What is the Relationship between Marine Protected Areas (MPAs) and Poverty in Indonesia?

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Rian Puspita Sari

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Members of the Examining Committee:

Dr. Natascha Wagner
Prof. Dr. Peter van Bergeijk

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Inquiries:

Postal address:
Institute of Social Studies
P.O. Box 29776
2502 LT The Hague
The Netherlands

Location:
Kortenaerkade 12
2518 AX The Hague
The Netherlands

Telephone: +31 70 426 0460
Fax: +31 70 426 0799

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List of Acronyms

BPS	Badan Pusat Statistik (Statistics Indonesia)
CBD	Convention on Biological Diversity
COP	Conference of the Parties
FEM	Fixed Effect Method
FIE	Food Energy Intake
GDRP	Gross Domestic Regional Product
HCI	Head Count Index
IUCN	International Union for Conservation of Nature
KKP	Kementerian Kelautan dan Perikanan (Ministry of Marine Affairs and Fisheries)
MMAF	Ministry of Marine Affairs and Fisheries
MPAs	Marine Protected Areas
OLS	Ordinary Least Square
UNCLOS	United Nations Convention on the Law of the Sea

Abstract

The main purpose of this study is to examine whether marine protected areas (MPAs) in Indonesia have an impact on poverty alleviation. It takes municipality and province as unit of analysis, and employs a panel data set from 2006 to 2010 for municipality level and from 2005 to 2010 for province level. In the estimation, there are 294 municipalities and 33 provinces are involved. The fixed effect model is employed in order to control for regional and municipality characteristics. As outcome variables different measures of poverty are considered and compared such as the poverty headcount index, the poverty gap, and the poverty severity. The primary independent variable is MPAs, which is defined using different definitions such as the share of MPAs, an indicator for the presence of MPAs, and the absolute size of MPAs. Population growth and GRDP growth are the other independent variables which control for regional socioeconomic characteristics.

The results show a significant impact of MPAs on poverty reduction. It is demonstrated by the negative relationship between MPAs and the poverty measures for almost all indicators of poverty and MPA definition. On average, protection of marine areas gives contribution on poverty alleviation. Beyond MPAs, this paper also confirms existing findings about poverty dynamics. Characteristics of the region, economic growth and population growth determine poverty considerably. Regarding economic growth, the poorer the area the more desirable the formation of an MPA.

Relevance to Development Studies

This paper is indicative of the importance of considering environmental factors in determining poverty. Efforts in sustaining the environment become more and more important in development policies. The formation of marine protected area is one of the policy implementations that might contribute to the regional development progress.

Keywords

Poverty, marine protected areas, MPAs

Chapter 1
Introduction

1.1 Background

The ecosystem is at danger to collapse. This issue was reported by the Millennium Ecosystem Assessment and it has become a big challenge, which is faced by the global community. The Millennium Ecosystem Assessment collected considerable evidence related to the collapse of ecosystems around the globe. Human activities, which have considerably increased in the past five decades, have changed biodiversity and they have changed the services of the ecosystem. This issue needs to be given special attention since biodiversity is very crucial for human well-being. It not only provides people's livelihoods, but it also contributes to "security, resiliency, social relations, health, and freedom of choices and actions" (Millennium Ecosystem Assessment 2005).

Some activities are advocated in response to the report regarding environmental degradation. One example of such a response is the formation of marine protected areas (MPAs). MPAs are considered, "as the simplest of marine management tools that can offer some of the highest gains"[1]. In the past several years, MPAs have been designated by many countries as suitable solution for several problems such as over-exploitation of marine resources and pollution, all of which lead to environmental degradation. Harrabin (2012) stated that "marine protected areas are heading for 10-fold rise within decade"[2].

Indonesia is a large maritime country, which has 310 million hectares of marine area, 17.504 islands, and about 95,186 km of coastline (Statistics Indonesia 2012). The country has been participating in establishing MPAs for conserving marine ecosystems. The government of Indonesia has been intensifying its efforts of conservation in order to implement the sustainable management of marine and fisheries resources for several decades (Kementerian Kelautan dan Perikanan 2008).

The reason for conserving marine areas in Indonesia is very plain. Almost one-fourth of the population of Indonesia lives at the coastal zones. The Indonesians rely greatly upon marine natural resources as they use those for their livelihood.

[1] www.marine-conservation.org
[2] www.bbc.co.uk

Therefore, sustainability is very important in order to assure the capacity of this environment to support further development and to enhance the well-being of coastal communities (Haeruman 1988).

Up to 2012, Indonesia has established 112 marine protected areas (MPAs) which have a total size 16.06 million hectares. The increasing size of MPAs in Indonesia is in line with the target of the Indonesian government to achieve 10 million hectares of MPAs by 2010 and 20 million hectares of it by 2020. This target has been stated in the Strategic Plan of the Ministry of Marine Affairs and Fisheries 2010-2014 (Ministry of Marine Affairs and Fisheries 2010).

Conserving nature is important. However, this is not the one and only issue, which needs attention. In emerging countries such as Indonesia, there is another challenge, which has to be tackled. It is poverty. Combating poverty has been a big concern in most developing countries for several decades. Especially, as the objective number one of the Millennium Development Goals, poverty alleviation is desired to be achieved by all member states of the United Nation by the year 2015. Therefore, all sectors are urged to contribute to poverty reduction (Roe and Elliott 2005:3) since most people agree that poverty alleviation is a central objective of economic development (Ray 1998:249).

Environmental sustainability, conservation efforts, and poverty alleviation seem to be issues that cannot be separated when jointly aiming for conservation and development. There is more than one concept in the literature related to the link between conserving the environment and reducing poverty. Some people argue that tradeoffs between poverty reduction and environmental improvement are inevitable, while others claim that under certain conditions there are possibilities for poverty alleviation and environmental protection to reach a win-win situation (Gjertsen 2005:199).

Regarding those conditions, establishing MPAs has challenged Indonesia to cope with two vital issues. There is the big question whether the establishment of MPAs in Indonesia can trigger both conservation and development goals as it was stated during the 7th meeting of the Conference of the Parties (COP7) to the Convention on Biological Diversity (CBD) in 2004. "Protected areas should be committed to reduce biodiversity loss and contribute to poverty reduction and the pursuit of sustainable development" (UNEP-WCMC 2008).

1.2 Research question

The objective of this study is to examine the relationship between MPAs and poverty in Indonesia. In order to obtain this objective, this study addresses the question about the nature of the relationship between marine protected areas (MPAs) and poverty in Indonesia. Based on the current literature it is not clear whether a positive or negative correlation exists between MPAs and poverty. Therefore, the case study at hand is presented.

The rest of the paper is organized as follows: Chapter two highlights the literature on MPAs and poverty, the theoretical set up, and some existing evidence. Poverty and MPAs in Indonesia are discussed in chapter three. Data and methodology are described in chapter four. Chapter five presents the results and a discussion of this study. Finally, chapter six gives a conclusion.

Chapter 2
Literature Review

This chapter will explore the general theory about poverty and marine conservation. First of all, it will discuss the concept of poverty and poverty measurement, marine conservation in general and the history of the establishment of marine protected areas in Indonesia. Then, the link between marine protected areas and poverty will be introduced. Finally, this chapter will provide empirical findings from previous studies.

2.1 The concept of poverty and poverty measurement

The terminology of poverty is defined in several ways (Lawson et al. 2012) and it ranges from the purely financial dimension to a multidimensional one beyond the focus on income. In terms of income, a poor person is defined by the World Bank as someone who is chronically poor and has less than one dollar of income a day. This definition relates to the ability of a person to fulfill his or her daily physical needs. The World Bank also defines poverty as "a condition of life so characterized by malnutrition, illiteracy, and disease as to be beneath any reasonable definition of human decency." From the definition above, we understand that poor people cannot only be helped by increasing their income, but also by focusing on other aspects that constitute their living conditions and livelihood decisions might help them; for instance, by increasing the opportunity of poor people to get access to education, healthcare, or assets for supporting their livelihood (Roe and Elliott 2005).

Since concept of poverty should cover all most important areas, the OECD Development Assistance Committee (2001:37) defined five core dimensions of poverty related to different capabilities of individual and household. These are economic capabilities, human capabilities, political capabilities, socio-cultural capabilities, and protective capabilities.

A change in the understanding of poverty is also noted by Bass (2005). The notion of poverty, which was seen and measured only by outcome, has shifted to an understanding, which sees and measures the factors supporting such outcomes "(e.g. lack of income, assets, civil and political rights, voice, and rule of law and services, including safety net). A significant part of this change has been to incorporate environmental and political aspects within the definition of poverty" (Ibid). If definition and measurement of poverty focus on individuals or households, we cannot see the link between poverty and the environment. Since

the understanding of poverty has shifted to wider aspects, with one of them relating to assets, environmental aspects can be incorporated if we relate the fact that most of the poor people depend highly upon natural resources for their basic needs. This shift "has major implications for poverty and environment linkages. It highlights the importance of increasing access to (environmental and non-environmental) assets in reducing poverty, and how a lack of access to assets will underpin poverty" (Ibid).

Causes of poverty vary widely. It could be caused by individual, household, community, or regional characteristics (World Bank 2005:125). Individual characteristics are age, education, employment status, health status, and ethnicity. Household characteristics can be determined by the size of the household, dependency ratios, gender of the head, assets, employment, income structure, and average health and education of the household members. Characteristics of the community are given by infrastructure, land distribution, access to public goods and services, social structure and social capital. Regional determinants of poverty are, for example, isolation or remoteness, resource base, weather and environmental conditions, regional governance and management, and inequality (Ibid: 127).

People are considered as poor when their consumption is below the poverty line (Miranti 2010:80). The estimation of the poverty line that is used by Statistic Indonesia were based on the food energy intake (FIE) method, that is "calculated using an expenditure of 2,100 calories worth of food per capita per day, plus some essential non-food allowance" (Suryahadi et al. 2012:6). Populations who have an average expenditure per capita per month below the poverty line are identified as poor people (Statistics Indonesia 2012).

There are different ways of measuring poverty. Indicators of poverty can be expressed in the poverty head count index (HCI) that will be denoted by P_o, the poverty gap index (P_1), and the squared poverty gap or poverty severity index (P_2). The head count index is the percentage of the population below the poverty line. The assumption behind this measurement is that all the poor are at the same level of welfare. The poverty gap is the average gap between the living standard of poor people and the poverty line. In deciding policies related to poverty, this index is often used (Nallari et al. in Farwati 2012). Finally the squared poverty gap aims at addressing the severity of poverty by giving more weight to individual and households that are further away from the poverty line.

2.2 Poverty, environment, and conservation

The literature points out different factors and variables that determine poverty: education, unemployment, human capital, ethnicity, migration, economic growth, geographic location, environment degradation, and so on.

Several studies focus on the relationship between poverty and environmental degradation. Some argue that poor people cause degradation of the environment since they depend on natural resources for their livelihood. On the contrary, some others claim that environmental degradation lead to acute poverty since the environment's ability tends to decrease in providing for the basic needs of the poor people. Indeed, the link between environmental degradation and poverty is still a debated one (Duraiappah 1996).

Those two issues above are big challenges for poverty advocates and conservationists in order to explore the linkage between the two. The association between conservation and poverty is not a new hypothesis, the relationship is obvious. In fact, there might be a two-way relationship that considers the impact of activities of conservation on poverty as well as the role of poor people in conservation efforts (Roe and Elliott 2005). Conservation activities might reduce the number of poor people directly by giving opportunities to poor people to get higher incomes. Yet, conservation activities might hurt poor people by limiting their access in utilizing natural resources. Another side of the coin is the role of poor people in affecting conservation activities; it is not clear whether they might reduce or enhance the efforts of conservation (Ibid: 6; Sims 2010:3).

However, the perception that the poor degrade the environment is likely to be overturned since an important strand of the literature claims that environmental degradation might be caused by other factors. Evidence shows that several decades ago, in most developing countries, poverty levels were higher and nature was not too much degraded. Nowadays, there is a considerably decline of poverty levels in most developing countries and the nature is reported to be in danger to collapse. It seems sensible to look at other factor that might affect environmental deprivation besides poverty. In the case of fisheries resource, for example, mechanized destructive fishing gears, not the poor fishermen, are the main cause of over-exploitation of resources (Nadkarni 2000).

Moreover, one study claims that poor people are concerned about the sustainability of natural resource for their future. "Where the poor appear to degrade the environment, it is basically because of lack of incentives and appropriate institutions, including lack of clarity on property rights" (Prakash *in*

Nadkarni 2000). Another study also informs that poverty is rarely a major cause of environmental degradation (Bass 2005).

It seems that the poor cannot be blamed as main cause of environmental degradation. There are other aspects we need to be concerned with related to the poor and environmental changes. Since the poor depend upon natural resources for their livelihood, they are also very vulnerable to environmental changes that are either natural or man-made. Even, the Stockholm Conference on Environment and Development (1972) considered "poverty as the worst form of pollution" (Ibid).

Development project often have externalities that affect a number of people harmfully. Some projects related to environmental improvement often face dilemma. Wildlife conservation, for example, with its aim to improve the quality of the environment, is expected has potential deteriorating poverty (Nadkarni 2000).

As conservation activities are expected to cause harm in some communities, the worthwhileness of such projects has to be assessed taking into account the interests of the affected community.

It is argued in the literature that conservation activities should not harm local communities and their neighbors who are poor and depend upon the resources and services of the environment under protection to fulfill their basic needs. IUCN as cited in van Beukering et al. (2007) recommend that protected areas contribute to poverty reduction:

> "Protected areas should strive to contribute to poverty reduction at the local level (either directly or indirectly), and at the very minimum not create, contribute to, or exacerbate poverty. In order to achieve their potential both to conserve biodiversity and to assist in reducing poverty, protected areas should be integrated within a broad sustainable development system; and knowledge about the linkage between protected areas and poverty needs to be improved".

Some researchers argue that poverty of coastal communities, particularly those faced by fishers, is caused more by socioeconomic factors related to characteristics of natural resources and technology used. "Fixity and rigidity of fishing assets, low opportunity cost, and preference for a particular way of life" are the main issues of coastal poverty (Kementerian Kelautan dan Perikanan 2012). Poverty is a critical socioeconomic problem in most coastal communities and it is related to their dependence on natural resources. In addition, access to

data of coastal poverty in detail remains a challenge (Lawson et al. 2012). This is where the study at hand contributes as we have a large dataset about Indonesian municipalities.

2.3 Marine protected areas and its social impacts

Marine protected areas, can be considered a simple tool of marine management. They are defined as "any area of intertidal or sub tidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (IUCN in Mascia and Claus 2009).
Since conservation "is often synonymous with protection or preservation of selected range of, often endangered, species and habitats rather than broad scale resource management" (Roe and Elliott 2005:4), marine protected areas (MPAs) are, indeed, habitat and species protection. Therefore, MPAs are expected to act as bank resource of fisheries, which can support an enhancement and sustainability of coastal communities' subsistence, particularly those of fishers. MPAs should not act as no take zone, yet it is a balance of conservation efforts and sustainability of utilization. Each stakeholder has the same proportion of responsibility to the MPAs discourse (Kementerian Kelautan dan Perikanan 2008:77). MPAs have been an effective tool in protecting biodiversity of marine and coastal areas, and sustainable utilization of natural resources such as fishery catch and tourism (Ibid: 87).

Marine protected areas (MPAs) are recognized as one of the "most significant new ecosystem-based management approaches"; it is a management tool as a result of a process of decision making which involves institutional interests between "resources users, stakeholders, local government, local people, national government, and international agencies" (Pomeroy et al. 2007).

Environmental impacts of MPAs are relatively well recognized (Halpern 2003); however, the social impacts of MPAs are not easy to be understood and its analysis is relatively narrow (West et al. 2006). It should be noted that the sociocultural dimension of MPA performance has not been well studied (Pomeroy et al. 2007:1). Marine protected areas, as a popular strategy in order to manage fisheries and conserve biodiversity, are increasing in number and size worldwide. However, their contribution to poverty reduction and sustaining development remains contested (Mascia and Claus 2009).

Some claim (Roberts et al. as cited in Pomeroy et al 2007; Leisher et al. 2007) that MPAs offer a win-win strategy that allows to conserve biodiversity and to decrease

poverty. Others criticize this line of reasoning and argue that MPAs frequently place ecological interests and local people importance disproportionately (Paddock 2006; West et al. 2006). Therefore, the impact of MPAs on human well-being is a scientific question of critical policy importance (West et al. 2006; Mascia and Claus 2009).

One of the critics highlighted the impact of MPAs rights displacement. Focusing on rights reallocation, rather than displacement, "MPA rights reallocation may affect the governance, economic well-being, heath, education, social capital, and culture of resource users, local communities, and other social groups" (Mascia 2004). Those individual and groups might lose their rights and ownerships due to the establishment of marine protected areas. Resource control also will be affected by the reallocation of rights (Ibid).

2.4 Theoretical set up

The huge literature on poverty reduction took the stance that poverty is a hindrance for development. The causes of poverty are linked to several identifying factors that could potentially elevate or reduce poverty. At the regional level, poverty depends upon natural, social, human, financial, and physical capital (Kristjanson et al. 2005). In Indonesia, explosion of the population, economic performance, human capital, physical capital, and financial capital are several regional aspects that are predicted to play a role in changing the incidence of poverty within a region (Aritenang 2008).

The dependence of the poor upon natural resources cannot be denied since they rely highly on utilizing natural resource in their surroundings. Thus, efforts for conserving natural assets seem an important factor in influencing the poor. The establishment of marine protected areas, for instance, is one of the conservation activities that are expected to contribute to poverty reduction (Badalamenti et al. 2000; van Beukering et al. 2007; Anna 2008).

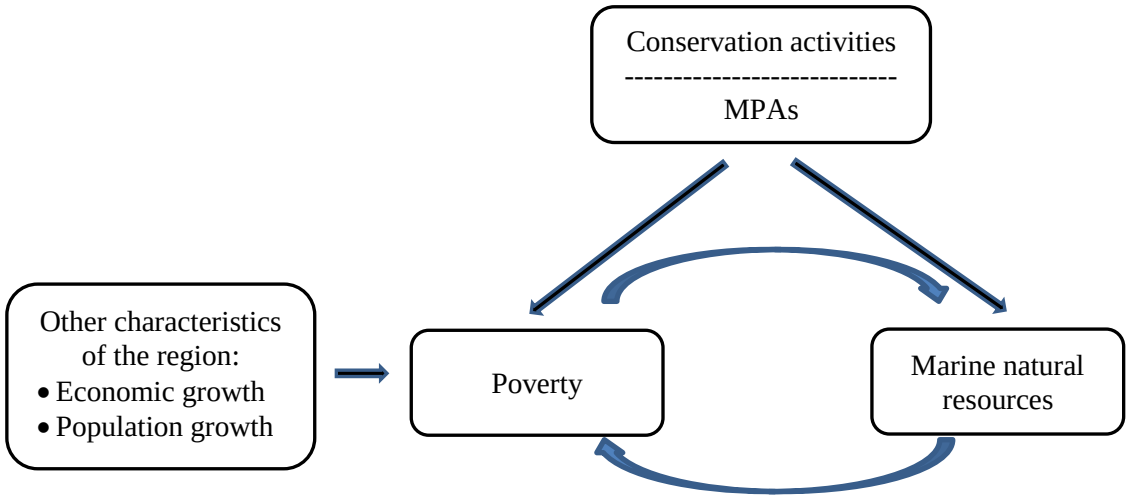
The literature on marine protected areas takes the view that the establishment of MPAs may be good or bad for the poor. By restructuring the link between marine environment and people, marine protected areas have direct and indirect effects concerning the advantages of marine environments and the gains of social group (Mascia 2004). MPAs are a simple tool for conserving marine resources and they might give a contribution to alleviating poverty. MPAs have the ability to increase the total catch through spillover of fish abundance from no take zone areas. In addition, they have the potential to generate alternative incomes for the poor through the tourism sector (Sanchirio et al. as cited in Pomeroy et al. 2009).

As one of the ecosystem-based management approaches, MPAs take into account the relationship between environment and people. The establishment of MPAs has the purpose to manage the behavior of people in utilizing coastal and marine resources. Thus, "MPAs performance is directly linked to human behavior and human want them to perform. MPAs are directly linked to the socioeconomic environment in which they operate" (Bromley as cited in Pomeroy et al. 2007).

Obviously due to a linkage between human being and nature, people affect and are affected by the MPAs. Yet, since MPAs have a considerable impact on the behavior of human being in their use of marine natural resources, a key issue now is to understand how MPAs perform and how they affect human (Pomeroy et al. 2007). As a big maritime country, the approach of designating MPAs is important for sustaining the marine environment in Indonesia in order to tackle degradation of the environment, which has received considerable attention during the last decades. Since almost one fourth (MMAF 2011) of the Indonesian population depends highly upon marine and coastal resources, we can now analyze to what extent poverty is affected if there is an effort for conserving natural resources.

To sum up, Figure 2.1 draws the link between marine natural resources, the poor, and conservation activities. MPAs are expected to have an impact on poverty measures since they involve regulations about the management of marine natural resources, on which the poor in term depend.

Figure 2.1
The link between MPA, marine natural resources and regional poverty



Besides regional characteristics such as economic and population growth, an important aspect that is expected to contribute in reducing poverty at regional level is natural resources. Since, in fact, the poor highly rely on natural resources, an effort to conserve environment, such as marine protected areas approach, is expected to have an impact on poverty measure at regional level.

2.5 Empirical evidences

Several studies show that marine protected areas (MPAs) can have quite different impacts on poverty alleviation. A study conducted by Silva (2006) examined the linkage between poverty, MPA management and destructive fishing gears in Tanzania. This paper attempted to assess whether alternative income generating activities as a component of MPA management strategies may reduce the pressure on fishing and address poverty concerns. The empirical analysis was based on household survey data from a sample of villages located along the coast of mainland Tanzania and Zanzibar. This paper made a contribution in examining the relationship between characteristics of the household, activities in marine protected areas, and household choice in using fishing gears. The results show that there was not direct impact of marine protected areas on local people in using destructive fishing gears. However, there was a positive linkage between some aspects of poverty and the choice of fishing gear (Ibid). Underlining the role of MPAs that restrict access of fishers in fishing, it looks as if there is an effect of MPAs establishment on poverty.

Badalamenti et al. (2000) examined the impact of Mediterranean marine protected areas on cultural and socio-economic factors. They reviewed the data on MPAs in Greece, Spain, Italy, and France. Lack of data on the social, cultural and economic factors related to Mediterranean MPAs is one of the obstacles in the development of those MPAs. The size of the population and the culture and traditions are important factors to be given attention to in assessing the socio-economic impact of protected areas. Existence of MPAs could help communities through the tourism sector. In their study, Badalamenti et al. found that, in general, tourism is seen as potential source of livelihood. However, the impact of growth of the tourism sector has become a new issue to be concerned with. Another observation is that there was an increasing number of fish catches by fishermen. Significant increases in the biomass of fish might come from the no-take zone areas of MPAs. In addition, the authors noted that the impact of marine protected areas varies across regions. Specific characteristics of each region may give different results.

A similar result was also found by Mascia and Claus (2009). In order to provide scientific information for policy making and to further study MPAs, they reviewed the scientific literature of MPAs and studied the impact of the installation of

marine protection on coastal communities with respect to five indicators of social well-being, which are frequently studied. These are "food security, employment, community organization, income, and resource control" (Mascia and Claus 2009). The authors listed 21 works from various sources based on three important points: (i) Evidence on the conditions of MPAs, before and after installation or inside and outside areas; (ii) Information on groups who use the resources; (iii) And information on social impacts of MPAs. Biological factors were excluded.

Based on their review the result shown that MPAs "shape the social well-being and political power of fishing communities" (Ibid). The establishment of marine protected areas might represent a sustainable approach in order to improve food security and to empower local people. Since MPAs alter the rights of fishing communities, competition for fishing decreased. Thus, the establishment of MPAs helped increase food security for particular groups. The negative and positive effects of MPAs, according to their results, differ within and among social groups. Nevertheless, currently, MPAs affect small scale fisheries negatively.

A different investigation was conducted by Gjertsen (2005). While the previous study excluded the biological aspect, this paper examined the effect of marine protected areas on both biological and socio-economics aspects. This research examined whether MPAs in the Philippines promote a win-win goal between coral reef health and poverty. Biological indicators were given by the health status of the coral reefs in protected areas. The human wellbeing indicator used is nutritional status of children. The study involved 40 MPAs located in 29 municipalities in four provinces which were established during 1986-1997. All of the MPAs contain coral reefs. They expected that the larger MPAs would give bigger effects on biological and human welfare indicators. Yet, the study did not reveal any significant output that showed that the creation of MPAs could achieve both goals. At the same time, there was a significant statistical result that showed the positive effect of MPAs on the health of coral reefs. However, no result was found of the installation of MPAs on human welfare. An important point is that a dummy for the region and regional finances were included in the assessment: Funding for conservation activities might compete with projects for regional development such as infrastructure, education, and health facilities.

Chapter 3
Poverty and Marine Protected Areas in Indonesia

3.1 Poverty in Indonesia

Poverty in Indonesia, which has been combated for decades, has been shown a decreasing trend during the period 1976 to 2009. It decreased from 40.1% to 15.4%. In the period 1996 to 1999, the figures were less favorable due to the crisis which hit Indonesia and caused a sharp decline on growth (Miranti 2010; Teguh and Nurkholis 2011). During this period, poverty rose from 17.47% to 23.43%. In 2012, there were 28.59 million poor people in Indonesia which amount to roughly 12 of the population of Indonesia (Badan Pusat Statistik 2013).

The policies of poverty reduction in Indonesia have shifted from a macro top-down approach to a community or household participatory approach that employs joint projects at the local level in different sectors such as education, financial services, and health. Nevertheless, those policies are still debated concerning their effectiveness (Teguh and Nurkholis 2011).

Several studies examine the determinants of poverty in Indonesia. The impact of growth on poverty may vary at the national and the regional level and also across time due to different economic conditions and policies implemented (Friedman 2003). Similarly, variations across sectors are observed. Before and after the Asian Financial Crisis, service sector is the greatest contributor to poverty alleviation. Industrial sector growth has shown inappropriate results for poverty alleviation after the crisis even this sector is the second main contributor to GDP. (Suryahadi et al. 2012).

Evidence shows that decentralization in Indonesia, which has been implemented since 1999, has created greater disparities among provinces and municipalities. This, in turn, influenced the level of poverty in each region (Aritenang 2008).

Indonesia has 497 municipalities of which almost 66% are located at coastal zones. Around 32% of the people in the coastal municipalities live below the poverty line[3]. This demonstrates that poverty is a crucial problem for coastal communities in Indonesia. However, the lack of disaggregated data covering coastal communities remains a central limitation to studies of coastal poverty in Indonesia. Particular census or survey data are required to provide information

[3] The data from Directorate PEMP 2006 in KKP 2012

about the socioeconomic condition of fishing households (Kementerian Kelautan dan Perikanan 2012).

3.2. Why MPAs?

In recent years, the establishment of marine protected areas has been all around the world (Dixon and Sherman 1991). Preservation of the nature is the primary objectives of marine protected areas (Agardy 1993) through some efforts are made to protect species (Stoner 1996), "threatened environments"(Rubies and Limousin 1990), and biodiversity. In addition, MPAs nowadays play a role beyond these primary purposes. In and around MPAs new activities can be launched that can be valuable for the economy (Farrow 1996). Concomitantly, MPAs constitute a new arena for the interaction between human being and the institutions surrounding them (Caldecot as cited in Badalamenti et al. 2000).

Some efforts are required to sustain natural resources. These efforts involve changes in the management of marine natural resources. These changes concern the objectives, approaches and policies of fisheries resource management. It shifted from maximizing catches to sustaining stocks and ecosystems, and from maximizing the interest in the short term to both short and long term interests. It also changed the conventional management, which focused on species-based management into conservation and ecosystem-based management. The marine ecosystem is a system that builds on the interaction between nature as provider and humans as user. MPAs, which operate by setting limitations to or eliminating human activities, affect the socioeconomic environment directly. MPAs are planned in order to manage human behavior in utilizing marine and coastal resources (Pomeroy et al. 2007:2).

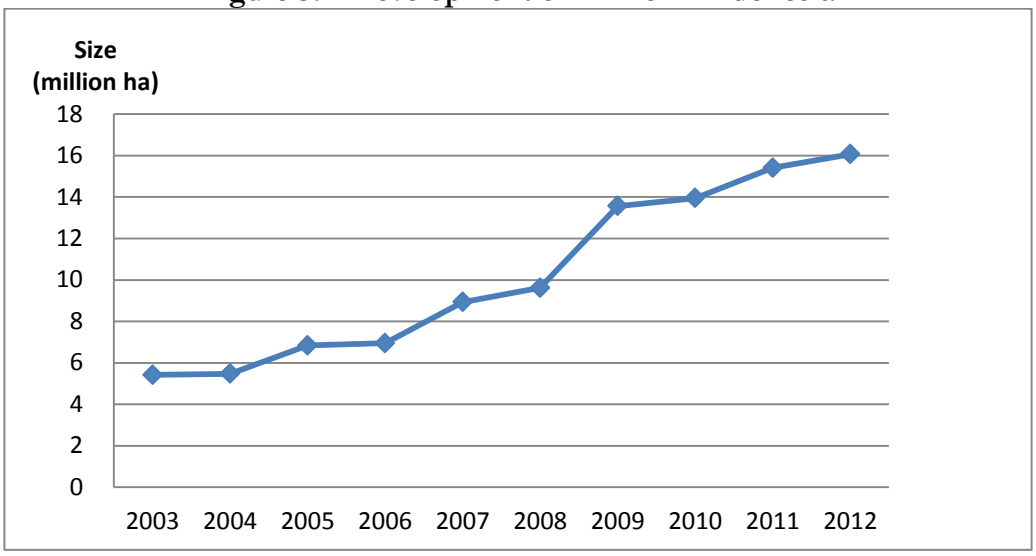
Indonesia, ratified by the United Nations Convention on the Law of the Sea (UNCLOS) in 1982, is the biggest archipelago in the world (Kementerian Kelautan dan Perikanan 2012). Two thirds of its area is covered by water. Indonesian marine fisheries could give 6.5 million ton /year of which 5.03 million ton/year that have been already utilized. Sustainability of this resource is a concern since this resource is not only a livelihood source for almost one fourth of the Indonesian population, but a source of food also for all Indonesian people[4].

The importance of marine resource in Indonesia cannot be neglected. Thus, sustaining this resource is crucial. Indonesia has been designating marine protected areas for several years. Up to 2012 Indonesia has established 112 MPAs with more

[4] www.kkp.go.id

than 16 million hectares of size (Figure 3.1.). The total size of MPAs almost tripled between 2003 and 2012 (Kementerian Kelautan dan Perikanan 2012).

Figure 3. 1 Development of MPAs in Indonesia



Source: Kementerian Kelautan dan Perikanan 2012

3.3 Historical background of conservation activities and marine protected areas in Indonesia

The history of conservation began during the occupation of the Dutch in Indonesia in 1714 when Cornelis Chastelein donated his six hectares of land at Banten to establish nature reserve. In the early 1841, the government of the Netherlands issued regulations on the conservation of nature in the occupied territory of the Dutch East Indies. Cibodas is the first nature reserve, which was declared by the Director of the Bogor Botanical Garden with the aim to preserve the forest and its flora and fauna.

In addition, existing evidence suggests that conservation activities in Indonesia had already been undertaken for a long time before the Dutch occupation started. Already before the colonial period, many Indonesian kingdoms and sultanates declared reserved areas as kingdom lands. Several activities regarding sustainable utilization of natural resources were implemented. For instance, one can find "Sea Commander (panglima laot) in Aceh, the river protected area (lubuk larangan) in Sumatera, *Kelong* in Batam, *mane'e* in North Sulawesi, *sasi* in Maluku and Papua, and

awig-awig in Lombok" (Haeruman 1988: 220 ; Kementerian Kelautan dan Perikanan 2008) .

A regulation for marine protection was formally provided in 1920 when the regulation on fisheries was enacted with the purpose to protect fishery resources and ban fishing using toxic materials, anesthetics, and explosive material. Further steps were then taken in order to support protection of marine ecosystems. Proposals to promote marine ecosystem conservation were developed at the First National Parks Conference, which was held in Seattle, USA in 1962. Then, these proposals were further developed at the second conference in 1972. In 1975, the proposal for the establishment of marine conservation areas was discussed in Canada. After the first marine conservation area, Cagar Alam Banda National Park, was established in 1976, there was a workshop on protection and conservation of nature that was held in Bogor Indonesia in 1977. Then it was followed by the workshop on marine conservation in 1978 at the same city.[5]

An important year for conservation was 1984 when the Directorate General for Forest Protection and Nature Conservation (PHPA) of the Ministry of Forestry released the National MPAs system as a framework for marine protection selection areas and started its activities in order to develop the MPAs in Indonesia. In 1986, Indonesia had already more than 400.000 hectares of marine reserves (Kementerian Kelautan dan Perikanan 2008:25).

The importance of marine resources for development was stated in the State Policy Guidelines (GBHN) in 1988, which explained the importance of proper management of marine resource for sustainability of the ecosystem. Conservation activities in Indonesia are also supported by the Law No. 5 of 1990 which has shifted the conservation paradigm from an area reservation emphasis to the conservation of ecosystems, species and genetic (Ibid: 26)

The Directorate for Conservation and Marine National Park, which was renamed into Directorate for Conservation and Fish Species, and is part of the Ministry of Marine Affairs and Fisheries, has the duty to improve the sustainable fishery resource management through MPAs and to develop concepts of conservation. Yet, in the process of managing the MPAs in Indonesia, the Law No.60 of 2007 gives local governments the authority to develop aquatic conservation areas called Regional Marine Protected Areas (Regional MPAs). Local government participation can be seen in the establishment of a number of Regional MPAs. In 2008, at least 31 regional MPAs were declared with a total size of about 3.9 million hectares. Indonesia has achieved more than 13 million hectares of MPAs by 2010,

[5] http://kkji.kp3k.kkp.go.id

and has targeted 20 million hectares by 2020 (Kementerian Kelautan dan Perikanan 2012).

According to the Government Regulation of the Republic of Indonesia No.60/2007 regarding Fishery Resource Conservation (MMAF 2009), the different types of aquatic protected areas are defined as follows:

> "Aquatic National Park refers an aquatic conservation area, with its original ecosystem, established for the purpose of education and scientific research as well as activities supportive to sustainable fishery management, aquatic tourism and leisure.
> Aquatic Protected Area refers to an aquatic conservation area, with characteristic features, established for the purpose of protecting the diversity of fish species and leisure.
> Aquatic Tourism Park refers to an aquatic conservation area created for the purpose of aquatic tourism activities and leisure.
> Fishery Protected Area refers to a specific aquatic area, be it fresh, brackish or sea water, with specific condition and features, serving as a nursery ground/feeding ground for a specific species of fish, established to serve as a protected area".

Up to 2010, there are 8 Aquatic National Parks, 58 Aquatic Protected Areas, 17 Aquatic Tourism Parks, and 4 Fishery Protected Areas. They are spread in 82 municipalities in 27 provinces (Figure 3.2).

Figure 3. 2 The distribution of MPAs in Indonesia

Source: Kementerian Kelautan dan Perikanan (2012) scale: 1: 1,000,000

The distribution of MPAs (Figure 3.2) is shown by the blue sign. The total size of MPAs, up to 2010, is about 4.5 percent of total marine area of Indonesia. The highest percentage is in the Eastern part of Indonesia, particularly in Nusa Tenggara Timur and Papua.

3.4 How do MPAs contribute to poverty alleviation?

This section provides an overview of existing evidence for some areas in Indonesia showing that the establishment of MPAs has contributed to increasing the welfare of local communities.

The most important economic revenues, which are provided by MPAs, are the protection of fishery resources associated with breeding, nursing, and recruitment habitat (Badalamenti et al. 2000). MPAs also contribute to improving the economic condition of communities adjacent to MPAs through tourism activities. Since ecotourism is a sustainable way of understanding tourism activities, it does not negatively impact marine and coastal ecosystems (Agardy 1993).

Spill-overs from the no-take zones of the MPAs provide increased catches for fishermen (Leisher et al. 2007). After ten years of establishment, fishermen in Seribu Islands National Park enjoy an increase in production. In the high season, fishermen gain 327.360 million kilograms. These catches are higher than those without MPAs which amount only to 278.257 kilograms. And also in the low season, differences exist between areas with and without MPAs (Anna 2008).

The community of Bunaken National Park had the same experience. Their perception of the existence of MPA is positive. An increase of fish has increased their earnings. They noticed an abundance of fish supply due to the effect of spillover from the MPAs' no-take zones (van Beukering et al. 2007)

The evidences presented above shows the benefits derived from the establishment of MPA in two marine national parks in Indonesia. Inhabitants of those national parks not only enjoy benefits from abundant fish caught, but also receive revenues from tourism activities in their areas.

van Beukering et al. (2007) conducted a study to examine the contribution of MPAs topoverty reduction in Indonesia. The Bunaken National Park is study site. Bunaken is located in Manado, at the Northern Sulawesi Island, and has about 30,000 people who live in the 22 villages inside the national park. They depend upon fishing and farming as their mode of subsistence. However, recently, tourism has become an alternative source of income since Bunaken attracts tourists with offers of coral reef diving and due to its diversity of marine life.

Located at the heart of the coral triangle, this MPA is one of the famous marine tourism destinations in Indonesia. The tourism industry in this area has been growing about 10-15% per year and has helped the community directly and indirectly. Thirty percent of the entrance fees to the park go to the community for developing its activities. The national park has also provided the opportunity to diversify the livelihood of the people. The park has employed about 80% of the local people to work as tourism operators; other generate their income through sales of souvenirs and other products such as handkerchiefs, fruits, and fish (van Beukering et al. 2007).

Poverty in sub districts of Bunaken was reported to vary substantially. The poverty rate on several islands was approximately 30 percent based on the national poverty line of 2004. While in the sub-district nearby Manado city, the rate of poverty was not higher than 10 percent in the same year (Ibid).

The research by van Beukering et al. comprised a qualitative and quantitative assessment. Data came from focus group discussions and interviews at the community level, which involved 299 interviews in and around Bunaken National Park. Selected villages were chosen as representative of Bunaken's population and control villages which have similar characteristic as the MPA villages. Based on the hypothesis that there was possibility of differences between poverty levels within MPA and non-MPA areas, this research build a comparison between those areas. In order to examine the role of MPAs on reducing poverty, this research tested the determinants of monthly income. A multiple regression framework was used by employing different characteristics such as MPA/non-MPA, fishing activities, tourism activities, age of respondent, education of respondent, and the average age of children as dependent variables.

The result of the focus group discussion and interviews showed that the association between the establishment of MPAs and poverty reduction is positive. The quantitative assessment shows that there is no statistically significant difference in income of fishers in MPA and non-MPA areas. However, their time spent for fishing is different for roughly the same amount of income. The MPA fishers spend less time for fishing since they have additional jobs in the tourism sector. "So the MPA fishers are better off because of the MPA" (Ibid).

Seribu Island's coastal community also gains from the installation of marine protection areas. Seribu Island (means thousand islands), located in the north of Jakarta, is a chain of hundreds of small islands. Result of a study by Ana (2008) showed that there are two major benefits for the community from the protection of marine areas; (i) abundance of fish caught, as mentioned above, and (ii)

alternative livelihood through tourism activities. The community obtains profits from entrance fees and taxation, for example. In general, this MPA currently acts as an engine of local economic growth (van Beukering et al. 2007).

Another example that shows the contribution of MPAs in accelerating the welfare of the local community can be seen in the case of Raja Ampat MPA. Located in Papua Island this MPA "lies within the Bird's Head Seascape at the heart of the Coral Triangle, [and] this area covers around 4.5 million hectares of ocean, small islands, and coral reefs" (Agostini et al. 2012). Conserving Raja Ampat's marine area is not only of national importance, but also globally. This area is known as "critical habitat for threatened marine species, and is a cetacean migratory corridor and the world's most diverse coral reef" (Ibid).

Raja Ampat is an evidence of success of an MPA that combines conservation, tourism and economic activity through a program called COREMAP. The acronym stands for Coral Reef Rehabilitation Management and Programme. This area has enjoyed the benefits of MPA creation. The environmental indicator showed a 30 percent increase in four years. The village development is supported by a Village Grant, which is managed by a local organization[6].

[6] http://kkji.kp3k.kkp.go.id , accessed on July 2013

Chapter 4
Data and Methodology

4.1 The data

The units of analysis of this study are the municipality and the province. By 2010, there are 33 provinces in Indonesia, which cover 497 municipalities of which 317 of them are coastal municipalities. This study involves 294 coastal municipalities, which are covered in 33 provinces. Some municipalities are new. Therefore, in this study, we need to exclude 23 coastal municipalities. Their data are cannot be conveniently included in the empirical model since they were formed after 2005. This paper uses panel data from 2006 to 2010 for the municipality level and data from 2005 to 2010 for the province level.

4.1.1 Marine protected areas (MPAs)

By the year 2010, there are 87 marine protected areas (MPAs) in 82 municipalities which are located in 27 provinces. The total size of MPAs is more than 13.95 million hectares which is about 4.5 percent of the Indonesian marine area. As primary information, the data of MPAs in this paper draws on a database[7] and published books by the Directorate for Conservation and Fish Species of the Ministry of Marine Affairs and Fisheries of Indonesia. The MPA data contains the year of establishment, size of area, biological characteristic, and socioeconomic condition.

In the process of establishing an MPA, supporting data with information about the area, which is proposed to be protected, is needed then, the data is compiled as database, which is provided by the Directorate for Conservation and Fish Species.

4.1.2 Poverty indicators and control variables

Indicators of poverty are considered as outcome variables in the empirical model and were calculated by Statistic Indonesia (Badan Pusat Statistik –BPS Indonesia). In the analysis we use the data that were collected through the National Socioeconomic Survey (SUSENAS). The method to estimate the poverty line is the Food Energy Intake (FEI) method and the poverty line is "calculated using an expenditure of 2,100 calories worth of food per capita per day, plus some essential non-food allowances" (Statistics Indonesia 2013). Indicators of poverty involved in this study are the Head Count Index (P_0) which reflects the percentage of poor people living below the poverty line, the poverty gap (P_1) which is the average gap

[7] Accessed on June 2012

between the living standard of poor people and the poverty line, and poverty severity (P_2) which is distribution of expenditure among the poor[8].

Explanatory variables which are used to control for regional characteristics, are growth of the Gross Regional Domestic Product (GRDP) and population growth. All of these data are obtained from the Statistical Year Book of Indonesia, which is provided by Statistics Indonesia for the period 2005-2010.

4.1.3 Summary statistics

The main question of this paper is whether MPAs have an impact on poverty alleviation at the municipality level. A simple comparison between municipalities that have established MPAs and those that have not established MPA shows that there is a positive relationship between marine protection and poverty. Table 4.1 illustrates summary statistics by MPA establishment. Difference in means statistics (column 4) indicates that non MPA-municipalities have a lower level of poverty across all measure compared to those with MPAs.

Table 4. 1.Summary statistics

Variable	(1)		(2)		(3)		(4)
	All municipalities		Non MPA-municipalities		MPA-municipalities		Difference in means
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev	(2)-(3)
P_0	18.27	9.88	17.67	9.86	20.67	9.57	-3.00***
P_1	3.55	2.72	3.40	2.67	4.12	2.78	-0.72***
P_2	1.06	1.11	1.01	1.09	1.24	1.14	-0.23***
Population growth	1.89	1.48	1.95	1.53	1.63	1.24	0.32***
GRDP growth	6.15	4.21	6.16	4.38	6.10	3.49	0.06
MPA size (km2)	363.92	2026.47			1801.19	4302.69	
MPA share	0.11	0.61			0.52	1.28	

***,**,* significant at 1%, 5%, and 10% respectively

However it would be a mistake to jump from this univariate association to the conclusion that Marine Protected Areas in Indonesia cause poverty at the municipal level, since the establishment of an MPA is not the only factor that affects poverty. There are others characteristics that are also expected to contribute to poverty alleviation. Further, multivariate models are needed to disentangle the relationship. They are provided in the next subsection. This paper employs a multivariate estimation to account jointly several factors influencing poverty. The fixed effects model is used to control for municipality fixed effect in determining poverty.

[8] www.bps.go.id

4.2 Methodology

In chapter two we discussed the conceptual relationship between poverty alleviation and marine protected areas. This chapter provides the empirical strategy, which is used to examine a causal effect of marine protected areas on poverty reduction.

The following equation is estimated to examine the effect of MPAs on poverty at the municipality level:

$$Y_{it} = \beta_1 popgrowth_{it} + \beta_2 GRDPgrowth_{it} + \beta_3 MPA_{it} + \beta_4 year_t + \propto_i + u_{it} \quad \text{..... (eq.1)}$$

Where Y is the annual poverty indicators (P_0, P_1, and P_2) at the municipality level; the subscripts stand for municipality *i* in year *t*. Population growth and GRDP growth are municipality characteristics we can control for. MPA is the primary independent variable, which is represented by the share of the MPA relative to a municipality marine size, which can range from zero to one. The year is dummies capture changes over time. The municipality fixed effect is represented by α_i; while u_{it} is the idiosyncratic component.

Regarding each province which consists of several municipalities as lower level of regional administration, this study also estimates the impact of MPAs on poverty at the province level. This estimation addresses the expectation that there are spillover effects generated by MPAs across municipalities. The province model looks as follows:

$$Y_{it} = \delta_1 popgrowth_{it} + \delta_2 GRDPgrowth_{it} + \delta_3 MPA_{it} + \delta_4 year_t + \lambda_i + u_{it} \quad \text{..... (eq.2)}$$

β_3 and δ_3 are the coefficients of interest which will explain the impact of MPAs on municipality and regional poverty. The MPA variable, in this study, is defined to be the share of the MPA size relative to the municipality or regional marine size. If MPAs are a determinant of poverty alleviation, we expect those coefficients to be negative; this means that the establishments of MPAs play a role in reducing poverty at the decentralized level. Further, as poverty is hypothesized to be affected by population growth, rapid population growth would escalate the percentage of the poor. The sign of β_1 and δ_1 are expected to be positive. Besides, if economic growth at the decentralized level is pro poor, then we would expect a

negative sign for the coefficients β_2 and δ_2. The dummy variables coding for the years will explain the changes overtime. We expect the signs to be negative indicating a decrease in poverty over time.

The two equations above are also used to investigate whether there is an impact from having an MPA on reducing poverty. In this case the primary independent variable will be an MPA dummy.

4.3 Research variables

A huge variety of independent variables have been used in examining the determinants of poverty. The determinant variables and their effect on poverty which are involved in this paper will be discussed below and a summary of those variables is provided in Table 4.2.

There are several indicators that can be used in determining poverty. The incidence of poverty (P_0) is the number of poor people divided by the number of people in the population. It is also known as Headcount Index. This index is easy to interpret[9]. The poverty gap index (P_1) is the gap between their standard of living of the poor and the poverty line. P_2 is known as poverty severity index which is "sensitive to the distribution of living standards among the poor".

The primary explanatory variable that is used in this study is the share of MPAs which is expected to explain the role of natural resource management in poverty alleviation. According to Kristjanson (2005), natural assets, are important factors that determine poverty. Every effort on sustaining natural resource is expected to have an impact on poverty.

Furthermore, the literature claims that the determinants of poverty at the regional level are related to the characteristics of the region. One of these characteristics is economic performance which can be represented by regional economic growth. It was shown by Ferreira et al. (2001) that economic growth has a strong correlation with poverty alleviation. Dollar and Kraay (2002) added that growth of the economy might decrease poverty by increasing the incomes of everyone in society, including the poor. Since in Indonesia economic growth differs from region to region (Aritenang 2008), this regional characteristic is considered to be a control variable in this study.

Moreover, the growth of the population can explain changes in poverty at the regional level. Since population growth varies among regions in Indonesia[10], this

[9] http://www.nscb.gov.ph
[10] http://www.datastatistik-indonesia.com, accessed on July 2013

determinant is also controlled for in this study. Aritenang (2008), in his estimation of the determinants of poverty in Indonesia, argued that population is one of the major factors that affects poverty. The same result is also shown by Wodon et al. (2001) in their study on the determinants of poverty in Latin America. They found that increases in the population may increase the number of poor people. A summary of the definition, source of data, and expected sign of each variable, is provided in Table 4.2.

Table 4. 2.Summary of variables

Variable	Detail	Expected sign	Source of Data
Dependent variable:			
Poverty	Poverty indicators: - Head Count Index (Po) by municipality and province - Poverty Gap (P_1) by municipality and province - Poverty severity (P_2) by municipality and province		Statistics Indonesia
Independent variables:			
MPA	Share of MPA relative to the total regional marine size, MPA dummy	Negative	Ministry of Marine Affairs and Fisheries-Indonesia
GRDP	Growth of gross regional domestic product by municipality and province	Negative	Statistics Indonesia
Population	Growth of population by municipality and province	Positive	Statistics Indonesia

Chapter 5
Result and Discussion

In this chapter the results of the estimation using poverty indicators as dependent variable and MPA indicators as primary independent variable are presented. There are two basic estimations involved. These are the impact of marine protected areas on poverty at the municipality and province level.

5.1 The impact of marine protected areas (MPAs) on poverty at the municipality level

As discussed in the previous chapter the estimation strategy in this study depends upon the fixed effect model. Considering the wide variety of unobservable features that might be correlated with poverty at the municipality and regional level, applying pooled OLS might produce biased results since it does not control for the static characteristics of each municipality or region (appendix Table 5a.1 and 5a.2).

By controlling for the static characteristics of each municipality, the results (Table 5.1.) show that the creation of marine protected areas significantly decreases the percentage of poor people, the poverty gap, and poverty severity. With respect to the preferred measure of poverty, the ratio of the head count (P_o), at the average MPA share of 0.11 the ratio of people under the poverty line decline by 5.7% (column 1, row 3). A similar result is shown if different poverty indicators are considered. When employing the poverty gap (P_1) and poverty severity (P_2) as dependent variables, it can be shown that at the average MPA share of 0.11 the gap between the living standard of the poor and the poverty line will be reduced by about 2.2%; and it also reduces the gap of the distribution within the poor by about 1%. It is not surprising that these impacts differ across poverty indicators as the poverty indicators also differ in scale and measurement. In fact, the magnitudes of the found impact correspond to the different poverty indicators and solely represent different sides of the same coin.

Moreover, the results also show the poverty reducing effect of MPAs in terms of their absolute size. Every 100 km^2 increase of MPA will reduce the ratio of people under the poverty line by about 1.9 percent[11]. This coefficient seems smaller compared to the coefficient of share of MPA variable. However, one important

[11] see Appendix Table 5a.3, column 1, row 3

thing that should also to be considered is the relationship to the mean size, which is provided in Table 4.1. In term of absolute size, on average, the size of an MPA is 363.92 km^2. At this size an MPA will reduce the percentage of poor people by 6.9. Thus, these results demonstrate that, on average, MPAs play an important role in reducing poverty no matter what definition of MPA is chosen for.

Table.5. 1
Impact of marine protected areas on poverty at the municipality level by using share of MPA as primary independent variable (Fixed Effect)

Explanatory variables	Percentage of poor (P_0)	Poverty gap (P_1)	Poverty severity (P_2)
Population growth	**1.868****	**1.182****	**0.556****
	(0.798)	(0.388)	(0.217)
GRDP growth	**-0.033***	**-0.021****	**-0.009***
	(0.017)	(0.008)	(0.005)
Share MPA	**-0.516****	**-0.197****	**-0.075****
	(0.475)	(0.090)	(0.050)
Dummy 2007	**-1.079*****	**-0.410*****	**-0.161****
	(0.185)	(0.090)	(0.050)
Dummy 2008	**-3.191*****	**0.365*****	**0.249*****
	(0.189)	(0.092)	(0.051)
Dummy 2009	**-4.546*****	**-0.959*****	**-0.279*****
	(0.196)	(0.095)	(0.053)
Dummy 2010	**-5.181*****	**-0.872*****	**-0.196****
	(0.281)	(0.137)	(0.076)
Constant	17.820	1.845	0.147
	(1.587)	(0.772)	(0.431)
Observation	1452	1452	1452
R-squared	0.547	0.2285	0.149
Number of groups	294	294	294

- Standard errors in parentheses
- ***p<0.01, **p<0.05, *p<0.1

If we relate this result to the type of MPAs, the important impact of MPAs on poverty alleviation seems to be driven by Aquatic Protected Areas which constitute the main type of protection in this study. In section 3.3 it is explained that 58 (almost 67%) MPAs are Aquatic Protected Areas by 2010. That Aquatic Protected Areas are also positively linked to reducing poverty is shown in the

empirical analysis[12]. This type of MPAs was established by local governments, and is known as KKPD (District Marine Conservation Area)[13]. This result suggests that KKPD are pro-poor since they were installed by local governments who know best their area's and community's preferences.

The results above show that the two definitions of MPAs (share and absolute size) yield similar outcomes; however, the share of MPA is preferred. It would be harder to make a comparison across regions which vary in the absolute size of the area. By using the share of the area, which ranges from zero to one, the comparison is more convenient.

The important role of MPAs in alleviating poverty is also revealed by the estimation result which involves yet another definition of the MPA variable. By using an indicator variable of MPA, the effect of MPAs shows a considerably decrease in the percentage of poor people, the poverty gap, and the severity of poverty at the municipality level (Table 5.2 row 3). The results tell us that municipalities that have established MPAs could decrease their percentage of poor people by about 2.3% compared to non MPA-municipalities. They also decreased the poverty gap and poverty severity; the coefficients are -0.7 and -0.3 respectively.

The coefficients associated with the time dummy variables also reveal a significant negative relationship (Table 5.1 and 5.2, column 1, row 4 to 7). Coefficients are bigger in later years in absolute size. It means poverty decreases a lot over time and even more so in later years. Thus, we can say that MPAs are one of the factors, which reduce poverty over time.

The other regional characteristics, which are the growth of the population and GRDP growth, also affect poverty significantly. In Tables 5.1 and 5.2 (row 1), it can be seen that population growth escalates the percentage of poor people, the poverty gap, and poverty severity at the municipality level. In other words, population growth deteriorates poverty prospects (Wodon et al. 2001). Meanwhile, growth of GRDP has a different impact. It reduces poverty for all of indicators of the poverty (row 2). As found by Farwati (2012), in her study, which took the period from 2004 to 2010, the link between economic growth and poverty is negative in Indonesia. Put differently, economic growth in Indonesia helped the poor.

[12] See Appendix Table 5a.5
[13] Buku Statistik Kelautan dan Perikanan 2011

Table.5. 2
Impact of marine protected areas (MPAs) on poverty at the municipality level by using MPA indicators as primary independent variable
(Fixed Effect)

Explanatory variables	Percentage of poor (P_0)	Poverty gap (P_1)	Poverty severity (P_2)
Population growth	**1.762****	**1.143****	**0.541****
	(0.793)	(0.387)	(0.217)
GRDP growth	**-0.033***	**-0.021****	**-0.009***
	(0.017)	(0.008)	(0.005)
MPA dummy	**-2.229*****	**-0.685*****	**-0.272****
	(0.469)	0.229	(0.128)
Dummy 2007	**-0.977*****	**-0.380*****	**-0.149*****
	(0.185)	(0.090)	(0.051)
Dummy 2008	**-3.064*****	**0.403*****	**0.264*****
	(0.190)	(0.093)	(0.052)
Dummy 2009	**-4.436*****	**-0.929*****	**-0.267*****
	0.196	(0.096)	(0.054)
Dummy 2010	**-5.047*****	**-0.836*****	**-0.181****
	(0.282)	(0.138)	(0.128)
Constant	18.317	2.008	0.211
	(1.578)	(0.771)	(0.431)
Observation	1452	1452	1452
R-squared	0.547	0.287	0.150
Number of groups	294	294	294

- Standard errors in parentheses
- ***p<0.01, **p<0.05, *p<0.1

Indeed, that growth of GRDP captures the development of the regional economy. Considering this pro poor growth, the important thing is that if the regional economy is doing better, then we can expect the numbers of poor to be reduced. However, the result of this paper demonstrates that economic growth is not only the factor influencing poverty alleviation. It can be shown that despite controlling for GRDP growth and the time trend, MPAs have a direct effect on poverty reduction.

A related question is whether MPAs affect poverty in the same direction at different level of economic growth. Results show that in general, MPAs installation reduces poverty. The interaction between GRDP growth and MPA

indicators produce a positive coefficient[14]. It means, in the sense of economic growth, the richer the region the less the effect of MPAs in alleviating poverty. By considering this evidence, we can say that MPA could be installed in the poorer area without apprehension about its impact might be less pro-poor in faster growing regions.

5.2 The impact of marine protected areas (MPAs) on poverty at the province level

As stated before, this paper also conducts the analysis of the impact of MPAs on poverty at different levels of the regional administration. Since MPAs are expected to generate spillover effects, it is important to examine the impact of MPAs at the province level in order to understand whether MPAs can give a significant contribution to poverty reduction at the higher level of a province.

At the province level, the impact of MPAs is also significant and slid poverty reducing. The coefficient associated with the share of MPAs is -1.486 and indicate the poverty reducing impact of MPAs at the province level. It is significant at the 10% level. The other indicators of poverty also show a significant association. The coefficients associated with the share of MPAs are negative and significant in both specifications the one for the standard of living of the poor people relative to the poverty line and the one for the distribution of the living standard within the poor. The coefficients are -0.820 and -0.343, respectively. When employing the dummy variable for MPA, it does not reveal a significant association with poverty at the province level (Table 5.4, row 3).

GRDP growth determines poverty significantly no matter at which level of regional administration the analysis is carried out. This can be seen from the significant and positive association between GRDP growth and poverty at the province level (Table 5.3 and Table 5.4 row 2). On the other hand, the population growth has no impact on poverty at the regional level (row 1).

[14] see Appendix Table 5a.4

Table.5. 3

Impact of marine protected areas on poverty at the province level by using the share of MPA as primary independent variable

(Fixed Effect)

Explanatory variables	Percentage of poor (P_0)	Poverty gap (P_1)	Poverty severity (P_2)
Population growth	0.044	0.010	0.0008
	(0.097)	(0.045)	(0.024)
GRDP growth	**-0.086*** **	**-0.032** **	-0.008
	(0.031)	(0.015)	(0.008)
Share MPA	**-1.486***	**-0.820*** **	**-0.343***
	(0.756)	(0.351)	(0.184)
Dummy 2006	**1.051*** **	0.067	-0.003
	(0.339)	(0.158)	(0.082)
Dummy 2007	-0.046	0.050	0.012
	(0.341)	(0.158)	(0.083)
Dummy 2008	**-1.954*** **	0.217	0.155
	(0.341)	(0.159)	(0.083)
Dummy 2009	**-3.099*** **	**-0.655*** **	-0.0004
	(0.350)	(0.163)	(0.085)
Dummy 2010	**-3.712*** **	**-0.917*** **	**-0.314*** **
	(0.357)	(0.166)	(0.087)
Constant	18.104	3.646	1.108
	(0.406)	(0.189)	(0.099)
Observation	192	192	192
R-squared	0.75	0.48	0.25
Number of groups	33	33	33

- Standard errors in parentheses
- ***p<0.01, **p<0.05, *p<0.1

Table.5. 4

Impact of marine protected areas on poverty at the province level by using MPA dummy as primary independent variable

(Fixed Effect)

Explanatory variables	Percentage of poor (P_0)	Poverty gap (P_1)	Poverty severity (P_2)
Population growth	0.045	0.011	0.001
	(0.098)	(0.046)	(0.024)
GRDP growth	**-0.090*** **	**-0.034** **	-0.009
	(0.032))	(0.015)	(0.008)
MPA Dummy	-1.275	-0.601	-0.233
	(0.1.429)	(0.668)	(0.348)
Dummy 2006	**1.021*** **	0.051	-0.010
	(0.342)	(0.160)	(0.083)
Dummy 2007	-0.078	0.032	-0.005
	(0.344)	(0.161)	(0.084)
Dummy 2008	**-1.993*** **	0.194	0.105
	(0.344)	(0.161)	(0.084)
Dummy 2009	**-3.210*** **	**-0.717*** **	-0.026
	(0.348)	(0.163)	(0.085)
Dummy 2010	**-3.874*** **	**-1.005*** **	**-0.350*** **
	(0.356)	(0.166)	(0.087)
Constant	18.966	4.046	1.261
	(0.143)	(0.534)	(0.278)
Observation	192	192	192
R-squared	0.74	0.46	0.23
Number of groups	33	33	33

- Standard errors in parentheses
- ***p<0.01, **p<0.05, *p<0.1

These results found support the argument that the creation of marine protected areas benefits the poor (Leisher et al. 2007; Beukering et al. 2007; Anna 2008). MPAs are one of the simplest tools for conserving natural asset while at the same time they play an important role in reducing poverty (Kristjanson et al. 2005). In our preferred model, the empirical specification at the municipality level, the results show a negative relationship between MPAs and poverty alleviation in Indonesia no matter what definition of MPA or what measure of poverty are taken. The impact of MPAs can be captured better in this lower level of analysis as the fixed effects at the municipality level allow us to control for unobserved, static

municipality characteristics that are also likely to influence poverty and the creation of MPAs. Thus, while we cannot fully rule out reverse causality and omitted variable bias, the estimation with municipality fixed effects allows us to at least reduce such sources of bias stemming from time-fixed municipality characteristics.

Then, the next question is "how can MPAs reduce poverty?" According to Sanchirio et al. as cited in Pomeroy et al. (2009) the establishment of marine protected areas, in the short term, will give a disproportionate impact as a result of the closure of particular areas for fishing. Nevertheless, MPAs can then provide advantages in the long term. Not only might MPAs be able to recover their habitat in the long term, communities living adjacent to the protected area also might have higher levels of adaptation as response to MPA policies. Concerning biological aspect, MPAs offer abundance of fish population as a result of spill-overs from their no-take zones. Besides fishing for their subsistence, fishers can sale their increased fishing catches. Increasing total catches of marine living organisms means gaining higher earnings. A better marine environment and higher fish quality might lead the regional fisheries sector to perform better.

Another channel through which MPAs offer possibilities for generating income is the tourism sector. Communities adjacent to the MPAs get direct profit through alternative livelihood strategies related to the tourism sector. The region also gains economic benefits from entry fees for example.

Chapter 6
Conclusion

This paper provides evidence about the relationship between environmental conservation and poverty alleviation as joint development objectives. This study examines the role of marine protected areas (MPAs) in Indonesia on poverty reduction by empirically testing whether MPAs in Indonesia are pro-poor.

There are two basic estimations involved in order to identify the impact of marine protected areas at different regional levels (i.e. municipality and province level). The fixed effect model is used as method to capture static regional characteristics.

The results show that both at the municipality and province level benefits from marine protected areas are experienced in terms of poverty reduction. Marine protected areas have a non-negligible role in reducing regional poverty. MPAs demonstrate their significant role for different indicators of poverty such as the poverty head count index (P_0), the poverty gap (P_1), and poverty severity (P_2). Moreover, a significant impact of MPAs is also shown for different definitions of MPA, which are the share of MPAs relative to total marine area, their absolute size, and an indicator for MPAs.

Thus, the marine protected areas in Indonesia, are expected to contribute to alleviating poverty. MPAs have direct and indirect impacts on their surroundings. Through their recovered habitat they are able to give economic benefits by providing abundant marine natural resources and promising tourism activities. The positive impact of MPAs on poverty reduction is driven by the main type of MPA which is Aquatic Protected Areas. Yet, these Aquatic Protected Areas constitute the majority of MPAs in Indonesia by 2010. This might drive the finding

The study also confirms other determinant of poverty at the regional level such as population growth and regional economic performance where the latter is represented by the growth of the gross regional domestic product. The results support previous studies which indicate that those variables contribute in explaining poverty in Indonesia.

Last but not least, this study is indicative of the necessity to consider environmental aspects in examining poverty measure. Efforts in sustaining the environment become more and more important in the development policy arena. Marine protected areas are one of the policy implementations, which can positively influence the regional development progress.

This study does not address all open questions. Future studies should consider a partial measurement of poverty to gain more precise result. However, the period of the study is crucial. It would be desirable to employ a longer period to gain more precise result, which can explain changes of poverty due to environmental factors and some other variables.

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Appendices

Table 5a. 1
Impact of marine protected areas (MPAs) on poverty at the municipality level (Pooled OLS)

Explanatory variables	Percentage of poor (P_0)	Poverty gap (P_1)	Poverty severity (P_2)
Population growth	0.146	**0.242*** **	**0.133*** **
	(0.175)	(0.048)	(0.019)
GRDP growth	0.087	0.021	0.008
	(0.062)	(0.016)	(0.007)
MPA dummy	**3.048*** **	**0.794*** **	**0.276*** **
	(0.645)	(0.176)	(0.071)
Constant	16.850	2.803	0.702
	(0.556)	(0.152)	(0.061)
Observation	1452	1452	1452

- Standard errors in parentheses
- ***p<0.01, **p<0.05, *p<0.1

Table 5a. 2
Impact of marine protected areas (MPAs) on poverty at the province level (Pooled OLS)

Explanatory variables	Percentage of poor (P_0)	Poverty gap (P_1)	Poverty severity (P_2)
Population growth	0.590	**0.284*** **	**0.143*** **
	(0.373)	(0.101)	(0.041)
GRDP growth	**-0.261***	-0.064	-0.016
	(0.157)	(0.042)	(0.017)
Share MPA	-1.820	0.046	0.184
	(2.638)	(0.711)	(0.287)
Constant	16.624	2.912	0.741
	(1.361)	(0.367)	(0.148)
Observation	192	192	192
R squared	0.03	0.05	0.07

- Standard errors in parentheses
- ***p<0.01, **p<0.05, *p<0.1

Table 5a. 3
Impact of MPAs (absolute size) on poverty at the municipality level (Fixed Effect)

Explanatory variables	Percentage of poor (P_0)	Poverty gap (P_1)	Poverty severity (P_2)
Population growth	**1.837****	**1.171****	**0.552****
	(0.795)	(0.387)	(0.217)
GRDP growth	**-0.033***	**-0.021****	**-0.009***
	(0.017)	(0.008)	(0.005)
MPA size	**-0.00019*****	**-0.000077****	**-0.000029****
	(0.000053)	(0.000026)	(0.000014)
Dummy2007	**-1.076*****	**-0.410*****	**-0.161****
	(0.184)	(0.090)	(0.050)
Dummy2008	**-3.188*****	**0.367*****	**0.250*****
	(0.188)	(0.092)	(0.051)
Dummy2009	**-4.532*****	**-0.953*****	**-0.277*****
	(0.195)	(0.095)	(0.053)
Dummy2010	**-5.180*****	**-0.871*****	**-0.196****
	(0.280)	(0.136)	(0.076)
Constant	17.888	1.870	0.157
	(1.582)	(0.771)	(0.431)
Observation	1452	1452	1452
R-squared	0.549	0.287	0.150
Number of groups	294	294	294

- Standard errors in parentheses
- ***p<0.01, **p<0.05, *p<0.1

Table 5a. 4

Impact of marine protected areas (MPAs) on poverty at the municipality level by including interaction between MPA and GRDP growth

(Fixed Effect)

Explanatory variables	Percentage of poor (P_0)	Poverty gap (P_1)	Poverty severity (P_2)
Population growth	**1.787****	**1.155*****	**0.547****
	(0.792)	(0.387)	(0.217)
GRDP growth	**-0.048****	**-0.028*****	**-0.012***
	(0.019)	(0.009)	(0.005)
MPA dummy	**-2.797*****	**-0.949*****	**-0.394****
	(0.547)	(0.267)	(0.149)
MPA*GRDPgrowth	**0.095****	**0.044***	**0.020***
	(0.047)	(0.230)	(0.013)
Dummy2007	**-0.975*****	**-0.379*****	**-0.149*****
	(0.185)	(0.090)	(0.050)
Dummy2008	**-3.053*****	**0.409*****	**0.267*****
	(0.190)	(0.093)	(0.052)
Dummy2009	**-4.425*****	**-0.924*****	**-0.265*****
	0.196	(0.096)	(0.054)
Dummy2010	**-5.032*****	**-0.829*****	**-0.178****
	(0.282)	(0.138)	(0.077)
Constant	18.352	2.024	0.219
	(1.576)	(0.770)	(0.431)
Observation	1452	1452	1452
R-squared	0.555	0.289	0.152
Number of groups	294	294	294

- Standard errors in parentheses
- ***p<0.01, **p<0.05, *p<0.1

Table 5a. 5
Impact of marine protected areas (MPAs) on poverty at the municipality level by including dummies of MPA type
(Fixed Effect)

Explanatory variables	Percentage of poor (P_0)	Poverty gap (P_1)	Poverty severity (P_2)
Population growth	**1.718****	**1.130*****	**0.534****
	(0.790)	(0.387)	(0.217)
GRDP growth	**-0.033****	**-0.021*****	**-0.009***
	(0.017)	(0.008)	(0.005)
MPA	**-0.0004****	**-0.0002 *****	**-0.0001****
	(0.0001)	(0.0001)	(0.00004)
National park dummy	7.347	4.012	1.670
	(5.837)	(2.855)	(0.600)
Tourism park dummy	-1.087	-0.812	-0.378
	(1.979)	(0.968)	(0.542)
Marine preserve	**-1.903*****	**-0.454***	-0.182
dummy	(0.532)	(260)	0.146
Dummy2007	**-0.981****	**-0.384*****	**-0.150*****
	(0.184)	(0.090)	(0.050)
Dummy2008	**-3.069*****	**0.401*****	**0.264*****
	(0.189)	(0.092)	(0.052)
Dummy2009	**-4.407*****	**-0.916*****	**-0.262*****
	(0.196)	(0.096)	(0.054)
Dummy2010	**-5.035*****	**-0.830*****	**-0.179****
	(0.280)	(0.137)	(0.077)
Constant	18.168	1.963	0.198
	(1.581)	(0.773)	(0.434)
Observation	1452	1452	1452
R-squared	0.558	0.293	0.154
Number of groups	294	294	294

- Standard errors in parentheses
- ***p<0.01, **p<0.05, *p<0.1