Basin and the South Sumbawa Basin.

Environmental services

Coastal waters are unique in nature, beauty, and natural scenery as a blend of marine landscapes, waves, beaches and small islands, as well as sunlight and biodiversity that are targeted by tourists or tourist attractions. The tourist attraction is anything that has uniqueness, beauty, and value in the form of

diversity of natural wealth, culture, and man-made products that become the target or purpose of tourist visit. Tourist attraction can be divided into three types of natural tourism attractions, cultural attractions and tourist attraction.

The beaches of the coastal region of NTB has the beauty or stunning natural scenery, so it becomes one of the tourist attractions that become a mainstay for the development of tourism destinations of a region or country in the world. Beach attractions are often associated with "4S" (sand, sea, sun, surf), which means a tour that provides the beauty of nature and the comfort of a combination of sunlight, sea and sandy beaches and waves. The coastal waters of NTB have various coastal attractions on the island's main islands and small islands.

Underwater panorama of coastal waters of NTB is very beautiful because of wide and potential coral reef distribution, so it can be developed as an underwater tourist destination. Based on its territorial, the potential of natural attractions under the sea in NTB can be grouped into several areas namely Gili Matra, Senggigi, Sekotong, Kuta, Gerupuk, Ekas Bay, Moyo Island, Saleh Bay, Satonda Island, Sangiang Island and Gili Banta.

The coastal waters of NTB have high coastal waves with plunging ruptures that are suitable for surfing. Some surf beaches are Bangko-bangko, Kuta, Gerupuk, Ekas Bay, Maluk, Jelaga, Rantung, Sejorong, Lakey, and Sekongkang. The entire beach is a surfing location visited and a favorite of foreign tourists.

Analysis of feasibility of the model

The feasibility analysis of the sustainability model of coastal waters resource management of NTB is done by looking at the value of Stress and R Square values. The value obtained from the data processing using RAP Analysis contained in Rapcosmile method. Value of model of RAP analysis result is obtained from value of Stress (standard deviation) and Squared Correlation (RSQ, R^2)(Table 1).

With reference to these statistical values, the equation can be used to estimate the sustainability of coastal waters resource management of NTB Province. In addition, the model can also be used for forecasting the sustainability of coastal waters resource management of NTB Province.

The values of Stress indicate the magnitude of model deviations, in which case the value per management dimension ranges from 12.90 to 13.70%, which means that standard deviation is tolerable. This is in accordance with the revelation of Ahmad and Susi (2005) that the greatest acceptable/tolerable stress value is 25%.

The values of R^2 = 92.89-95.51% mean the following: (a) all attributes in all sustainability dimensions used in the equation strongly influence the variation of the sustainability dimension of management (4.49-7.01% equation is determined by the attributes, (b) Almost all data (92.89% -95.51%) are able to explain the equation, and (c) the equation is eligible (R^2>60.0%) to be used for forecasting (Sri Mulyono, pers.com., 2001).

Based on the results of RAP Analysis, it is known that the value of "Stress" is less than 25%, and the value of "R Square" is more than 90% (Table 1). Stress value indicates that the deviation of statistic model formed can still be accepted/tolerated, in accordance with the opinion of Ahmad and Susi (2002) stating that the stress value allowed is not more than 25%. While the R Square value indicates all attributes give a strong influence/determination on the value of each dimension.

Analysis of management sustainability status

The management sustainability status of coastal waters resources of NTB Province is assessed using Rapcosmile method. Fig. 3 and Fig. 4 are the results of RAP analysis, part of Rapcosmile, showing the sustainability value of coastal waters resource management.

The management sustainability status attached to each management dimension refers to the standard issued by Setyo (2003). Sustainability status of Biological Dimension (22.00%) is "Not Sustainable". Two dimensions of management with "Less Sustainable" status are Ethical/Regulation (29.51%) and Economy (49.98%). While the dimensions of the status "Quite Sustainable" consists of Social/Institutional (52.88%), Ecology (54.34%) and Technology (55.56%) are "Quite Sustainable" (Table 2).

Although the three dimensions of management are "Quite Sustainable" (> 50-75%) but their status may deteriorate to "Less Sustainable". Dimensionof Ethical/Regulation is also potentially degraded to "Not Sustainable".

Sensitivity analysis of management attributes

Understanding of sensitive attributes are attributes that give negative effects (negative impact) on the sustainability value of management. These attributes can be seen and known from the results of Leverage Analysis in the Rapcosmile method (Fig. 5).

The selection of sensitive attributes is based on the smallest value index of the sustainability dimension. Based on the sequence of index of sustainability dimension of coastal waters resource management activity of NTB Province, it is obtained the value of sustainability index that should be prioritized based on the order of dimension sustainability value.

Discussion

Based on the results of RAP analysis can be considered that the status of sustainability of coastal waters resource management results that have been done by the parties "less sustainable". The cause evaluated refers to the results of the Leverage Analysis method. Through this analysis method, it can be assumed that some of the attributes of management contribute negatively to the value of management sustainability. The condition is thought to be caused by 21 attributes that are categorized as “sensitive attributes” obtained from the Leverage Analysis (Table 3).

Thus, 33.33% of all management attributes belong to a group of sensitive attributes. This situation is allegedly caused by the management of coastal perarain resources has been carried out by the parties independently without coordinating and synchronizing with other parties. In addition, management is planned and implemented in an integrated and unsustainable manner.

Referring to Fig. 5, it is known that the causes of low Biological Dimension (22.00%)was (a) the decreasing condition of fish resource abundance, especially the reef fish, (b) the increasing trend of biomass, and (c) the fish resource utilization status approaching the maximum sustainable yield (fully exploited = 100% of MSY). While the attributes that allegedly contributed to the low value of Dimension of Ethical/Regulation (29.16%) were (a) has no provincial regulations on marine tourism management plans, marine transportation management plans, coastal area management plans, action plans for coastal area management, and fisheries management plans and (b) the occurrence of illegal fishing and destructive fishing activities, the frequency of marine security patrol activities is still lacking, and law enforcement against criminal acts at sea is still weak. Meanwhile, Dimension of Economics (49.98%) is slumped, the cause is allegedly contributed by four attributes namely sectorial contribute to the GDP at constant price 2010, sex ratio, dependency ratio, and level of young people.

The management of NTB coastal waters resources that have been implemented by the parties for more than two decades, resulted in less favorable sustainability status. The status indicates: (a) weaknesses in the process of planning, implementation, monitoring and evaluation of development programs, (b) the implementation took place on its own, (c) the limited budgets of coastal development, and (d) the capacity of the parties that involved in each stage of the coastal management process.

This is due to the lack of initiation and the enactment of many local regulations related to the utilization of coastal waters resources. Until now, the people of NTB already have two local regulations related to coastal waters, namely: (1) Regional Regulation of NTB Province No. 2/2008 on Management of Coastal Areas and Small Islands, and (2) Regional Regulation of NTB Province on Zoning Plan for Coastal Zone and Small Islands in 2017-2037 which have been approved by the Provincial House of Representatives of NTB Province.

Up to now, the authority and responsibility of coastal waters resource management in Indonesia has been handed over to regency/city governments and provincial governments. This situation has an impact on the weak coordination, synchronization, and evaluation of coastal and small island development programs. The result is the overlapping of coastal waters resource management plans, programs and actions. Thus, the achievement of the management program implemented is not as stated in the planning document.

Since last year 2016, the Government of the Republic of Indonesia (RI) has enacted RI Law No. 23/2014 on Regional Government. This law provides the authorities and responsibilities to the Provincial Government to manage coastal waters. This law also revokes the authority and responsibility of regency/municipal governments to manage coastal waters. The policy will have a positive effect on the sustainability of coastal waters resource management as the planning, coordination and evaluation functions are gripped by the Governor. While the negative effect is the reduction in the amount of development funds allocated for management because it only comes from one source is the provincial government.

Conclusion

Based on the results of RAP analysis and Leverage analysis using Rapcosmile method can be summarized as follows: (a) management planning does not have a roadmap of activities and achievements of activities, (b) management actions are dominated by coastal waters resources utilization activities, (c) has happened management that less-coordinated, less-synchronized, less-focused, and less-integrated against goals of sustainable management, and (d) do not have evaluation methods for assessment of performance, sustainability and achievements of implementation of program and action plans of coastal waters resources management. Improving the sustainability status of the coastal waters resources management requires/needs active participation and intervention from the Governor is Head of Provincial Government. It is recommended that the Governor establish an institution of coastal and marine management. Membership board of the institution consists of at least bureaucrats, technocrats, coastal communities, entrepreneurs, and indigenous peoples.

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