

# Monitoring The Land Accretion Development at Coastal Area of Blanakan, Subang Indonesia

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**Abstract.** A land accretion is formed by deposition in estuaries. Recently, a land development in Subang coastal area has raised an increase. Beside its potential, coastal areas are also threatened with damage including abrasion, accretion, loss of mangrove forests, and sea water intrusion. One of the coastal areas that have been arising in very extensive land is Blanakan coastal in Subang Regency. This study aims to monitor the development of a land accretion that have been arise during the period of 1990 to 2015 and also to examine the use of a land accretion and analyze the impact of a land accretion to the social and economic conditions in the Blanakan Coastal Areas. The method used in this research was descriptive quantitative method. In this research, The Landsat imageries were overlaid came from 1990, 2000, 2010, and 2015 to determine the development of a land accretion. Based on the results of Landsat imagery overlaid over the period 1990-2015. Overall, during the period 1990-2015, accreted land formed was an area of 782.9 hectares and abrasion area of 73.3 hectares with changes in the most far reaching 1580.3 m. The use of land accretion in the Blanakan Coastal mostly used for a fishpond with a key commodity is Milkfish and Bago shrimps. The impact of land accretion to the social and economic conditions was reflected through the five indicators such as livelihoods, income, education, health, and ownership of assets.

**Keywords:** coastal area, monitoring, land accretion, Blanakan, Subang Indonesia

## 1. Introduction

Coastland is an area of encounter between land and sea, in which a mutual relation still takes place[1]. As an archipelago state with the coastline reaching 99.093 km, the potential of coastline area in Indonesia is very vast and advantageous for various economic activities[2]. One of the provinces possessing potential along the coastline being currently developed is the province of West Java [3].The length of coastline in the province of West Java extending in the northern part from Cirebon district to Bekasi district is approximately 365 km long and in the southern part from Ciamis district to Sukabumi district is around 355 km.

Subang district is geographically located in the northern part of the province of West Java. Of all existing sub-districts, there are four coastal districts, namely Blanakan, Sukasari, LegonKulon, and Pusakanagara sub-districts. The length of coastline in the coast of Subang district reaches the number of 68 km [4].



The utilization of coastal areas to sustain people's economic activities frequently causes destructions, such as abrasion, accretion, seawater intrusion, and the decreasing number of mangrove forests and the damage of coral reefs [5, 6]. Several beaches in Subang district have been objected to abrasion as in Muara Karang – Legon Wetan until Pondok Bali, as well as along the area of Patimban. Sedimentation happened in the estuary indicated with deltas throughout the river as the aftermath of land accretion along the coastline. BPLHD reported that the furthest abrasion occurred in Indramayu sub-district of 48.57 km, whereas the longest accretion ensued along Subang Beach reaching the length of 50.44 km[7].

Land accretion is a land formed by sedimentation at river mouth. In Subang district, the widest land accretion was formed in Blanakan sub-district with the average of 686.53 m, while the land accretion formed in Pusakanagara sub-district had the average 159.32 – 538.50 m [7,8]. Up to the present time, the land accretion in Blanakan coast is only used as an embankment. However, the utilization has not been maximized because it is hampered by weather or high tides that it causes crop failure. The measurement of the width of the land accretion was lastly conducted by BPLHD West Java in 2004 which mentioned that the land accretion in Subang district was 6000 Ha in 2002. Furthermore, there is no government agency that conducts the land accretion measurement. The measurement is usually performed by companies having business in the area[9]. Based on the facts mentioned, the land accretion measurement is required so it can be utilized optimally to bolster the community's economic needs and local revenue. Moreover, this research will analyze the usage of land accretion by the community. The effects of the existence of the land accretion on social and economic condition of people in Blanakan Coast will also be identified.

## 2. Methods

The method used in this research is the descriptive quantitative method. The population in this study was Blanakan sub-district. The sample in this study was a village with land accretion consisting of 7 villages, such as Cilamaya Girang, Rawameneng, Jayamukti, Blanakan, Langensari, Muara, and Tanjungtiga. As for the number of inhabitant sample was counted using purposive sampling with Slovin formulary; that is of 99 people.

The data recollection technique in this research was study of literature, study of documentation, interview, and field observation. The data processing technique was divided into 2; the first one was Landsat imagery interpretation covering RGB transformation, image enhancement, and cropping. Meanwhile the second one was social data processing performed by conducting interviews, tabulation, and creating tables and graphics.

The data analysis technique in this study was separated into 2, which were to analyze the development of the land accretion using perpendicular grid to measure the distance of development of the land accretion throughout 1990 – 2015. The illustration of the usage of perpendicular grid can be seen in picture 2. As for the utilization of the land accretion area and the effects of existence of the land accretion on socioeconomic condition was conducted using cross-tabulations with parameters of income, livelihood, education, and ownership of assets/facilities.

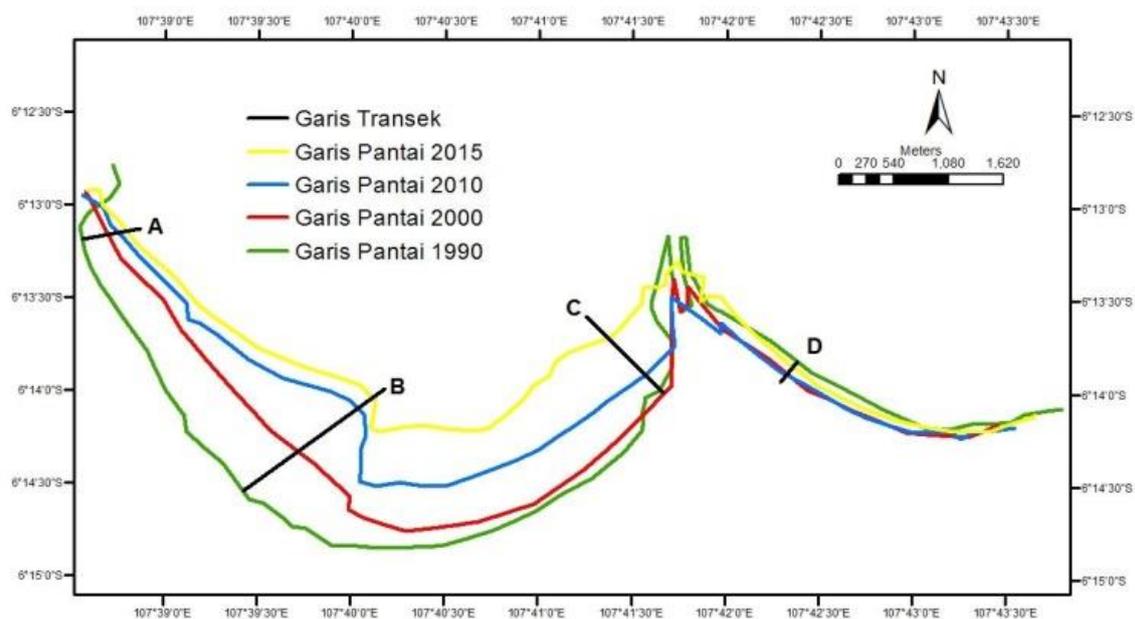


Figure 1. Transect measurements lines

### 3. Results and Discussions

#### 3.1 The development of the Land Accretion in Blanakan Coast Subang District throughout 1990-2015

To identify the land accretion development in Blanakan Coast, a Landsat imagery overlay was conducted from the year 1990, 2000, 2010, and 2015. Each landsat coastline was delineated and then overlaid. The outcome of the Landsat imagery overlay throughout 1990-2015 showed transformations in the coastal area of Blanakan sub-district caused by land accretion as well as abrasion. These two coastal dynamics take turns in transforming the visual of Blanakan coast. Below is the table of the development of the land accretion in area and distance throughout the period of 1990 – 2015 visualized in table 1 and table 2.

Table 1. The Development of Accretion and Abrasion in Blanakan Coast throughout 1999-2015.

Year	Area (Ha)	
	Accretion	Abrasion
1990-2000	242.6	69
2000-2010	266.9	8.2
2010-2015	277.3	0
<b>total</b>	<b>786.8</b>	<b>77.2</b>

**Table 2.** The Development of Width of Accretion and Abrasion in Blanakan Coast throughout 1990 – 2015

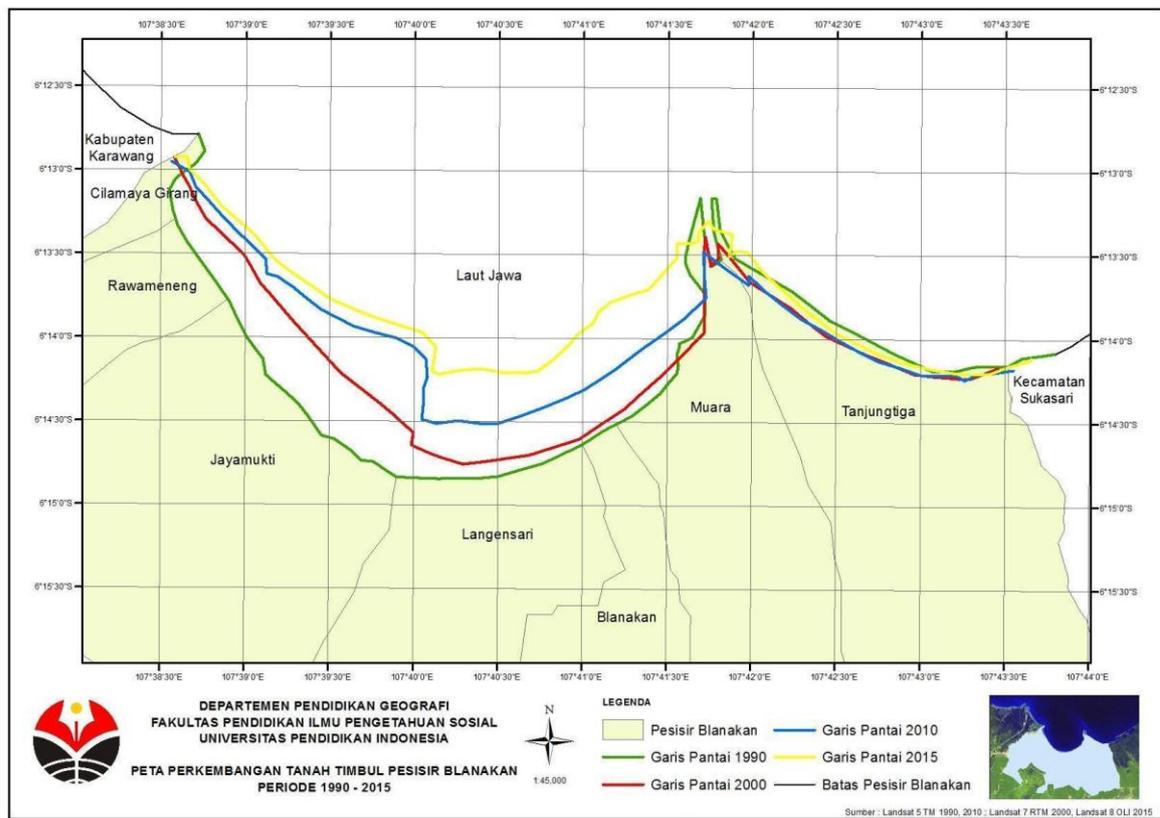
Sample	Length (m)			Total
	1990- 2000	2000- 2010	2010- 2015	
<b>A</b>	255.4	100.6	89.1	445.1
<b>B</b>	684.7	721.9	173.7	1580.3
<b>C</b>	-64.5	270,3	509	444.5
<b>D</b>	-165.3	18	60	-87.3
<b>Total</b>	<b>177,6</b>	<b>277,7</b>	<b>208</b>	<b>2382.6</b>

Overall, the land accretion formed in the period of 1990-2015, the land accretion is of 786.8 Ha and the abrasion is of 77.2 Ha. For the past 25 years, the land of Blanakan Coast has undergone the furthest changing reaching 1,580.3 m.

The most significant accretion is seen in the coastal area in the western of Ciasem River, covering CilamayaGirang, Rawameneng, Jayamukti, Blanakan, Langensari, and Muara villages. The area of the land accretion forms throughout 1990 – 2015 is 739.6 Ha. Besides, abrasion happened during 1990-2000 was 18.6 Ha wide. Meanwhile, at the eastern side of Ciasem River, there is only Tanjungtiga village and the most dominant dynamic was the abrasion throughout 1990-2010 that was 51,9 Ha in. Apart from abrasion, in the period of 2010-2015, land accretion is also formed but its area is not as enormous as it is in the coastal area in the western part of Ciasem River, of 47.2 Ha. Averagely, throughout 25 years, there has been land accretion formed with the total in width 786.8 Ha; roughly 31.5 Ha of land accretion is formed each year.

The land accretion formed in Blanakan coast is caused by over sediment runoff from Ciasem River which is then pushed by the stream towards the western part, proven by the wind rose resulted in data recordings from 1996 until 2010 in northern Subang beach which indicated dominant wind facing to west and southwest. Moreover, because the effects of wind, the sedimentation happening in the study areas in Blanakan coast is also influenced by the fact that the western side of Subang district coast is more slope compared to the coast in the eastern part. The sediment is then trapped in Blanakan sub-district bay [7]. Sedimentation is also influenced by the changing of coastline shape. Moreover, the coastal water is also affected by the dynamics of interaction between water inputs from the sea and freshwater from the river [10].

The western part of Blanakan Coast (bordered by Ciasem River) is an area with the widest area of land accretion. This is because its morphology which is shaped as a bay (protruded inside) and slope. This protruded inside and slope shape is what causes sediment from Patimban Beach, Pamanukan is easily trapped in the area and formed a land accretion. Apart from the morphology, there are also rivers with small estuary that all sediments coming from various directions will be collected and deposited there. As for the eastern part of Blanakan, there is only Tanjungtiga village which for the period of 1990 – 2010 had undergone fairly great abrasion. Its morphological shape which is not too protruded (relatively even) to the sea eases the strong sea stream and high tidal wave to move pass it, eroding the land. Furthermore, the decreasing of mangrove forests density has reduced its function as a wave retainer that the abrasion was difficult to withstand [7].



**Figure 2.** The map of the development of land accretion throughout 1990 – 2016

### 3.2 The Utilization of the Land Accretion Area in Blanakan Coast in Blanakan Coast

The existence of land accretion is utilized by coastal communities to open an embankment to provide their economic needs. All land accretion areas in Blanakan Coast is used as embankments. According to juridical law, land accretions belong to Perhutani. However, in reality, Perhutani allows the people to work on them under the circumstances that they have to care about the sustainability of ecosystems there. To run the land accretion, people need to administer licensing letters by paying around IDR 500.000 – IDR 2.000.000 to Perhutani but through village head. By paying the money, people normally acquire 2 Ha of land for each. Since as time passes the land accretion formed is getting many, the number of people interested in managing them is increased, too. Therefore, Perhutani cooperates with local community to set up an Institution of Forest Villagers/Lembaga Masyarakat Desa Hutan (LMDH) in every village. LMDH functions as a bridge between Perhutani and the society.

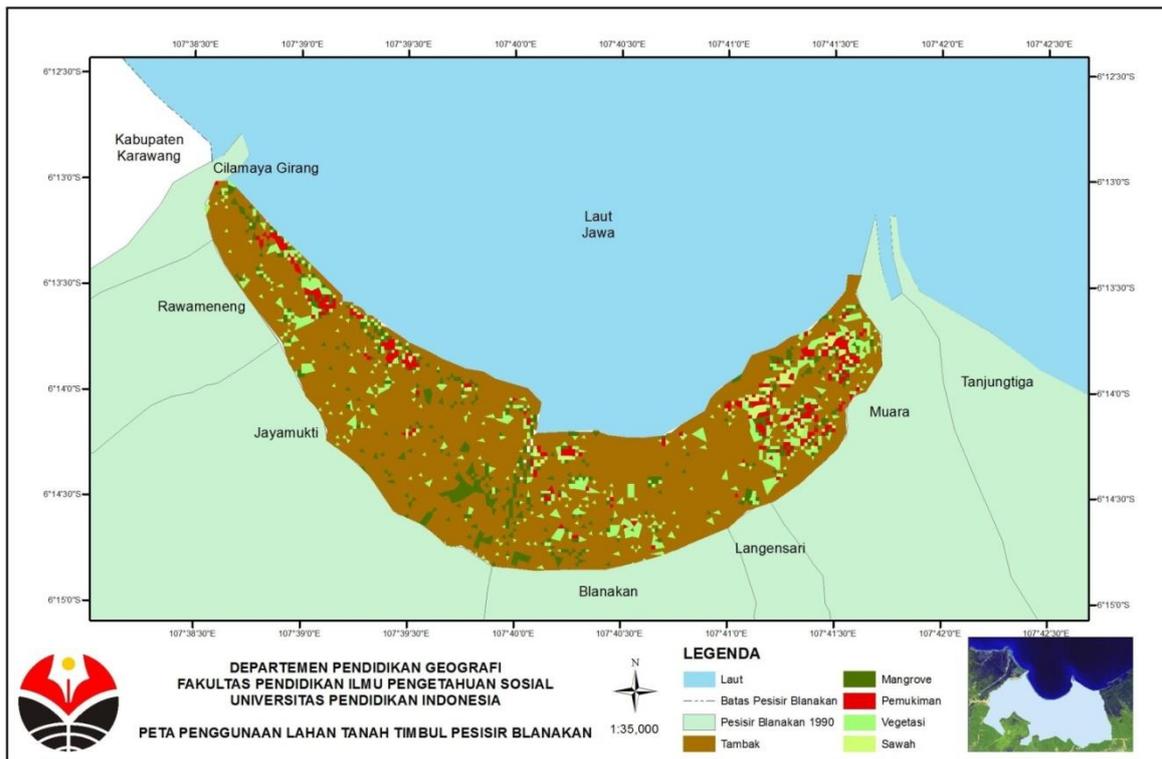


Figure 3. The map of the utilization of the land accretion in Blanakan Coast

3.3 The Impact of Land Accretion on Social and Economic Condition of Blanakan Coast Society

The existence of land accretion has provided several impacts on social and economic condition of Blanakan Coast Society, Subang District. Accreted land helps people in the society to satisfy their primary needs. The socioeconomic condition can be identified using 5 indicators, i.e. livelihood, income, education, health, and ownership of assets.

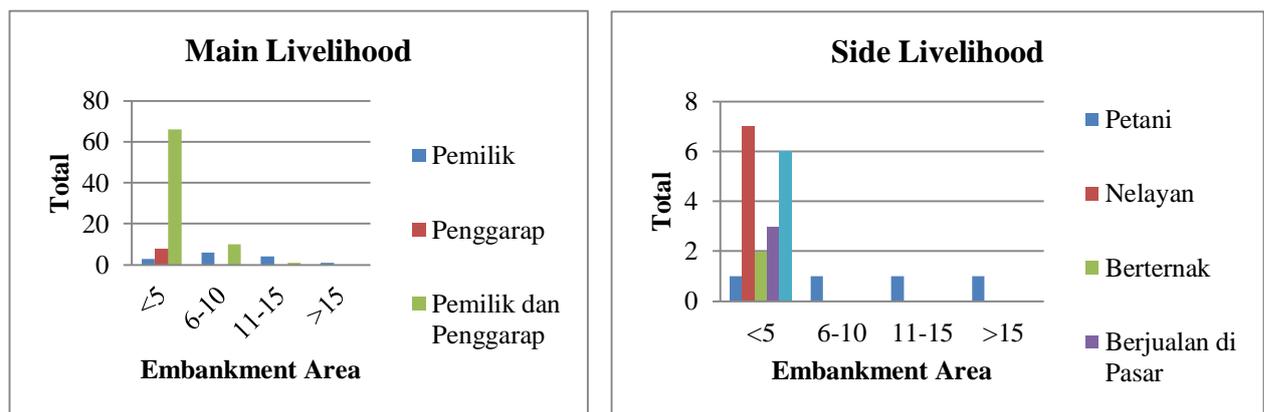
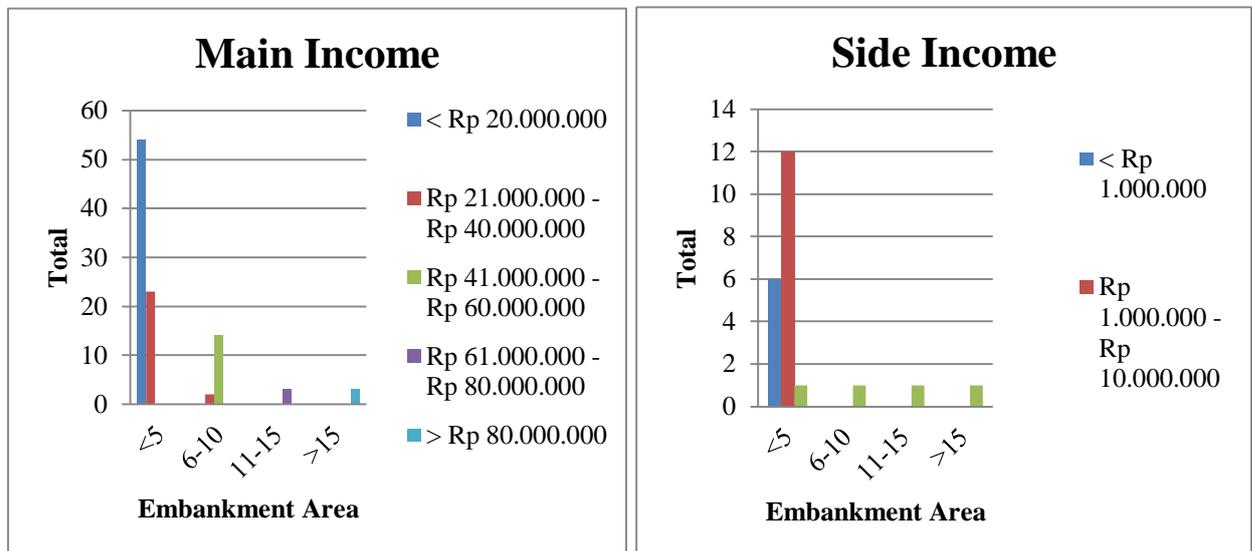


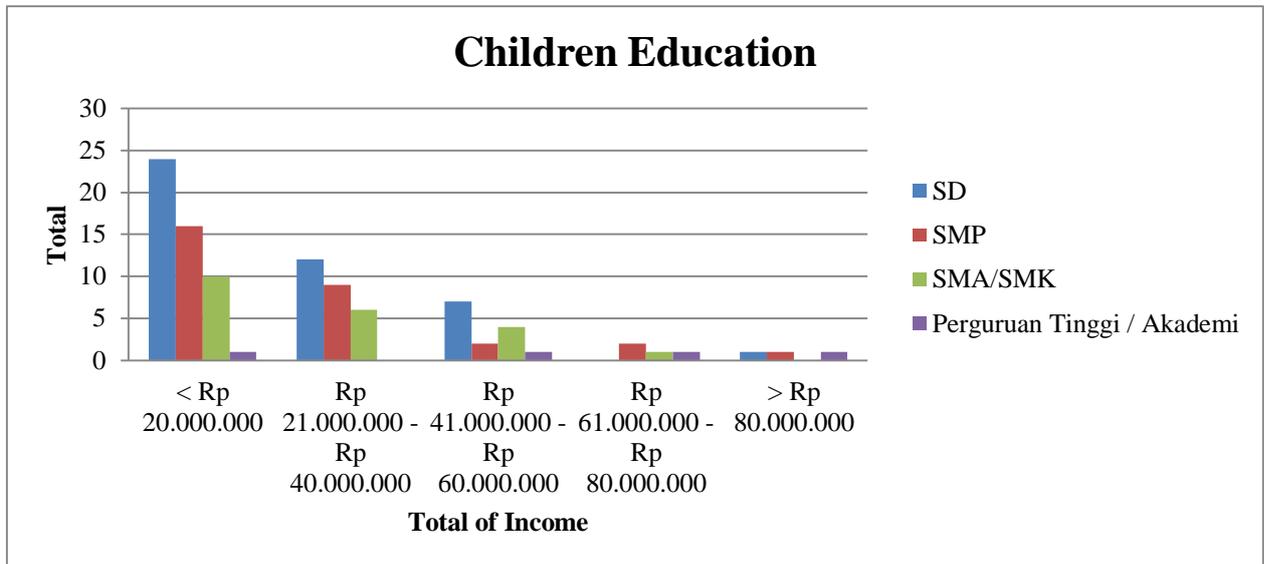
Figure 4. The embankment area with main and side livelihood

Majority of people who live in Blanakan Coast are the owners of as well as the workers at embankments with varied embankment area ranging around 1-5 Ha.

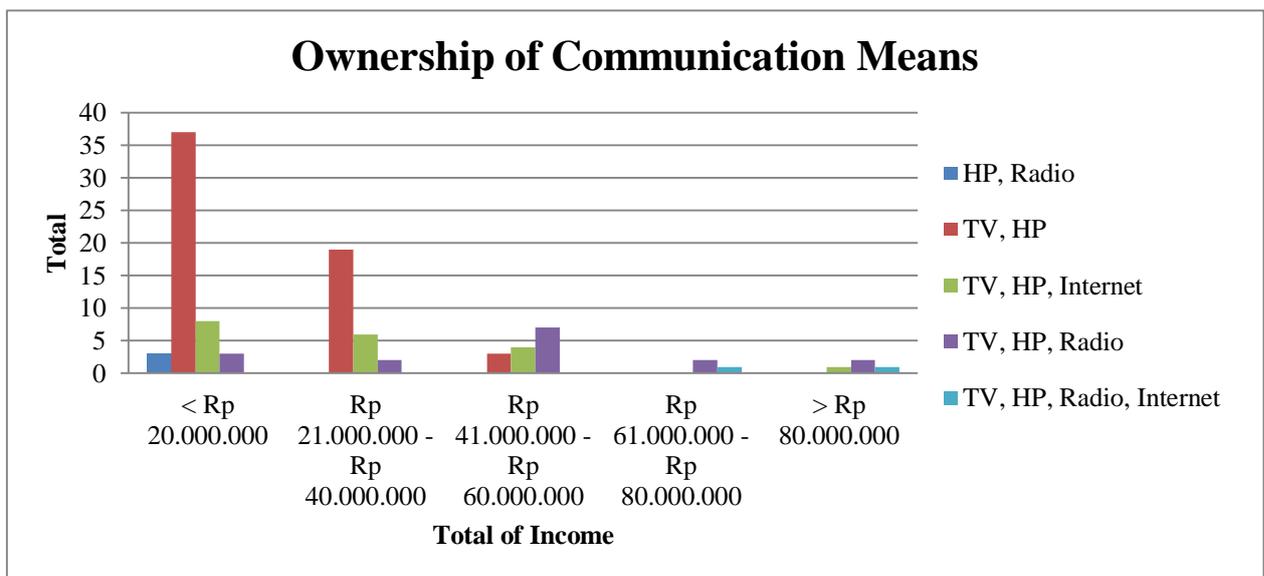


**Figure 5.** The embankment area with main and side income

People who own embankments with the area of 1-5 Ha commonly have side livelihood to meet their necessities, such as farmers, fishermen, farmers, sellers at markets, and owners of small shops. On the other hand, the owners of embankments with the area of above 5 Ha usually own rice fields as side livelihood. The wider the embankments one has, the higher their income is. The main income of < IDR 20,000,000 places first belonging to embankment owners with an area of 1-5 Ha. The most side income is found at the group of farmers whose embankments are of 1-5 Ha, as what has been discussed earlier that it is the group with most side livelihoods. Embankment farmers whose income is < IDR 20,000,000 have more schooled compared to other income groups. Found in this group are children with level of education ranging from Primary School, Junior High School, Senior High School, and University. All respondents involved in this research state that they wish their children should be educated until attending the university so they can get better professions and income compared to their parents.

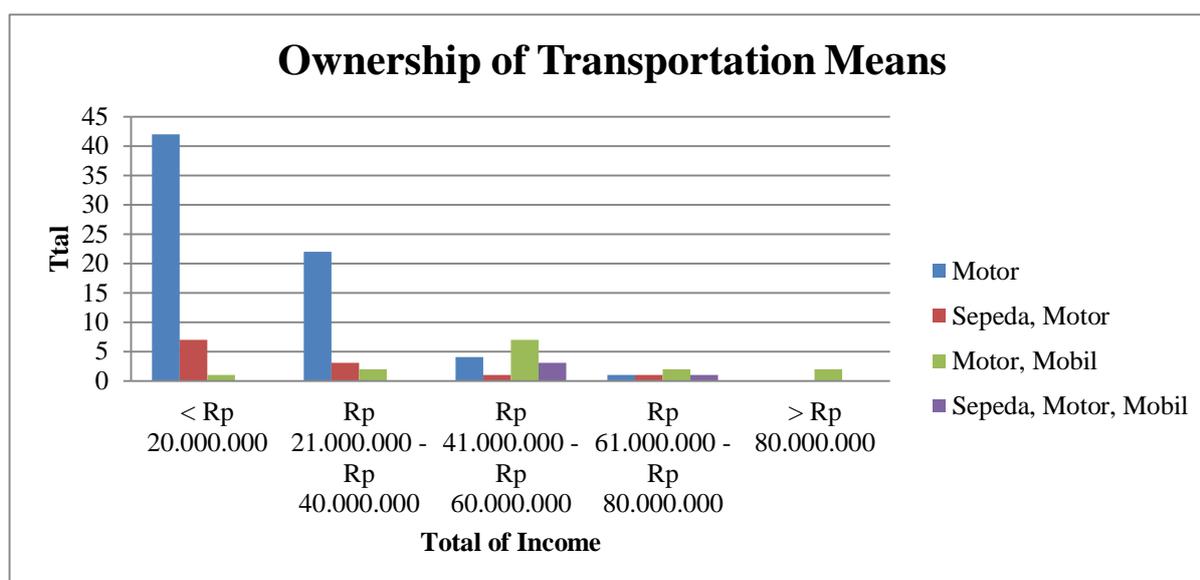


**Figure 6.** Total of Income with Children Education



**Figure 7.** Total of Income with Ownership of Communication Means

As for the indicator of health, all respondents state that they have had their own lavatory even though the condition is still varied, from the ones that are feasible to use and the less feasible ones. The awareness to live healthily has been decent. The last socioeconomic which is the ownership of assets, are separated into the ownership of residence, ownership of communication means, and ownership of transportations. Of all respondents, only two of them rent their house, typically newcomers who come as embankment workers. For the ownership of communication means, the lesser the farmers' income is, the more limited the communication means they have. Most of them only have televisions and cellphones. On the other hand, the group of embankment farmers whose income is >IDR 80,000,000 owns more varies.



**Figure 8.** Total of income with ownership of transportation means

Similar to the ownership of communication means, the lesser the embankment farmers' income is, the fewer the vehicles they have. Nearly all of the respondents ride motorbikes and in the group with the income of > IDR 20,000,000, the highest ownership of transportation means belongs to motorbikes group. Meanwhile the most varied ownership of transportation means belong to the group of embankment farmers with the income of IDR 41.000.000 – IDR 60.000.000, that are bicycles, motorbikes, and cars.

#### 4. Conclusion

Based on the landsat imagery overlay throughout 1990-2015, overall, during the period, the land accreted is 782.9 Ha and the abrasion is of 73.3 Ha with furthest changing reaching 1.580,3 m. The dynamics in Blanakan Coast, Subang District can be divided into 2. The western part (Cilamaya Girang, Rawameneng, Jayamukti, Blanakan, Langensari, and Muara Village) is the area with more land accretion, which is 741.2 Ha with the furthest accretion of 1,580.3 m. Meanwhile, for the eastern part, there is only Tanjungtiga village, the dominant dynamic is abrasion. During 1990-2010, abrasion has occurred spreading to 75.3 Ha abrade the coast as far as 147.3 m. However, since 2010-2015, land accretion was formed as wide as 41.3 Ha and the coast undergoes an addition up to 60 m. Based on the result of the landsat imagery interpretation, it is known that the utilization of land accretion in Blanakan Coast is as follows. From the total of area of 786.8 Ha, the land accretion formed from 1990-2015, an area of 639.9 Ha is used by the community there as embankments. Besides, there are also mangroves of 43.5 Ha, vegetation of 71.6 Ha, rice fields of 5.4 Ha, and residency of 26.4 Ha. The existence of embankments in Blanakan Coast helps the economy of local community. With these embankments in accreted land, the livelihood becomes more varied. The more the embankments owned, the higher their income, the ownership of assets and their welfare regarding education and

health. For the government of Subang Regency, this research can be considered as a recommendation on the protection of coastal areas, especially in deciding zones of land utilization such as embankments and mangrove. This is to avoid conflicts which may arise when the area is managed by local community.

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