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Communities Vulnerability Mapping of Spermonde Coral Islands

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Abstract

The purpose of this research is to map the vulnerability of communities in seven islands of Spermonde. Vulnerability assessment was conducted in July 2013 using an environmental and socio-economical stand point. Identification of the vulnerability issues were grouped into indicators (climate, island morphological, marine resources and socio-economical changes), with each given a scale of 1-5.and attributes in the form of a semi-structured questioner. To check for the type and severity of a disaster, 62 respondents were asked to rank the disaster on a scale of 1-4. Results indicate that the majority of respondents find that change in climate, island morphology, marine resources and socio-economical conditions hardly affect them. The disaster that they fear the most is the danger of losing their source of income. In terms of vulnerability index, Bone Tambu and Lumu-Lumu islands are under very high vulnerability for Island and Socio-economic change. In terms of Climate and Marine Resource change, there are no significant differences among the islands. The trends show that these two categories fall under medium to high, with marine resource dynamic change always being higher than the climate change index, except in Kapoposang Island. Overall, there are no differences between each zonation in vulnerability indexes.

Keywords: vulnerability indicators and attributes, island environmental condition, socio-economical condition, coral island communities, Spermonde.

Introduction

The existence and condition of the coral reefs are influenced by biological and physical processes from natural causes and human activities. Since 1983 there has been indication that the majority of the coral reef ecosystem in Spermonde are at risk due to resource gathering that exceed the environmental carrying capacity (Moll, 1983; Pet-Soede et al, 2001), the use of destructive fishing gear and activities, such as: bombs, poison (Moll, 1983, PSTK, 2001, Jompa et al, 2006, Chozin 2008, Nature Bestari, 2009), coral mining (Badawing et al, 2011), changes in sea surface temperature (Jompa and Yusuf et al, 2010), and other causes not yet known. The accumulation of these natural processes, climate change, and human activities (anthropogenic) can be seen in the reduction of land area and coral reef structures. Badawing et al (2001) concluded that in the span of 32 years (1978-2010), 74% of coral islands (37 islands) and 52% of coral reef structures (26 structures) in the waters of Makassar and Pangkep have experienced extensive reduction in area to the point that they have become potentially become uninhabitable. Since 2008, as islanders felt changes in weather patterns and island abrasion, many have moved their houses further inland. Furthermore, overfishing in Spermonde have caused long-term changes in the composition and structure of the catch (Pet-Soede et al, 2001) as well as the pattern of

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marine resources utilization (Yanuarita and Neil, 2005). In general, small islands are expected to bear the worst effects of climate change. If the ecosystem is the source of livelihood and existence of an island community, any changes that occur in the ecosystem will affect the existence of that community. The existence of Spermonde coral islands is a combination of various factors: history, culture, socio-economy, hence why it was chosen as a research subject. The determination of community vulnerability as a result of changing environmental and socio-economical conditions serves as an important reference for the planning and management of the islands, especially when dealing with natural events such as climate change or natural resource changes due to human activities.

Methodology

Research was conducted in July 2013, on the seven islands chosen to represent Spermonde reef zonation, namely: Samalona, Bone Tambu, Lumu-Lumu, Barrang Lompo, Badi, Lanyukkang, and Kapoposang (Figure 1).

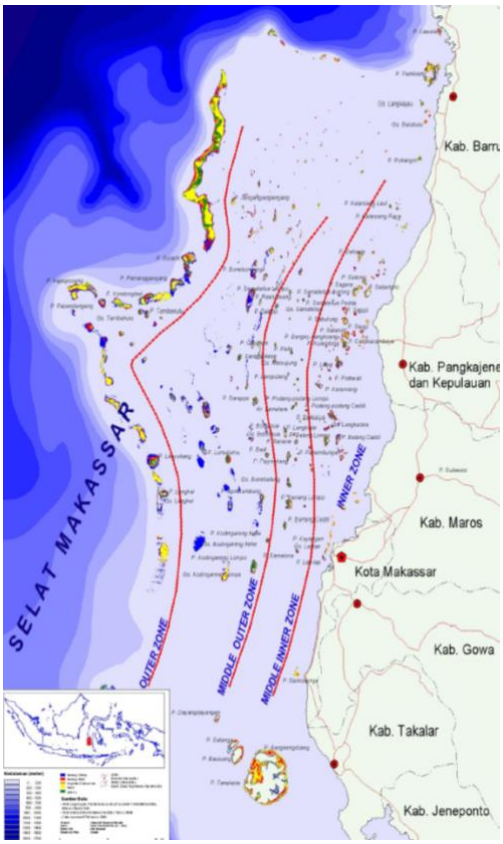

Figure 1. Research Location

Issue identifications were grouped into vulnerability indicators and attributes in the form of a semi-structured questionnaire. Vulnerability indicators were grouped into: 1) climate change indicator, 2) island morphological change indicator, 3) marine resources

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change indicator, 4) socio-economical change indicator, and 5) disaster/calamity ranking. Each attribute of the vulnerability indicator/ issue were weighted 1-5, with 1 = no change; 2 = minor change; 3 = change, but without impact on livelihood; 4 = change, with impact on livelihood; and 5 = major change that stongly affects livelihood. Interviews and FGDs (Focus Group Discussions) were conducted with respondents from varied age groups, genders, and vocations. There was a total of 62 respondents.

Results and Discussion

Local Perception

Results of the vulnerability identification and the weight of the seven vulnerability indicators, as done by the locals, is shown in Figure 2 to Figure 5 below. Each attribute of the vulnerability indicator/ issue is given a weight of 1-5, with with 1 = no change; 2 = minor change; 3 = change, but without impact on livelihood; 4 = change, with impact on livelihood; and 5 = major change that stongly affects livelihood. In an effort to cross-check, respondents were asked to rank the severity of more than 13 types of disasters with a scale of 1-4, with 4 = very scary, 3 = scary, 2 = somewhat scary, and 1 = not scary. The results of the disaster ranking is shown in Figure 6.

Of the climate change indicators, only the rising sea level attribute is considered to have changed and greatly affect the lives of the respondents. For the rainstorm attribute, the majority of respondents claim there is no change.

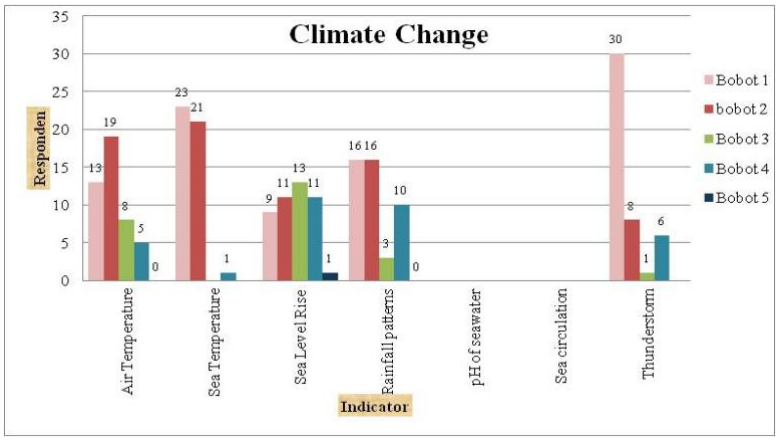

Figure 2. The Weight of Climate Change According to Respondents

For the island change indicator, only one respondent answered that the size of the island has changed and influenced their life. Island morphology, island use, dependence on the island, and fresh water sources are considered unchanged. What the majority of the respondents considered to have somewhat changed is the presence of vegetation.

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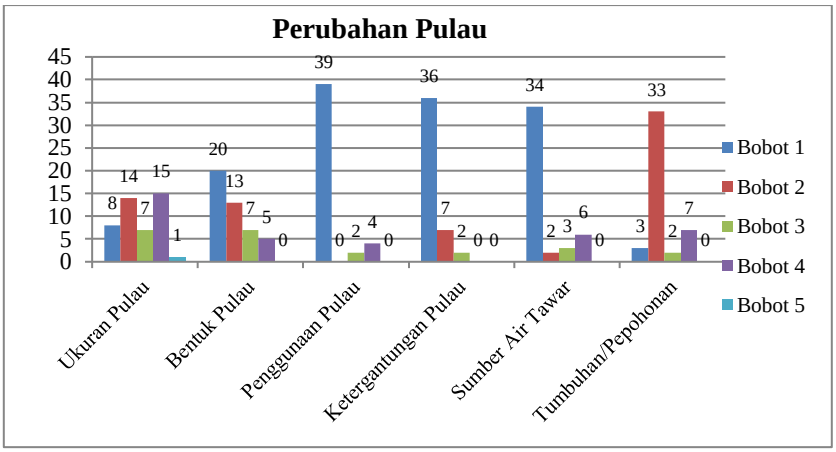

Figure 3. The Weight of Island Morphology Change According to Respondents

For the marine resources change indicator, one respondent gave a weight of 5 for coral reefs, while 13 respondents answered that there was no change. In addition, four respondents claimed that competition in utilization has changed and affected their lives. The conditions of the seagrass ecosystems, target species, and the intensity of marine resource utilization is considered unchanged.

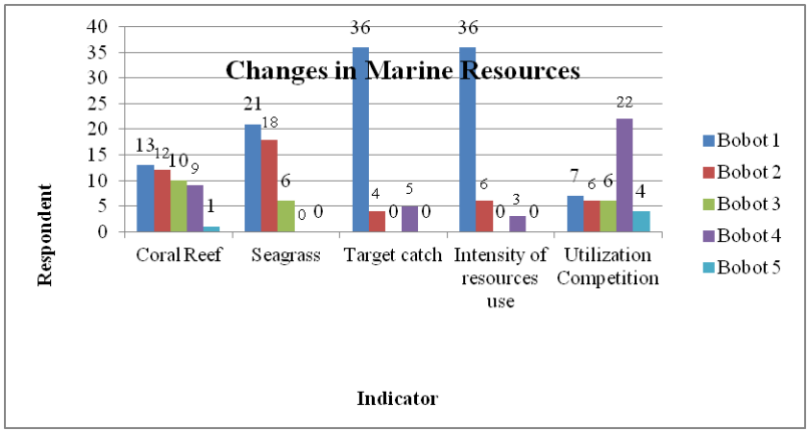

Figure 4. The Weight of Marine Resources Change According to Respondents

For the nine attributes of socio-economical change, the majority of respondents answered there was no change, except for the population and number of houses attribute, which has somewhat changed.

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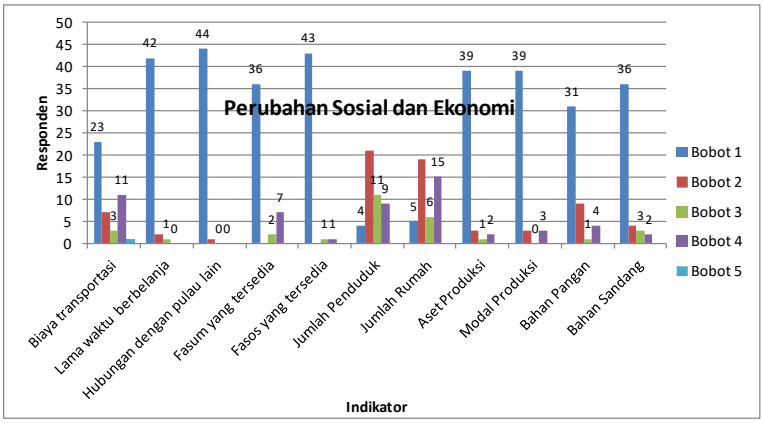

Figure 5. The Weight of Socio-Economical Change According to Respondents

Disasters that were rated as very scary were: abrasion, rainfall, rising sea levels, decrease or loss of fresh water sources, loss of livelihood, difficulty of finding a job, the loss of marine resources, and lack of public facilities. However, the perception that such events are very scary was not held by the majority of respondents. In general, the respondents weighted all disasters, be it in the past, present, or future, as scary or somewhat scary.

The type of disaster given the highest weight (very scary) by most respondents, such as the loss of sources of livelihood, are the ones with direct economical impact. It seems that so far, the respondents have the ability to deal with the various disasters and therefore do not consider the challenges insurmountable.

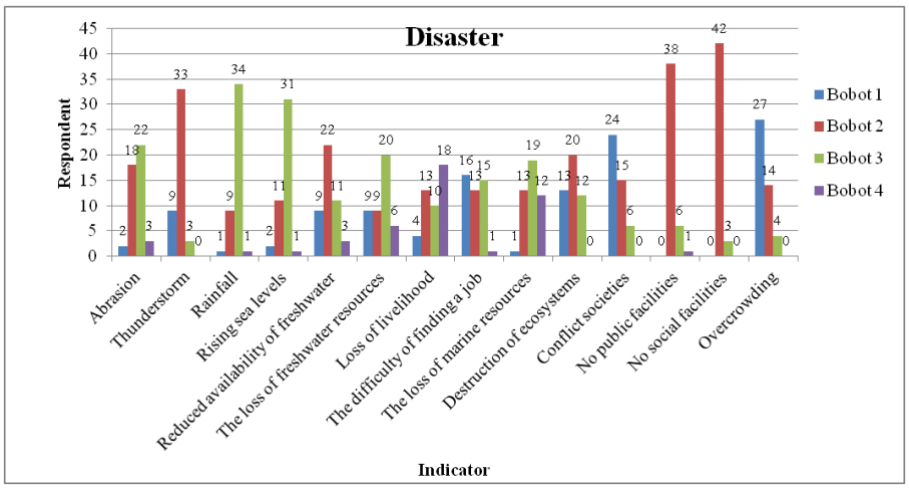

Figure 6. The Weight of Disasters According to Respondents

Island Vulnerability Index

The island vulnerability index is formulated based on the analysis of respondents' perceptions and on the analysis of selected indicators. Assignment of weight to an attribute is performed through expert ranking system, which is then used to score the four indicators.

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The score of each indicator is used as a component for calculating the vulnerability index of the island. The results of the index calculations group the range of island vulnerability into categories as shown in Table 1.

Table 1. The Range of Island Vulnerability Categories

Index Range	Category
< 12,08	Low vulnerability
12,09 - 18,13	Medium vulnerability
18,14 - 24,18	High vulnerability
> 24,19	Very high vulnerability

Of the vulnerability index formed, the categories for the seven islands are re-plotted in Figure 7. Presentation of the vulnerability index is based on the distance of an island from the mainland, in-shore toward off-shore. Judging from the vulnerability of socio-economic changes, four islands, namely: Barrang Lompo, Badi, Bone Tambu and Lumu-Lumu, are categorized as having very high vulnerability. Judging from the change of island morphology, the islands of Bone Tambu, Lanyukang and Lumu-Lumu also have very high vulnerability. Based on these two indexes, zonation does not seem to have an influence on those two vulnerability index categories.

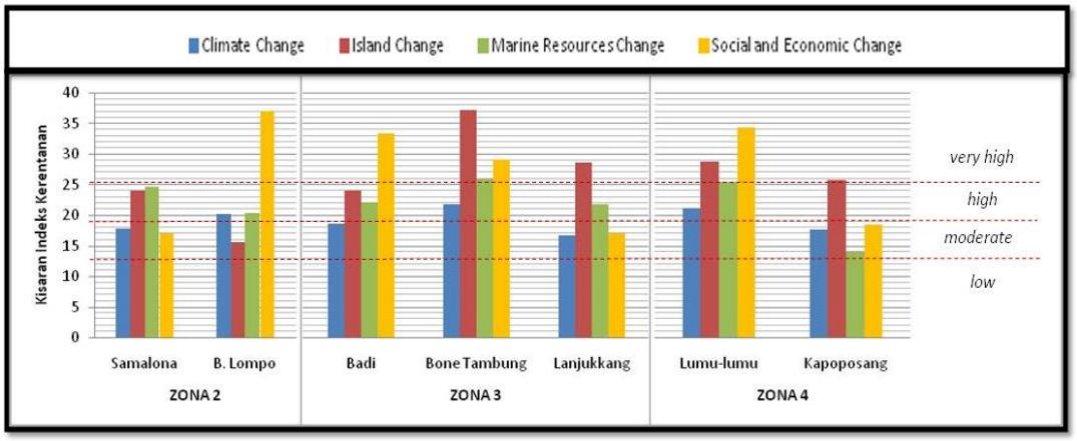

Figure 7. Vulnerability Index Range from In-shore to Off-shore

Data from two types of vulnerability index, the Climate Change Index and the Marine Resources Change Index, indicate similar conditions between all islands. The value movement of the two types of index range from moderate to high, which means there are no significant inter-island differences. However, the dynamic change of Marine Resource is always greater than that of Climate Change, except in Kapoposang Island. Apparently, respondents in general tend to feel/notice changes in marine resource before finally connecting those changes with the possibility of changes in climate. In general, the dynamics

of the four inter-island Vulnerability Indexes follow a similar trend: when one index is low, the other three indexes also tend to be low, and vice versa. In other words, the four Vulnerability Indexes are interconnected, and public awareness regarding their occurrence often happen simultaneously.

Conclusion

The majority of the islanders feel the most change in the following areas: sea level rise, change in vegetation due to settlement increase, increased competition of marine resource utilization, and population growth. For residents of the islands of Samalona, Barrang Lompo, Badi and Bone Tambu, climate change in the form of sea level rise is already felt, but is not considered disruptive. For residents of the islands furthest from the mainland, Lanyukang and Kapoposang, change in rainfall patterns have already affected their lives.

Bone Tambu Island and Lumu-Lumu Island have two very high vulnerability categories: island morphology change and socio-economic change. Judging from the Climate Change Index and the Marine Resources Change Index, inter-island conditions are not significantly different. The value movement of these two types of indexes range from moderate to high, which indicates no significant differences among the seven islands. However, the dynamic change of Marine Resources is always greater to that of Climate Change, except in Kapoposang Island.

In general, the dynamics of the four inter-island vulnerability indexes follow a similar trend: when one index is low, the other three indexes also tend to be low, and vice versa. Thus, vulnerability indexes are not influenced by zonation.

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References

Badan Pusat Statistik Pangkep. 2010. Kabupaten Dalam Angka.

Badawing, Dewi Y.S, D.A. Suriamiharja, Jamaluddin Jompa and Yusran Nur Indar. 2011. Long Term Morphological and Socio-Ecological Dynamics of Spremonde Reef Islands: Management Options. Dissertation Hasanuddin University. Makassar.

Chozin M. 2008. Illegal but Common: Life of Blast Fishermen in the Spermonde Archipelago, South Sulawesi, Indonesia. Master Thesis Ohio University. USA.

Hakanson, Lars and Andreas C. Bryhn. 2008. Tools and Criteria for Sustainable Coastal Ecosystem Management. Examples from the Baltic Sea and other Aquatic Systems. Environmental Science and Engineering. Berlin, Springer. Download: www.springer.

Hughes, T.P. and J.H. Connell, 1999. Multiple Stressor on coral reefs: A long term perspectives. Limnol. Oceanogr. 44 (3, part 2), 1999. 932-940. Obtained www.springer. On 07/09/2010.

Jompa, Jamaluddin, Dewi Yanuarita, Magdalena Litaay, Aidah A.A. Husain, Syafyuddin Yusuf. 2006. The Fate of Degraded Coral Reefs under Anthropogenic Pressures in Spermonde Archipelago, South Sulawesi, Indonesia. Presented at CZAP, Batam 29 August-2 September 2006.

Jompa, Jamaluddin and Syafyuddin Yusuf. 2010. First Record of Relatively Severe Bleaching in the Spermonde Archipelago, South Sulawesi Indonesia: Potential Consequences and Management Challenges. Presented at International Symposium on Small Islands and Coral Reef in Ambon August 4-5, 2010.

Kangas J, Pesonen M, Kurtila M, Kajanus M. 2001. A'WOT: integrating the AHP with SWOT analysis. Proceedings-6th ISAHP 2001 Berne, Switzerland:18-198.

Kangas J, Kangas K. 2005. Multiple criteria decision support in forest management-the approach, methods applied, and experiences gained. Forest Ecology and Management 207(1-2):133-143.

Moll, Hans. 1983. Zonation and Diversity of Scleractina On Reefs Off S.W. Sulawesi Indonesia. Thesis. Leiden University, Netherland. 106 pp.

Nature Bestari, 2008. Evaluasi Program COREMAP II terhadap Aktivitas Destructive Fishing di Pangkep. Laporan Akhir sebagai kerjasama CV. Nature Bestari dengan RCU COREMAP II Provinsi Sulawesi Selatan.

Pet-Soede C., W.L.T. van Densen, J.S. Pet and M.A.M. Machiels 2001. Impact of Indonesian coral reef fisheries on fish community structure and the resultant catch composition. Fisheries Research 51: 35-51.

Pusat Studi Terumbu Karang (PSTK)/ Center for Coral Reef Research (CCRR) , 2002. Laporan Akhir Penelitian Ekosistem Kepulauan Spermonde. Kerjasama PSTK Unhas dengan PMO-COREMAP.

UNEP and SOPAC. Building Resilience in SIDS: The Environmental Vulnerability Index. www.unep.org. Diunduh pada tanggal 25 Februari 2012.

Yanuarita, Dewi and Muh. Neil, 2005. Utilization of Marine Resources in the Spermonde Archipelago. Joint Research Hasanuddin University and Kyodai University "Natural Resource Management and Socio-Economic Transformation under the Decentralization in Indonesia: Toward Sulawesi Area Studies.

IPCC, 2001 dalam CTI-CFF, 2013. Climate Change Adaptation for Coral Triangle Communities: A Guide for Vulnerability Assessment and Local Early Action Planning (LEAP Guide). www.coraltriangleinitiative.org (diunduh 18 Juni 2013).