ASSESSING THE PUBLIC AWARENESS LEVEL ON THE PRESERVATION OF CORAL REEFS (THE CASE STUDY IN BIAK NUMFOR, PAPUA, INDONESIA)

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Abstract. The aim of this study was to assess the level of public awareness on the importance of coral reefs preservation in Biak Numfor, Province of Papua, Indonesia. The study employed the descriptive qualitative research method. For data collection, techniques such as questionnaires and interviews, as well as documents, were used. The result of this study showed that the level of public awareness on the coral reefs preservation is as follows: (1) in the district of Oridek with a population of 4,665 people, a percentage of 52% is aware of the necessity to regulate the management of marine resources corals; (2) in the district of Amaindo (population of 2,209 people) the level of awareness was high, with a total of 18% concerned with the need for regulation management of marine resources, and the Padaido county, with a population of 1,707 inhabitants that have high levels of awareness about the need to regulate the management of marine resource utilization at 15%, as well as in the districts Biak East with a population of 6,698 inhabitants that has a level of consciousness regarding the need for management of marine resources especially coral reefs by 15%. In terms of public knowledge about the things that destroy coral reefs, the Aimando region has the highest percentage, namely 50% of people already know all that can damage coral reefs. While people in the Aimando district are aware of things that can damage coral reefs by 21%, the percentage corresponding to the Padaido district is about 16%, in East Biak district-level people's knowledge to cause damage to coral reefs is at 13%. People in the region of Oridek have a high level of awareness. The Core map programme impacts most notably the increased well-being of coastal communities. In order to maintain the balance and preservation of coral reefs, a law regulating these issues should be passed. Core map has to continue existing, in order to preserve the existence of coral reef ecosystems to sustain life aquatic biota.

Keywords: public awareness, coral reefs, preservation, Papua, Indonesia.

Rezumat. Evaluarea nivelului de conştientizare a publicului privind conservarea recifelor de corali (Studiul de caz în Biak Numfor, Papua, Indonezia). Scopul acestui studiu a fost de a evalua gradul de conştientizare a opiniei publice cu privire la importanţa conservării recifelor de corali din Biak Numfor, provincia Papua, Indonezia. Studiul a utilizat metoda descriptivă de cercetare calitativă. Tehnicile de colectare a datelor folosesc chestionare şi interviuri, precum şi documente. Rezultatul acestui studiu a arătat că nivelul de conştientizare a populaţiei cu privire la conservarea recifelor de corali este următorul: (1) în raionul Oridek cu o populaţie de 4.665 de persoane, 52% sunt conştienţi de necesitatea de a reglementa gestionarea resurselor marine coraliere; (2) în districtul Amaindo (populaţie de 2.209 de persoane) nivelul de conştientizare a fost ridicat, cu o preocupare totală de 18% privind necesitatea gestionării reglementării resurselor marine şi a judeţelor Padaido cu o populaţie de 1.707 de locuitori care au un nivel ridicat de conştientizare, necesitatea de a reglementa gestionarea utilizării resurselor marine este de 15%, precum şi în raioanele Biak-Est, cu o populaţie de 6.698 de locuitori, cu un anumit nivel de conştiinţă unde ar trebui să se stabilească gestionarea resurselor marine în special recifele de corali la 15%. În ceea ce priveşte cunoaşterea de către public a lucrurilor care distrug recifele de corali, districtul Aimando are cel mai mare procentaj, şi anume 50% dintre oameni cunosc deja toate lucrurile care pot deteriora recifele de corali. În timp ce la nivelul districtului Aimando oamenii au cunostinţă de lucrurile care pot deteriora recifele de corali în proporţie de 21%, dar în districtul Padaido este de aproximativ 16%, în districtul East Biak cunoştinţele oamenilor despre cauzele care provoacă daune recifelor de corali este în procent de 13%. Oamenii din regiunea Oridek au un nivel ridicat de conştientizare. Programul Core map afectează în special creşterea bunei stări a comunităţilor de coastă. Pentru a menţine echilibrul şi conservarea recifelor de corali trebuie să se adopte o lege care să reglementeze aceste probleme. Ar trebui continuată găsirea fisurilor în Core map pentru a menţine existenţa ecosistemului recifelor de corali şi pentru a susţine viaţa acvatică.

Cuvinte cheie: conştientizarea publică, recifele de corali, conservarea, Papua, Indonezia.

INTRODUCTION

Environmental issues have been the foremost concern today's people have to cope with, and it is only growing more complex as they advance. It is believed that human beings are the ones to blame for their slightest footprints causing damages to the environment (KUMURUR, 2008). However, it is not that the people themselves are unaware of the issues they generate. The notion is confirmed by individuals, realizing that most of the environmental issues such as coastal ecosystem and forest damage primarily root from their daily activities.

The issues also take place in coastal area, where the area is an essential life-supporting vessel providing resources and commodities for the surrounding people, if utilized properly. In the coastal area, most of the resources are renewable, e.g. fishes, shrimps, mollusks, pearl oysters, crabs, seaweed, mangrove forest, and coral animals, whose existence depends on efforts of preservation by a human. Moreover, the coastal area also possesses potential prospects as a space of environmental services, such as sites and habitats for recreational activities and medium of transportation. This is in line with HARYANTO (2008) who argues that the potency of marine and coastal area embodies hidden economic value for everyone, particularly communities in coastal areas.

On the contrary, the promising perspective lacks support from efforts of preservation by the surrounding community, shown by their state of ignorance towards the environment, e.g. littering, the preference for burning trash as the most efficient way of cleaning, illegal logging without efforts of reforestation, and construction of housing and offices with no concern of soil infiltration (DILISTI, 2011). This is possibly due to the insufficient information on

preserving the environment or the people's lack of motivation for maintaining the existence of the environment.

One cannot simply impose the burden of coral reef management solely to the government. The community is expected to integrate with the government in efforts of maintenance to generate an optimal result to preserve coral reefs. To maintain it, the slightest contribution from both sides counts. The government is responsible for disseminating information and knowledge about coral reef to the community – on the kinds and benefits of coral reef, its function, its preservation efforts, and possible impacts if the damage to coral reef gets worse – to be further practiced by the community in actions of utilization and conservation. Given that, the community will develop a sense of belonging to the coral reef, resulting in optimal preservation efforts.

Literature Review. Coral reef plays a significant contribution to the surrounding community, either viewed from a social, economic, or cultural aspect. It is the foremost primary underwater ecosystem which supports almost everything to the community: supporting the community's livelihood, as a habitat for commercial commodities, a support for tourism industry, providing sand for the beach, and as a barrier for waves and coastal erosion (WESTMACOTT et al., 2011). Moreover, DAHURI (2003) asserts that coral reef is a productive spot acting as a spawning ground, nursery ground and feeding ground for the fishes. With that in mind, it is deduced that the breed of fishes surrounding the coral reef is highly productive. Also, Dawes states that coral reef also acts as a medium for other organisms, such as oysters, lobsters, and tortoises. It is mentioned by DAHURI (2003) that a coral reef ma provide high organic/primary productivity due to the reef's ability to hold nutrients within the system and to act as a pool, accommodating every input from outside. As a result, the nutrients generated by the coral reef as a metabolic excess are utilized by plants without having to spread them to the water beforehand. There are eight general benefits of coral reef, i.e. (a) a barrier for the beach against the sea breeze, tidal waves, ocean current, and storm; (b) a resource of germplasm and biodiversity essential for food, bio technology, and health industries; (c) a medium for the fishes to breed (decorative fishes and target fishes living within the coral reef); (d) a shelter for underwater organisms; (e) a source of organic materials, enabling fishes to disguise to hunt for food; (f) as construction material for roads and buildings, raw material for industries and jewelry, such as coral rock; (g) as a potential spot for capture fisheries and coral tourism; and (h) a barrier for beach against wave erosion. Furthermore, loss of food security and values of biodiversity are the possible impacts happening in consequence of damage to the coral reef.

Contributing Factors of Damage to Coral Reefs. As an ecosystem, the coral reef is highly susceptible to changes in surrounding environments including human activities, and it requires a long time to recover. BURKE et al. (2002) mention factors contributing to the damage of coral reef, i.e.: (1) poor management of construction within the coastal area; (2) marine activities, such as ship from port and direct damage from anchoring; (3) illegal logging and changes in land use, causing an increase of soil sedimentation; (4) over-fishing activities, disturbing the balance within food chain in the coral reef ecosystem; (5) the involvement of bombs and poisons in fishing activities; and (6) global climate change.

Moreover, IUCN points out five objectives of underwater conservation sites, i.e. (1) protecting and maintaining underwater and estuary system, ergo, resulting in long-term sustainable resource of living and preservation of genetic biodiversity; (2) to prevent the decrease and as a conservation habitat of rare species; (3) to protect the underwater ecosystem from human activities which may damage it; (4) to provide sustainable welfare for the community; (5) as an appropriate management of underwater environment, with a broad spectrum for human activities primarily aimed at marine and estuary maintenance. It is essential for the surrounding community to develop mutual understanding, cooperation, and sense of belonging, as a preventive way to minimize the impact of damages to the coral reef.

On top of that, WESTMACOT et al. (2011) asserts that to prevent the widespread damage to coral reef, the government has to disseminate these policies to the coastal and fishermen community, i.e.: (1) setting a no-fishing zone and limitation of allowed fishing tools to use; (2) educating the fishermen to take specific protection for algae-eating and coral-eating fishes into consideration; (3) regulating the fishermen to not perform destructive fishing activities; (4) monitoring the composition and size of catches; (5) developing alternative livelihood sources for the fishermen community (if needed); (6) setting limitations for foreign fishermen through the permission granting system; and (7) setting regulations limiting coral reef biota harvesting for aquarium and souvenirs.

Dissemination to raise the community's awareness of coral reef conservation is vital, for them to experience sustainable benefits as a result of the preservation efforts. Henceforth, contributions from the community need to be focused on the identification, planning, and implementation of conservation in the coastal area to gain numerous possible benefits (SUPRIHARYONO, 2007). Without contributions from the community, it is almost impossible for the government to execute the "Codes of Conduct for Responsible Fisheries".

This is in accordance with the obligation of the government to conduct the MCS (Monitoring, Control, and Surveillance) system, aimed to maintain rationality of fish and environment resources management and harmony within utilization and sustainability of fish resources (SUPRIHARYONO, 2007). Furthermore, the government has several alternatives for encouraging the community to get involved in the management and maintenance of marine resources and environment. Through the persuasive way, consultation and intimate approach are available to persuade the community to participate in the programme implementation. Despite the long duration needed for the initial process to work effectively, persuasion is able to calm down tensions and likelihood of conflicts. Furthermore, MITCHELL et al. (2007) point out that consultation with the community is preferred to (1) address any upcoming issues more efficiently; (2) obtain information and understanding which is beyond science; (3) formulate socially-accepted alternatives; and (4) develop a sense of belonging to optimize the implementation. The awareness raising programme is mainly aimed at the

fishermen community; however, the government needs to consider executing the program to other stakeholders too, since the fishermen only take the role of actors, not policy makers.

The key aspects of sustainable development comprise local empowerment, self-support, and social justice. One effort of implementation is to progress from traditional environmental management of fish resources dominated by professionals from government and private sectors, to the approach which involves different layers of the community (MITCHELL et al., 2007). In addition, WESTMACOTT et al. (2011) argue that the efforts of developing sustainable fish resources are somehow tricky to execute, considering the numbers of people participating, the local community will have to strive to adapt to the new regulations and to cope with limited sources and options of livelihood.

As a consequence, the development of cooperation within the community and availability of alternative sources of income is critical to support sustainable livelihood. Moreover, the government is urged to conduct an empowerment in economic and social aspects of the local community within the coastal area with the intention to enhance the community's welfare, by utilization of coral reef potential. If executed properly, the programme enables the community to experience sustainable resources of commodities within the coral reef ecosystem and to opt for alternative ways of fishing, leaving the coral reef undamaged (NOTOATMODJO, 2005; WESTMACOTT et al., 2011; MALAU, 2013).

RESEARCH METHOD

The research combined quantitative and qualitative methods where quantitative data were obtained based on a survey of 180-240 households in the sample villages in Biak Numfor regency. Of 19 districts in the Biak Numfor Regency, this study involved four districts, namely Oridek, Padaido, Biak Timur, and Aimando; all are located in coastal area and island. The districts were preferred due to a higher rate of utilization of the potential natural resources among others. The quantitative data comprised a demographic characteristic of household members and economic standing of the households. Concurrently, the qualitative data were acquired by observation, comprehensive interview, focus group discussions, and forum, aimed to gain better understanding beyond the social and economic condition of the community and its relation to the utilization of marine resources, particularly coral reef.

RESULTS AND DISCUSSION

The Biak Numfor islands regency is located in Papua province, consisting of three main islands: Biak Island (1,833.86 km^2), Supiori Island (437.11 km^2), Numfor Island (331.26 km^2); and 41 smaller islands, e.g. Padaido Island and Mapia Island. The regency has a total area of 4,010 km^2, with a land area of 2,602.23 km^2. Biak Numfor is one of the regions with a tropical climate and tropical rain forest, with an average of 2,228 mm yearly. This is due to the fact that the regency geographically faces the Pacific Ocean. In addition, it is quite difficult to identify and differentiate between a wet and dry season in Biak Numfor. Based on data of 2004, the maximum temperature recorded is 30.5^0 Celsius on average, while the minimum temperature and average daily temperature have been registered at 23.9^0 Celsius and 27.2^0 Celsius respectively.

Number of Household Members Involving in Coremap Activities. The survey result elucidates the awareness level of society of Biak Numfor as follows: 47 percent of household members in Oridek district involved in Coremap activities, while in Biak Timur, Aimando, and Padaido, the rate of people involving Core map activities is 24 percent, 21 percent, and eight percent respectively (Fig. 1).

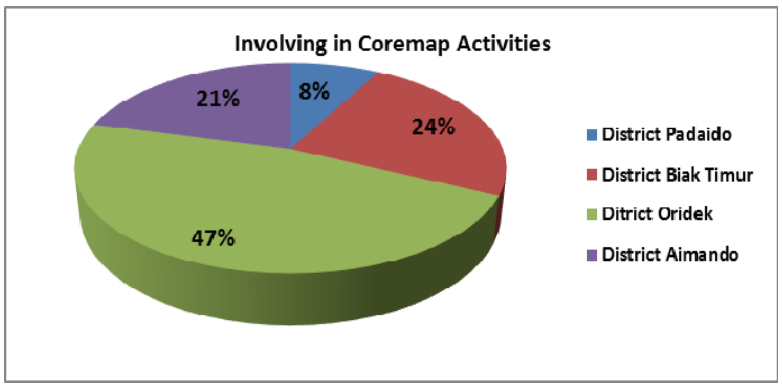

Figure 1.The percentage variation of the household members' involvement in Core map program.

Management of Marine Resources Utilization. As obtained from the survey, the awareness level of Biak Numfor society on the significance of regulations for management and utilization of coral reef is elucidated as follows: 52 percent from 4,665 people in the Oridek district are aware that management and use of coral reefs need to be regulated. Moreover, in Aimando, 18 percent of 2,209 people have the awareness that the community needs to be regulated in terms of management and utilization of coral reef. Furthermore, only 15 percent in both Padaido and Biak Timur district (from 1,707 and 6,698 people respectively) are aware of the need for rules to regulate the management and utilization of coral reef (Fig. 2).

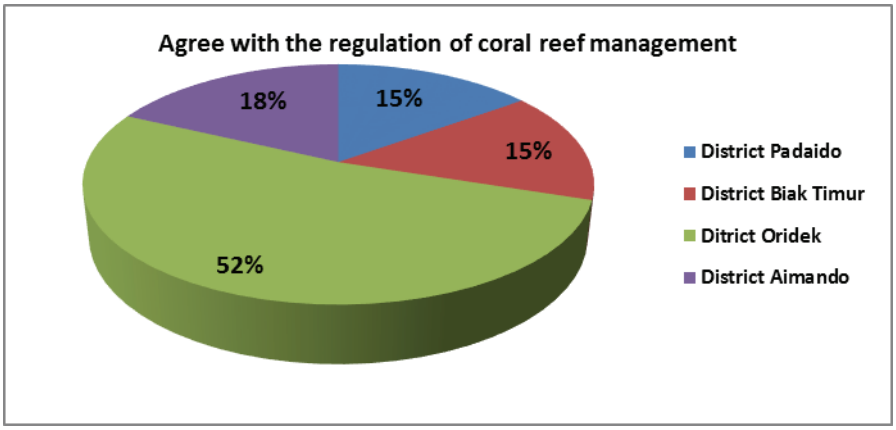

Figure 2. The percentage awareness of Biak Numfor society towards regulation of coral reef management.

Knowledge of Coral Reefs. People in every district in the Biak Numfor Regency have different knowledge of coral reefs. Among all members of society with adequate knowledge within the Biak Numfor Regency, 49 percent are from Oridek district, while 21 percent of the group are from Aimando. Moreover, the society in Biak Timur and Padaido needs further dissemination of coral reef information, since only 15 from each district have sufficient knowledge about the coral reef (Fig. 3).

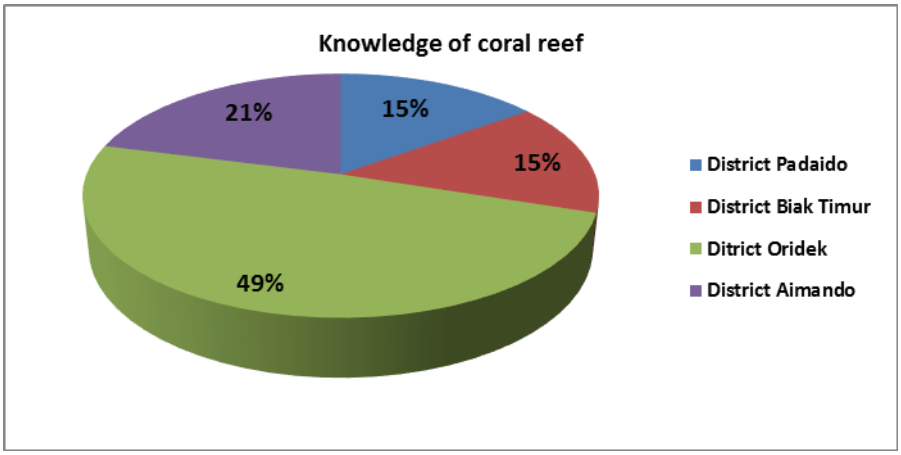

Figure 3.Tthe percentage variation of society within Biak Numfor who knows the coral reef.

Knowledge of Benefits of Coral Reef. The research discovered that a particular group of people in Biak Numfor have already known of the benefits of coral reef prior to the Core map program. The distribution of community members within Biak Numfor whose knowledge of coral reef benefits is displayed as follows: of all community members within Biak Numfor who understand the coral reef benefits, 49 percent are from Oridek district. Moreover, there is 21 percent of the society of Aimando district who understands the benefits of coral reef, while the rest 16 and 14 percent of the group are from the Padaido and Biak Timur district respectively (Fig. 4).

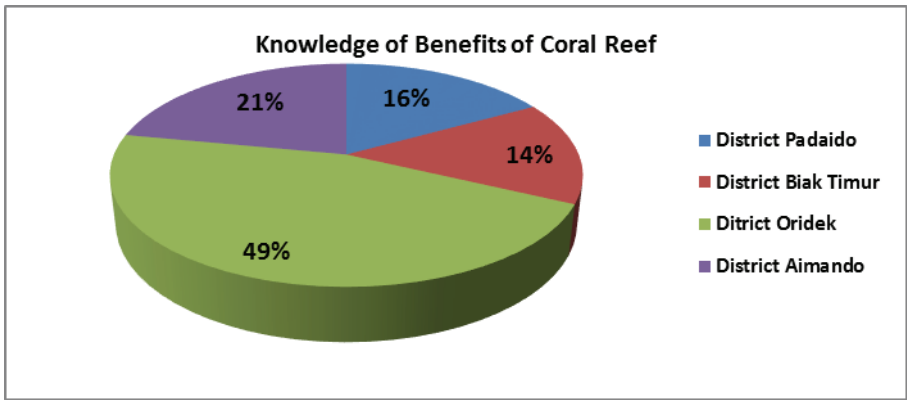

Figure 4. The percentage variation of society within Biak Numfor who know the benefits of coral reef.

Knowledge of Factors Contributing to the Damage of the Coral Reef. The observation reveals that the society in Biak Numfor needs more dissemination on coral reef and factors causing damage to it. This is due to the fact that knowledge is not distributed evenly to every district in the Biak Numfor regency. Of all community members with knowledge on the factors damaging coral reef, 50 percent are from the Oridek district, while 21 percent of the group are from the Aimando district. Moreover, the rest 16 percent and 13 percent of the group belong to the Padaido and Biak Timur district respectively (Fig. 5).

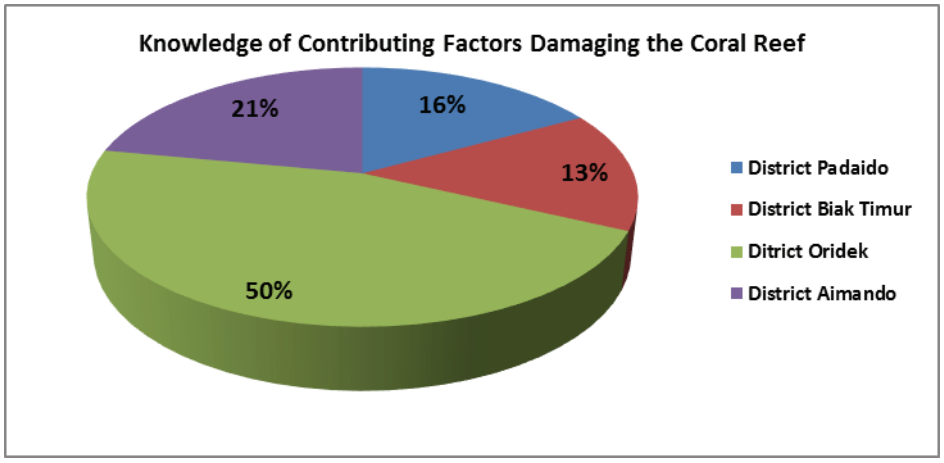

Figure 5. The percentage variation of community members in Biak Numfor who understand the factors damaging the coral reef.

Use of Fishing Gears that Damage Coral Reef. The following Fig. 6 illustrates that some community members in Biak Numfor have realized of the impact of damages to coral reef and thus, opposing the use of dangerous fishing gears to the coral reef. 52 percent of the group are from Oridek district, while 16 percent are from Aimando. Additionally, 16 percent and 14 percent of the group belong to the Padaido and Biak Timur district respectively.

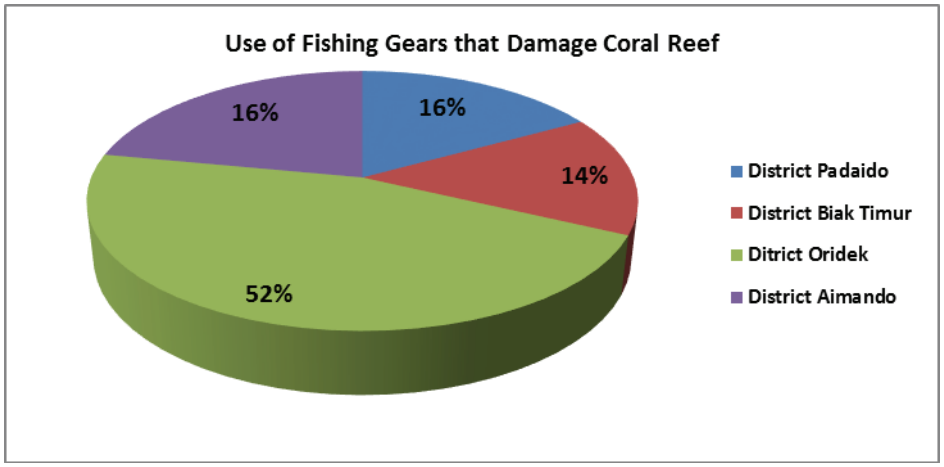

Figure 6. The percentage variation of community members within Biak Numfor opposing the use of dangerous fishing tools to the coral reef.

Knowledge of Ban of Explosives Use in Fishing Activity. There are some community members in Biak Numfor who understand of the destructive force of explosives in fishing activity, and the damage to the coral reef. However, the information needs to be disseminated more comprehensively, as it is unevenly distributed to each member within the community. Of all people whose knowledge of damage of explosives to the coral reef, 47 percent, and 21 percent belong to Oridek and Aimando district respectively. Moreover, 17 percent of the group are from Padaido, while 15 percent are from Biak Timur (Fig. 7).

Knowledge of Coral Reef Prior to the Core map Program. Previous to the core map program, there are some community members in Biak Numfor whose basic understanding of coral reef. Aimando is the district with most members whose basic knowledge of coral reef before the implementation of core map program, with 70 percent, while in Oridek, there are 30 percent of community members with basic understanding of coral reef. On the contrary, community members in Padaido and Biak Timur have no initial knowledge of the coral reef before the core map program.

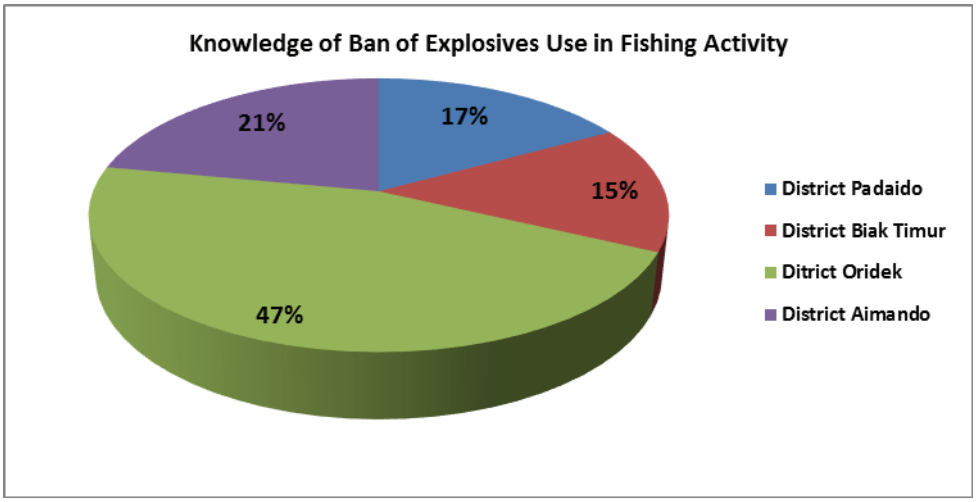

Figure 7. The percentage variation of community members who understand the damage of explosives in fishing activity.

Knowledge of the Ban of Fish Anaesthetic on Coral Reefs. People's knowledge regarding the ban of anesthetic on coral reefs in each district is different; in Oridek district, the percentage of people's understanding is at 41 percent preceded by Biak Timur district with 23 percent. Furthermore, the percentage of Aimando district is at 21 percent and the Padaido district has the lowest percentage among all with 15 percent. The following Fig. 8 illustrates the explanation of people's understanding regarding such an issue:

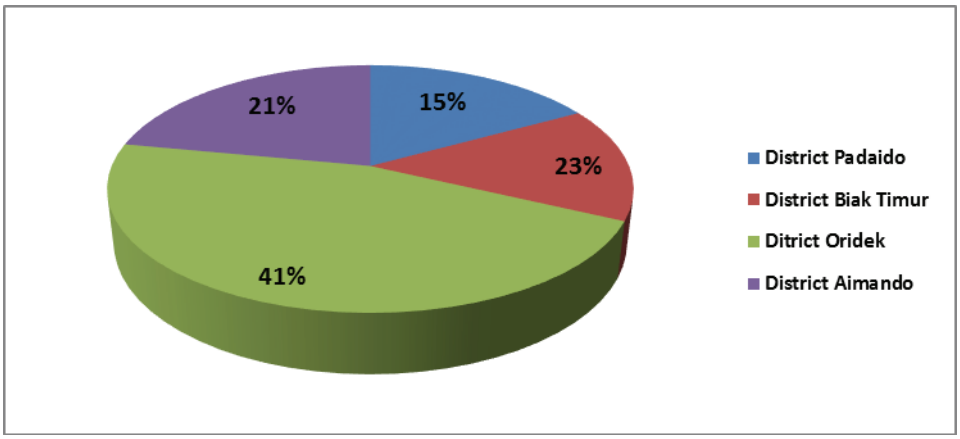

Figure 8. The percentage understanding of the Ban of Fish Anaesthetic on Coral Reefs.

Knowledge regarding the Conservation of Coral Reef. The percentage of the understanding of people of Biak Numfor Regency on the conservation of coral reef is varied. The percentage of the Oridek district is at 48 percent, Aimando with 21 percent, and the lowest districts are Padaido and Biak Timur with a percentage of 16 % and 15 % respectively (Fig. 9).

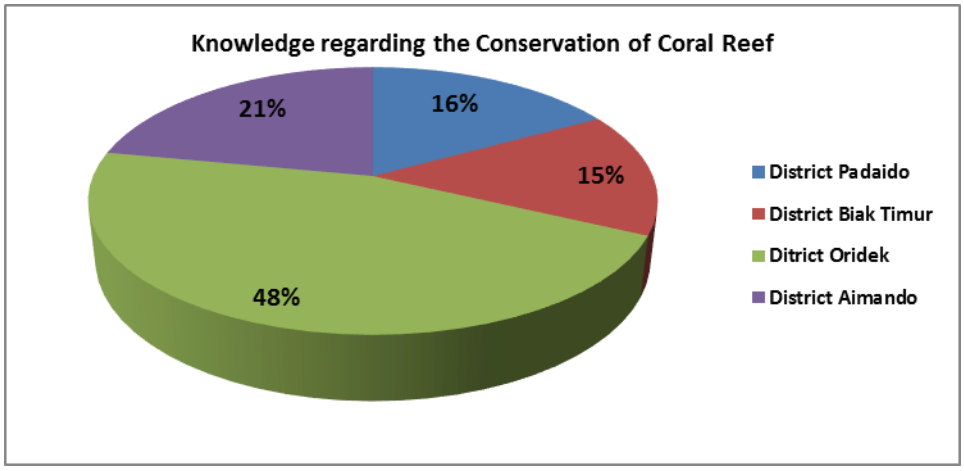

Figure 9. The percentage variation of understanding of the Ban of Fish anaesthetic on Coral Reefs.

Knowledge of the Core map Programme. People's knowledge of the core map programme in each district is different; in Oridek district, the percentage of people's knowledge is at 48 percent, followed by the Aimando district with 21 percent and Padaido district with 16 percent. Further, the lowest percentage among all is Biak Timur district with 15 percent (Fig. 10).

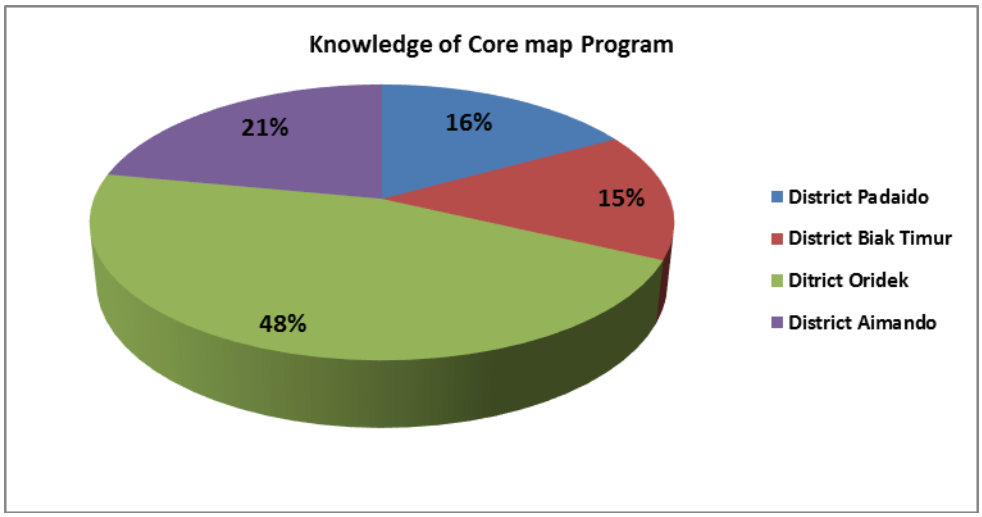

Figure 10. The percentage Knowledge of the Core map Program.

Eagerness to Involve in Core map Activity. People's eagerness to involve in core map activities in Biak Numfor Regency is at a different level. Each district has its own percentage, in which Padaido district gets 17 percent of its total population who wants to involve in core map activities, and then it is followed by Biak Timur district with 15 percent and Oridek district with 46 percent. Aimando district, however, arrives at 22 percent of its total population. Fig. 11 illustrates people's eagerness to involve in core map activities.

Knowledge of Coral Reef Supervision. Coral reef supervision should be importantly conducted to avoid its damage that caused by people's negligence in managing marine resources. Most people in Biak Numfor have understood the marine resources supervision with different levels of knowledge in each district, which Oridek district reaches 41 percent of its total population, followed by Aimando district with 33 percent and Biak Timur district with 22 percent. The lowest percentage of 4 percent, on the other hand, is from Padaido district of its total population.

Sustainability of the Core map Programme. The Core map programme gives a positive impact on people's life improvement in Biak Numfor Regency that they can live independently and preserve the natural resources. On top of it, people are eager to sustain this core map programme to maintain its good impact (HANING, 2008). From Fig. 12, it illustrates that people in Oridek district want to sustain the programme with 50 percent, followed by the Aimando district with 20 percent, the Padaido and Biak Timur district with 15 percent.

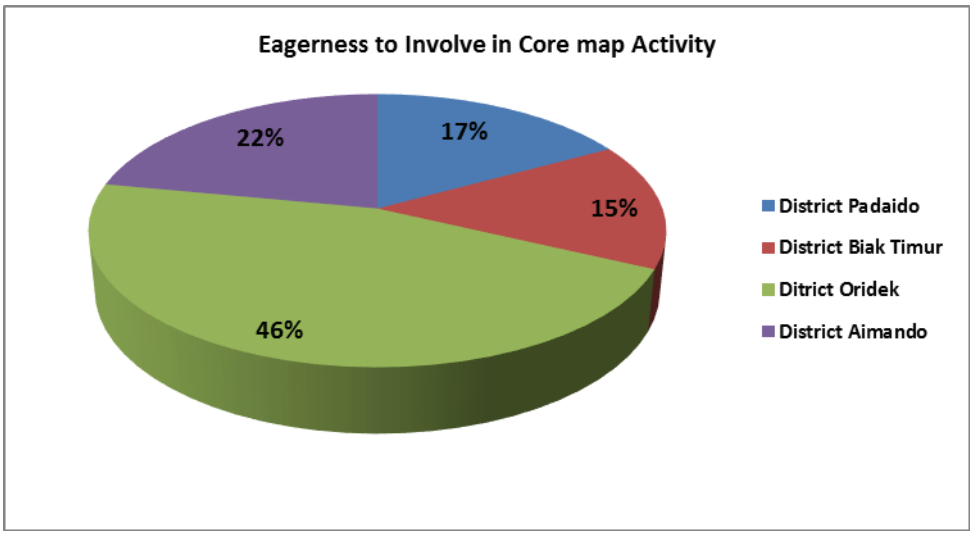

Figure 11. The percentage variation of People's eagerness to Involve itself in core map Activity.

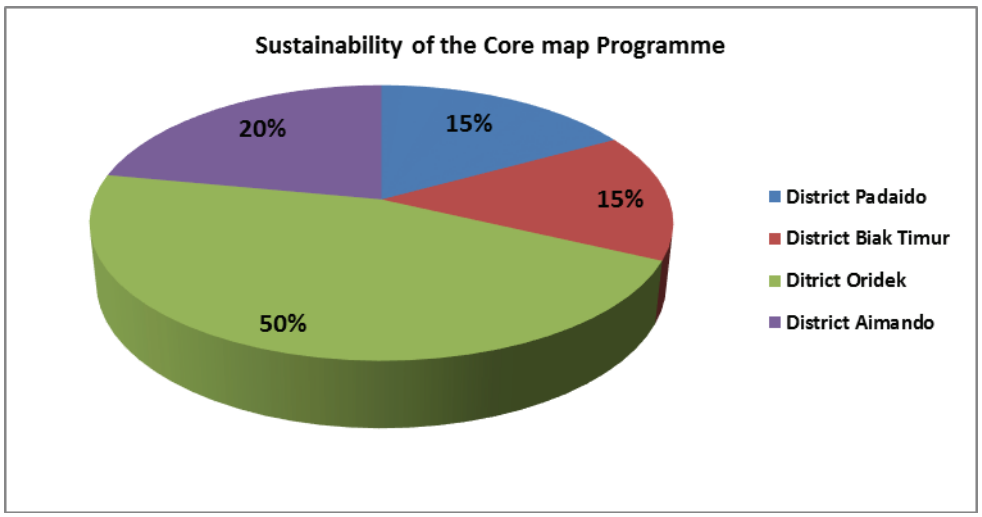

Figure 12. People's Eagerness to sustain the Core map Programme.

Supervision Activities in Each District. Developing core map programme requires community's involvement in which people in Oridek district have involved at 64 percent, Padaido district at 20 percent and Aimando district at 15 percent. Unfortunately, there is no programme involvement from people in Biak Timur district.

Punishment Approval for Violation. It is necessary to punish people who break the rule for its enforcement around core map location in which community obedience can support the programme development. The awareness level of individuals towards the rule in Biak Numfor Regency is different; 15 percent of people in Paraido district are aware of the rule, while in Biak Timur, Oridek and Aimando district, the rate of individuals who are aware of the rule is 14 percent, 51 percent, and 20 percent respectively.

Knowledge of Coral Reef Harvesting Ban. Coral reef as a marine resource should be preserved due to the ecosystem balance in its marine. If there is damage to the coral reef, the other habitats will be affected by its damage as well (NOVACZEK, 1997). Several coral reefs have been damaged in these days era, and it caused by surrounding people's daily activity that they have continually harvested coral reef as a building material. For that reason, there should be a regulation regarding the ban of coral reef harvesting in any ways (ASEP, 2001).

Based on survey results, some respondents from Biak Numfor Regency agree with the implementation of the rule on the ban of coral reef harvesting. It is expected that it can help preserving coral reef ecosystem in the region. The data from the survey reveal that people in the Oridek district agree with the regulation, and this gets the highest percentage, of 53 percent, followed by the Biak Timur district and the Aimando district that rate of people who approve the ban of coral reef harvesting is 30 percent and 12 percent consecutively.

The Thinking Level of Society about Exhausting Marine Resources. As obtained from the survey, most people argue that marine resources will be slowly exhausted (SIREGAR, 2010; WASKITO & MUGI, 2012). A survey in each district acquires various results; 59 percent of people in Oridek district claim that marine resources will be run out, and then the percentage in Biak Timur district is 27 percent. Furthermore, the rate of people in Aimando and Padaido district who believe in exhausting marine resources is only 11 % and 3 % respectively.

CONCLUSIONS

The purpose of this study is to understand the people's role in preserving coral reef through the core map programme and to discuss the impact of the programme on community welfare improvement around East Region in Indonesia. Environmental preservation is crucial for people to care about; therefore, actual action and broad knowledge are required to conserve coastal area. The results show that: (1) people in Oridek district have bigger awareness and thinking level than the other districts, (2) better coral reef is successfully achieved by implementing the core map programme, (3) the most dominant impact of the core map programme is on coastal community's welfare in Biak Numfor Regency, (4) it should be a coral reef balance and preservation after the core map programne implementation by setting a law of regulation, (5) the core map programne sustainability is required to preserve coral reef ecosystem and its marine biota.

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