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The Influence of Personal Religious Practices on Destructive Behavior to Natural Resources and Environment

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Abstract
The aim of this paper is to analyze the factors driving on destructive behavior of individuals to natural resources and environment. Using a case study in eastern Indonesia, we investigated behavior of individual fisherman in coastal communities and their impacts on coral reefs. We characterize economic, non-economic and cultural/behavioral factors influencing destructive behaviors such as coral mining, blast fishing, and poisoning fishing. Economic and noneconomic/social factors are household size, age, origin, education, income, social activities, mobility, and primary job. However, we characterize individual cultural/behavioral factors with religious ritual practice, more specifically by the number of pray performed by respondents calculated by set of movement (*raka'at*). Using logistic regression, we shows that the piety of people in performing ritual worship (pray) has influenced significantly the behavior of respondents. The more devout people in performing ritual worship, the less destructible people are to the environment. Meanwhile, several social and economic variables have affected the destructive behavior of people including household size, age, origin, mobility, and main job. Three variables including income, education and social activity have no significant influence to the destructive behavior of people to natural resources and environment.
Keywords: religious ritual, coral reef, blast fishing, poisoning fishing, destructive behavior

1. Background

The issues of natural resources and environment are an important part of world religions teaching. All religions agree to the idea that human being plays an important role in cultivating, protecting and looking after the earth and every single creature of God. The Holy Bible presents, *"So God created man in his own image…..God blessed them, and God said unto them, Be fruitful, and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth"…. It was so; and God saw everything that he had made, and, behold, it was very good*", (Genesis 1:27-29,31). In other verse says, "*and the Lord God took the man, and put him into the garden of Eden to dress it and to keep it",* (Genesis 2:15). The two verses of Genesis indicate that all humans have a responsibility to look after the earth. The core faith of Christianity pertaining to the issues is the acknowledgement that the world was created by God and that God has given man the role of caretakers. Christians should therefore, do all that they can to look after the world in which they live (ICT, 2011).

And God created the great whales, and every living creature that moveth, which the water brought forth abundantly, after their kind, and every winged fowl after his kind: and God saw that it was good. And God blessed them, saying, Be fruitful and multiply, and fill the waters in the seas, and let fowl multiply in the earth, (Genesis 1:21-22, KJV). Those verses indicate that: *Firstly*, the Bible affirms the goodness and intrinsic value of all living things. *Secondly*, it also points out commonalities between human beings and other living things. *Thirdly*, it contains the mandate that we treat the natural world with care and respect.

In the teaching of Islam the earth was created by God and God's wisdom has ordained to grant human beings stewardship (*khilafah*) on the earth. As a stewardship, man is also the executor of God's injunctions and commands and he is the only manager of the earth and not a proprietor, (Mahasneh, 2003). He is also a beneficiary and not a disposer or ordained. However, heaven and earth and all that they contain belong to God alone and man has been granted stewardship to manage the earth in accordance with the purposes intended by God as its Creator. Man has a right to utilize it for his own benefit and the benefit of other created beings, and for the fulfillment of his interests and of theirs.

Instead of having right to utilize and harness natural resources, man has also an obligation to conserve them quantitatively and qualitatively. Natural resources should be perceived as a source for living of man and since they are created by God, man has to realize the objectives of those created by God such as contemplation and worship, inhabitation and construction, sustainable utilization, and enjoyment and appreciation of beauty. Therefore, man has no right to cause the degradation of the environment and distort its intrinsic suitability for human life and settlement. Nor has he the right to exploit or use natural resources unwisely in such a way as to spoil the food bases and other sources of subsistence for living beings, or expose them to destruction and defilement, (Mahasneh, 2003).

It is clear that the destructive acts to nature are contrary to Islamic norms and values. In addition, the destruction of nature will cause misery to humankind because it leads natural disasters and shortages of food ingredients derived from nature. It is easy to find many verses in the Holy Koran concerning with the obligation to preserve natural resources and environment. In Surah Ar Rum (chapter 30:41), God says: *"Evil (sins and disobedience of Allah, etc.) has appeared on land and sea because of what the hands of men have earned (by oppression and evil deeds, etc.), that Allah may make them taste a part of that which they have done, in order that they may return (by repenting to Allah, and begging His Pardon)".* In Surah Ash-Syu'ara (chapter 26:183) God also says: *"And defraud not people by reducing their things, nor do evil, making corruption and mischief in the land".*

The prophet Mohammed (peace and blessings upon him/pbuh) declares, "The world is beautiful and verdant, and verily God, be He exalted, has made you His stewards in it, and He sees how you acquit yourselves." He emphasizes also strongly the friendly behavior to natural resources and environment in his Hadists. Prophet Mohammed (pbuh) forbids cutting down cedar trees in the desert where animals found shade and shelter. He also says that one of the branches of faith is to remove litter from the street. He emphasizes that when in the last hour on the Day of Judgment, if one of us hold a plant in his hand, we suppose to plant it. The world is green and delightful, and God has put you in charge of it (Mahasneh, 2003).

Prophet Mohammad (pbuh) says that any Muslim who plants or cultivates vegetation and eats from it, or another person, animal or bird, eats from it will receive a reward for it from Allah. He (pbuh) also says that anyone who plants a tree under which people seek shade or shelter from the sun will have his reward with Allah. Therefore, cutting down of trees without strong and legitimate reason is encroaching on the bounties of Allah, and encroaching on the beauty of the environment, which Allah has created (Ramly, 2007).

By considering the meaning of these verses and the prophet saying (*Hadist*) above a Moslem should be an environmentalist. However, the destructive acts to natural resources and environment especially to coral reef resources are still practiced by people, mostly Moslem, residing in coastal areas (Soeharsono, 1995; Afifi, 2003). The question arises then, "is there any relationship between personnel piety indicated by performing religious ritual worship and destructive behavior to natural resources and environment?" Besides, "is there any influence of socioeconomic conditions on destructive behavior natural resources and environment?"

One study about the relationship between religion and natural resources and environmental conservation can be found in the fieldwork of Stuart Harrop (2010). He examines the relationship between conservation and Islam in Sumatra while actively raising awareness of Islamic teachings about conservation. The aims of the study is to show that natural resource conservation can benefit from the integration of key religious concepts and traditional conservation approaches into conventional management plans and conservation strategies, while local people can benefit from making conservation relevant to them. He finds that several key principles in Islam such as *Tauhid, Khalifah, Mizan* and *Fitrah* underpin nature conservation and outline the human role in conserving natural resources. Moreover, three interrelated land-use management systems in Sumatra apply Islamic principles within nature conservation to include *Himaor*–[1], *Harim*–[2], and *Ihya Al Mawat*–[3].

[1] *Hima*or is management zones established for sustainable natural resource use

His study attempts to implement a faith-based community outreach program to strengthen and integrate these religious management systems into the legally recognized traditional, or *Nagari* system, which usually comprises several villages.

In contrary, studies pertaining to the influence of socio-economic condition on the destructive behavior of people to natural resources and environment can be found in the work of Herman Cesar (1996). Cesar found that economic development in many developing countries poses a threat to the existence of coral reef ecosystems. Sedimentation of sewage or industrial waste and household can lead to coral mortality since it hinders sunlight penetration. Pollution from industrial waste and tourism industries such as chemicals, iron, and waste also endangers the survival of coral reefs. In addition, tourism industries have also potential threatens to the survival of coral reef ecosystem. For example, construction development in many beach tourism sites, sewage produced by tourist, boat anchor, and untrained divers can destroy coral reefs slowly. The dredging of sand and coral reef for construction uses is a highway to the distinction of coral reef.

Study of Djohani (1998) and Mathew (2001) indicated that economic condition of coastal area related to poverty problem caused the behavioral damage to coral reefs. High growth of population and competition of the catchments area lead people to use destructive techniques in exploiting coastal resources. It brings further about habitat degradation and rapid depletion in fish stocks. As a result, it is difficult for them to catch fish in quantities to meet their daily needs. They become an easy target for the financiers who recruit them for their business interests. The financiers provide them with food, fishing gear, boats and all these are considered as a debt that must be paid so that they become dependent on the financiers. At this point, the fishers have no choice instead of catching fish by using potassium to pay its debts on time.

Other study carried out by Afifi (2003) found that the destructive behavior to coral reef practiced by the community was a result of the lack of public knowledge of the existence of coral reef ecosystems. They find satisfaction and joy when they hear the sound of the explosion of explosive materials they throw into the sea. It looks like a child excited and happy when playing firecrackers. Moreover, various external factors such as ineffectiveness of government intervention, limitations of alternative livelihoods in coastal areas, and high demand for commodities of the fishery driving the increased activity of exploitation of coastal resources in ways that are considered possible by the community.

These studies show there are many factors influencing the destructive behavior of people to coral reefs. However, all these studies use qualitative approach. Therefore, it is necessary to carry out a study applying quantitative approach which can measure the rate of those variables in influencing the destructive behavior to natural resources and environment. In the perspective of conservation and management, Jackson (1997) suggests the need for quantitative analysis in assessing the range of human activities on coral reef ecosystems and their impact.

In this paper, we focus our analysis on the influence of personal religious practices on the destructive behavior to natural resources and environment. To do this, we analyze the influence of ritual worship (pray) on the destructive behavior to natural resources and environment. Besides, we also analyze the influence of social and economic conditions of households on the destructive behavior of households communities to natural resources and environment.

2. Research Method

a. Location and Study Sample

This study is intended to build a case that can be also generalizable through out Indonesia since the majority of Indonesia communities are Moslem. Therefore, findings of this study could be considered as the situation in Indonesia coastal community.

The research was conducted in coastal area of the eastern part of the island of Lombok Indonesia which includes some villages such as Sambelia, Labuan Lombok, Leper, Dadap, Aik Genit, and Bunut Tunjang. The selection of this area as a research site is based on the consideration that the activity of coral reefs destruction is being undertaken by local people mostly coral mining activity. Coral mining has been carried out by the community and become their main occupation. Coral taken from the seabed is used to produce lime used as a

[2] *Harim* or inviolable sanctuaries used for protecting water resources and their services
[3] *Ihya Al-Mawat* encourages reviving neglected land to become productive

raw material for construction or building. Lime demand especially in rural area does not decline as occurred in urban area. Due to its low prices rural population still continues to use coral lime. Meanwhile, urban communities prefer to use cement instead of coral lime because the quality of cement is better. In addition, there are also some activities that indirectly affect the existence of coral reefs in the region. These activities include blast fishing and the use of cyanide (potassium) to catch ornamental fishes.

In this study, unit of analysis is household, whose members engage in activities that potentially destruct coral reefs. The number of households falling into this group is 157 households. In addition, there are 50 households, whose activities do not have negative impacts on coral reefs. Sample as control plays a significant role to eliminate bias in analysis. Total respondent is 207 households selected randomly.

b. Data Collection

The data used for analysis are collected through sample survey. During the data collection we also use in-depth interviews and observation. Interview method is used to obtain primary data from selected respondents. In the meantime, observational method is used to observe as well as to ensure the economic activity undertaken by respondents. We attempt to see directly the daily activities of the respondents to make sure that respondents are actually doing the activities mentioned.

The required data consists of data supporting research variables including number of movement set (cycles) performed by prayers every day as an indicator of their piety in performing religious rituals (PRAY), several economic variables, and social variables. There are two variables to include in economic variables such as total household income (INCOME), and principal occupations (MJOB). Social variables include number of household members (HSIZE), age of respondent (AGE), birthplace (ORIGIN), length of schooling year (EDUCATION), social activities followed by respondents (SACTIVITY), mobility of respondents is indicated by activity of traveling undertaken within three (3) months prior to survey (MOBILITY). Meanwhile, data for variable associated with the destruction of coral reefs (DESTRUCTION) comprises coral mining, blast fishing and poisoning.

c. Data Analysis

Method of data analysis used in the research is multivariate analysis using binary logistic regression analysis. The method is used to estimate the probability of respondents choosing one of the two attributes that are owned by dependent variable. Dependent variable in this study is the activity of respondents that has a negative impact on coral reefs. The dependent variable is categorized as a dichotomous variable whose value consists of 1 (one) and 0 (zero) and called dummy variables. Meanwhile, the independent variables are in the form of continuous variables and dummy variables. To estimate the probability of respondents engaging in activities that have a negative impact on coral reefs, we use the following formula (Seenprachawong, 2001):

$$\text{Log} = \left[\frac{\text{Prob (yes)}}{\text{1-Prob (yes)}} \right] = \alpha 0 + \beta 1 Q + \Sigma \beta i Ei + \sum \beta i Si$$

Variables in the model represent variables ritual piety/ prayer (Q), a number of economic variables (E) such as income and main job/employment, and a number of social variables (S) such as number of household members, age, birthplace, education, social activities, and mobility. The model can estimate the effect of ritual piety towards coral reef-destructive behavior simultaneously with the other independent variables.

3. Results And Discussion

a. Research Variables and Its Value

Dependent variable is destructive behavior (DESTRUCTION) indicated by activities carried out by households, which have negative impact to the existence of coral reef. Those activities include coral reef mining, blast fishing, and poisoning (the use of cyanide to catch ornamental fishes). Coral reef mining is the most destructive practice to coral reefs. Coral reef is used as raw material for producing coral lime. Demand of coral lime is still high since the other alternative materials such as cement is relatively more expensive than lime. Therefore, people in coastal area produce coral lime to fulfill the market demand. The variable of DESTRUCTION is a dummy variable, which has two values or dichotomous value. If respondent's household

carries out one of those activities, then it is scored by 1, and otherwise.

Meanwhile, there are nine (9) independent variables, which have different values. These variables can be categorized as religious, economic, and social variable. Religious variable is represented by the pity of people in performing religious ritual such as praying (PRAY). In Islamic religion, praying is an obligation for each Moslem to perform it. The more pious a person in performing ritual worship the better their behavior towards humans as well as the surrounding natural environment, including coral reef resources.

The PRAY variable is measured by the number of set of movement (cycles) during practicing daily praying (*sholat*). Daily pray is differentiated from obligatory pray and *sunnah* (encourage) pray. Daily praying consists of 17 *raka'at* (set of movement), while the number of *sunnah* pray *raka'at* varies according to *syari'ah*. Encourage prays performed in daily basis are Rawatib, Duha, and Tahajjud. Several encourage prays performed at special times are Eid ul-Fitr, Eid ul-Adha, Friday pray, and Istisqo ' pray.

There are two variables categorized as economic variables including total household income (INCOME) type of primary work or main job (MJOB). These variables are assumed to have a relatively strong link to community attitudes, especially towards natural resources. The relationship between those variables with behavior to natural resource could be positive or negative. The form of those relationships between the two independent variables (total household income and type of primary job) and destructive behavior to coral reefs will be verified through the test of significance in the econometrics model.

Variable of income is measured by the amount of income (nominal value) obtained during the first year and in continuous form. This income is earned by all family members who are working in various sectors.

The type of respondents' work is quite diverse, including farmers, traders, fishers, laborers and others. For the purposes of data analysis, the type of respondents' work can be divided into two types of work - fishing and non-fishing.

Variables categorized as in social variables consist of household size (HSIZE), AGE, place of birth (ORIGIN), EDUCATION, MOBILITY, and social activity (SACTIVITY). Each variable has theoretically a connection or influence over the destructive behavior of coral reefs. However, the meaningfulness of the variable will be verified after the test of significance. The value of those variables vary between continuous and dichotomous. Social variables such as age, household size, and education are categorized as continuous variables. Household size is measured by the number of family member living together under one roof of house. Data for education are the length of study in year. Meanwhile, several variables including mobility, social activity, and place of birth (origin) are dichotomous variables. Mobility is measured by traveling activities of respondents outside the area during the last three months. If respondent have traveled outside he/she is considered to have a mobility. Social activity is measured by the presence of respondent in various social activities in the area such as religious assembly (*majlis taklim*), gathering of citizens (*arisan*), and mutual cooperation (*gotong royong*). Respondents are distinguished by place of birth - born in the current area of residence and other areas.

Table 1: Variables Used in the Analysis

Variable Name	Definition	Mean	Standard Deviation
DESTRUCTION	DESTRUCTION = 1 if respondent carries out destructive practices to coral reef	.76	.426
PRAY	Number of pray in set of movement (raka'at) practiced by respondent in single day	14.29	7.085
INCOME	Total annual income of household (IDR)	4,912,836	6,855,255
MJOB	MJOB = 1 if respondent's main job is fishery	.33	.471
HSIZE	Respondent's household size	4.47	1.507
AGE	Respondent's age (in year)	39.22	9.470
ORIGIN	ORIGIN = 1 if respondent's place of birth in in the research site	.50	.501
EDUCATION	Respondent's length of study (in year)	4.42	3.633
SACTIVITY	SACTIVITY = 1 if respondent has participated in any social activity	.42	.494
MOBILITY	MOBILITY = 1 if respondent has left the research site during the last three months	.05	.225

b. Variables influencing the Destructive Practices to Coral Reef

Based upon the result of logistic regression analysis, the piety of respondent in performing ritual worship (pray) has influenced significantly the destructive behavior to natural resources and environment. It is indicated by the value of regression coefficient and the significance level. The negative sign of coefficient regression indicates that the piety of respondent in performing ritual worship has negative influence to the destructive behavior to natural resources and environment. The more devout people in performing ritual worship the less tendency people to destructive behavior to coral reef. The more devout people could be a result of a better understanding of the religion teaching and they are more willing to abide by the teaching. Respondents who perform ritual worship regularly can prevent them from taking action that can potentially destroy coral reefs. It has been verified by the level of significance and the value of standard error (α) at 5 percent. The result has proven that religious values play a significant role in influencing the way people behaves in their daily live. People who perform less ritual worship tend to take action that has negative impacts to natural resources and environment especially coral reefs.

Table 2: Probability of Household Carrying Out Destructive Practices to Coral Reef

Variables	Coefficient	Standard Error	Significance
PRAY	-.074	.035	.034
INCOME	.000	.000	.100
MJOB	-1.560	.406	.000
HSIZE	.315	.151	.038
AGE	-.046	.023	.047
ORIGIN	-1.042	.442	.019
EDUCATION	-.081	.060	.179
SACTIVITY	.002	.394	.996
MOBILITY	-1.380	.822	.093
Constant	4.596	1.309	.000
Number of Cases	207		
Chi-square	47.478		
Significance of Chi-square	0.000		
-2 log likelihood	178.003		
Dependent variable	DESTRUCTION (respondent carries out destructive practices to coral reef)		

From the two economic variables including in the model, only main job (MJOB) has significantly influenced to the behavior of people in dealing with their natural resources and environment at 5 percent of standard error. Meanwhile, INCOME variable has no significant impact to the destructive behavior of people at 5 percent standard error. It means that people who has primary job in fishery sector tend not to carry out activity that destroy natural resources and environment. Therefore, it can be concluded that people whose activity potentially destroys natural resources and environment are not fishemen. Fishermen are usually more aware about the role of coral reefs in the ecosystem of coastal area, which was shown in an earlier study as one of the significant factor (Afifi, 2003). Coral reefs are perceived as a habitat of fish. Thus, if we destroy them then fish will vanish and fishers cannot fish anymore. Finally, they will lose their source of income (livelihood). Therefore, they strive to prevent the existence of coral reefs.

Among six variables categorized as social variables, there are three variables (ORIGIN, HSIZE and AGE) have significantly influenced to the destructive behavior to natural resources and environment at 5 percent of standard error. Meanwhile, there is one variable (MOBILITY) has significant influenced at 10 percent. The other two variables including EDUCATION and social activity (SACTIVITY) have no significant influence to the destructive behavior of people to natural resources and environment especially coral reefs.

The differentiation between migrants and indigenous people is used to highlight the existence of two sets of people living in the area. About half of respondents can be perceived as indigenous and the rest are migrants. Based on the result of logistic regression analysis, the indigenous people tend not to take any action resulting negative effect to natural resources and environment. The sense of belonging from indigenous people to their environment is apparently higher than those that perceived as migrants. Indigenous people tend preserve their environment since it belongs to them and they live there for good.

The number household member can also influence the behavior of respondent. Respondent with higher number of household member are more likely to engage in any destructive activity. It is understandable since the needs of big household size are relatively higher than a small one. The limitation opportunities for livelihood in coastal area push them to do anything to fulfill their daily needs. Activities such as coral mining, blast fishing, and poisoning do not need high skill, so that everyone can involve in these activity without any certain

requirement.

The result of regression analysis shows that age can influence inversely the behavior of people to natural resources and environment. Young people are more likely to carry out any action that has negative impact to natural resources and environment. Meanwhile, old people are less likely to engage in those activities. Those activities require certain capabilities in term of power and endurance. To dig coral, it needs certain level of strength since it is not easy to separate a piece of reefs from their substrate. In any cases, older people are wiser so that they are aware that such activities are not morally accepted.

The last significance variable influencing the destructive behavior of people to natural resources and environment is mobility of respondent. Respondents who have left their home or travelled to outside their residence during the three months prior to the survey are less likely to engage in any destructive activity. By leaving their home for a certain period of time, respondents have opportunities to become acquainted with other cultures and situations. Through this acquaintanceship, they can either learn something or gain experiences to broaden their view and their view of live. This is considered as a mean of learning, thus it is expected to influence positively their behavior to natural resources and their environment. It can be concluded that mobile respondents are more likely not to engage in any destructive action carried out their residence.

4. Conclusions

Based on the analysis above there are some conclusions that can be drawn. *First*, the performing of ritual worship (pray) has significantly affected the destructive behavior of people to coral reefs. Worship practiced by people is potentially able to prevent them from doing destruction activities to coral reefs. The more devout people in performing ritual worship, the better the behavior of the people in dealing with human being and their environment as well. *Second*, only one variable of economic (main job) has significantly affected the destructive behavior of community to coral reef. Meanwhile variable of income does not have significant influence to the destructive behavior of people. People who work mainly as a fisher tend not to engage in activities damaging to coral reefs because they have better understand toward the existence of coral reef ecosystems. *Third,* social condition of households has significantly affected their destructive behavior to coral reefs. Several variables categorized as social variables have affected the destructive behavior of people including household size, age, origin, and mobility. Meanwhile, the other two variables including education and social activity have no significant influence to the destructive behavior of people to natural resources and environment.

Religious values and norms have contributed greatly to the creation of high human civilization since they encourage people to maintain their relationship with human being and their environment. Therefore, religious education should be carried out as an effort to improve the quality of our natural resources and environment. In addition, to stop destructive activities carried out by local people, government has to administer community capacity building program. Capacity building is an imperative measure to reduce human induces to natural resources and environment. Since people have no access as well as capacity to other alternative for livelihood, they undertake economic activities that have negative impact on the environment. Moreover, law enforcement is another important measure to reduce pressures on natural resources and environment. Law and regulation should be enforced consistently to provide both a deterrent effect on offenders and preventive effect against anyone who intends to carry out destructive action.

References

Afifi, M, 2003. Socio-Economic and Ecological Impacts of Coral Reef Management in Indonesia. Cuvillier Verlag Göttingen.

Cesar, H, 1996. Economic Analysis of Indonesian Coral Reefs. The World Bank and Environmental Sustainable Development Vice Presidency, Jakarta.

Djohani, Rili, 1998. “Abatement of Destructive Fishing Practices in Indonesia: Who Will Pay?,” dalam Hatziolos, ME; Hooten, AJ; Fodor, M, (eds): *Coral Reefs, Challenges and Opportunities for Sustainable Management*. The World Bank, Washington DC.

ICT: http://www.learn-ict.org.uk/projects/secondary/religion/christian.htm . Download August, 2011.

Jackson, BC, 1997. “Reefs since Columbus”. *Coral Reefs* **16:** 23–32.

Holy Bible, King James Version. http://www.biblegateway.com.

Holy Koran, Interpretation of the Meanings of The Noble Quran, Published by Dar-us-Salam Publications. http://www.dar-us-salam.com/TheNobleQuran/.

Mahasneh, Hyder Ihsan*, 2003*. "Islamic Faith Statement*". In* Palmer, Martin and Finlay, Victoria (eds): Faith in Conservation. The World Bank, Washington DC.

Mathew, Sebastian, 2001. "Sustainable Fishing in Coral Reefs: Social Dimensions", In Heidi Wittmer and Zien-Elabdin Hasan (ed)., Proceeding of the INCO-DEV International Workshop on Policy Option for the Sustainable Use of Coral Reefs and Associated Ecosystems. ACP-EU Fisheries Research Report No. 10, Brussels.

Ramly, Nadjamuddin, 2007. Islam Ramah Lingkungan; Konsep dan Strategi Islam dalam Pengelolaan, Pemeliharaan, dan Penyelamatan Lingkungan. Penerbit Grafindo Khazanah Ilmu, Jakarta.

ScienceDaily, December 16, 2010.

http://www.sciencedaily.com/releases/2010/12/101216111701.htm

Seenprachawong, Udomsak, 2001. An Economic Analysis of Coral Reefs in the Andaman Sea of Thailand. EEPSEA Research Report.

http://www.worldfishcenter.org/Pubs/coral_reef/pdf/section2-5.pdf

Suharsono, 1995. Kondisi Terumbu Karang di Indonesia Pada Umumnya dan Khususnya Pulau Lombok. Puslitbang Oseanologi – LIPI Jakarta.