

IMPACT OF RECLAMATION ON FISHERY ACTIVITIES IN MALAYSIA

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ABSTRACT

Reclamation activities are the process of creating new land from the ocean, lake and riverbeds with the aim of overcoming the scarcity of land needed for development. While the reclamation activities would benefit the society, the process could pose certain disadvantages to the residents in the area. Thus, the main purpose of this study was to determine the perception of fishermen towards reclamation activities at Merambong Shoal and the reclamation impact towards their income and fish catch. A structured questionnaire was used as a research instrument to collect the data of 79 fishermen who are actively fishing at Merambong Shoal. Descriptive analysis, paired sample t-test, and mean ranking analysis were used to analyze the data collected. The result in mean ranking analysis revealed that the majority of the fishermen had a negative perception towards the reclamation activities. Paired sample t-test analysis revealed that after the reclamation occurred, fishermen experienced a decrease in total income with a mean value of RM1,967.72 as well as fish catch with a mean value of 12.849kg. It is therefore important that relevant authorities preserve, and improve the Merambong Shoal ecosystem; also good management practices are needed to ensure that the number of fish catches will not be further affected by the reclamation activities.

Keywords: Reclamation activities, coastal ecosystem, fish catch, fishermen

INTRODUCTION

Reclamation is a process of creating new arable land that can be used by human for urbanization and development. The purpose of reclamation varies from time to time. [1] claimed that reclamation is done in order to overcome problems among rural communities regarding unemployment, congestion and shortage of housing. Reclamation also, is a known method for overcoming the scarcity of land in many countries in the world. Most of such communities can be found living close to the coastal areas. There are several methods that can be used to reclaim the ocean. One of the simplest methods is by filling the specific area with enormous amounts of heavy rock or cement then filling with clay or dirt till desired height is reached. Usually, the filling is done with sand from the other part of the ocean.

Many countries in this world had conducted reclamation activities with different purposes. [2] stated that countries such as Malaysia, Indonesia, Singapore, China, Japan, and Bahrain had adopted this method in order to overcome land shortage due to the continuous population increase of the countries. Singapore for example implemented reclamation activities since the beginning of colonial of Singapore with the purpose to expand the industrial areas, housing as well as airport. On the other hand, China practiced land reclamation along the coast since 1949 and with all the reclamation activities that had been organized; China had become the most densely populated region in the world [3].

[4] indicated that reclamation along coastal lines in Malaysia started since the 18th century for agriculture purposes. However, the purpose of reclamation had been changed from time to time, ranging from agriculture to development of the country. Many small scale reclamation projects have successfully been implemented in various parts of the country such as Penang, Malacca, Labuan, Langkawi, Kota Kinabalu, either as public sector or private sector projects. This reclamation activity had been practiced a lot in south western-coast. Johor had carried out many reclamation projects for the development of the state's coastal areas. Some of the reclamation projects that had been fully completed are Danga Bay, Port Tanjung Pelepas and Puteri Harbour. Meanwhile, there are still ongoing projects, some of which are still in planning (example: Princess Cove, Tebrau Bay Waterfront City, and Pengerang). Forest City is the latest reclamation project under Mega Project Iskandar Malaysia that had been carried out near the Merambong Shoal. This development is a joint venture between Country Garden Group and Iskandar Esplanade Danga 88 Sdn Bhd. The partnership gave birth to Country Gardens Pacific View Sdn. Bhd. (CGPV). This project is being built between south-west Johor and north-west Singapore and was started in early 2014. This project was estimated to cover around 1,386 ha of the ocean. The project is scheduled for completion in 20 to 30 years. This project will feature condominiums with world class-amenities expected to become an economic hub linking Iskandar region and neighbouring Singapore.

The size for the sea to be reclaimed in its original plan was 1,900 hectares. The Department of Irrigation and Drainage (DID) Malaysia Guidelines mandated that Detailed Environment Impact Assessment (DEIA) to be conducted for all coastal reclamation projects that involving the area of 50 hectares or more. The beginning of the reclamation phase was started without the EIA and after several months, the Federal Department of Environment (DOE)Malaysia issued a stop work order and mandated the Country Garden to complete the DEIA before this project can be proceed. More than 50 modeling simulations were done to revise the shape of the island in order to minimal the impacts on the natural habitats. The total acreage of total areas to be reclaimed was reduced by 30% and development from the revise layout had changed into separate islands. The developers mentioned that the development had adopted best practices to minimize the environmental impact through integrated solutions to achieve zero impact on the surrounding area and will not be an obstacle for fishermen to fish. Precautionary steps and Environment Impact Assessment (EIA) has been carried out and approved by the authority. Thus, it shows that the development of Forest City is safe for the environment and could be continued after being stopped for a while for a strong reason. Even though it had been stated that fishing activities will be unaffected, problems related to the production of fish and the livelihood of the fishermen in

the area is not fully investigated. Their concern about the reclamation activities was not being heard by the developers. Developers and the outsiders do not have any knowledge about the situation that had affected the fishermen since the reclamation projects started. In light of these concerns, this study was conducted to determine the perception of fishermen towards reclamation activities at Merambong Shoal and the impact towards their income and fish catch. Thus, this study is important to give knowledge to the authorities and society about the real situations that happened in the reclamation site and to convey the feeling of the fishermen and their perception about the reclamation itself.

2. LITERATURE REVIEW

The coast is the most intensely used of all human settlement areas in the world and it contains a diverse and potential habitat that is important for human, development and subsistence. More than half of the world population lives within 60km of the shoreline and the number is expected to have increased to three quarters by the year 2020. Majority of community that are crowded along the coastal areas are poor communities. Coastal zone consists of natural elements such as daily tides, mangrove forests, coral reef, tide flats, sea beaches, storm waves and Barrier Island. These natural elements are the unique characteristics that coastal zone have [5]. The coastal zone is known for its extreme productivity of renewable resources, it is a rich source of protein, mangrove products, and other economic foods and services [5]. This situation makes the coastal area a place of high priority and interest to the people. The reclamation activities that occur caused the direct effect towards the natural coastline length and sea area [3]. For example, coastal wetland in China has a sharp drop in its length with the total cumulative lost approximately 22,000km after reclamation activities conducted in the country since 1949 [6]. Land reclamation is a process to create new land from the sea due to the shortage of land resources. For example, [7] described that in the 21th century, the population of China is estimated to have increased from 200 million to 300 million. However, the total farmland will reduce to 1,800 km². Thus, China will need 400 million to 500 million populations existing space. Therefore, coastal reclamation is one of the solutions to increase resources of shoreline and harbor tract. As been highlighted by [8], reclamation of marine is the important utilization of ocean for mankind to produce goods and provide living space for human. Reclamation is increasingly used in Asia to provide additional land in cities, in part to provide public urban spaces and to provide other convenience of modern cities. There are significant volumes of reclamation currently being carried out in Asia [9]. According to [10], Hong Kong has the longest history of reclamation with over 10% of Hong Kong developed land area reclaimed from the sea.

Other than that, reclamation activities would decrease the unemployment rate of the country by creating temporary and new employment to the local community. The availability of this opportunity might encourage the younger people to remain in their village instead of migrate out. The local community will get business opportunity that has higher income potential compared to their previous job. Forest City, for example, will create a new dimension in the development of Johor and is estimated to create 15,000 to 20,000 job opportunities. This statement can be

supported by [11] on the benefits of reclamation activities. The plan indicated that reclamation activities could provide new access or improve the existing access conditions for the public.

According to [12], even though reclamation activities could give economic benefits to the local community, it also will lead to the destruction of the environment. Also, based on studies by [13] - [15] reclamation activities could alter the ecosystem and cause adverse impacts to the natural morphology of the coastal area. This situation could lead to a decreased productivity of the marine resources at the affected area. Furthermore, the reclamation activities have brought out series of severe environmental problems include sharp reduction of coastal wetlands and marine biodiversity as well as caused significantly decrease in coastal ecosystem functions and services. The study by [16] highlighted that reclamation materials and pollutants generated during reclamation activities causes pollution of the marine environment, and overall fish catch by the fishing community had been decreased by 55% after the reclamation was carried out.

Merambong Shoal is known as the largest seagrass bed in Peninsular Malaysia located at the Western Tebrau Straits. This place became the main fishing ground for the fishermen since this shoal is a vital part of the marine ecosystem in terms of productivity level, habitat, and nursery area for numerous marine species including marine mammal Dugong. Unfortunately, fishing activities had been affected once the reclamation projects took place near the Merambong Shoal area with shoal not being fully utilized by the fishermen as usual. Fishermen were restrained from fishing near the shoal because the project is in progress. According to [17] reclamation causes reduction of mangrove area and destruction of seagrass bed. As fishing is the main occupation of the community in this area, destruction of Merambong Shoal will cause a decreased income level due to decreasing number of fish catch. [18] remarked that this situation may affect the community's quality of life. This statement shows that coastal area is a very sensitive area and any development at this area needs to be highly evaluated.

[19] stated that perception refers to the personal tolerant of the phenomena, causes and its outcome, which influences fundamental actions to be taken by the individual, group or community. Perception is about extracting information from the external environment. It involves the operation of senses and is affected in the shadow of expectation, hope, fear, needs and memories that make up the internal world. Recent studies have shown that by interviewing fishermen, information about their perception regarding the situation that happened can be useful for both marine conservation and fisheries management. It can be a tool that can be used to identify the fishermen self-proclaim about the reclamation that had occurred.

3. METHODOLOGY

This study focused on fishermen who are actively fishing at the Merambong Shoal, Gelang Patah Johor. The data on fishermen was obtained from the Department of Fisheries Malaysia and 79 fishermen were interviewed by four (4) trained enumerators who were hired to assist in conducting the interviews with the fishermen.

A structured questionnaire was used as the research instrument, and consisted of three (3) sections with questions were developed in Malay language. The first section in the questionnaire was designed to explain the socio-demographic profiles of the respondents such as gender, race, age, education level, marital status, and household size. The second section consisted of

questions related to fishing activities in terms of their fish catch and income before and after the reclamation took place. The third section was designed to obtain information on the perception of fishermen towards reclamation activities. The fishermen were given 12 statements on perception based on a five-point Likert scale question ranging from “1 = Strongly Disagree” to “5 = Strongly Agree”.

The statistical analyses applied in this study were descriptive analysis, paired sample t-test, and mean ranking analysis. Descriptive analysis was used to analyze and summarize the fishermen’s demographic profiles while paired sample t-test was used to examine the differences in income, and fish catching rate of fishermen pre- and post-reclamation. Mean ranking analysis was applied to rank the order from the highest to the lowest of the perception of fishermen towards reclamation activities.

4. RESULTS AND DISCUSSION

4.1 Socio-demographic profile of fishermen

Table 1 shows the socio-demographic profiles of the respondents. Majority of the fishermen were male and accounted for 91% (72 fishermen) whereas 9% (7 fishermen) were female. This result indicated that fishing activities were dominated by male fishermen. As the location of the study was highly populated by Malays, thus most of the fishermen were of the Malay race, accounting for 94% while the remaining 6% (5 fishermen) were Chinese. In addition, about 27% of the fishermen (21 fishermen) belong to the age group of 41 - 50 years old, 25% (20 fishermen) were within the age group of 51 - 60 years old. Meanwhile, 16% (13 fishermen) were aged between 31 - 40 years old, 14% (11 fishermen) were aged 61 - 70 years old as well as fishermen who were aged below or equal to 30 years old. A few of the fishermen were aged 71 years and above and this accounted for 4% (3 fishermen) only. In terms of education, 50% (39 fishermen) of total number of fishermen had primary school education while 43% (34 fishermen) of the respondents finished their secondary school, 6% (5 fishermen) did not have any formal education and only 1% (1 fisherman) had tertiary education. The study also showed that 81% (64 fishermen) were married, while 15% (12 fishermen) were single and about 4% (3 fishermen) were widow or widower. Majority of the fishermen had a household size within 1 - 3 which accounted for 49% (39 fishermen). About 39% (31 fishermen) reported a household size within 4 - 6 and only 11% (9 fishermen) had a household size within 7 - 9. The results also indicated the fishing experience of fishermen wherein 23% (18 fishermen) of the total number of fishermen had between 11 - 20 years of experience, followed by 22% (17 fishermen) of them with experience of equal or above 41 years. About 20% (16 fishermen) had experience equal and below 10 years, 19% (15 fishermen) had fishing experience between 21 - 30 years and 16% (13 fishermen) had experience between 31 - 40 years. The result indicated that most of the fishermen were with long experience in fishing activities.

Table 1: Fishermen Socio-Demographic Profiles

Profile		Frequency (n=79)	Percentage (%)
Gender	Male	72	91
	Female	7	9
Race	Malay	74	94
	Chinese	5	6
Age (years old)	≤ 30	11	14
	31 – 40	13	16
	41 – 50	21	27
	51 – 60	20	25
	61 – 70	11	14
	≥ 71	3	4
Educational Level	No formal education	5	6
	Primary school	39	50
	Secondary school	34	43
	Tertiary school	1	1
Marital Status	Married	64	81
	Single	12	15
	Widow/Widower	3	4
Household Size	1 – 3	39	49
	4 – 6	31	39
	7 – 9	9	11
Fishing experience (years)	≤10	16	20
	11 – 20	18	23
	21 – 30	15	19
	31 – 40	13	16
	≥41	17	22

4.2 Effects of pre and post reclamation towards income and fish catch of fishermen

A paired sample t-test was conducted to evaluate whether the reclamation activities had significantly affected the fishermen income level and fish catch at the Merambong Shoal. The analyzed data in Table 2 showed that there were differences in the mean of income and fish catch before and after reclamation. The mean for income before reclamation was RM3,139.24 while the mean for income after reclamation was RM1,967.72. Meanwhile, the mean for fish catch before reclamation was 23.614 kg, and the mean for fish catch after reclamation was 12.849 kg. This shows that the fishermen gained lower income and lower fish catch after the reclamation occurred. Table 3 shows the results of paired sample t-test. The population means difference in income was RM1,171.52 and it was 95% confident that the population mean difference ranged between RM667.33 and RM1,675.71. Meanwhile the population mean difference in fish catch was 10.765 kg and it was 95% confident that the population mean difference ranged between 8.858 kg and 12.791 kg. The null hypothesis stated that the mean difference in income and fish catch of fishermen before and after reclamation is 0. The result of p-value was 0.000, which was less than the significance level of 0.01; thus the decision is to reject the null hypothesis. This

result meant that there was a statistical significant difference in income and fish catch of pre and post reclamation. Thus, it can be concluded that the changes in income level and fish catch were caused by the reclamation activities that had been done at the Merambong Shoal, consequently will affect their livelihood. The finding of this study was similar to that of [20] in terms of decreasing income level of communities where reclamation occurred.

Table 2: Paired Sample Statistics

	Before Reclamation		After Reclamation	
	Mean	Std. Deviation	Mean	Std. Deviation
Income	3,139.24	2,994.821	1,967.72	2,130.292
Fish Catch	23.614	20.402	12.849	17.580

Table 3: Paired Sample T-Test

Pair	Item	Paired Differences					t	df	Sig, (2-tailed)	Decision
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
					Lower	Upper				
1	Income (RM)	1,171.52	2,250.98	253.16	667.33	1675.71	4.626	78	.000***	Reject
2	Fish catch (kg)	10.765	9.013	1.014	8.858	12.791	10.616	78	.000***	Reject

Note: ***Significant at 1% significance level (2-tailed)

4.3 Fishermen perception towards reclamation activities

The mean score and standard deviation for each statement on the fishermen perception towards reclamation activities at the Merambong Shoal are shown in Table 4. A total of 12 statements were used in this study. The score of the statements were recorded as 5-point Likert scales (1-strongly disagree; 2-disagree; 3-neutral; 4-agree; 5-strongly agree). This analysis showed the rank order from strong agreement of the respondents to poor agreement to a particular statement. A mean score above 4.0 indicated that the respondents had a strong agreement with the statement. The statements had mean scores ranging from the highest (4.44) mean score to the lowest (3.43) mean score.

Based on Table 4, most of the fishermen agreed that reclamation activities gave negative impacts to the ecosystem (mean score of 4.44). The fishermen believed that sea reclamation had damaged the natural ecosystem and reduced the mangrove area with mean scores of 4.43 and 4.42 respectively. The fishermen also believed that the development from reclamation activities had caused the land price to increase (mean score of 4.42). Besides, the fishermen agreed that destruction of marine habitat from reclamation activities had caused the fishermen income to decrease (mean score of 4.37). The fishermen also revealed that seagrass bed areas are declined due to effects from reclamation activities with mean score of 4.30. The fishermen claimed that

reclamation activities did not give positive impact to the ecosystem (mean score of 4.13). Furthermore, fishermen believed that water pollution from reclamation activities had caused the aquatic creatures decrease (mean score of 4.06), sea area could be damaged easily due to sea reclamation (mean score of 4.01), and the development that comes from reclamation activities cannot increase the income of villagers at the affected areas (mean score of 3.61).

However, the fishermen did not consider all the statements to influence them to have negative perception on reclamation activities. The fishermen had neutral perception on statements that reclamation activities did not give any job opportunity to the folk at that areas (mean score of 3.49) and development from reclamation activities did not improve any infrastructure at the affected areas (mean score of 3.43). The overall mean score was 4.17, indicating that the fishermen did have a negative perception towards the reclamation activities that had been done at the Merambong Shoal. These findings were supported by [13] - [15] and [17] that reclamation activities could alter and degraded the ecosystem and marine biodiversity at the reclamation area and surrounding.

Table 4: Fishermen Perception towards Reclamation Activities at Merambong Shoal

Item	1	2	3	4	5	Mean	Std. Deviation
1. Reclamation activities give negative impacts to the ecosystem.	0	1.3	3.8	44.3	50.6	4.44	0.635
2. Sea reclamation had damaged the natural ecosystem.	0	1.3	2.5	48.1	48.1	4.43	0.614
3. Mangrove area had decreased when reclamation activities are carried out.	0	2.5	2.5	45.6	49.4	4.42	0.672
4. Development from reclamation activities had caused the land price to increase.	0	1.3	13.9	26.6	58.2	4.42	0.778
5. Destructive of marine habitat from reclamation activities had caused the fishermen income decreased.	0	5.1	16.5	50.6	27.8	4.37	0.787
6. Seagrass bed areas are declined due to effects from reclamation activities.	0	1.3	5.1	55.7	38.0	4.30	0.627
7. Reclamation activities do not give positive impacts to the ecosystem.	1.3	5.1	5.1	57.0	31.6	4.13	0.822
8. Water pollution from reclamation activities had caused the aquatic creatures decreased.	0	8.9	10.1	46.8	34.2	4.06	0.896
9. Sea area could be damaged easily due to sea reclamation.	0	5.1	16.5	50.6	27.8	4.01	0.809

10. Development that comes from reclamation activities cannot increase the income of villagers at the affected areas.	8.9	11.4	22.8	41.8	15.2	3.61	1.148
11. Reclamation activities do not give any job opportunity to the folk at that area.	1.3	13.9	35.4	32.9	16.5	3.49	0.972
12. Development from reclamation activities does not improve any infrastructure at the affected areas.	8.9	11.4	22.8	41.8	15.2	3.43	1.151
Overall mean						4.17	0.348

Note: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

CONCLUSION

Nowadays, reclamation activities are important for development of the country. These activities will create job opportunity and improve the facilities of the country. Even though the activities are beneficial to the country and already passed the Environment Impact Assessment (EIA), they would also affect and alter the ecosystem of the surrounding areas. Productivity of fish will decrease with a consequent decrease in fish catch of the fishermen. This study was carried out to examine the perceptions of fishermen towards the reclamation activities that had been done at the Merambong Shoal. The study revealed that most of the fishermen were aged between 41 to 50 years old and had 11 to 20 years fishing experience. Most of the fishermen had low literacy level because they only attended primary education. The results from the paired sample t-test showed that the fishermen mean income level and fish catch had decreased significantly following the reclamation activities. From the mean ranking analysis, an overall mean score of 4.17 showed that the fishermen had negative perception towards the reclamation activities. Most of the fishermen agreed that reclamation activities had destroyed the environment and ecosystem of the Merambong Shoal. Also causing the number of fish catch to decrease thereby affecting the income of fishermen. The findings suggested that the government and relevant authorities need to minimize the reclamation impacts towards the Merambong Shoal ecosystem in order to ensure that the number of fish catches will not be furthered affected by the reclamation activities. Besides, relevant authorities need to preserve and gazette specific areas for the fishermen fishing activities. This would ensure that the fishermen have sufficient resources to improve their income and livelihood and such will promote positive perception towards reclamation activities.

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