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Coastal Resources Conservation in Indonesia: Issues, Policies, and Future Directions

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Abstract

Blessed with vast coastal region, Indonesia has developed its economy by better utilizing the available resources therein. The coastal region, consisting of about 81,000 km shoreline and more than 17,000 small islands, has provided huge contribution to the national economy and served as the solid basis for various human activities. The region and its resources should be sustainably available and existed to support the country's future economic development. Nevertheless there is a serious concern for its future, particularly regarding the status of the resources which essentially are the important life supporting system. The main coastal ecosystems that constitute Indonesian coastal region are mangrove forest, seagrass meadow, and coral reefs. Variety of goods and services are produced by these coastal ecosystems. Some of the goods and services are exploitable, usable, marketable, tradable, and highly priced. Some other goods and services, however, are remained unidentified, non-quantified, non-tradable, and unable to be monetized by using the existing technologies and market mechanisms. Consequently, the resources tend be underestimated and undervalued and eventually misused and mismanaged.

Keywords: Coastal, Policies, Resources

Introduction

Naturally, coastal region and its resources have certain carrying capacity and limit in number. Hence, they should be utilized as economic goods in proper manners by which parts of the resources can be taken out without jeopardizing the capacity of the resources to reproduce and renew. In terms of area, the natural formation and condition of the region cannot be merely and unintentionally converted into other purposes without maintaining the minimum area, space, or amount of the resources in their pristine states in order to maintain the sustainability and balance of the coastal ecosystem. In other words, while utilization of the coastal areas and resources are extremely important for Indonesia, at the same time management conservation must be in place.

By conservation it refers to a resource management approach by which responsible and sustainable utilization of the resource can be achieved through preservation, protection, and enhancement of biodiversity quality value. The conservation of natural resource simply consists of protection, preservation, and sustainable utilization of the resources (Law No 32/2009). Formerly, it was alleged that in the rural areas of the coast, where dependency of the community on the availability of natural resources are really high, conservation-oriented development approach should be given the highest priority. Now, even most of the coastal regions including the ones in urban areas should also be managed by intently adapting and implementing conservation mechanisms. Coastal region and its resources are now in critical states and progressively deteriorating. The declining state of the coastal region alarms and entices serious attention of both public and private sectors, and even all the related stakeholders, to band together to protect and conserve the region. We are now at the stages where actions must be taken to save our coastal region as the most valuable resources that sustains our nation and provides livelihood for our people. This article shortly

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explains the current condition of Indonesian coastal resources, the factors or variables determining and affecting their threat and existence, and the government policies addressed to manage the resources. Some examples of conservation initiatives and practices that have potentiality to be amplified and transformed are discussed. The paper ends up with some recommendations on the future policy directions that should be attentively taken and implemented.

The Fortunes of The Resources

Coastal ecosystems are the ones situating within the coastal zone areas, the places where the land and the sea meet. The coastal zone can be categorized into landward and seaward. The landward category consists of inundated and undated areas which are influenced by marine process such as tides, sea-winds, and salt intrusions. The seaward includes the waters that are influence by land-based natural process such as sedimentation and influx of fresh water. Three salient ecosystems that form Indonesian coastal regions are mangrove forest, coral reefs, and seagrass bed. Within these three ecosystems, various species of fish are living. Some species live there permanently. Some others choose the ecosystems as their habitat just for the certain period of their lifecycles. The ecosystems are functioning as spawning grounds, nursery grounds, refugees, and temporal shelters for many fishes and mega fauna such as dugong, turtle, manta ray, and whale shark. Some exotic, ornamental, and aquarium fish are also found in the ecosystems. Other formations of coastal ecosystems are seashore, beach, swamp forest, and estuary. Some parts of the coastal ecosystems have been transformed into industrial areas, residence, and commercial areas. This article only focuses on three main ecosystem; the mangroves, seagrass beds, and coral reefs, as well as main important fish that are found within the ecosystems.

Mangrove Forest

Mangroves are trees which are very successful inhabitants of the intertidal zone in tropical region. They grow better in sheltered coastlines, bays, and estuaries. About 45 species of mangrove are found in Indonesia, 30 species of which are identified in Nusa Tenggara and Maluku, 43 species in Papua (Monk *et al*, 1997, Burke *et al*, 2002; Kartikasari *et al*, 2012.). The total areas of the Indonesian mangrove forest was about 2.9 million ha in 2005, significantly went down from 1980's 4.2 million ha. The deforestation rate was estimated at 1.24% per year, one of the highest in the world (Murdiyarso *et al*, 2015). Traditionally, mangrove forest existence brings about huge benefits and impacts to people. Directly, it provides foods, woods, and raw-material of charcoal for coastal communities. Indirectly, it provides environmental services as nursery and spawning grounds, coastal protection from storms, waves, and tsunami, nutrient cycling and balancing, ecotourism, natural laboratory, medicine and pharmacology, textile coloring-substances, and objects for research and study. In the period 1980s to 2000s, when world shrimp price and market demand were skyrocketing, vast mangrove areas were converted into shrimp pounds, especially in the northern coast of Java and southern coast of Sulawesi. The conversion eventually resulted in environmental problems that reduced productivity of the ponds. Although the conversion continually occurs now, it is apparently at slower rate than before.

Recently, mangrove forest was scientifically proved as a high carbon-storing ecosystem. It is even higher than that of rain forest and therefore also functions effectively in climate global change mitigation (Murdiyarso *et al*., 2015; Donato *et al*., 2011). A study done by Conservation International (CI) in Kaimana West Papua in 2016 found that one hectare mangrove could compensate in equivalent the total carbon emission of 20 luxury cars operating in 25 years. Adding this function of carbon storage to the traditional uses and benefits of mangroves, the monetary value of this ecosystem is getting higher and exceedingly important. Hence, the remaining mangrove areas in Indonesia which is about 25% of the global ecosystem should be conserved as a global natural capital and national source of sustainable growth.

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Coral Reefs

Coral reefs occur along the shallow tropical coastlines where the waters are clean, clear, and warm. They are one of the most productive ecosystems in the world. The basis for this high productivity is a combination of the production of the reefs with support from its surrounding waters. Coral reef ecosystems have important economic outputs especially in providing fish for human consumption. Approximately one third of the world's fish species are said to live in coral reefs (Clark, 1992). The ecosystem supports booming tourist industry that focuses on reef diving, snorkeling, and underwater photographers. It also functions in coastal protection, sediment retention, nitrogen fixation, feeding places, nursery and spawning grounds for marine organisms. It has aesthetic values, provides artistic inspiration, sustains the livelihood of coastal communities, and supports cultural, religious, and spiritual values (Cesar, 2000).

Indonesia is endowed with spacious coral reefs resource. A survey in 2002 showed that Indonesia's reefs ecosystem was 51,000 km^2 that consisted of 581 species. This coral diversity was the highest in the world (Burke *et al*., 2002). Nonetheless, due to mismanagement, this valuable resource significantly decreased to be 39,538 km^2 in 2012 (Burke *et al*., 2012). Although Indonesia still maintains its status as the largest coral reefs country in the world, somewhat more than 93% of the resources are threatened to die at medium or higher rates. It implies that if the resources are not properly and painstakingly managed and wisely used, they will be vanished and consequently brings about negative impacts to the country. A recent study of P2O-LIPI indicated that Indonesia's coral reef area was estimated at the range of 40,000 to 85,000 km^2. Yet by using remote sensing method, the area was estimated only at about 25,000 km^2, or approximately 14% of the world's coral. The study also counted reefs diversity and listed 569 species throughout Indonesian waters, making the country as the hottest reef biodiversity in the planet. Nevertheless, based on the field survey in 1,259 locations, only 5% of the ecosystem was found in excellent condition, 27% good, 38% fair, and the remaining 30% was poor (P2O-LIPI, 2015[a]). Regionally, Indonesia and other five countries (Malaysia, PNG, Philippines, Solomon Islands, and Timor Leste) have been considered as the richest coral areas that accounts for about 30% world's coral. Given their strategic importance to the global climate and economy, the six countries have established a regional organization by the name of Coral Triangle Initiative for Coral reefs, Fisheries, and Food security (CTI-CFF). One of the main objectives of the organization is to conserve and manage the ecosystem so that it can result in positive impacts to the countries and global communities (Nikijuluw, 2013).

Seagrass Beds

Submerged seagrass beds are often abundant in the shallow waters tropical coastal environments. Seagrass beds, or meadows, are highly productive and valuable resources which enrich the sea and provide shelter and food for some of the most important and valued species of fish and shellfish. Megafauna such as dugongs and turtles are highly dependent of seagrass. High price fish such as spotted-spinefoot *(Siganus spp)* mostly associates with seagrass. Another function of seagrass beds is to transfer carbonate sand to dynamic beach systems nearer to the shore. The ecosystem acts as sediment collectors and help to prevent coastal erosion. There are 12 species of seagrass which occur throughout Indonesian waters (Monk *et al*., 1997). Yet Burke *et al*., (2002) identified 13 species and a recent review by P2O-LIPI (2005[b]) revealed 15 species. The total world's seagrass species is 69 from 6 families. Not so much attentions that have been paid to study seagrass in Indonesia. The P2O-LIPI is one of the pioneers and has surveyed 54 locations in total since last 40 years. By using remote sensing technique to estimate areas of seagrass in 29 locations, it was discovered that there are 25,792 ha seagrass beds. Said to say, only about 13% of this total areas are in healthy condition. Other 73% are in fair or medium rate and 14% are unhealthy. An intensive study on the seagrass function as carbon sequestration has just been initiated by Ministry of Marine Affairs and Fisheries (MMAF) collaborating with other institutions.

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Consumption Fish

The total potential consumption fish in the eleven Indonesia's Fisheries Management Areas (FMAs) is estimated at 6.4 million tons of MSY (maximum sustainable yield) per year (Adrianto, 2016). About 80% of the MSY or about 5.2 million tons is determined as the Total Allowable Catch (TAC). The MSY and the corresponding TAC are the amount of fish that can be caught without jeopardizing their sustainability. There are countless consumable fish species. By the MSY estimate, they are categorized into eight groups: large pelagic fish (including big tuna), little tuna, shrimps, demersal fish, small-pelagic fish, coral fish, lobsters, and squids. The statistics of Indonesian Capture Fisheries which is based on the landing reports in fishing ports and places has recorded the catch by 191 species of finfish, 11 species of crustaceans, 11 species of mollusks, and 4 species of aquatic animals. In total, 216 species are recorded in this annual statistics. Overall, Indonesia has fished near its MSY and beyond the TAC. Of the 88 fisheries (Species and FMAs combined), 67 of which (or 77%) have been overfished. Totally, production reached 6.1 million tons in 2014, a bit below the MSY but fairly above the TAC. In the words, the resources tended to have been fully exploited. Hence there should be earnest attempts to manage the resources so they can still be available in the future.

Coral-Associated Fish

Most of the fish species in Indonesia are coral-dependent and associated ones. It is the most challenging task to study population of the fish. Nonetheless, several surveys have been conducted to understand them. A series of surveys conducted by Allen and Erdmann (2012) in 1999 and 2005 revealed a relatively modest fish of about 600 species in the Pulau We and northern tip of Sumatra. Another survey carried out in Bintan dan Riau Archipelago in 1997 discovered an impoverished reef-fish of only 315 species. There were no comprehensive surveys for the Java region, although it was estimated a total 500-600 species in Seribu Island, Northern Jakarta. The waters of Bereau region in East Kalimantan are inhabited by 900 species. The Bereau region is possibly the richest marine fauna in the Greater Sunda Islands (Sumatra, Java, and Kalimantan). There were about 1,000 coral fish species found in Nusa Penida, Bali. A slightly over 1,100 species were found in Maumere Bay, Flores. A survey at the Banggai and Togean Islands, Central Sulawesi, in 1988 documented 820 species. Approximately, 1,200 and 1,000 species were found in Aru and Halmahera waters, respectively. The waters of West Papua Province where Bird's Head Seascape (BHS) is located is possibly the richest and most biodiversity region in Indonesia and even in the world. More than 1,638 coral-associated fish were documented in the BHS. Several surveys done in the BHS at the course of 1998 to 2015 indicated 1,437 species for Rajaampat Islands, 1,005 species for the Fak-Fak and Kaimana, and 965 species for Cendrawasih Bay (Allen and Erdmann, 2012). Comparing the richness of the BHS with those of CTI countries and the eastern Indian Ocean, one could say that the BHS is the epicenter or the hotspot of marine biodiversity.

Driving Forces

Decreased areas, diminished qualities, and loss of ecological functions of the Indonesian coastal resources as explained previously, combined with the facts that the country is largely relying on the resources, could be regarded as a strong motivation to conserve the resources. Understanding factors affecting and underlying this resource degradation is necessary prior to determine strategic and feasible conservation programs. Following are the prominent drivers of the resource degradation.

1. Political uncertainty and bureaucratic inertia tend to thwart coastal conservation. Particularly at the regional government level that holds discretions and authorities in resource utilization and management, change in political regime that occurs every five or ten years is usually followed by policy shift and reform. New government regime often revokes previous government-initiated conservation policies by applying policies that are against conservations.

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2. Lack of scientific information can discourage and hamper coastal conservation programs. The information that is available in the local universities and research institutions are limited. When available, they are not clear enough, nor well packaged, to convince government and people to conserve the resources. Indigenous knowledge, technologies, and practices that have existed from time immemorial can be relied on and used to develop community-based conservation programs. Nonetheless, such an important knowledge tends to be disregarded by decision-makers. Researches should be advanced and locally undertaken to provide specific scientific basis for regional conservation programs. Researches also should be carried out to value coastal ecosystems based on their functions and produced goods and services. Knowing the monetary value of the ecosystems can be used for trade-off between with and without conservation scenarios.
3. Heavy urban population, unceasing urbanization, lack of employment opportunities, poverty, and unavailability of coastal management plan are also factors hindering conservation programs. In rural economy, artisanal farmers and fishers use environmentally unfriendly technologies and production Method. In urban economy, coastal regions are converted and reclaimed in order to have new and inexpensive space for the sake of development. Of the 32 Indonesia's provincial capital cities, only Bandung is a landlocked one. Almost all provincial capital governments choose coastal region reclamation as a solution to overcome the problems of space laxity.
4. The greedy of the people is apparently the root of overuse and overexploitation of the resources. People utilizing the resources are exercising their environmental ethic principles by loftily esteeming the resources as economic objects. Three common ethics that are underlying the mankind habits in utilizing, exploiting, extracting, and conserving the resources are the anthropocentrism, biocentrism, and ecocentrism (Nikijuluw, 2015). The adherents of these three environmental ethics are normally using the resources excessively beyond their carrying capacity and their ability to reproduce, regenerate, and renew. A combination of the three ethics may avoid the greediness and excessive uses. Yet admiration of the resources as the God's creation would possibly prevent and avoid heedless uses of the resources. This can be regarded as the theocentrism principle, a reformed environmental ethic that glorifies and honors the God as the creator of the universe and shows high respect to the natures as God's creation. The numbers of followers of the theocentrism should be added and multiplied in this country so that their influence and power will be big enough to determine and implement right conservation policies.

Lesgislation Policies

The Government of Indonesia (GOI) has decided to implement conservation approach as a part of natural resource management and utilization strategies. Numerous regulations at different level of governments have been formulated and passed. Most of the applied regulations on coastal resource conservation, however, are issued by the MMAF. Selected laws are shortly explained below.

1. The Law No 32/2009 on Protection and Management of Living Environment could be regarded as the foundation of conservation policy in the country. It is implied in the law that conservation and utilization of a coastal region likes two sides of the same coin. For the maximum benefit to people and nature, conservation and utilization should not be separated one from each other. It is also stated in the law that the protection and management of a living environment are systematic and integrated endeavors to sustain environmental functions and to protect the environment from destruction and pollution. The law also defines conservation as an approach by which responsible and sustainable utilization of the resource can be guaranteed through preservation, protection, and enhancement of biodiversity quality value. The conservation of natural resource simply consists of protection, preservation, and sustainable utilization
2. The Law No 5/1990 on Conservation of Living Natural Resources and Their Ecosystems focuses on conservation principles. It emphasizes and elaborates responsibilities of government and people in

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conservation initiatives. It also explains essential meanings of protection, preservation, and utilization of fauna and flora.

3. The Law No 27/2007 on Coastal Region and Small Island Management which was amended by the Law No 1/2014 are the main legal Reference for coastal resource conservation. In order to manage coastal region and small islands, provincial and regential government are obligated to have so-called the Strategic Plan of Coastal and Small Island (RSP3K), Zoning Plan (RZP3K), Management Plan (RPP3K), and Action Plan (RAP3K). The plans must be developed by involving, and engaging all relevant stakeholders. Local communities should be consulted and heard in their process of legislation. They must be endorsed by the central government before being implemented. The laws also stipulate the conservation objectives that include protection of fish resources, fish habitats, nursery grounds, fish migration paths, customary law-managed areas, and coastal ecosystems that are highly vulnerable to external changes.

Supporting the above national Laws, the Minister of Marine Affairs and Fisheries (MMAF) followed them up by passing various implemented and applied legislations in forms of ministerial decrees and regulations. Four regulations that are directly dealt with coastal resource conservations are the Regulation No 02/2009 on the Procedures of Determining Marine Conservation Region, Regulation No 35/2013 the Procedures of Determining Status of Species Conservation, Regulation No 13/2014 in the Networking of Marine Conservation Region, and Regulation No 21/2015 on the Partnership in the Management of Conservation Regions.

Best Conservation Practices

Some best conservation practices have been introduced and implemented by the GOI with collaboration with non-profit organizations (NGOs), local communities, and other stakeholders. Three best practices are deliberately chosen to show that different approaches and initiatives that can finally meet the objectives of conservation. The best practice of species conservation has been initiated by the GOI with collaboration with NGOs. Another best practice is the Marine Protected Area (MPA) approach that was recommended the FAO, adopted by many governments, and widely implemented by NGOs. The last best practice is the CTI-CFF collaboration that was promoted by six countries in the region.

Species Conservation

One of the important species that has been fully protected is the whale shark (*Rhincondon typus*). By Ministerial Decree No 18/2013, the fishing of the species at its whole lifecycle is completely abolished. All parts of the fish body are banned for trading. This regulation is so effectively implemented that fishing of this species does not occur anymore in all FMAs. Continuous patrols done by local fisheries officers could be the main reason for the effectiveness of its implementation. The MMAF also selectively protects lobster (*Panalirus spp*), crab (*Scylla spp*), and blue-swimming crab (*Portunus pelagicus spp*) by determining their respective allowable minimum catch size. By Ministerial Regulation No 1/2015, it is enacted that the allowable minimum catch size for lobster, crab, and blue-swimming crabs are 8cm, 15cm, and 10cm, respectively. The regulation provides rooms for species regeneration and wild stock recovery. Fishers can only catch and traders can only market bigger sizes of these expensive species. The regulation has been effectively implemented in most FMAs. Other species that have been protected is globally renowned manta rays. The oceanic manta (*Manta birostris*) and reef manta (*Manta alfredi*) are banned for fishing and trading by the Ministrial Decree No 4/2014. The Decree, however, has not been well implemented yet in some coastal areas, especially among coastal community of Lombok island. Motivating by their higher price in China market, the fish is caught and traded illegally, sometimes covered up by traditional motives. Yet in other parts of the country, especially in Rajaampat, Cendrawasih Bay, and Kaimana, West Papua, the fish is protected by the local communities and used as an interesting object for diving tourism. There are many more

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species that are categorized as endangered, endemic, and threatened ones. Some species are listed in the appendix-II of CITES, meaning the hunting and trading of the species must be controlled and limited. The GOI teams up with international NGOs to study the CITES-listed species in order to collect their scientific information that can be used for conservation management purposes and for presenting Indonesia's standpoint in international negotiations and commitments.

Marine Protected Area (MPA) Approach

MPA may be regarded as an area conservation approach that recently has been introduced and developed in many parts of the world to protect coastal resources. MPA includes any marine geographical area that is afforded greater protection than the surrounding waters for biodiversity conservation or fisheries management purposes (FAO, 2011). The GOI defines MPA as a protected marine area that is managed by zoning system for sustainable fisheries management and fish habitat conservation (Minister of MMAF Regulation 21/2015). The zoning system implies that the protected area is divided into several zones such as strictly prohibited zone (no-harvest zone), buffer zone, and limited utilization zone. The MPA's objectives commonly include the following aspects: protection of marine biodiversity and critical habitat, ensuring sustainability of fish stocks and fisheries, support local and traditional marine-based lifestyles and communities, increase resilience to climate and other environmental changes, facilitate the resolution of multiple stakeholder conflicts, and protect cultural and archaeological sites (FAO, 2011).

Realizing strategic importance of an MPA and in order to participate with the global communities to protect marine resources and ecosystems, the GOI has pledged to establish 20 million ha of MPAs in the internal waters of Indonesia by 2020. By the end of 2015, about 17.2 million ha MPAs have been established throughout Indonesia. Most of the MPAs have shown direct impacts both to the ecosystems and livelihood of coastal-resource dependent communities. The GOI has accelerated to attain the 20 million ha target by 2019. The well-managed MPAs in Rajaampat that cover an areas of 1.6 million ha, for instance, has showed an improving quality of the coral reefs, reappearance of some mega faunas and exotic species, significant decrease of illegal fishing practices, better involvement and participation of the local communities in resource management and utilization, and increase visitation of foreign tourism. The set of the MPAs in Rajaampat and in the entire West Papuan waters that altogether covers about 3 million ha have been adapted as a seascape area that are jointly managed and reserved to protect biodiversity and to promote human well-being.

The CTI-CFF

CTI-CFF is an inter-governmental approach in managing coral reefs ecosystem. The CTI-CFF member countries are Indonesia, Malaysia, the Philippines, PNG, Timor Leste, and Solomon Islands that are collectively known as the CT6. The organization's objective is to protect the Coral Triangle region that represents the global epicenter of marine life abundance and diversity and therefore needs to be managed jointly with a common vision, goals, targets, principles, and programs across the region. The CTI-CFF region is home to 76% of the 798 coral species known and identified worldwide and approximately 37% of the 6,000 species of fish. Covering only 1.6% of the planet's oceanic area, the biodiversity contribution the CTI-CFF area is considered extremely high. To arrive at the organization's objective, action plans have been formulated under the Regional Plan of Action (RPOA) at the regional level and National Plan of Action (NPOA) at the national level. The RPOA and NPOA have the following main objectives:

1. Priority seascapes designated and effectively managed.
2. Ecosystem approach fisheries management (EAFM) fully applied.
3. MPAs established and effectively managed
4. Climate change adaptation measures achieved at regional, national, and local levels.
5. Threatened species status improving trough better management.

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Indonesia has adopted these five goals of the RPOA/NPOA. In all, there are 10 targets, 45 priority programs, and 170 detailed programs that have planned to meet the goals. Several working groups embracing various private and public organizations and institutions have been established to implement the NPOA. Local and international NGOs are involved to implement the NPOA at local and national levels. The success of Indonesia in achieving the national goals and targets eventually affects the attainment of the regional objective and consequently determine the state of world coastal resources and ecosystems.

Conclusion

The coastal region is so dynamic, seemingly unstable, and predisposed to changes due to unavoidable and unstoppable economic development, raising human population, and global climate change. Even without any conservation program and human intervention, implying that the coastal regions and resources are not used and exploited at all, it does not mean that the coastal ecosystems will not be hampered and isolated from the external changes. Therefore, coastal conservation program should be continuously developed by adapting the changes. The future coastal conservation program should be designed by taking into account their strategic functions as food source, critical habitat for plenty known and many still unknown species, space for human and economic activities, next generation's needs of coastal region, the interactions between land and marine uses, and the geographical connectivity of the region with other ecosystems. Considering all these variables, future coastal conservation policies and programs should be formulated and implemented by earnestly taking into account the following aspects:

1. Low environmental risk principle must be applied when economic development would radically and substantially change the structures and functions of the coastal region. The development indeed cannot be halted but can be wisely managed in such a way that the functions and structures of the coastal ecosystem will not change. The existing and available cutting-edge technologies can be exerted to use and simultaneously to maintain ecosystems' functions and structures. Damaging practices such as coastal reclamations is not a smart solution in order to have more space and gain more land for so-called development purposes. Additional space for urban development can be created by not altering contour and structure of the coastal region.
2. Costs of externalities that are forcefully paid by those who are not directly using coastal resources should be redirected to be incurred by the resource users. The government should have an initiative to fairly and justly estimate value of coastal region and use the estimate information to factor the costs on the resource users. Distribution and redistribution of benefits resulted from coastal utilization is next to importance that should be under government policy.
3. While individual MPA program has shown positive results and impacts, by non-subsidiarity and ecological connectivity principles, not all conservation issues can be resolved by the existence of an individual MPA. Many species, particularly high migratory species and mega fauna, are journeying across MPAs. Hence, set of MPAs should be concurrently managed with a network approach. By considering all other uses and functions of coastal ecosystems, larger-scale coastal conservation region could be developed with seascape approach.
4. Coastal regions are strongly influenced by human activities in hinterland or upland. A poor management of upland area will detrimentally affect coastal region. Siltation, erosion, pollution, and chemical runoff into coastal areas are the impacts of upland poor management practices. As a consequence, coastal and upland regions should also be managed altogether in an integrated system. This integrated upland-coastal region management that is widely known as the ridges-to-reefs approach should be introduced and implemented in Indonesia.

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http://sjdgge.ppj.unp.ac.id

Reference

Adrianto, L. (2016). Fisheries Management and Governance in Indonesia: Present and Future. Fakultas Kelautan dan Perikanan, Institut Pertanian Bogor.

Allen, G.R. and M.V. Erdmann. (2012). Reefs Fishes of the East Indies. Volume I-III. Tropical Reef Research, Perth, Australia.

Atkinson, S. *et al*. (2011). The Seascape Guidebook. How to Select, Develop, and Implement Seascapes. Conservation International. Arlington, Virginia. 60p.

Burke, L. *et al*. (2002). Reefs at Risk in Southeast Asia. The World Resource Institute (WRI), UNEP, WCMC, ICLARM, and ICRAN. 72p.

Burke, L. *et al*. (2012). Reefs at Risk. Revisted in the Coral Triangle. World Resource Institute (WRI). 72 p.

Carter, E., A. Soemodinoto, and A. White. (2011). Guide for Improving Marine Protected Ara Management Effectiveness in Indonesia. USAID, CTSP, TNC, CI. 49p.

Cesar, H.S.J. (2000). Coral Reefs: Their Functions, Threats, and Economic Value. Pages 14-39 ,n Cesar, H.S.J (2000). Collected Essay on the Economics of Coral Reefs. CORDIO and SIDA 242p.

Clark, J.R. (1992). Integrated Management of Coastal Zones. FAO Fisheries Technical Paper. No.327 Rome. FAO. 167p.

Conservation International (CI). (2009). Seascape. A Future for Marine Conservation. Proceedings of the Annual Seascapes Strategy Workshop. Kota Kinibalu, Malaysia. 11-23 December 2008. 58p.

Donato, *et al.* (2011). Mangroves Among the Most Carbon-Rich Forest in the Tropics. Nature Geoscience, Vol 4. May 2011. NGEO-1123.

FAO. (2011). Fisheries Management. 4. Marine Protected Areas and Fisheries. FAO Technical Guidelines for Responsible Fisheries, No:4 Suppl 4. Rome. 198p.

Huffard, C.L. *et al.* (2011). Defining Geographic Priority for Marine Biodiversity Conservation in Indonesia. Conservation International (CI) Indonesia. Jakarta.

Kartikasari, A., A.J. Marshall, and B.M. Beehler. (2012). Ekologi Papua. Seri Ekologi Inodnesia Jilid VI. Yayasan Pustaka Obor Indonesia. 981p.

Monk, K.A., Y. de Fretes, and G.Y. Lilley. (1997). The Ecology of Nusa Tenggara and Maluku. The Ecology of Indonesia Series. Volume V. Periplus Edition. 966p.

Murdiyarso, D. *et al*. (2015). The Potential of Indonesian Mangrove Forest for Global Climate Change Mitigation. Nature Climate Change, 27 July 2015. Nclimate-2374.

Nikijuluw, V.P.H. (2013). Nilai Strategi Kawasan Segita Terumbu Karang. Jurnal Pesisir dan Pulau-Pulau Kecil. 2: 9-20.

Nikijuluw, V.P.H., and L. Adrianto (Eds). (2015). Coral Governance. Published by the Indonesia National Coordinating Committee. CTI-CFF. IPB Press 644p.

Nikijuluw, (2015). Inter-Governmental Approaches in Coral Reef Management, p289-325 in Nikijuluw, V.P.H., and L. Adrianto (Eds). 2015. Coral Governance. Published by the Indonesia National Coordinating Committee. CTI-CFF. IPB Press 644p

P2O-LIPI (Center for Oceanology Institute, Indonesian Institute of Science). (2015[a]). Peta Status Terumbu Karang Indonesia. 1-page Map.

P2O-LIPI (Center for Oceanology Institute, Indonesian Institute of Science). (2015[b]). Peta Status Padang Lamun Indonesia. 1-page Map.

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