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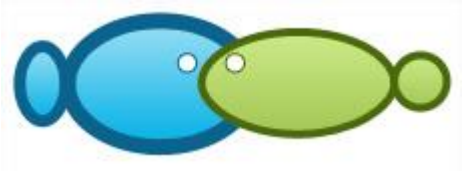

Coastal community preference on the utilization of mangrove ecosystem and channelbar in Indramayu, Indonesia

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Abstract. This study discusses the perception and preference of coastal community, what they want and how they prioritize the utilization of mangrove ecosystem and channelbar. Analysis factor is used to measure variables in the models. The highest mangrove ecosystem damage is caused by community activities to mangrove forest resources. To rehabilitate the mangrove ecosystem the government must provide employment opportunities to substitute their income. Alternative occupation that becomes preference is utilizing non timber forest product that has economic value and give it the added value as tertiary product; cooperation of environmental services through utilization of channelbar; supporting the creation of ecotourism zone and environmental education along with its flora and fauna. As to the policy implication that can be implemented the government must protect the mangrove forest area for habitat preservation.

Key Words: alluviation, aggradation, sedimentation, alternative income, sustainability.

Introduction. Coastal north coast of Java Island which is part of Indramayu, reaches 68,703 km^2 or about 35% of Indramayu, which covers 11 districts and 35 villages. Coastal length reaches 114.1 km with 64.68 km sandy beaches and 44.91 km muddy beaches with depth ranging from 10-70 cm. The mangrove forest in Indramayu originally grew and flourished around the estuary of Cimanuk River (Pabean Ilir Village). Mangrove forests continue to grow as the channelbar grows in the estuary of the Cimanuk River and its surroundings, mainly as a result of government efforts to prevent flood disaster in Cimanuk River by creating three flood channels. Mangrove forests have various functions and benefits which play an important role in the inhabitant's life, biologically, ecologically, physically and socioeconomically (Yanagisawa et al 2010; James et al 2013; Abino et al 2014; Sandilyan & Kathiresan 2015).

The width area of mangrove (forest) in Indramayu is estimated about ±12,715.76 ha within the span of eight districts. Mangrove forest grows on land as state forest area (protected forest area of ±7.927 ha. Of the total area of mangrove forest, only 12% (1,525.85 ha) is still in the form of mangrove forest, while the rests (88%) are mostly open ponds (ponds without mangrove vegetation) for shrimp/fish culture. The mangrove vegetation is only found sporadically with low density on the edges of embankment ponds and/or the middle of the ponds as well as in river estuaries and in the channelbar. Such conditions lead to degradation of mangrove ecosystem quality, as the result there is a significant decrease of coastal ecosystem productivity, specifically of the mangrove ecosystem in Indramayu.

Some of the environmental problems found along Indramayu coast includes: abrasion, sedimentation, seawater intrusion, water pollution, and flooding. This phenomenon is in line with several studies about mangrove forest destruction, which is generally a social and economic aspect, where communities convert mangrove forests into fish/shrimp ponds and salt, rice fields and settlements. As with its ecological aspect, the environmental problems are caused by the widespread of over exploitation mangrove

logging (Macintosh et al 2002; Kusmana et al 2008). Deforestation to the levels that do not allow natural recovery is a serious threat to the mangrove ecosystem.

The shrinking of mangrove ecosystem area in Indramayu is due to the increase of land conversion. The change in mangrove ecosystem condition becomes an environmental problem in Indramayu. The changes are caused by the conversion of mangrove cover for pond activities, residential building construction and road construction for transportation, and also Perum Perhutani (state-own forestry enterprises) has difficulties in controlling the protected forest areas for fishponds by community. In fact, protected areas can be a source of raw material for the daily life of local people, can serve as tourism facilities, represents cultural and spiritual identity, and provide ecological services for the surrounding environment (Chen et al 2009; Saprudin & Halidah 2012; Carandang et al 2013; James et al 2013; Widiastuti et al 2016; Idrus et al 2017; Small et al 2017).

The coastal communities' behavior to the condition of mangrove ecosystem and channelbar basically (or often) stem from their perception of assessing themselves and their environment. This behavior begins with interpreted sensing, followed by feeling/emotion that raises hope and taking specific action at the end. Perception is related to the cognitive/knowledge process of a person to a phenomenon at a certain moment to his environment. Perceptions are strongly influenced by several other factors: situational factors, needs, desires and also emotional states. Similarly, the perception of coastal communities in Indramayu includes the interpretation of objects/signs from the individual point of view. Perceptions on the utilization of mangrove ecosystems and channelbar can affect the behavior and attitude, either individually or of groups.

Perception is a process where a person selects, organizes, identifies, and interprets the sensory information he receives in order to understand his environment (Robbins et al 2011). Preference is a person/group option to like or dislike towards the utilized objects (Kotler 1994; Hardy & Heyes 1999). Similarly, the preference of coastal communities towards the utilization of mangrove ecosystems and channelbar in Indramayu shows the public's preference from the various options that exists. Preferences to the use of mangrove forests and channelbar are the desire or the tendency of individuals to utilize an ecosystem or not, which is influenced by certain factors. The community's preference in choosing the use of mangroves is different, because each individual has different preferences. However, in general, the level of public preference can be obtained based on the factors which become consideration to utilize mangrove forests and channelbars. Perception and preferences analysis besides aiming to know what is liked or approved and the vice versa by coastal communities, is also to determine the order of importance of an attribute of a product/service (de Souza-Queiroz et al 2017; Schmidt et al 2017).

This paper presents the findings on the mangrove forest problems in Indramayu so that it needs to be reformulated to mangrove forest management related issues. This research was focused on the arrangement of coastal community perception and preference of utilization of mangrove ecosystem and channelbars through focus group discussion (FGD) and field surveys. This study aimed to find out what factors predominantly influence the perception and preference and the desired trends/priorities of coastal communities on the existence of mangrove ecosystems and channelbars. Data analysis and synthesis was conducted to establish utilization strategy of mangrove ecosystem and channelbar by coastal community in Indramayu.

Material and Method

Description of the study sites. This study was conducted for six months starting from April 2015 in Indramayu, West Java Province. This research was conducted in 5 (five) coastal area districts that have mangrove forest, namely: District of Karangsong, Pabean Udik, Pabean Ilir, Lamaran Tarung, and Cemara Wetan. Sampling consists of (1) Expert Sampling. The number of sample in this study is 75 respondents (n=75), i.e. the stakeholders who acted as key informants, both from the expert elements of the government, coastal communities, and non-governmental organizations. The key

informants were selected through snowball sampling technique; and (2) Coastal Community Sampling. Sampling at the fisherman level was using purposive sampling. Sample was taken by multi stage random sampling (Groves et al 2011) based on fisherman population incorporated in farmer group of fishermen (KTN).

Statistical analysis. This study used two kinds of factor analysis, namely exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). CFA was used to verify the factor structure while EFA to determine the factor structure. The results were analyzed using principal factoring method to EFA and maximum likelihood estimation technique to CFA (Jiao 2014) based on the research. Generally in factor analysis, the matrix loading factor obtained is difficult to interpret. Therefore it is advisable to apply factor rotation, which transforms the matrix by multiplying the orthogonal matrix against it to obtain a meaningful interpretation. The methods that can be used in factor rotation are quartimax rotation, varimax, equimax, oblique, and promax. EFA test was done by (Bartlett's test of sphericity (BTS) and Kaiser-Meyer-Olkin (KMO). In this study, KMO and BTS test play an important role for accepting the sample adequacy. CFA test uses SEM (structural equation modeling) approach with maximum likelihood method as the unfitness estimation (discrepancy estimation). Variables information and description from questionnaire related to perception and preference of coastal community to the utilization of mangrove ecosystem and channelbar in Indramayu is presented in Table 1. Statistical analyses were performed using IBM SPSS AMOS® software version 24.0.

Table 1

The description of questionnaire: perception and preference

Variable	*Description*
Id	*Respondents identification*
Perception (PS)	15 items measuring the perception of utilization of mangrove ecosystem and channelbar; 5 point scale; 1=(extremely dissatisfied/disagree), 5= (extremely satisfied/agree).
	PS1 to PS2 measure economic value (X1), PS3 to PS4 measure livelihood (X2), PS5 to PS6 measure land ownership (X3), PS7 to PS8 measure ecotourism (X4), PS9 to PS11 measure disaster mitigation (X5), and PS12 to PS15 measure wildlife animal habitat (X6).
Preference (PF)	9 items measuring the preference of utilization of mangrove ecosystem and channelbar; 5 point scale; 1= (extremely dissatisfied/disagree), 5= (extremely satisfied/agree).
	PF1 to PF2 measure value added (X7), PF3 to PF4 measure income (X8), PF5 to PF6 measure business settlement (X9), and PF7 to PF9 measure education and training (X10).

Results. Indramayu with an area of 2,099.42 km^2 has a considerably potential of natural resources offered by agriculture, forestry, ponds, and marine fisheries. In terms of population density, in 2016 the population in this region was 1,718,495, or the population density was averagely of 819 inhabitants per km^2. Population density is one of the most important indicators in assessing pressure or potential pressure on forest areas.

Land condition inside mangrove area. In Indramayu, mangrove forest grows in nine districts, in the north with 722.53 ha of the area are channelbar. Mangrove forest within the forest area of a ±8,023.55 ha is protected and managed by Perhutani KPH Indramayu. According to Dishutbun-Indramayu (2011), they are 1,283.77 ha (16%) in good condition and 6,739.78 ha (84%) in damaged condition. Meanwhile, the mangrove outside of the forest area of ±4.370 ha are 1,879.1 ha (43%) in good condition and 2,490.9 ha (57%) in damaged condition. Further details of the aforementioned areas are presented in Table 2.

Table 2

Mangrove forest distribution inside forest area and outside of forest area in Indramayu

Mangrove forest distribution inside forest				*Mangrove forest distribution outside forest*			
No.	*District*	*Village*	*Area (ha)*	*No.*	*District*	*Village*	*Area (ha)*
1	Kandanghaur	Parean-Girang	294	1	Kandanghaur	5 villages	425
2	Losarang	Cemara	2,046	2	Losarang	3 villages	408
3	Cantigi	Cangkring	1,186	3	Cantigi	5 villages (e.g. Lamaran-Tarung)	973
		Lamaran-Tarung	1,623	4	Pasekan	6 villages (e.g. Pabean Ilir)	1.116
4	Sindang	Babadan	445			Biawak Island, Gosong Island, and Candikian Island (Pabean-Ilir)*	>120
5	Pasekan	Karang-Anyar	892	5	Indramayu	4 villages (e.g. Karangsong and Pabean-Udik)	718
		Pasekan	445	6	Krangkeng	4 villages	345
		Pagirikan	297	7	Karang-Ampel	2 villages	25
		Totoran	235	8	Juntinyuat	3 villages	35
		Pabean ilir	2,155	9	Sukra and Patrol	-	50
Total	5 Districts	10 Villages	7,927	Total	9 Districts	32 Villages	>4.215

* - Local regulation of Indramayu number 6 of 2014 concerning management of coastal and small islands (Peraturan-Daerah 2014).
Source: Dishutbun-Indramayu (2011).

Utilization of mangrove forest and channelbar. Indramayu has 43,027.41 ha wide of forest potential that consists of 40,653.41 ha state forest and 2.37 ha community forest. The types of commodities cultivated are teak forests with an area of 21,144.37 ha, mangrove forest (protected forest area) of 8,023.55 ha and cajuput forest of 5,130.75 ha.

Figure 1 and Figure 2 gives information on land use and on utilization of channelbar. Based on the data in Figure 1, the most land use in the location is ponds or fishponds, which is about 67.63%. The history of land use based on the results of field interviews show that the ponds or fishponds located in Indramayu were previously mangrove forests, whereas ponds or fishponds located in channelbar were originally open lands or shrubs. Based on the Spatial Plans (RTRW) of West Java Province, about 70.36% of protected area in the form of mangrove forests are used as ponds or fishponds, while there is 12.64% left of the total protected area remain as mangrove forest. Lamaran Tarung village has the widest use of land in the form of pond with an area of about 1,060.10 ha. This condition shows that there are many inconsistencies between the appointment of land use location in Spatial Plan (RTRW) and the actual land use in the field. As for the channelbar in about 4 villages with an area of 722.53 ha, the four types of land use are mangroves (29%), shrubs (42%), water bodies (6%), and ponds/fishponds (23%) (Figure 2).

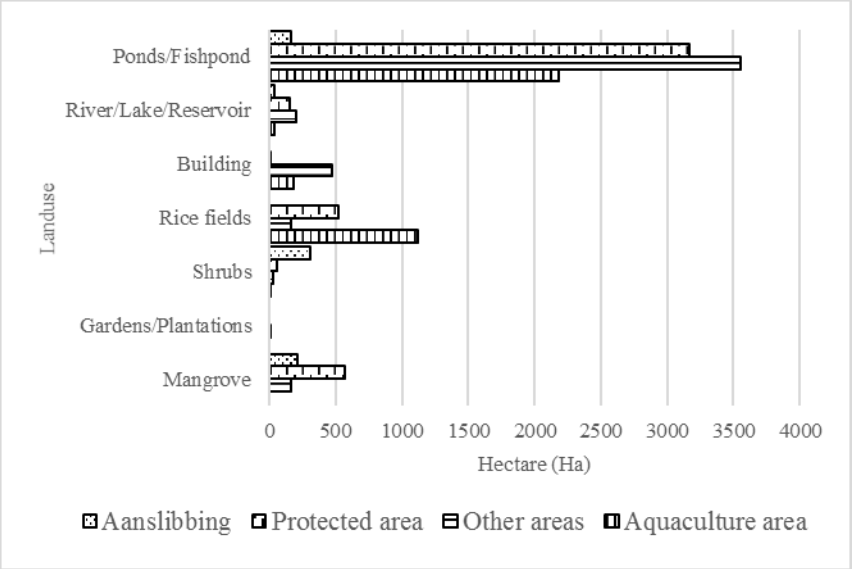

Figure 1. Mangrove forest land use in study location based on West Java Province Spatial Plan (RTRW).

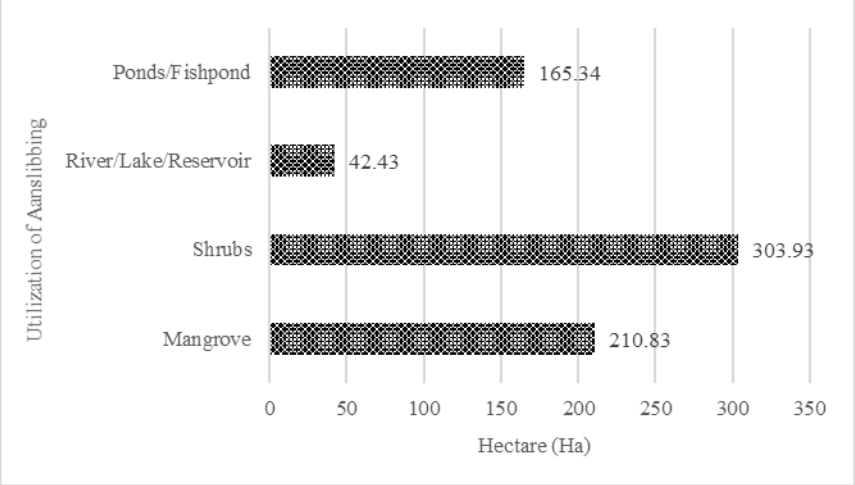

Figure 2. Channelbar utilization in the study location in Indramayu.

Respondents profile

Education level and age. Education is one of the indicators of human development success. From 75 respondents, most of them only finished their education in elementary and junior high school (65%). According to the Statistic Center Agency (BPS), on average, Indramayu citizens spend 5.46 years studying at schools (BPS-Indramayu 2016). The respondents were ranged from twenty five to seventy years of age where the respondents in the productive age category represented 88%.

Livelihood. In general, +/- 70% of the community around mangrove area live as farmers (fish culture, sea grass, rice field, and mango) whilst the rest of +/- 30% works as farmer, seller, government officer, and laborer.

Income. Monthly income of respondents is divided based on the monthly income, the respondents are as follows; those who earns below the Minimum Regional Income rate of 170 USD is 61%. Between 255 and 595 USD is 28%. Above 295 USD is 11%.

Description of factor analysis

Validity and reliability test. Validity test of 24 variables in the questionnaire was applied to see its reliability. The reliability test of each variable was measured using Cronbach's alpha with minimum of 0.70 (≥0.7). This test detected inconsistent indicators. The results of reliability test indicate that the value of Cronbach's Alpha 0.782 so the variables can be considered as reliable.

Validity test factor. The results of Kaiser-Meyer-Olkin (KMO) and Barlett's Test analysis showed that the KMO value is 0.762 (Figure 3a), or in the range 0.5-1. Since it has a value above 0.5, the KMO meets the requirements; therefore factor analysis process is doable. This condition is also indicated by Barlett's value of 320.242 with a significance of 0.000. This shows that there is no correlation between variables so that factor analysis can be performed. Thus Bartlett Test of Spehricity meets the requirements because of the significance below 0.05 (5%). In other feasibility tests, a variable indicator can be worth to be analyzed if the value of MSA (Measure of Sampling Adequacy) is more than 0.5.

(a)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.762
Bartlett's Test of Sphericity	Approx. Chi-Square	320.242
	df	21
	Sig.	.000

(b) **(c)**

Anti-image Matrices | Communalities

	Anti-image Correlation	Initial	Extraction
Disaster_Mitigation1	.775[a]	.778	.863
Disaster_Mitigation2	.782[a]	.787	.883
Disaster_Mitigation3	.848[a]	.674	.699
Education_Training1	.634[a]	.665	.795
Education_Training3	.623[a]	.574	.783
Animal_Habitat1	.879[a]	.522	.573
Animal_Habitat2	.760[a]	.468	.744

Extraction Method: Principal Axis Factoring.
a. Measures of Sampling Adequacy(MSA)

(d)

Factor Correlation Matrix

Factor	1	2	3
1	1.000	.317	.445
2	.317	1.000	.582
3	.445	.582	1.000

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

Figure 3. KMO and Bartlett's test (a); Anti-image matrices (b); Communalities (c); Factor correlation matrix (d) (n=75).

In Figure 3b, it is shown that the MSA number is obtained from anti Image Matrices (Anti Image Correlation), which is the correlation number marked ([a]). It can be seen from the

24 tested variables, there are 7 variables that meet the MSA requirement which is above 0.5, so that the seven variables in the study are feasible for further factor analysis. From the result of three factor validity tests above can be concluded that empirical indicators have fulfilled the valid requirement as variable shaper.

Extraction and rotation. Extraction is a method for reducing data from several variables into several lesser factors. Through extraction will be produced communalities, total variance, and factor correlation matrix.

Communalities is the variance in observed variables accounted for by a common factors. Communality is more relevant to EFA. Figure 3c shows that the 7 variables tested meet the communality requirement which is the extraction value which is more than 0.5 (Communalities >0.5). The higher is the communalities value (greater than 0.5 or near to 1), the tighter relationship between the variable with the established factors will be. The communality value indicates the meaning of how much a variable can explain a factor. For example the value of Disaster_Mitigation1 is 0.863, it means that Disaster_Mitigation1 variable can explain the factor equal to 86.3%. Similarly with other variables, where all of them >50%, therefore it can be concluded that all variables can explain the factor.

Total variance explained shows that there are three factors that become the perception/preference of coastal community to the utilization of mangrove ecosystem and channelbar because the Eigen value is above 1. Factor which has Eigen value above 1 is used to calculate the number of factors formed. There are seven components which can represent variables that are grouped into three factors. Cumulatively, the variance can be explained by the three factors to seven variables by 76.3%.

Factor correlation matrix is the last step for factor determination. There are three factors formed (Figure 3d). Figure 3d shows that the components 1, 2, and 3 have correlation value 1. Because of all the components value are >0.5 then the three factors formed can be considered precise in summarizing the seven variables exist.

Rotation method was conducted to emphasize loading factors differences on each variable, as well as to ascertain its placement into factors. 24 variables were analyzed via principal axis factoring (PAF) and maximum likelihood (ML) extraction methods, followed by both orthogonal (promax) rotations (Blunch 2012). Pattern Matrix[a] shows the loading factor coefficients of each variable (Table 3). In this study, 24 variables studied were reduced to three factors and seven variables were maintained. In Table 3 we have sorted the correlation values from the highest to the lowest per factor. Disaster_Mitigation1 (PS9), Disaster_Mitigation2 (PS10), and Disaster_Mitigation3 (PS11) were correlated with factor 1, the values are 0.954, 0.952, and 0.791, respectively. Values correlated with factor 2 were Education_Training3 (PF9), and Education_Training1 (PF7) were: 0.951 and 0.703. The Animal_Habitat2 (PF13), and Animal_Habitat1 (PF2) were 0.910 and 0.498 correlated with factor 3. Thus, it can be concluded the member of each factors:

- Factor 1 (Disaster Mitigation): PS9, PS10, PS11 (Perception);
- Factor 2 (Education and Training): PF9, PF7 (Preference);
- Factor 3 (Animal Habitat): PS13, PS12 (Perception).

Table 3

Three factors for seven variables in pattern matrix (n=75)

Pattern Matrix[a]			
	Factor		
	1	*2*	*3*
Disaster_Mitigation1	*.954*		
Disaster_Mitigation2	*.952*		
Disaster_Mitigation3	*.791*		
Education_Training3		*.951*	
Education_Training1		*.703*	
Animal_Habitat2			*.910*
Animal_Habitat1			*.498*

Extraction Method: Principal Axis Factoring; Rotation Method: Promax with Kaiser Normalization[a]; a - Rotation converged in 5 iterations.

Construct validity test. In SEM, CFA is addressed to test the validity and reliability. More precisely, to test theoretical concept, construct, or latent variable that cannot be observed directly. The main purpose of CFA is to confirm the measurement model which formulation comes from theory (Brown 2015). Confirmatory factor analysis diagram for the present study is presented in Figure 4. Construct variable in Figure 4 is a structural relationship picture established based on variable values which are correlated with its factor (Blunch 2012) (Table 3).

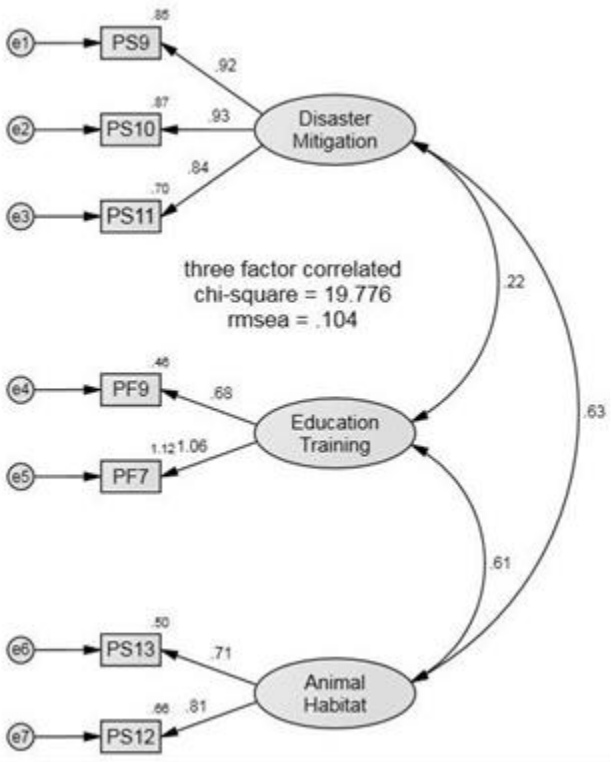

Figure 4. Confirmatory factor analysis diagram with standardized estimates (n=75).

Validity and reliability construct test is seen from the composite reliability (CR) value from indicators block that measure the construct. CR result show a satisfying value if it is above 0.7. Therefore, on construct is not found reliability problem from the model formed. Probability value (p-value) for weight value for indicators on construct above shows they are under 0.05 (Table 4a) regression weights. Chi-squares 19.778 (>0.05) probability value and degree of freedom (df=1.798) ≤2.00 indicate that the data is empirical identic from the theory/model.

In Table 4b fit of construct model, the GFI value 0.935 (>0.90) indicates that the model tested has good conformance (Hooper et al 2008). The standardized root mean square residual (SRMR) values of zero to 1.0, but SRMR values as high as 0.08 are also considerably accepted. The comparative fit index/CFI is a revised form of the normed fit index (Diamantopoulos et al 2000; Byrne 1998) that performs well even when the sample size is small. A value of CFI = 0.96 or higher is presently recognized as indicative of good fit. The result shows that the RMSEA value is 0.104, while the tolerance value of an acceptable model is 0.08 or smaller (Tabachnick & Fidell 2007; Byrne 1998). In general, the GFI value over 0.90 indicates a variable factor relation and has goodness of fit model (Table 4b) can be used to measure perception and preference of utilization of mangrove ecosystem and channelbar.

In Table 3c standardized total effects indicate that the dimension of education and training is the dominant variable or has the strongest influence on the preference of mangrove ecosystem and channelbar utilization. This ranking is shown by the education and training variable that has the largest total effect coefficient value of 1.058 (PF7)

against mitigation dimensions. This means that every increase of preference to PF7 education and training dimension of 100% will increase the utilization of mangrove ecosystem and channelbar to 105.8%. Environmental education, for instance, environment recreational is beneficial for physical and mental health (Bell et al 2015), creation and maintenance of social relationship (de Souza-Queiroz et al 2017). Experiential factors providing manifold opportunities for people to engage with their natural surroundings should be considered a strategy (Bieling et al 2014). As for community perception, the mitigation dimension is PS10 (0.935). The effectiveness of mangroves for coastal protection depends on factors at landscape/geomorphic to community scales and local/species scales (Lee et al 2014). Mangroves play an important role in the protection of the coast from the natural disasters like tsunami, floods, cyclones, and sea level rise (Unnikrishnan et al 2012; Lee et al 2014; Sambu & Sribianti 2016).

Table 4

Amos output: Estimates and Model Fit: (a) Regression weights, (b) Model fit of construct, and (c) Standardized total effects (n=75)

(a) Regression weights

			Estimate	*S.E.*	*C.R.*	*P*
PS9	<---	Disaster_Mitigation	1.000			
PS10	<---	Disaster_Mitigation	.978	.075	12.986	***
PS11	<---	Disaster_Mitigation	.880	.085	10.375	***
PF9	<---	Education_Training	1.000			
PF7	<---	Education_Training	1.519	.338	4.494	***
PS13	<---	Animal_Habitat	1.000			
PS12	<---	Animal_Habitat	1.252	.221	5.665	***

***,** - statistically significant at 1, 5% levels respective.

(b) Model Fit of construct

	CHI-SQUARE	*CMIN /DF*	*RMSEA*	*SRMR*	*GFI*	*CFI*
Three Factor	19.776	1.798	0.104	0.0676	0.925	0.972

(c) Standardized total effects

	Animal habitat	*Education training*	*Disaster mitigation*
PS12	.811	.000	.000
PS13	.710	.000	.000
PF7	.000	1.058	.000
PF9	.000	.682	.000
PS11	.000	.000	.837
PS10	.000	.000	.935
PS9	.000	.000	.921

Discussion. Based on the study, from 24 variables measured there are 7 extraction variables which are grouped in three dimensions. Community in general has a preference toward the existence of mangrove forests in their villages should be protected, both to keep wildlife habitat and for disaster mitigation. Even the community prioritizing mangrove forests in this village, therefore this location should be used as a place for environmental education, research and training. Preferences supported by the above perceptions, will certainly have consequences on the existence of mangrove forests and the utilization of channelbar to support the sustainability of mangrove ecosystems.

Attitudes and motivation, directly has a major role in influencing the behavior towards the mangrove ecosystem (Yunus et al 2015).

In another analysis results, Indramayu people showed a very low interest and desires on the utilization of wood from the mangrove forest around their village. In addition, people consider that the existence of settlements should be reduced or even factory buildings should be prohibited to enter the mangrove forest area. The reason is in line with the people's desire to keep the water conditions around the mangrove forests area maintained for their daily needs. Positive perceptions of the mangrove ecosystem can reduce the pressure of degradation and deforestation on the coast (Samad et al 2013).

Related to the channelbar phenomenon around the coast, according to Perhutani as state forest stakeholders, the channelbar area appears today is the result of sedimentation from the impact of the abrasion in some parts of BKPH Indramayu forest area with an area of 80,000 ha. The emergence of channelbar can be a disputes problem between Perhutani and the community. As according to Dishutbun, Bappeda (Region Plan Agencies), and BLH (Living Environment Agencies) as the organization of regional apparatus (OPD), the existence of channelbar in mangrove area in Indramayu is very beneficial for the area that has the channelbar, but very harmful to the affected areas abrasion. All three OPDs feel to have a responsibility to take care of the channelbar by doing reforestation activities. This reforestation activity aims to prevent the channelbar area from re-abrasion. The OPD also recommends that the area should be used as a reforestation area, if it is to be utilized for economic activities by the community, it should be directed to the activities which are beneficial in preserving the environment and support education, such as ecotourism or environmental services.

The interviews with the community members (farmers/fishermen groups (KTN)) revealed that they strongly support the reforestation activities in the channelbar area. The community members of farmer groups, especially in Pabean Ilir Village have not been engaged in milkfish fishponds exploitation in mangrove area and now they start to carry out agricultural activities with watermelon and melon commodities. On the other hand, non-members of KTN are still conducting fishpond activities in channelbar and Perhutani area. Non-members of KTN have a desire to no longer work on ponds in the channelbar area, but the community has no other expertise to meet their life needs except working on ponds.

In addition, the omission in the absence of supervision, reprimand, retribution withdrawal, and so on by the Government to the community make them continue to work on ponds in the channelbar land. Non-members of KTN stated that another livelihood solution with the same income is needed as a substitute for working on ponds.

Considering the obstacles (rules) associated with land ownership, especially Government Regulation No. 16 year 2004 on Land Arrangement, Law PA Article 9 verse (2), (Peraturan-Pemerintah 2004), and Letter of the Minister of Agrarian Affairs/Head of National Land Affairs Agency no. 410-1293 year 1996 on the control of channelbar and reclamation land status (BPN 1996), the government should be careful in observing the policy in the use and control of the channelbar because every citizen has the right to have a right to land if they meet the requirements in accordance with the law.

Mangrove forests land in Indramayu controlled by the community is limited to property ownership because it only gets recognition based on "community consensus", Perum Perhutani who gives "silvofishery right for ponds" and village head who gives SKT (land certificate) to "utilize" the channelbar. Indeed, there is an opportunity for every Indonesian citizen to acquire land ownership. It is contained in the provisions of Article 9 verse (2) of the UUPA which is "Every Indonesian citizen, both men and women have equal opportunity to obtain a right to land as well as to obtain benefits and results for themselves or their families" (UUPA 1960).

Up to 2004, Perum Perhutani has managed 7,927 ha of mangrove forest (65.3%) from all mangrove forests in Indramayu with function as protection forest (protected area) and more than 4,215 ha (34.7%) is a cultivation area. In Regional Regulation No. 22 year 2010 on Spatial Planning of West Java Province Year 2009-2029 (Peraturan-Daerah 2014), it has been determined two policies for the development of protected

areas, namely: (1) the achievement of the protected area by 45%, and (2) maintaining and improving the quality of protected areas. Strategies to achieve the extent and quality of protected areas are as follows: (a) enhancement of protected area functions within and outside forest areas; (b) gradual recovery of functionally altered protected areas; (c) gradual shifting function of reserves and limited production forests into protected forests; (d) restrictions on the development of regional infrastructure around protected areas to avoid the growth of urban activities that encourage the conversion of protected areas, and (e) the determination of forest area of at least 30% of total watershed area (DAS).

Conclusions. In general, it can be concluded that the model structure of perception and preference of coastal community established is quite feasible in goodness of fit model both based on factor validity test (EFA) and construct (CFA), so it can be used as basis for further analysis such as description analysis or policy analysis.

Based on the calculation, statistically, there is a match between perception and preference of community to the utilization of mangrove ecosystem and channelbar in Indramayu. Community's majority preference and desire is toward sustainable condition of mangrove ecosystems while they are still able to take advantage of mangrove forest around their village. The evidence of community support to the utilization of channelbar area with reforestation activities is by not doing pond activities or counter-reforestation activities by KTN members.

The indication of the total effects value from seven variables found in education and training dimensions, wildlife habitat, and disaster mitigation of 24 variables measured indicate community preference as a priority option of mangrove ecosystem and channelbar utilization in Indramayu. The majority preference on the use of mangrove forest is to have it as educational environment (PF7).

Policy implications. As an area that has a long enough coast, the government of Indramayu must maintain the certainty of mangrove forest area for the preservation of mangrove ecosystem. Therefore, the government needs to prepare a grand design that provides information related to the mangrove areas in their region.

In terms of territory and the potential of mangrove forest resources, Indramayu is potentially developed as a mangrove information center area representing West Java province. The desired government implications are: (a) to prevent the conversion of its function, from a protected area to a developing cities of its surrounding; (b) controlling state forest lands utilized by the community for non-mangrove activities; (c) repair damaged mangrove areas; (d) determine the mangrove area which can be used as ecotourism and environmental education zones along with its flora and fauna (Kusmana et al 2008; Chen et al 2009; Ouyang & Guo 2016); (d) encourage the creation of cultural ecosystem services are described through the behavior of landowners, community cultural practices, and landscape planning (Plieninger et al 2015).

The high number of dependent people on mangrove forest resources shows the difficult access to other livelihood substitution options. Therefore, to support the revamping of mangrove area to its function, the government or the authorities need to provide working opportunities based on direct and indirect benefits of mangrove forest sustainably (James et al 2013; Sambu et al 2014; Widiastuti et al 2016; Idrus et al 2017), which can be: (a) silvofishery ponds, combining fishponds with mangrove plantation; (b) community forest with sustainable management and a cutting cycle of 15-30 years or depending on the purpose of planting; (c) the culture of mangroves utilization to obtain non timber forest product; and (d) silvofishery covering capture fisheries, aquaculture and utilization of non-timber mangrove forest products (Wibowo 2011). As part of a landscape, mangroves provide a level of fisheries ecosystem services (Cummings & Shah 2018).

Community ownership on channelbar land in government land often becomes social issues and tenurial dispute. The different purpose of channelbar land utilization between Perhutani/OPD (reforestation) and the community (ponds), sometimes causes disputes. Based on that, to achieve the agenda of mangrove development in the future, it is necessary to have stakeholders cooperation on the channelbar utilization, by

implementing payment scheme for environmental services to protect the mangrove ecosystem. An important factor in establishing stakeholders cooperation with communities to achieve sustainable forest product utilization is to bring it into an institution (Simpson et al 2016; Sukwika et al 2016).

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