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Development of Small Island Socio-Economic Infrastructure in Indonesia

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Abstract: Climate change and global warming are predicted to affect the lives of people in coastal areas and small islands which need facilities and infrastructure to develop all the socio-economic activities. However, Indonesia does not currently lead to sustainable development on its small islands. This study was aimed to determine the extent to which Indonesia has done a sustainable development on its small islands based on infrastructure and socio-economic community. The research was descriptive-exploratory where the data was collected from several sources of literature, writing and research and then presented exploratively. Based on the findings, the availability and utilisation of infrastructure to support the community needs and to preserve the environment on the small islands have not been sustainable. The government should develop the socio-economic and infrastructure aspects. Socio-economic aspects include population density, access to beaches, public participation, job employment, income, access to market and price of goods. Meanwhile, infrastructure aspects include the availability of green lanes and sea transportation, drainage, management of waste and public bathing, washing and toilet facilities and clean water.

INTRODUCTION

Indonesia is an archipelago with a large number of islands. According to the Coordinating Ministry for Maritime Affairs data of 2017, Indonesia had 17,504 islands, only 16,056 have been identified, in terms of the name. This substantial number of islands becomes one of the factors leading Indonesian people to be fishermen which amount to around two million people, spread across the archipelago. Indonesia is also well-known as a maritime country whose sea area is 2/3 of the entire vast territory and marine resources is so abundant. Indonesia has a potential resource in the forms of coastal regions, which are transitional areas between lands and seas, supported by the existence of coastline of around 81,000 km[1]. This long coastline holds a large wealth of natural resources including biological and non-biological potentials. The biological ones are in the forms of fisheries, mangrove forests and coral reefs while the non-biological ones are among others, minerals, mines and tourism.

Climate change and global warming are predicted to affect people's lives in coastal areas and small islands in various parts of the world including Indonesia.

Over-exploitation of marine resources resulted in the degradation of coastal resources which has been exacerbated by the economic crisis, it has pushed many parties to compete for remaining resources in various ways. This situation affects and lead people's lives in coastal area and causes marginalisation of coastal communities which is also caused by many factors, among which there is no Integrated Coastal Management approach yet.

One of the impacts arising from this condition is the acceleration of sea-level rise which can cause further effects such as submergence of small islands, increased flooding, coastal erosion, seawater intrusion and changes in ecological processes in coastal areas. Changes that occur in the biological-physical aspects will also have an impact on the socio-economic coastal resources[2]. Besides, the development of residential areas and rapid population growth in coastal areas is also one of the things that will experience fundamental changes due to climate change[3].

The development of island infrastructure both in the form of facilities and infrastructure plays a significant role. The availability of facilities and infrastructure can support all people's activities and in turn, will improve the social and economic welfare. The condition of physical assets also influences the distribution of resources and services to meet the needs of society.

The development of small islands so far has not shown optimal results and does not lead to sustainable development[4]. The high population and, at the same time, the limited land available lead to the symptoms of environmental damages including pollution and result in the degradation of marine ecosystems such as mangroves and sea fishes. According to Budiharjo and Djoko[5], the development of the archipelago needs various developments in ideas, thoughts and approaches that are sustainable.

Sustainable development is a way of looking at activities carried out systematically and planned in the framework of improving the welfare and quality of life and the environment of human beings without reducing the opportunity for future generations to enjoy and use it. In such development, there is a planned change process, including exploitation of resources, direction of investment in technological development orientation and institutional changes which are all in harmony to increase the potentials both of the present and the future to meet the needs and aspirations of the community. In this case, the authors were not in the capacity to justify the pros and cons of developing small islands in Indonesia but only to provide an analysis of various studies on the development of small islands based on infrastructure and socio-economic sustainability.

Theoretical basis

The concept of sustainable development: The concept of sustainable development has been the centre of attention in policy considerations around the world, since, the publication of the 1987 Bruntland report. Sustainable development is a concept that can meet current needs without reducing the ability of future communities to meet their needs[6]. The Bruntland Commission defined sustainable development as a process in which the exploitation of resources, investment direction and institutional change are compatible with the present and future potentials to meet human needs and aspirations. The concept of sustainable development continues to be received widely by observers of development and environment. Sustainable development involves three dimensions, namely economic, social and ecological sustainability as 'a triangular framework'[7] as shown in Fig. 1.

The concept of sustainable development emerged as a meeting point of differences between development-and environment-based thinking groups. These differences influence human thought that they need regulations to use the limited natural resources. The meeting point of these two perspectives is the concept of sustainable development which is an effort to combine the urgent need for development and the importance of protecting the environment. Sustainable development has a meaning related to the economy and ecology at the same time where economic growth wants to be sustained by the preservation of the ecological function of the natural surroundings, so that, the economy can continue to grow without limits. Economic development usually has a goal to increase the production of goods and services to improve welfare while ecology to produce environmental services.

Nijkamp and Finco[8] in 'Pathways to Urban Sustainability' wrote that the issue of sustainable development had been a policy paradigm since the late 20th century until now.

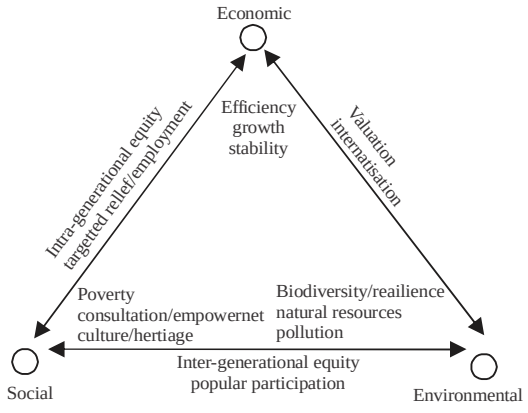

Fig. 1: The elements of sustainable development[7]

Thus, policy development that takes into account the principles of sustainable development has the following characteristics: visionary, towards better future space and time (medium/long term), non-declining and even distribution of time), integration of social, economic, ecological and political systems and building participation and togetherness of all stakeholders in plans and actions that guarantee sustainability.

Classification of small islands: Three criteria used as small island boundaries are Physical boundaries (island area), Ecological boundaries (proportion of endemic and isolated species) and Cultural uniqueness. Besides, the size of the island can be seen from the independence of the population in meeting basic needs[1]. Bengen and Rizal[9] classified islands based on their geological processes, namely:

- Continental Island: a rock-type island that is rich in silica. The biotas on this type are the same as those found on the mainland
- Volcanic Island: a kind of islands formed from volcanic activity which arose slowly from the seabed to the surface. The rock types on this island are basalt and silica (low-grade)
- Raised Coral Island, a kind of islands formed by coral reefs that rise to the surface of the sea due to geological processes. If this process continues, then the corals will form terraces like rice fields in the mountains
- Low Island: an island where the land is not too high compared to the sea face. Islands of this type are most vulnerable to natural disasters such as hurricanes and tsunami waves
- Atolls: ring-shaped coral islands. In general, they are volcanic islands that are overgrown by coral reefs in the form of fringing reefs, then turn into barrier reefs and eventually become atoll islands

Hehanussa classifies small islands in Indonesia based on the morphology and genesis of the island as follows: hilly islands and flat islands. The hilly island consists of Volcanic Island, Tectonic Island, Teras Terangkat Island, Petabah Island (monadnock) and combined Island.

In general, small islands have unique characteristics, among others based on smallness, isolation, dependence and vulnerability. This vulnerability is due to ecological fragility.

MATERIALS AND METHODS

This study was descriptive-exploratory, where data was presented exploratively and collected from several sources in the forms of literature, writings and researches. Presentation of data analysis was arranged as follows:

- The concept of sustainable development on small islands
- Sustainable use of small islands
- The concept of infrastructure development in small islands

The discussion then continued with a description of "the principle of developing small islands sustainably based on infrastructure and socio-economic community" as material for further analysis to conclude. The paper ended with conclusions and suggestions on sustainable development in small islands in Indonesia.

RESULTS AND DISCUSSION

The concept of sustainable development on small islands: The dependence of economic development on effective management of natural resources and ecosystem sustainability maintenance in the concept of sustainable development gave rise to the concept of ecologically sustainable development. In principle, both are the same. But, the latter emphasises the importance of guaranteeing and passing on to future generations a quantity of natural capital that can provide an economically sustainable outcome and environmental services including natural beauty (amenities).

Bengen and Rizal[9] proposed six things needed in the sustainable use of coastal and marine resources in Indonesia, namely:

- Rehabilitation of damaged coastal and ocean areas
- The internalisation of the externality costs into every development activity
- Determination of user fees for each use of marine resources
- Sea is managed with a 'co-management' system
- The sea reorientation from the State's property to the people's
- The sea must be considered as part of a global ecosystem

Dahuri *et al*.[1] argued that the sustainable development of small islands including coastal and beach areas can only be realised if management is carried out in an integrated manner. The same thing was stated by many other experts. Beller *et al*.[10] suggested that sustainable development on a small island depends on how long the population can maintain the following conditions:

- Energy, water and other resources are available to meet the needs of activities on the island
- Natural systems or their replacements are capable of handling or absorbing all waste generated and also able to provide life support services such as clean air, clean water of economic value

- Appropriate technology to maintain all support systems to run
- The islanders are able and quite flexible to live in a new environment, brought about by development
- Ecosystems are quite complex to deal with emergencies and natural disasters
- The government and the community want to take the steps necessary to prevent environmental damages, both on land and in marine resources

Sustainable use of small islands: The unbalanced policy concerning the use of small islands has a negative impact. On the one hand, over-protective policies can make the small island areas undeveloped. On the other hand, the destruction of small islands can occur due to the pressure of over-utilisation. For this reason, a balanced policy is needed whereby efforts to use small islands are increased while the ecological balance of the region is maintained. As an entity with special characteristics and vulnerabilities such as remoteness, limited land area, limited human resources and long distances from the market, management of small islands requires a different format from other regional areas such as those in the mainlands.

The confusion in managing Indonesian wealth in the forms of small islands was shown by the government's policy in the middle of 2000. The government intended to lease some uninhabited small islands to foreign parties for an economic reason[11]. However, most people refused this idea because it could endanger the security of the Unitary State of the Republic of Indonesia.

Attention to the management of small islands in Indonesia began with the establishment of the Department of Maritime Affairs and Fisheries. The management will be adjusted to the geographical and socio-cultural backgrounds and the ecosystem of the local community. The direction of management policies must be sustainable and community-based. This approach stands for three approaches, namely rights, ecosystems in the allocation of island space and groups and according to local socio-cultural conditions.

Ongkosongo[12] identified the uses that have been and are being carried out on small islands, among others as the mainlands of the countries such as Indonesia, the Philippines, Singapore and the Maldives:

- Determination of the territorial waters of a country or between countries such as Christmas Island
- Development including settlements such as Kelapa Island
- Activities and making a living for the people such as Batam Island
- Recreation, tourism and sports such as Putri, Kotok and Bidadari Islands
- Conservation of biodiversity and culture such as Galapagos and Rambut Islands
- Cultural conservation such as Onrust Island
- Education such as Pari Island
- Transportation including sea and air transportation such as Ambon Island
- Producer of mineral, biological and energy resources, such as Misima Island in Papua New Guinea
- Specific activity such as Pabelokan island
- Defense and security such as Sambu Island
- Prison such as Nusakembangan and Alcatraz Islands

Concerning the small island utilisation program in Indonesia, some normative aspects that are accurate and data are needed. Based on the conditions, potential and opportunities in resource optimisation, Hidayat proposes some considerations as follows: integration and sustainability, assigning economic value to the environment, spatial planning, safeguarding the protection function, empowering local communities, increasing community income, controlling pollution and water quality and developing residential areas.

The concept of infrastructure development in small islands: Based on the results of research conducted by Burhanuddin, etc. on the priorities of sustainable infrastructure development in the Makassar City of Barrang Lompo by looking at the availability of basic infrastructure expected to increase the potentials in Barrang Lompo Island, the priority infrastructure in island development include:

Transportation: For sustainable transportation, the unavailability of green lines and the use of modes and infrastructure are still dominated by motorised vehicles. Sustainable transportation is an effort to meet the mobility needs of current people without reducing the ability of future generations to meet their mobility needs.

Drainage: Drainage in the residential environment on Barrang Lompo Island which is only in the forms of ditches is temporary, excavated by the community, very small in size and not connected with other drainages and does not lead to the final drainage. The concept of a sustainable drainage system as the top priority of activities must be aimed at managing surface runoff by developing facilities to retain rainwater. Based on the function, rainwater retaining facilities can be grouped into two types, namely storage type and absorption type. For liquid waste disposal, the community prefers traditional disposal such as disposing directly into the sea, both artificial and direct absorption into the ground, so that, it can damage the island's environment.

Management of waste and public bathing, washing and toilet facilities: The waste management system on small islands is still traditional where people still dispose of waste at sea and on empty land by hoarding and burning which can damage the ecosystem around the island, so, the need for sustainable management and

generate additional income from '3R' waste management. Based on the results of research conducted on Barrang Lompo Island, infrastructure for bathing and washing is in the forms of communal wells that are used by the entire island community. While for latrines, the community prefers the disposal of faeces at sea.

Clean water: The need for clean water on Barrang Lompo Island includes drinking, cooking, bathing, washing and toilet needs. For drinking water needs, people prefer to buy gallon water (distributed from cities). For cooking needs, people choose to use wells. The problem of clean water sources is more on the supply, both from wells and gallons. Water from local water sources is brackish and turbid. The management carried out based on the principle of resource conservation which implies integration between the concepts of productivity and conservation of resources (sustainability-production-conservation of resources) in achieving the goal of managing alternative clean water sources, is not utilised. Various government efforts in providing clean water such as distillation of seawater using Reserve Osmosis, due to management problems, are not functioning.

CONCLUSION

The availability and sustainable use of infrastructure (basic infrastructure) in supporting community needs and preserving the environment on small islands is currently not sustainable.

Infrastructure aspects that need to be considered in sustainable development on small islands are the availability of green lanes and sea transportation, drainage, waste and toilet, washing and bathing facilities management and clean water.

The social aspects that need to be considered in sustainable development of small islands are human population density, protection of sites with cultural values, opportunities for public access to beaches and public participation.

Economic aspects that need to be considered in sustainable development on small islands are employment, income, market access and the price of goods.

RECOMMENDATIONS

It is recommended that the central and regional governments follow up on infrastructure improvements that meet the needs of the community and preserve the environment on small islands in Indonesia.

It is recommended to improve and manage community institutions, improve the quality of human resources, manage the allocation of population and tourist densities, improve the quality of institutions and their functions.

It is recommended to manage tourism activities based on natural resources, manage and utilise natural resources in the field of fisheries, manage natural resources as Original Local Government Revenue.

It is recommended to develop a local economy that emphasises empowering local potentials, be it natural resources, human resources and institutions, through the efforts of local communities to improve their welfare. This paper used the literature approach so it needed to be continued with further empirical research.

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