Coastal rehabilitation efforts through community perception: A case study in Karawang Regency, Indonesia

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Abstract. The successful implementation of coastal rehabilitation efforts is determined by people's perceptions, participation and needs. However, most often, these aspects are not considered during implementation. The purpose of the research was to analyze the perceptions, participation, and needs of the coastal community of Karawang Regency in supporting coastal rehabilitation efforts. This was a descriptive research with the quantitative and qualitative approaches used to obtain data. The research was conducted from December 2019 to February 2020 in three sub-districts and five villages in the coastal area of the Karawang Regency. The result showed that community perceptions on the implementation of coastal rehabilitation in the three study's sites were generally poor and moderate, while their participation was in the low and extremely low categories. The community's need in terms of socio-economic aspects rested on resolving social conflicts and providing adequate infrastructure, such as roads and settlements. The community's needs in implementing coastal rehabilitation efforts generally focused on building protective hard structures to support the mangrove vegetation life. Therefore, the government should consider the community's perception, participation and needs as resources for planning and implementing development strategies in coastal areas. This provides benefits from the coastal rehabilitation efforts as well as the continuous sustainability and maintenance of ecosystems.
Key Words: coastal communities, coastal erosion, mangrove ecosystems, survey methods.

Introduction. The province of West Java in Indonesia geographically has two coastal regions, the north coastal region, and the south coastal region. The north coastal region has a higher level of environment stress because economic activities are widespread, such as agriculture, aquaculture, mining, transportation, and tourism (BPLH Prov. Jawa Barat 2008). The main problem of one of the areas in the north coast of Karawang Regency West Java is the occurrence of coastal erosion along the coastline for 33.74 km, or 45.81% of the total length of 73.65 km (Fauzie 2016, 2017; Nopiana et al 2020b). According to Nopiana et al (2020a), coastal rehabilitation is one of the various efforts used to control erosion.

The successful implementation of a program, involving coastal rehabilitation efforts, is determined by the perception and participation of community. Therefore, it is important for policy makers, to formulate appropriate and acceptable strategies (Pratiwi et al 2018). In addition, the community needs must be known, because they serve as a priority scale used to determine, plan, and implement the effort (Adi 2008).

The use of mangrove ecosystems in the implementation of coastal rehabilitation efforts is one of the adaptive and sustainable protective strategies with several functions and economically feasible in dealing with coastal erosion (Gracia et al 2018). The effort to integrate the mangrove ecosystem is important for the community and policy makers to reduce the impact of erosion as well as improve ecological and socioeconomic quality (Hashim et al 2010).

Subsequently, studies on community perceptions, participation and needs have been widely conducted. However, no studies have been carried out on the utilization of mangrove ecosystems in coastal rehabilitation management. Nugraha (2018) and Cahyadinata et al (2019) conducted research on the perceptions and participation of the community restoring mangrove ecosystems in relation to aquaculture and fisheries. Roy (2014, 2016) studied the perceptions and participation of the community in mangrove ecosystems in relation to supporting the conservation of the coastal natural resources. Khairullah et al (2016) conducted a study regarding the perceptions on how mangrove ecosystems can reduce the risk of disaster; however, it was not explicitly related to coastal erosion prevention. Budiyanti (2015) researched the community needs in water conservation areas. The research purposed to analyze the perceptions, participation, and needs of the coastal community of Karawang Regency in supporting coastal rehabilitation efforts.

Material and Method

Time and location. This research was conducted for three months from December 2019 to February 2020 in coastal area locations of Karawang Regency, West Java Province. The selection of research sites were the coastal areas most affected by coastal erosion according to DLHPE Kab. Karawang (2008) and Nopiana et al (2020b) and are presented in Table 1. The areas are Cibuaya, Cilebar and Cilamaya Kulon Coast, which are in three sub-districts and five villages.

Table 1

Coverage of coastal areas affected by coastal erosion

No.	Research locations	Coastal areas affected by coastal erosion	
		Sub-districts	Villages
1.	Cibuaya Coast	Cibuaya	Cemarajaya, Sedari
2.	Cilebar Coast	Cilebar	Pusakajaya Utara
3.	Cilamaya Kulon Coast	Cilamaya Kulon	Pasirjaya, Sukajaya

Data collection. Secondary data collection was intended to obtain preliminary information on locations with severe impacts of erosion in the coastal area. The information was sourced from DLHPE Kab. Karawang (2008), Fauzie (2016, 2017), Komarudin (2013), Nopiana et al (2020a, 2020b, 2020c) and Nugraha (2018). Primary data were obtained from observations, in-depth interviews, and questionnaires, with the Likert Scale used for analysis as shown in Table 2.

Table 2

Respondents answers based on a Likert Scale (Cahyadinata et al 2019)

No.	Respondents' answers	Score
1.	Very much agree/very often/very much	5
2.	Agree/often/a lot	4
3.	Quite agree/enough	3
4.	Disagree/rarely/a little	2
5.	Strongly disagree/never/did not exist	1

This study employed the nonprobability sampling method which consist of a combination of judgment and cluster sampling techniques with the aim of producing accurate information compared to the probability sampling method. The target respondents were the communities around the coastline. Based on preliminary research, it was discovered that communities around the coastline were affected by erosion, while those in the upland area which is relatively far from the coastline, tend not to feel and understand the impact

of coastal erosion.

A total of 96 respondents were selected from the three research locations. According to Roscoe (1975), the basis for determining a decent sample size between 30 to 500 samples. Furthermore, if the sample consists of various categories, then the total number of sample members in each category should be at least 30 samples (Sugiyono 2012).

Analysis. This is a descriptive research which consists of quantitative and qualitative approaches in the form of survey methods to obtain accurate facts from the existent situations (Nazir 2014). The community perception and participation were analyzed to obtain information on the community requirements using the quantitative method as well as the needs using the qualitative method.

The data accuracy testing was first conducted by considering the reliability and validity of the data collected before the analysis phase. According to a series of measurements, reliability indicates consistency with validity used to evaluate the accuracy of a measuring instrument in carrying out its functions (Nasution & Usman 2008). This study employed the Cronbach's Alpha method in conducting the reliability testing. Meanwhile, validity testing utilizes the Factor and Item Analysis methods.

The questionnaire totaled 67 statements: 45 statements regarding community perception and 22 statements to explore community participation. The community perception and participation based on the statements of respondents considered to represent the community are shown in Table 3.

Table 3

The level and category of community participation based on a Likert Scale (Cahyadinata et al 2019)

No.	Response score interval	Category of community perception	Category of community participation
1.	4.21 – 5.00	Very good	Very high
2.	3.41 – 4.20	Good	High
3.	2.61 – 3.40	Moderate	Moderate
4.	1.81 – 2.60	Bad	Low
5.	1.00 – 1.80	Very bad	Very low

The preparation of various statements concerning perception is in accordance with the research carried out by Gumilar (2012) and Sari et al (2018). The design of this questionnaire was classified based on four dimensions, as follows:
1. There was a total of 12 statements on community perception in accordance with the damages caused by coastal erosion and the impact on life.
2. A total of 12 statements on community perception in line with the implementation of coastal rehabilitation efforts was also obtained.
3. Community perceptions on the relevance of mangrove ecosystems in preventing coastal erosion had a total of 7 statements.
4. Community perception on the function and role of mangrove ecosystems, consist of a total of 14 statements.

Furthermore, the preparation of various statements in the community participation questionnaire referred to Cohen and Uphoff (1977). It was grouped into four dimensions, as follows:
1. A total of 4 statements were obtained on community participation in the decision making of coastal rehabilitation program.
2. Participation of the community in the implementation of coastal rehabilitation program had a total of 10 statements.
3. Community participation in utilizing the rehabilitation program, consist of a total of 6 statements.
4. Community participation in evaluating the rehabilitation program had a total of 2 statements.

The analysis of community needs discussed the handling efforts of the socio-economic impacts on the community as well as to support the implementation of coastal rehabilitation efforts.

Results and Discussion

Reliability and validity test. The use of valid and reliable questionnaires in data collection is intended to obtain accurate results from the research (Sugiyono 2012). The reliability test results from all dimensions of the community perception and participation variables showed that the measurements carried out are stated in the consistent category. The Cronbach's Alpha reliability coefficient value is greater than the threshold value of 0.6. This is in accordance with the research conducted by Nasution and Usman (2008).

The results from the validity test conducted on community perception and participation questionnaire in all research locations were valid. The Measures of Sampling Adequacy (MSA) value in various statements is based on the results of the Factor Analysis, which is above the threshold value of 0.5 according to Nasution & Usman (2008). The validity test results were also shown in the Spearman correlation coefficient values as well as on other statements tested by Item Analysis, which showed the significance value in the two-tailed test below the 0.05 level. Therefore, the research questionnaire produced consistent and valid data, used for further analyzes.

Respondent characteristics. Data was obtained from the coastal regions of Cibuaya, Cilebar and Cilamaya Kulon from 32, 30, and 34 respondents, respectively. The majority of the respondents in Cibuaya (53.13%) and Cilebar (60%) were women, while in Cilamaya Kulon (55.88%) majority were men as shown in Table 4. Furthermore, majority of the male respondents were heads of households, but a few women respondents were heads of the household. The majority of female respondents were wives that represent heads of household, because during the research the husbands were at their respective workplaces. According to Mangunsong (2006), a wife or any member of the family is considered as a respondent that represents the head of the household.

The respondents in all study locations were between the ages of 15 to 64 years or 91.67%. This implies that majority of the respondents were in their productive age. Their educational level was relatively low with 80.21% of the 96 respondents being unable to complete or graduate from Primary School. The respondents were mostly traders (23.96%), considering the fact that some research sites were tourist areas. Furthermore, the main sources of income in the Cilebar (33.33%) and Cilamaya Kulon Coast were fishing activities (44.12%). Meanwhile, the majority of the respondents from the Cibuaya Coast region were traders (43.75%) and laborers (28.13%).

Table 4

The respondent characteristics in three research locations

Variable	Criteria	Cibuaya Coast		Cilebar Coast		Cilamaya Kulon Coast	
		Number	%	Number	%	Number	%
Gender	Male	15	46.88	12	40.00	19	55.88
	Female	17	53.13	18	60.00	15	44.12
Age	≤ 30	3	9.38	7	23.33	7	20.59
	31-40	10	31.25	6	20.00	8	23.53
	41-50	10	31.25	8	26.67	9	26.47
	51-60	6	18.75	5	16.67	7	20.59
	> 60	3	9.38	4	13.33	3	8.82
Main job	Fisherman	1	3.13	4	13.33	9	26.47
	Fish farmer	3	9.38	3	10.00	2	5.88

Variable	Criteria	Cibuaya Coast		Cilebar Coast		Cilamaya Kulon Coast	
		Number	%	Number	%	Number	%
	Rice farmer	0	0.00	3	10.00	4	11.76
	Trader	12	37.50	5	16.67	6	17.65
	Labor	7	21.88	3	10.00	4	11.76
	Housewife	6	18.75	9	30.00	7	20.59
	Others	3	9.38	3	10.00	2	5.88
The main source of household income	Fisherman	2	6.25	10	33.33	15	44.12
	Fish farmer	5	15.63	4	13.33	2	5.88
	Rice farmer	0	0.00	2	6.67	4	11.76
	Trader	14	43.75	7	23.33	10	29.41
	Labor	9	28.13	6	20.00	1	2.94
	Others	2	6.25	1	3.33	2	5.88
Years of formal school	Never attending school	7	21.88	5	16.67	3	8.82
	Not completed Primary School	9	28.13	7	23.33	9	26.47
	Completed Primary School	14	43.75	11	36.67	12	35.29
	Not completed and completed Junior High Schools	1	3.13	6	20.00	9	26.47
	Not completed and completed Senior High Schools	1	3.13	0	0.00	0	0.00
	College/University	0	0.00	1	3.33	1	2.94
Average monthly household expenditure	≤ 1,000,000.00 IDR	2	6.25	1	3.33	0	0.00
	> 1,000,000.00 IDR – 2,000,000.00 IDR	2	6.25	9	30.00	6	17.65
	> 2,000,000.00 IDR – 3,000,000.00 IDR	25	78.13	15	50.00	19	55.88
	> 3,000,000.00 IDR	3	9.38	5	16.67	9	26.47
Number of household members	1-4	23	71.88	24	80.00	27	79.41
	> 4	9	28.13	6	20.00	7	20.59
Number of dependents	Have no dependents	0	0.00	0	0.00	2	5.88
	1-3	23	71.88	24	80.00	26	76.47
	> 3	9	28.13	6	20.00	6	17.65
The distance of the house to the coastline	≤ 5	4	12.50	2	6.67	7	20.59
	6-10	6	18.75	2	6.67	2	5.88
	11-20	18	56.25	7	23.33	5	14.71
	21-30	2	6.25	3	10.00	1	2.94
	31-40	0	0.00	0	0.00	0	0.00
	41-50	2	6.25	2	6.67	5	14.71
	51-100	0	0.00	4	13.33	8	23.53
	101-250	0	0.00	5	16.67	2	5.88
	251-500	0	0.00	5	16.67	3	8.82
	> 500	0	0.00	0	0.00	1	2.94

Armiento (2018) reported that a respondent's income is estimated by the average monthly household expenditure. Approximately 50-78.13% of the respondents in the three study locations had an average monthly household expenditure of 2,000,000.00 IDR to 3,000,000.00 IDR. Subsequently, most households consist of 1 to 4 people. Meanwhile, the number of family dependents varied from 0 to 6 people. A total of 71.88-80% of the respondents families were between 1 to 3 people.

The majority of the respondents had houses around the coastline affected by erosion. Generally, the distance from the respondent's house to the coastline was approximately 50 meters (70.83%). In fact, 87.50% of the respondents houses in the Cibuaya Coastal region was approximately 20 meters.

Community perception. Perception is a person's view or assessment of a particular object, and this is due to an individual's sense of observation (Sari et al 2018). It is important to learn the public's perception because it is closely related to community behavior. This is also used to predict or change people's behavior in managing resources, which is shown by the increase in community awareness (Petrescu 2013; Irawan et al 2017; Wiyono et al 2018).

Community perceptions of coastal rehabilitation efforts are shown in the varied statements of the respondents. In the Cibuaya Coast region, respondents' perceptions were classified as poor with an average score of 2.14 and in the Cilebar and Cilamaya Kulon Coast are in the moderate category with an average score of 3.04 and 2.64, respectively.

One interesting fact discovered in this study was that the majority of the respondents in all the study sites were not aware of the cause of coastal erosion in their area. Approximately 96.88% of respondents stated that they were disturbed by the occurrence of coastal erosion. Meanwhile, 81.25% of respondents stated that the occurrence has caused psychological disturbances such as insecurity, depression, negative thoughts etc. Furthermore, 76.04% of respondents stated that they were dissatisfied with the government's assertiveness in applying law enforcement towards rules violating the utilization of coastal resources.

Community perception in Cibuaya Coast. The respondents perceptions in Cibuaya on the issue of coastal damage were in the moderate category of 2.86, whereas in other dimensions they had very bad and bad perceptions, with an average score ranging from 1.54 to 2.21 as shown in Table 5. In accordance with the issue of coastal damage, 84.38% of respondents believed that natural factors are the causes of coastal erosion. More than half of the respondents stated that human factors such as sea sand mining, conversion of mangrove forests and other activities were not the causes of coastal erosion. However, 43.75% of respondents admitted that in the past, the community had converted land in the coastal borders for farm and settlements. The above conditions show that lack of understanding on community behavior has an impact on the occurrence of damages in the coastal environment. Julis (2016) reported that understanding the issue of coastal damages in the South Padang Sub-district, Padang Municipality was still low, this caused the community to rely on the government in overcoming coastal erosion.

The perceptions of the poor respondents had an average score of 1.96 in Cibuaya, on the implementation of coastal rehabilitation efforts. This was due to lack of attention, concern and supervision on the coastal environment by the provincial, district and village governments. The rehabilitation efforts had been carried out in some of the affected villages, however there is limited study in Cemarajaya Village. The handling of social and economic impacts namely relocation of settlements and the construction of roads is still slow, and was almost never conducted. The poor perception of the respondents was also due to the ineffectiveness of the coastal protection built through Longitudinal Geotextile Sack (KGM) technology (the Beach Belt Program), which is is a beach protection technology made from polypropylene geotextile, sewn to form a sack. The construction aims to reduce the energy of waves moving to the coastline so that the waves arriving at the beach are not too strong and reduce the potential for coastal erosion (KKP 2017).

The community perception of the implementation of coastal rehabilitation efforts
in each research location

No.	Dimensions of perception that explored	The average score of respondents' answers			Category of community perception		
		Cibuaya Coast region	Cilebar Coast region	Cilamaya Kulon Coast region	Cibuaya Coast region	Cilebar Coast region	Cilamaya Kulon Coast region
1.	The issue of coastal damage related to coastal erosion and its impact on their lives	2.86	3.09	3.07	Moderate	Moderate	Moderate
2.	Coastal rehabilitation efforts that had implemented	1.96	3.01	2.06	Bad	Moderate	Bad
3.	Linkage of mangrove ecosystems with the prevention of coastal erosion	2.21	3.73	3.42	Bad	Good	Moderate
4.	The function and role of mangrove ecosystems	1.54	2.33	2.01	Very bad	Moderate	Bad
	Category of community perception in general	2.14	3.04	2.64	Bad	Moderate	Moderate

The perception of the utilization of mangrove ecosystems to prevent coastal erosion was bad (with an average score of 2.21). Generally, the community had not felt the effectiveness of the mangrove ecosystems. They were oriented towards using the hard structure method for coastal protection particularly in the Cemarajaya Village. Basically, majority of the community had a poor understanding of the functions and roles of the mangrove ecosystems. This is because the coastal areas in the village are mostly sand substrate and not mangrove habitats.

Community perception in Cilebar Coast. The score of each respondent in Cilebar is within an average range of 2.33-3.73, and in the moderate and good categories as shown in Table 5. Approximately 96.67% of the respondents considered natural factors as the cause of coastal erosion in the area. Subsequently, 83.33% of respondents stated that the presence of jetties in the area was not the cause of coastal erosion. However, according to some studies, the existence of jetties for aquaculture efforts is the cause of coastal erosion (Rofi & Hutahaean 2012; Nurhadi & Hutahaean 2013; Komarudin 2013). The perception of the community as stated above shows that the respondents paid little attention and did not understand the changes that occurred in the coastal environment. This condition is allegedly related to the low level of education in the region, which is reflected by the academic achievement of the respondents as shown in Table 4.

An average score of 3.01 stated in the moderate category was obtained from the respondents' perceptions towards implementing coastal rehabilitation efforts. This is believed to occur due to the cooperation between private sectors and community with the help of various groups of mangrove farmers that carried out planting activities along the coastline affected by coastal erosion in Cilebar Coast region. Approximately 43.33% of the respondents stated that they were quite satisfied with the partnership developed with

the government, private organizations and community. The private sector is encouraged by the local government to distribute part of their corporate social responsibility funds to support coastal rehabilitation and restore mangrove ecosystems. The local government plays a role in determining regulations, providing facilitation to the private sector, and mediating between the needs of mangrove farmer groups and the private sector.

The respondents from Cilebar Coast had a good perception of the use of mangrove ecosystems to prevent erosion (with an average score of 3.73). However, some people had low perception of this dimension particularly in Sukajadi Hamlet, Pusakajaya Utara Village, which is shown by the mangrove conversion of the rehabilitated land into aquaculture areas as shown in Figure 1. This condition is in accordance with the research carried out by Nugraha (2018) and Nopiana et al (2020c) which stated that the use of mangrove ecosystem in the coastal areas of the Karawang Regency was carried out without strict rules and sanctions.

(a)   (b)
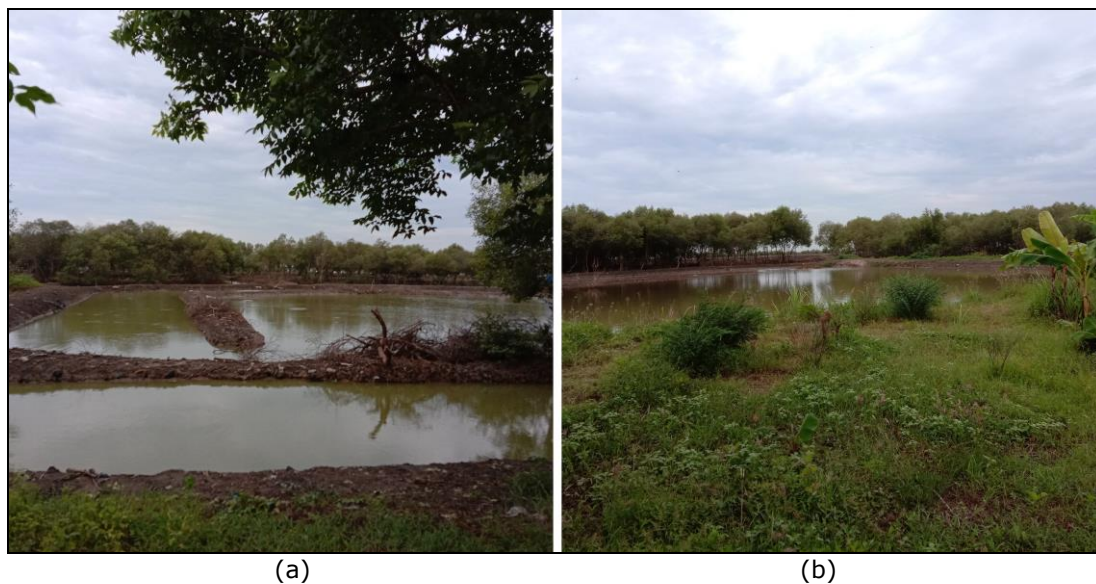
Figure 1. (a) Conversion of mangroves into aquaculture areas in Sukajadi Hamlet, Pusakajaya Utara Village, Cilebar Sub-district; (b) Individual community members opened it into open ponds.

The respondents perceptions on the function and role of mangrove ecosystems were stated in the moderate category, with an average score of 2.33. This condition was mainly due to the fact that the community had enjoyed the benefits of coastal protective services provided by the mangrove ecosystem. In addition to reducing the energy of ocean waves, it created sedimentation along the coastline, thereby adding more land to the sea. The community had also gained tangible benefits from these services, particularly in the form of tourism activities, as well as food and beverage providers.

Community perception in Cilamaya Kulon Coast. The score of each respondent's perception on the implementation of coastal rehabilitation efforts in the Cilamaya Kulon Coast region is within an average range of 2.01 to 3.42, and in the bad and moderate category as shown in Table 5. Approximately 85.29% of all respondents stated that they were not aware of the exact cause of coastal erosion and only believed that the occurrence is due to natural factors. However, one respondent stated that there were sea sand and coral mining activities in the past such as in the case of Sukajaya Village. This information offers an indication of the causes of coastal erosion in the area.

The poor perception of the respondents on the implementation of coastal rehabilitation efforts in the region had an average score of 2.06 due to their observations of the failures encountered during the application of mangrove planting in areas affected by coastal erosion (Pasirjaya Village). The mangrove planting program launched by both government and the private sector failed, because the vegetation was often swept away by the sea waves as shown in Figure 2. The failure was mainly due to the absence of the construction of sea wave barriers to protect newly planted mangrove seedlings. This

condition was exacerbated by the strong sea waves that hit the shoreline, particularly during certain seasons. Efforts such as the use of a Wave Breaker (APO) to protect mangrove seedlings from sea waves in the Semarang Municipality coast are effective. The APO was implemented by installing used tires that were neatly arranged and filled on the inside with mud sediments (Martuti et al 2018). At the Haji Dorani River, Malaysia breakwater is used as a sea wave barrier to protect seeds during mangrove restoration (Hashim et al 2010).

(a)   (b)
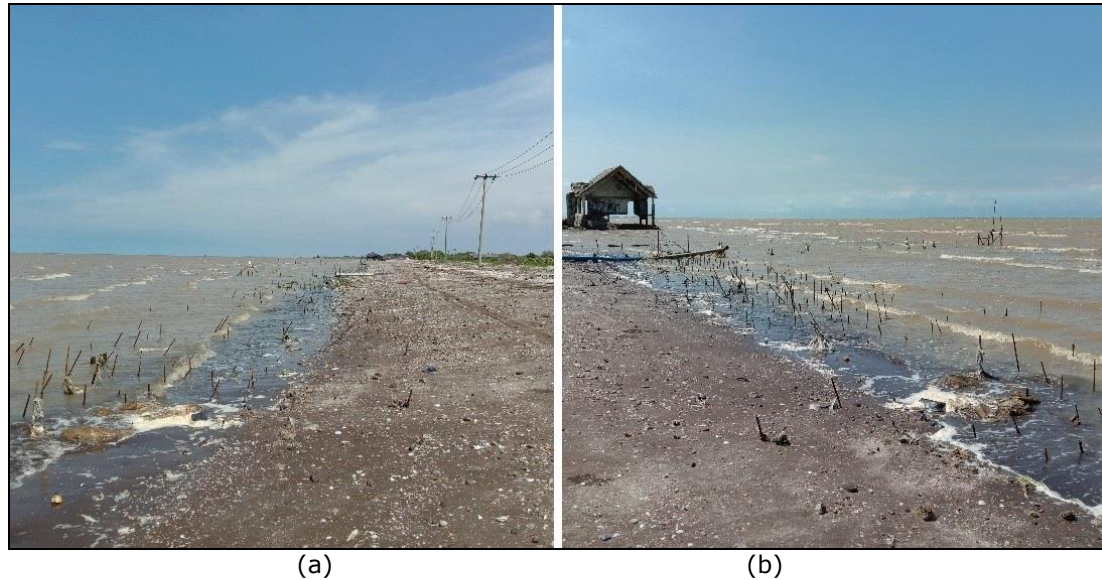
Figure 2. (a) Failure of planting mangroves in Pasirjaya Village, Cilamaya Kulon Sub-district; (b) The newly planted mangrove plants had disappeared; only the stakes remain.

The poor perception of this dimension was also triggered by the government's lack of attention, concern and supervision of the coastal environmental damages in the region. This was marked by the damaged and broken road infrastructure which was not repaired immediately, thereby complicating socio-economic activities. It significantly impacted the drastic reduction of tourism, difficulty in distributing fisheries and agricultural products, and accessing education, health, and other sectors in the region. Moreover, the issue of high tides occurring at the same time in the rainy season causes the coastal communities to become increasingly isolated.

The respondents perceptions on the use of mangrove ecosystems to prevent coastal erosion were included in the moderate category (with an average score of 3.42), while their perceptions on the functions and roles were in the poor category (at an average score of 2.04). Majority of the respondents understood that the mangrove ecosystems functions as a coastline stabilizer. This is due to the fact that the conversion of mangrove areas for tourism activities by the government has caused coastal erosion in the past particularly in the case of Pasirjaya Village (Nopiana et al 2020b). Although the majority of the respondents did not yet fully understand the function and role of the mangrove ecosystems. In general, as the function serves as a barrier or absorbent of strong winds from the sea to the land, as well as building materials and anchors. The poor community perception on ecosystems was rampant in several regions in Indonesia. Damages to the mangrove areas in West Muna Regency and Bombana Regency were partly due to lack of community awareness and understanding of the benefits and functions of the mangrove forests (Wa Alimuna et al 2009; Kartini & La Harudu 2019).

Community participation. The general assessment of community participation in the implementation of coastal rehabilitation efforts was in the low and very low categories, with an average score range of 1.73 to 2.44. The respondents in the Cibuaya Coast region were in the very low category, while those in the Cilebar and Cilamaya Kulon Beach areas were in the low category.

Community participation in Cibuaya Coast. The community participation in almost all dimensions was in the very low category, with an average score of 1.44 to 1.75 as shown in Table 6. Meanwhile, the dimensions of coastal rehabilitation efforts utilization are classified in the low category, with an average score of 2.08. In the decision making dimension, 71.88% of respondents stated that they had never participated in proposing ideas or thoughts, either in meetings or in discussion forums. Their reasons were based on the fact that they had never attended meetings and discussion forums (81.25%), and have never participated in deliberations or decision making related to coastal rehabilitation efforts in 84.38%.

Table 6

The community participation of the implementation of coastal rehabilitation efforts in each research location

No.	Dimensions of participation that explored	The average score of respondents' answers			Category of community participation		
		Cibuaya Coast region	Cilebar Coast region	Cilamaya Kulon Coast region	Cibuaya Coast region	Cilebar Coast region	Cilamaya Kulon Coast region
1.	Decision making in the coastal rehabilitation program	1.44	1.90	1.66	Very low	Low	Very low
2.	Implementation of the coastal rehabilitation program	1.65	2.15	2.32	Very low	Low	Low
3.	Benefit taking of the beach rehabilitation program	2.08	3.07	2.15	Low	Moderate	Low
4.	Evaluation of the coastal rehabilitation program	1.75	2.62	1.93	Very low	Low	Low
	Category of community participation in general	2.14	2.44	2.02	Very low	Low	Low

These are understandable reasons due to the absence of community meetings initiated by village, district or provincial governments that specifically and routinely discuss coastal rehabilitation efforts. Although meetings at the village level were routinely held on a weekly basis, it only involved the participation of a set of village officials that discuss general matters on governance. The discussion was related to the performance evaluation of village government officials, security and order, administrative order and the delivery of other up-to-date information. Every week the village government provides a meeting called "minggon". However, at this meeting the solutions to address the impact of coastal erosion are not discussed.

As many as 78.13% of respondents stated that the community had never responded or rejected the ideas offered in coastal rehabilitation efforts. This showed that the community had been apathetic and pessimistic about the coastal rehabilitation efforts undertaken. This was mainly due to lack of attention, concern and supervision by the government concerning the coastal environmental conditions. Another possibility was related to the poor educational level of the community. This was due to the fact that

majority of the respondents (93.75%), had never attended school, while some either did not complete or graduate from Primary School (Table 4). One factor hampering community participation is the low level of education, unwillingness to read and write, as well as the limited knowledge (Abe 2001).

The low participation is partly due to the low involvement of the community in coordinating, program description and administration activities. This is based on the answers of the majority of respondents which was approximately 84.38-90.63% that rarely and never participated or involved in various activities. This condition was suspected due to the fact that the coastal rehabilitation program implemented in this region is more project oriented. In other words, the community only acts as an object of the implemented program with the aim to obtain wages or incentives. Adi (2008) reported that participation is identical to physical involvement in the work and tasks; however, self-involvement encourages the emergence of responsibilities and total contributions to the programs implemented.

Low participation is also caused by lack of funds, time, energy, expertise, goods and moral encouragement. The majority of the respondents was approximately 65.63-87.50% as rare and never contributes to any of these factors. This condition was allegedly due to the coastal rehabilitation efforts implemented in this area which emphasizes on the hard structure method with capital intensive characteristics, therefore it did not require much community involvement. The construction of rock breakwater and coastal protection using the KGM technology (the Beach Belt Program) utilized more heavy equipment and other facilities.

The benefits of community participation are shown in their sense of enjoying or utilizing the results obtained from the implementation of coastal rehabilitation efforts (Rizqina 2010). Approximately 53.13-59.38% reported that the coastal rehabilitation efforts in the region had offered benefits and improved community welfare, however, 28.13-43.75% of the respondents stated otherwise. This was because some of the affected areas have not yet benefitted from this program. The possibility is that the respondents that had benefitted were from the rehabilitated location, while those that stated otherwise were from areas that had not yet been rehabilitated. However, 68.75% of the respondents were worried, anxious and depressed on the effects of coastal erosion.

Approximately 84.38% stated that this effort had no impact on the development of other village activities. Although the village government in this region has obtained developmental funding through the Village Fund, other areas within the same village have not been developed or worked on the Cemarajaya Village. The government only focuses on developing areas around village offices and settlements in certain hamlets.

Meanwhile, most of the respondents (75%) reported that the community did not participate in protecting and maintaining the results from the coastal rehabilitation. The role of the Community Surveillance Groups (called Pokmaswas), which is an authority that controls and monitors the program, was also not observed. The village government only occasionally orders its apparatus and the community to repair wave-retaining buildings.

Majority of the respondents (62.50%) stated that they rarely and never participated in evaluating and supervising the implementation of coastal rehabilitation efforts. Furthermore, approximately 84.38% were also rare and never offered suggestions and criticisms, either directly or indirectly. The implementation tends to be carried out top-down, not actively involving the community, therefore their potentials and aspirations are often overlooked. The above conditions are some of the factors causing the government programs to fail in several places (Rusmin 2005).

Community participation in Cilebar Coast. The community participation in almost all dimensions was in the low category, with an average score of 1.90 to 2.62 (Table 6). Meanwhile, the utilization of coastal rehabilitation efforts is in the moderate category, with an average score of 3.07. In this dimension, 56.67% of the respondents agreed that the implementation of the program in the region had improved the welfare of the community. Factors affecting the welfare of society are psychological disorders from the occurrence of environmental damage (Fahrial 2012). 26.67% of the respondents stated

that they no longer felt worried, anxious and depressed about the effects of coastal erosion. Subsequently, 46.67% of respondents actually reported otherwise. Allegedly, those with psychological disorders are from the affected locations (Sukamulya Hamlet, Pusakajaya Utara Village). However, 60% of the respondents from areas that have successfully implemented coastal rehabilitation efforts admitted that the community currently enjoys the benefits.

Community participation to utilize these efforts was also shown in the increasing potentials and creativity of the groups of mangrove farmers in the region. This is based on answers from 33.33% of respondents that stated that mangrove farmers tend to increase their creativity, by exploring their potentials for the success of the coastal rehabilitation efforts. The development of creativity is showed in their ability to manage groups, build partnerships, particularly with the government and private sector, as well as to share knowledge and experiences with mangrove farmers in other areas.

This is also observed in the opinions of 46.67% of respondents that reported that the community participated in protection and maintenance of the coastal rehabilitation efforts. At least, majority of the community participates in complying with the provisions stipulated by the group of mangrove farmers in utilizing land in the coastal rehabilitation area. This fact is inseparable from the role and authority of the farmers in protecting and supervising lands in irresponsible communities. Furthermore, the farmers are intensively educating the community, particularly on the role of mangrove ecosystems in protecting coastal areas from erosion.

Community participation in decision making shows that 53.33% of respondents have never participated in proposing ideas or thought, both in meetings and discussion forums. They never attended the meeting and discussion forum (56.67%), and never participated in deliberations (56.67%). As many as 60% reported that the community had never responded or rejected the ideas offered in the coastal rehabilitation efforts. Based on further interviews with respondents, only group members have the right to attend the forum. The general public is reluctant and unwilling to attend without being invited by the organizer. Community involvement is needed in order to determine the direction and strategy of policy implementation, with emphasis on the rights and obligations of every person (Nugraha et al 2018).

The low level of participation is influenced by the low outcome level of community involvement in administrative activities. The majority of respondents or 60-73.33% stated that they rarely or never participated in various activities. The respondent's statement confirmed the research results from the previous participation dimension which stated that the coastal rehabilitation efforts undertaken were exclusive, and that participation in these activities were only carried out by group members.

According to 40-70% of the respondents, stated that the community rarely donated funds, time, energy, expertise, goods and moral encouragement. Based on further interviews with the respondents, it was discovered that there were affected landowners that did not permit their land to be used for coastal rehabilitation efforts. The respective land was formally used as a pond which sunk due to coastal erosion. The land owners are not from the area, therefore they lack sense of responsibility towards the public interest. The involvement of the community plays an important role in maintaining and implementing the rehabilitation efforts in coastal areas. This encourages the community to have a sense of responsibility in the rehabilitation and maintenance, as well as the creation of a sustainable coastal environment (Martuti et al 2018).

On the contrary, 50% of the respondents reported that the community often participated in evaluating, assessing and overseeing the implementation of coastal rehabilitation efforts. The efforts by the group of mangrove farmers were assessed and supervised by the private sector as the aid provider. Additionally, as much as 50%, most respondents rarely and never provide suggestions and criticism of implementing these efforts, either directly or indirectly. This is because it was exclusively accounted by the groups of mangrove farmers, therefore the community is less concerned with this program.

Community participation in Cilamaya Kulon Coast. The community participation conditions in almost all dimensions are classified as low, with an average score range of

1.93 to 2.32 as shown in Table 6. Similarly, the dimensions of coastal rehabilitation efforts is in the very low category, with an average score of 1.66. In this dimension, 70.59% of respondents stated that they had never participated in proposing ideas or thoughts, either in meetings or in discussion forums. Approximately 76.47% of the respondents never attended meetings, discussion forums, and failed to participate in deliberations. This is due to the estrangement of relationships and social conflicts between the surrounding community and both of the mangrove farmers group and Pokmaswas, in terms of the utilization of coastal areas such as Sukajaya Village. Social conflicts also occur in other Indonesian regions, such as in the Kuta Beach in Badung Regency, due to differences in perspective and understanding, as well as conflict of interests in the coast related to abrasion handling, between the community and local government (Handoko 2007).

A total percentage of 76.47 stated that the community had never responded or rejected the ideas offered in the coastal rehabilitation efforts. Conflicts between the surrounding community with a particular mangrove farmers group (which also acts as Pokmaswas) deprived them of feeling mentally involved in the coastal rehabilitation efforts. The inadequate recognition of mangrove farmer groups by the surrounding community is because they are not group members, therefore, they have a low sense of belongingness. According to Sastropoetro (1988), the sense of belongingness used to manage a program arises when a person is recognized as a group member, therefore they have the responsibility to provide help in order to achieve the program's goals.

The low level of community participation is due to their involvement in coordination, program description and administration activities. Approximately 85.29-88.24% of the respondents stated that they rarely participated in various activities, therefore, they did not require community involvement. The control of coastal rehabilitation land by mangrove farmers groups or Pokmaswas limited the community to participate in the implementation of coastal rehabilitation efforts (Case in Sukajaya Village). They were only involved in planting mangroves as workers to earn wages (Case of Pasirjaya Village).
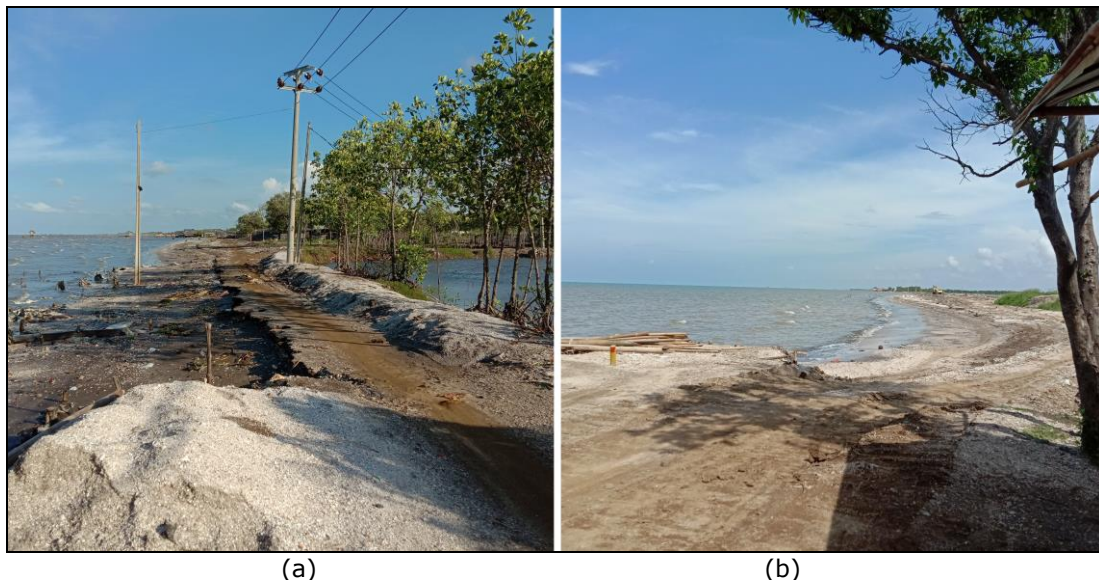

(a)   (b)

Figure 3. (a) Damage to the beach and the termination of road access in the Cilamaya Kulon Coast region; (b) This road would disappear if the high tide arrived, making it difficult for the community to access the region.

Meanwhile, 50-61.76% of the respondents stated that they rarely participated in community contributions in the form of funds, expertise, goods and moral encouragement. Low community contributions in the form of funds are due to the economic capacity in this region which is still very limited.

Furthermore, 61.76-70.59% of the respondents stated that the implementation of coastal rehabilitation efforts in this area failed to provide benefits and improve

community welfare. A total of 58.82% still feel worried, anxious and depressed on the impact of coastal erosion. Less intense and effective efforts made the community feel isolated by the government with damages on the coast. This condition makes the community isolated and difficult to improve their welfare as shown in Figure 3 (case in Pasirjaya Village).

According to 73.53% of the respondents there was an increase in the mangrove farmer groups, which encouraged the success of coastal rehabilitation efforts, by exploring their potential and creativity. An example is the innovation group in Sukajaya Village which planted mangroves in coastal waters as shown in Figure 4. Although it has not been massively applied, the innovations have begun to address the problem of damage or loss of mangrove seedlings in a certain monsoon season.

<div align="center">(a)   (b)</div>
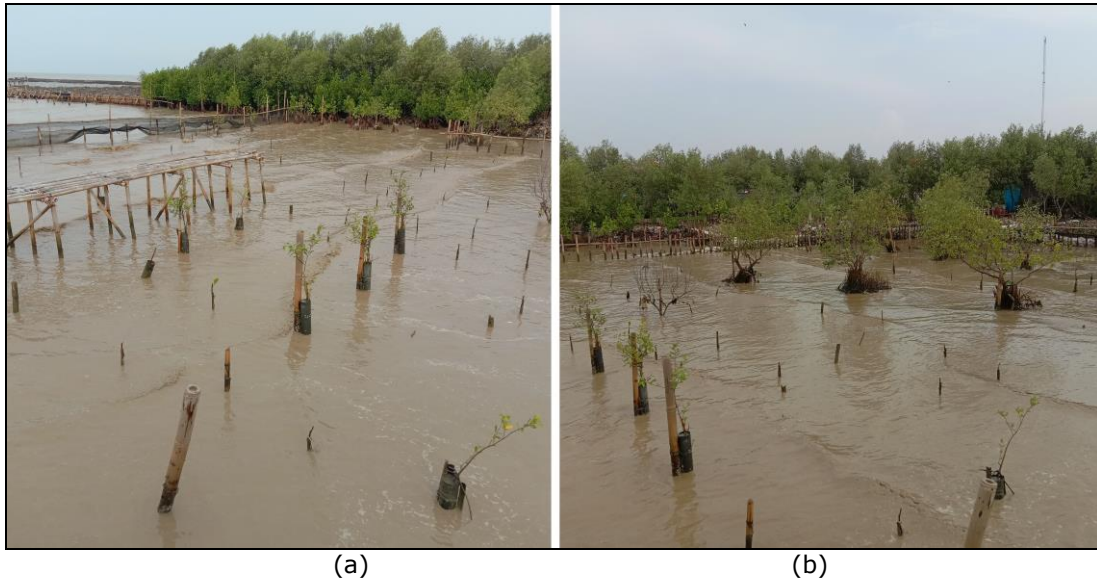
Figure 4. (a) Innovation in planting mangroves using the media of planting PVC pipe; (b) This planting method was quite successful and started to grow into mature mangroves.

Approximately 82.35% stated that the implementation of coastal rehabilitation efforts had no impact on increasing other village development activities. This is because the government was reluctant to carry out construction activities in locations affected by coastal erosion. It is based on the idea that assuming the village government repairs damaged roads, the tendency of developing infrastructure at that location becomes in vain, given that the road access is around the coastline and prone to coastal erosion.

Meanwhile, 70.59% of the respondents stated that the community did not participate in protecting and maintaining the results of the coastal rehabilitation. The influence and authority of the Pokmaswas was quite effective in safeguarding and monitoring the process. The socialization of violations on the utilization of coastal resources utilization and their legal consequences has been quite effective in limiting excessive and irresponsible community usage as shown in Figure 5 (case in Pasirjaya Village).

Community participation in evaluating the implementation of coastal rehabilitation efforts showed that most respondents, as much as 70.59% stated that they rarely participated in assessing and supervising the implementation of coastal rehabilitation efforts. Approximately 76.47% never gave suggestions and criticisms, either directly or indirectly. This condition is related to the non-transparency in the management of aid received by mangrove farmers from the government and private organizations, thereby, making it difficult for the proper implementation of the process. Therefore, honesty and open transparency in program management is the responsibility of the program manager in managing resources (Nordiawan et al 2007).

Figure 5. Notice board prohibiting the exploitation of coastal resources.

Community Needs. Basically, community needs analysis is carried out to determine people's needs, based on their acquired knowledge. Identifying community needs considers the problems perceived by the community and the potential that exists in the community (Adi 2008). A summary analysis of community needs at each research location is explained in accordance with the efforts to address the socio-economic impacts of the community, and the coastal rehabilitation as shown in Table 7 and Table 8.

Table 7

Community needs towards efforts to address social and economic impacts

Research Location	Community needs
Cibuaya Coast	• Relocation of community settlements in locations affected by coastal erosion to safer areas (case in Cemarajaya Village). • Construction of road infrastructure damaged by coastal erosion in Cemarajaya and Sedari Villages. It is important to carry out the development effort because the socio-economic life of the community is highly dependent on road access for trade and distribution of pond and captured fisheries, education, health etc. • Emergency and temporary social assistance for communities affected by coastal erosion. • Displacement of electricity poles affected by coastal erosion. This effort was urgently carried out, because the electricity poles were located close to the access road, thereby, endangering security and disturbing the comfort of the community.
Cilebar Coast	• Construction of road infrastructure damaged by coastal erosion. • Law enforcement and settlement of conflicts regarding the utilization of coastal rehabilitation land for aquaculture land.
Cilamaya Kulon Coast	• Settlement of social conflicts between the mangrove farmers group (Pokmaswas) and the community around the area (case in Sukajaya Village). • Support from the Karawang Regency Government to advance beach tourism activities (case in Pasirjaya Village). • Construction of road infrastructure, which was cut off due to coastal erosion (case in Pasirjaya Village).

Table 8
Community needs towards handling efforts to support the implementation of coastal rehabilitation

Research Location	Community needs
Cibuaya Coast	• Coastal protection construction in the form of hard structures, such as break water etc. The community does not want coastal protection in the form of KGM technology through the Beach Belt Program, because it is considered less effective from previous experience.
Cilebar Coast	• Coastal protection construction in the form of hard structures have not yet implemented in location affect with erosion. Therefore, the community proposes the construction of a coastal structure using the KGM technology (Beach Belt Program). The coastal protection construction is considered effective as the community observes coastal erosion prevention in Sukajaya Village, Cilamaya Kulon Sub-district. However, for locations with coastal rehabilitation, the community needs protection in the form of hybrid engineering, to support the success of simultaneous mangrove planting.
Cilamaya Kulon Coast	• Coastal protection construction in the form of hard structures (case in Pasirjaya Village). • Technical and materials assistance on mangrove planting engineering in coastal areas with sandy substrates (case in Pasirjaya Village). • Mangrove seedlings capable of withstanding and growing in coastal areas with sandy substrates (case in Pasirjaya Village).

Conclusions. In conclusion, community perception on the implementation of coastal rehabilitation efforts was classified to be poor in the Cibuaya Coast region, while in the Cilebar and Cilamaya Kulon Coast was in the moderate category. Meanwhile, the community participation in the Cibuaya Coast region was classified as very low, while in Cilebar and Cilamaya Kulon it is included in the low category. The community's need for handling social and economic aspects generally rested on the need to resolve social conflicts and provide adequate infrastructure, especially roads and settlements. Therefore, there is an adequate need to generally focus on the coastal protection construction in the form of hard structures to support the life of mangrove vegetation.

The government should consider the conditions of perception, participation, and community needs as materials for planning and implementing development in the coastal area of Karawang Regency. The implementation of coastal rehabilitation efforts must be carried out simultaneously and continuously, through good coordination between the district and provincial governments or with other parties. Alignment to development in coastal areas must also be increased to improve the community's standard of living and welfare.

The low level of education of coastal communities determines the need to focus on education sector development by local governments, both regency and provincial. The lack of knowledge and understanding of mangrove ecosystems' existence must also be a priority in the formulation of programs at related agencies. Improving the above factors is necessary to benefit coastal rehabilitation efforts, and coastal ecosystems' sustainability is maintained.

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