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Implementation of Blue Economy Concept as the Efforts of Mangrove Resource Conservation in Sidoarjo Coastal Area, East Java, Indonesia

Endang Bidayani[1,*], Soemarno[2], Nuddin Harahab[3], Rudianto[3]

[1]Doctorate Program, Faculty of Fisheries and Marine Science, University of Brawijaya, Malang, Indonesia
[2]Faculty of Agriculture, University of Brawijaya, Malang, Indonesia
[3]Faculty of Fisheries and Marine Science, University of Brawijaya, Malang, Indonesia

Abstract One of severely damaged mangrove forests in Sidoarjo Regency is located in Jabon and Sedati Districts. Major causes of the damage result from illegal logging for timber sale and areal conversion to fish ponds that make the mangrove resources be threatened. This study was aimed at formulating a mangrove resource management model based upon blue economy concept. It was descriptive with quantitative approach using survey method. Model analysis applied Smart PLS software. Results showed that mangrove resource management model in Sidoarjo coast involved institution, production cycle system, innovation and adaptation, social concern, waste free, resource efficiency. For future research, the model needs to develop possible variables affecting the sustainable blue economy management.

Keywords Implementation, Blue economy, Conservation, Mangrove

1. Introduction

Coastal area of Sidoarjo has long been in critical condition since mangrove forests were clear-cut by irresponsible people. Major cause of the damage was illegal logging activities for timber sale occurring since 2004. [1]

The area of mangrove forest in Sidoarjo Regency is 1,236.42 Ha. The damaged mangrove forest reaches 534.74 Ha, with the highest damage in Jabon, 131.37 Ha and Sedati, 137.58 Ha. [2]

An ideal area of mangrove forest is 400 m x 27 km [3], but it is recently only 50 m x 27 km inhabited by *Avicennia sp.* and *Bruguiera sp.* [4]. One of the impacts of mangrove forest destruction in Sidoarjo is sedimentation. According to Fusheries and Marine Service data of Sidoarjo regency [5], marine area of Sidoarjo has become about 33 km long, longer than initial spread, 27 km, as a result of sedimentation.

Mangrove forest destruction reduces catch volume and diversity, in which 56.32 percent of common fish catch species are difficult to obtain, and 35.36 percent of them is hardly caught. As a consequence, mangrove ecosystem destruction quantitatively causes mean income decline of the local people as much as IDR 667,562,- or 33.89 percent of the normal income before the damage [6]. Mangrove ecosystem contributes 27.21 percent to fisheries resources production. It also contributes more than 25 percent to small pelagic fish production. It means that mangrove ecosystem has important roles in supporting fisheries production, particularly small pelagic fish, shrimps, and shells. [7]

Mangrove forest destruction and its areal decline have caused (a) increase in coastal abrasion to the loss of Tapak Kuda Island, (b) reduction in fish catch volume and diversity of the coastal fishermen, and (c) eventually income decline of the fishermen in particular and coastal villagers in general. Thus, well-planned and systematic efforts and active participation of related stakeholders are needed to rehabilitate damaged mangrove forests. At the same time, various on-going deleterious mangrove forest activities are important to be prevented. [8]

Mangrove forest has ecological and economic benefits. The former works 1) to accelerate coastal development through sedimentation, 2) to protect coastal line from abrasion, 3) to become spawning ground for various marine biota, 4) to prevent seawater intrusion to the terrestrial, 5) to be protection and breeding area for various mammals, reptiles, birds, and insects, and 6) as microclimateic regulator. Mangrove communities act also as 1) food source for terrestrial biota, 2) nutrient source for marine biota, and 3) are capable of producing higher oxygen than terrestrial plants. The latter acts as household need producer (food material, firewood, charcoal, building material, and medicine), (2) industrial need producer (raw materials for

* Corresponding author:
endangbidayani@gmail.com (Endang Bidayani)
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paper, cosmetics, textile, skin, tanner, and stainer), (3) producer of fish, crab, shell, shrimp seeds, honey, and bird's eggs, and (4) tourism, research, and education media. [9]

Total economic value of mangrove forest in the coastal area of Tlanakan, Madura, in good condition is IDR 280,712,310,416.00/Ha/year, IDR 268,867,261,273.00,- as direct benefit value, IDR 5,558,554,467.00,- as indirect benefit value, IDR 8,468,232.00,- as optional benefit value, IDR 6,841,200,000.00,- as heritage value, and IDR 5,003,849,143.00,- as existence value. Mangrove species growing in this area is *Rhizopora sp, Bruguiera sp*, dan *Avicenia sp*. [10]. Meanwhile, mangrove forest of damaged condition has total economic value of IDR 52,672,513, 290.00, consisting of direct benefit value of IDR 20,183,079, 000.00.-, indirect benefit value of 23,213,053,409.00,-, optional value of IDR 9,084,019,871.00,-, existence value of IDR 185,571,010.00,-, and heritage value of IDR 6,790,000.00.-, respectively. [11]

Marine resources management should be based on the sustainable development. The essence of sustainable development is the development that meets present needs and does not reduce the ability to fulfill the need of future generation. The concept of sustainable development of Indonesia has recently shifted from green economy to blue economy. [12]

Blue economy is a change in economic paradigm employing ecosystem logic, i.e learning from how the nature works. [13] Blue Economy is a concept describing the economic activity not only to reduce wastes, but to increase human's economy as well. [14]

To prevent the problems of mangrove forest destruction, this study focused on blue economy concept-based mangrove resources management model. The use of this model is expected to be able to raise the economic growth, the sustainability of environments resources, and the distribution of people's prosperity.

2. Method

This study used descriptive method of quantitative approach through surveys. It was conducted from June 2014 to December, 2014 in Jabon and Sedati districts, Sidoarjo Regency, the Province of East Java.

Sampling technique applied non probability sampling with purposive sampling procedure. The primary data were collected using questioneers. Respondents were taken through proporsional random sampling technique following the formula of Slovin, 309 respondents.

This study bridged six related construct variables with sustainable blue economy management of mangrove resources in the coastal area of Sidoarjo, i.e. resource efficiency, zero waste, social inclusiveness, cylic system of production, innovation and adaptation, and institutional component. To determine whether the variables used influences the sustainable blue economy-based mangrove resource management, Partial Least Square (PLS) was applied using SmartPLS software. PLS is utilized to test the accuracy of theoretical concept on factors affecting sustainable blue economy-based mangrove resources management in the coast of Sidoarjo.

PLS is a powerful analytical method because it is not based on many assumptions, data are not necessary to be normally distributed multivariates (indicator can be used in the scale of category, ordinal, interval up to ratio in the same model), does not need large sample size, able to simultenously analyze the construct formed with reflective indicator and formative indicator, and has algoritm calculation efficiency in estimating a big and complex model under hundreds of latent variables and thousands of indicators. [15]

Variables used in preparing sustainable blue economy-based mangrove resources management are *dependent variables* (Y) and *independent variables* (X). The latter comprised **1) resource efficiency (X1)** including private investment in taking advantages of mangrove fruits (Ef1), private investment in utilizing the environmental service of mangrove presence as ecotourism (Ef2), private investmernt in taking advantages of mangrove occurrence as habitats for mangrove crabs, milkfish, and shrimps (Ef3), private investment in taking advantages of, amgrove presence as abrasion prevention (Ef4), private investment in benefiting mangrove ppresence as silvofishery support (Ef5), private investment in taking advantages of mangrove presence as carbon sink (Ef6), efficient use of mangrove fruit as production input (Ef7), efficient product distribution of mangrove fruits (Ef8), and consumption efficiency of mangrove fruit material in production process (Ef9); 2) **Zero waste** (X2) including mangrove fruit-materialized production wastes as compost (Tl1), production wastes as animal feed (Tl2), and production wastes as energy source for other production (Tl3); 3) Social concern (X3) including public easy accessed natural resources utilization (Ks1), private distribution in environmental service utilization of mangrove presence as equitable ecotourism (Ks2), and the use of mangrove as community defense effort against the issue of food vulnerability, energy, hazard impact, bad impact of climate change (Ks3); 4) production cycle system (X4) including minimum-waste implementation or low carbon emission through production cycle, efficient distribution and consumption (Sp1), and resource utilization that does not exceed the carrying capacity or the ability of the natural resources to naturally recover (Sp2), and internalization of cost, benefit and risk (resource economic valuation) for pro-growth investment (Sp3). 5) Innovation and adaptation (X5) including mangrove fruit product innovation yielding business opportunity (In1), innovation in benefiting the environmental service of mangrove presence as ecotourism yielding business opportunity (In2), innovation in benefiting the environmental service of mangrove presence as habitats for mangrove crabs, milkfish and shrimps yielding business opportunity (In3), innovation mangrove-materialized production wastes yielding business opportunity (In4), and adaptation of processed mangrove fruits as food source of the communities (In5); and 6)

Institutional Components (X6) including Good governance (L1) and resources sustainability (L2). The former consisted of sustainable blue economy management (Y). This indicator covers 1) economic growth (P1) and prosperity distribution (P2).

a. Measurement Model (Outer Model) Evaluation

Measurement model (Outer model) specifies the relationship between latent variables and their indicators, or otherwise, outer model defines how each indicator relates with its latent variables. There are two types of indicators in the outer model, reflective indicator and formative indicator. However, in this study, the indicators were reflective possessing the following characteristics: the direction of causal relationship moves from the latent variables to the indicator, and indicators are expected to be correlating **(**the instrument should have consistency reliability). The omission of an indicator will not affect the measured variables the outer model covers the following aspects:

- Convergent Validity measures the strength of correlation between construct and latent variables. Convergent validity value is loading factor on the latent variables with its indicators. The expected value is expected > 0.7. Nevertheless, *loading* value of 0.50 to 0.60 in scale development research is still acceptable.
- **Construct** validity test was done by looking at *Average Variance Extracted* (AVE) value. Expected AVE value is > 0.5. The formula of AVE is

$$\text{AVE} = \frac{\sum \lambda l2}{\sum \lambda l2 + \sum \lambda l\ var\ (st)}$$

where λl is loading factor (*convergent validity*), and st = 1 - λl^{A}.

- **Construct** reliability test was measured under two criteria, composite reliability and cronbach alpha. The construct will be reliable if the value of either composite reliability or cronbach alpha is 0.7.

b. Structural Model Test (Inner Model)

Structural model test was done to determine the relationship between latent construct. It includes:

1) goodness-fit model test*,* by looking at the determnation coefficient, squred-*R,* of the endigenous construct. R^2 of 0.67 is categorized as strong, 0.33 as moderate, and 0.19 as weak.
2) Parameter coefficient value and significance value of t-test.

c. Evaluation of *Goodness of Fit*

To validate the entire model, *goodness of fit* (GoF) was used. GoF index is a single masure used to validate the combined performance between measurement model (outer model) and structural model (inner model). GoF index value was obtained from the average value of communalities index multiplied by R^2 model as follows:

$$\text{GoF} = \sqrt{Com\ x\ R^2}$$

Com with upper bar is *average communalities* and R^2 with upper bar is average model of R^2. GoF values range between 0 – 1 under the following interpretation: GoF of 0.1 is small, 0.25 is moderate, and 0.36 is large.

Hypothesis test applied the following structural equation model:

Y= a + b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + b6X6 + E

Notes:
X1 = resource efficiency
X2 = zero waste
X3 = Social concern
X4 = cyclic system of production
X5 = innovation and adaptation
X6 = Institutional
Y = sustainable blue economy management model

Hypothesis tested:

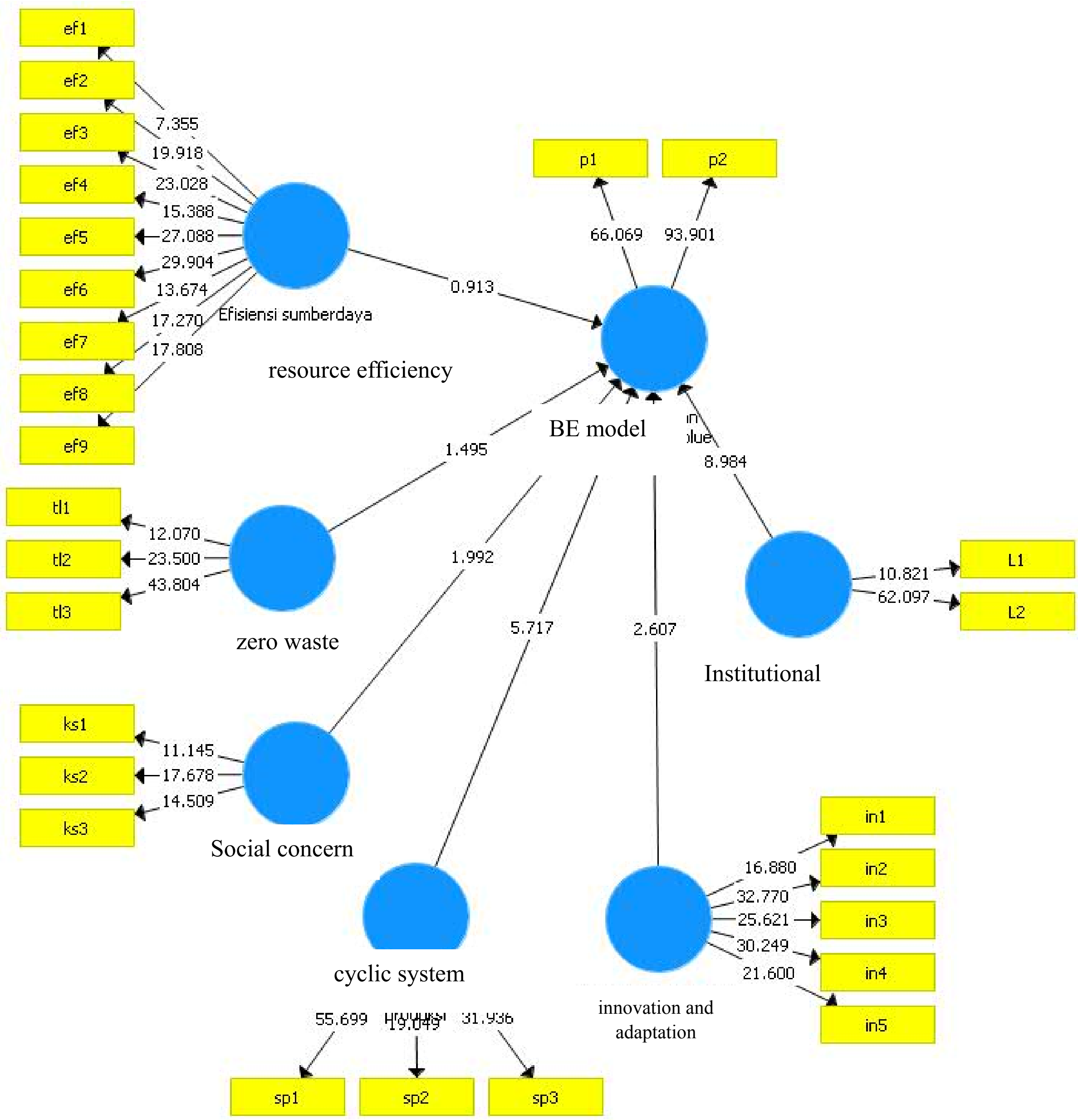
- T-1
  - *Ho* = There is no effect of nature efficiency on sustainable blue economy concept-based mangrove resource management
  - *H1* = There is effect of nature efficiency on sustainable blue economy concept-based mangrove resource management
- T-2
  - *Ho* = There is no effect of zero waste component on sustainable blue economy concept-based mangrove resource management
  - *H1* = There is effect of zero waste component on sustainable blue economy concept-based mangrove resource management
- T-3
  - *Ho* = There is no effect of social inclusiveness on sustainable blue economy concept-based mangrove resource management
  - *H1* = There is effect of social inclusiveness on sustainable blue economy concept-based mangrove resource management
- T-4
  - *Ho* = There is no effect of cyclic system of pproduction on sustainable blue economy concept-based mangrove resource management
  - *H1* = There is effect of cyclic system of production on sustainable blue economy concept-based mangrove resource management
- T-5
  - *Ho* = There is no effect of innovation and adaption on sustainable blue economy concept-based mangrove resource
  - *H1* = There is effect of innovation and adaptation on sustainable blue economy concept-based mangrove resource management
- T-6
  - *Ho* = There is no effect of insitutional com ponent on sustainable blue economy concept-based mangrove resource management

H1 = There is effect of institutional component on sustainable blue economy concept-based mangrove resource management.

3. Results and Discussion

This study relates six construct variables to the sustainable blue economy-based mangrove resources management in the coastal area of Sidoarjo – resource efficiency, zero waste, social concern, production cycles system, innovation and adaptation, and institutional. To test the impact of the six variables to the management of sustainable blue economy in mangrove resources we used Partial Least Square (PLS) with Smart PLS Software for 1) Model Evaluation; 2) Structural Model Design (inner model); and 3) Goodness of Fit Evaluation.

Smart PLS Software was applied to test the validity and reliability of each latent variable – Resource Efficiency, Zero Waste, Social Concern, Production Cycle System), Innovation and Adaptation, Institutional, and Sustainable Blue Economy Management. Correlation ≥0.5 indicates high individual reflection. If indicator loading value is <0.5, it should be discarded (dropped) since this indicator is less sufficient to measure latent variables.



Source: Data Processed (2015)

Figure 1. Structural Equation Path Diagram in the PLS Using Smart PLS Software

Figure 1 shows the structural equation path diagram in the PLS using Smart PLS Software, in which there is no indicator variable with loading value <0.5, and therefore, this indicator should not be discarded (dropped), so that we could conclude that the loading value of each indicator variable and the construct relationship (≥5) makes these indicators be valid.

3.1. Validity Test

Based on Fig. 1, the correlation values have met the Convergent Validity Test since the overall loading values are bigger than 0.5 indicating that the indicators are sufficiently reliable sufficient to accurately measure the latent variables, i.e. the loading values of the relationship between the indicator variables of Ef1, Ef2, Ef3, Ef4, Ef5, Ef6, Ef7, Ef8, Ef9 and X1 construct, the relationship between the indicator variables of TI1, TI2, TI3 and X2 construct, the relationship between the indicator variables of Ks1, Ks2, Ks3 and X3 construct; the relationship between the indicator variables of Sp1, Sp2, Sp3 and X4 construct; the relationship between the indicator variables of In1, In2, In3, In4, In5 and X5 construct, and the relationship between the indicator variables of L1 and L2 and X6 construct (λ).

Thus, the variable of the investment in Mangrove Fruit Utilization, the investment in Mangrove Environmental Service as Ecotourism, the investment in Mangrove Environmental Service as the habitat of mangrove shrimp, crab, and milk fish, the investment in mangrove Environmental Service to prevent abrasion, the investment in Mangrove environmental Service as silvofishery, Mangrove Fruit Utilization as efficient production input, the investment in Mangrove Environmental Service as carbon sink, Mangrove Fruit Utilization as efficient production input, efficient Product Distribution of Mangrove Fruit, and Mangrove Fruit Consumption for Production Process efficiency, could be considered to be valid to measure the latent construct of the Resources Efficiency.

The investment variable of Mangrove Environmental Service as carbon sink (Fig. 1) has the highest coefficient value of 29.904 meaning that this variable has the highest impact on the resource efficiency in coastal area of Sidoarjo. The effort made by Sidoarjo Regency involved 223.5 Ha of mangrove forest rehabilitation in Jabon district. In order for effort optimation, the district should provide volunteers of the monitoring community group (Pokmaswas) with more facilities.

Mangrove Fruit Production Waste variables as compost, Mangrove Fruit Production Waste as Fodder, and Mangrove Fruit Production Waste as Resources for Other Production, are also considered to be valid for Zero Waste construct measurement. Mangrove Fruit Production Waste variable as Resources for Other Production has the highest coefficient value of 43.804 (Fig. 1), indicating that it significantly influences the Zero Waste in the coast of Sidoarjo. The effort of the district included training on mangrove waste treatment as briquettes by students of Surabaya University. They are expected to play a significant role to transmit information on mangrove waste treatment to the community of Sidoarjo.

Equitable/easily accessible resource utilization distribution, private distribution of mangrove environmental services as ecotourism, and mangrove utilization as the Effect of low Food and Energy availability, Impact of Disaster, and Bad Impact of Climate Change, could be considered as valid to measure Social Concern construct.

Private Distribution of Mangrove Environmental Services utilization as ecotourism has the highest coefficient value, 17.678, meaning that it significantly influences the Social Concern in the coast of Sidoarjo. The government of Sidoarjo district may reinforce the private sector to develop mangrove tourism by simplifying business permit and providing tourism development.

Furthermore, minimum waste or less carbon emission application through the Production Cycles, Efficient Distribution and Consumption, Resource Utilization Management, and Internalization of Cost, Benefit, and Risk (Resource Economic Valuation) to make investment and pro-growth policy is considered to be valid for Production Cycle System construct measurement. This variable has the the highest coefficient value, 55.699, reflecting that it is the most powerful variable to influence Production Cycle System in the coast of Sidoarjo. Therefore, government's effort to train woman community on mangrove production waste utilization as materials for other production, such as liquid soap, briquettes, and compost, is expected to be able to build new business opportunity that may lead profits.

The variable of Product Innovation from Mangrove Fruits, Innovation in Mangrove Environmental Services Utilization as Ecotourism, Innovation in Utilizing Man grove Environmental Services as Crab, Milkfish, and Shrimp Habitat, and the Innovation of Utilizing Production Waste from Mangrove Material to Create Business Opportunities, and Adjustment of Mangrove Fruits Processing as Food Resources are considered to be valid to measure the latent construct of Innovation and Adaptation.

Fig. 1 shows that the Innovation variable in the Environmental Services Utilization of Mangrove Resources as Ecotourism which produces business opportunities has the highest coefficient, 32.770 meaning that the value this variable has the most influence towards Innovation and Adaptation in the coast of Sidoarjo. Therefore, District government should support the development of mangrove ecotourism, which in turn increases the district revenue.

Economic Growth and well-being equalization variables are also valid to measure the construct of Sustainable Blue Economy Management. Based on Fig. 1, the variable of Equalization well-being has the highest coefficient, 93.901, reflecting that this variable has the most influence on the Management of Sustainable Blue Economy in the coast of Sidoarjo. This result was in line with the main purpose of the Management of Sustainable Blue Economy in the coast of Sidoarjo is to equalize the well-being of the nearby communities.

Good Governance and Sustainable Resources variables were considered to be valid to measure the latent construct of the Institutional variable. Based on Figure 1, Investment in Mangrove Environmental Services Utilization as Carbon Emission has highest coefficient, 62.097. Sustainable Resources has the most influence on the Institutional in the coast of Sidoarjo. Thus, regency government could build the synergy between the government and the communities to achieve good governance. The government should also provide facilities and infrastructures to support Pokmaswas' activities in mangrove resources management.

Construct Validity Test was conducted by valuing Average Variance Extracted (AVE). AVE value should be ≥0.5.

Based on Table 1, it could be concluded that the exogenous latent variables of Resources Efficiency, Social Concern, Zero Waste, Production Cycles System, Innovation and Adaptation, and Institutional have AVE value bigger than 0.5, and the endogenous latent variable of Sustainable Blue Economy Management has also the AVE value bigger than 0.5. It indicates that the indicators used for variables (TI1, TI2, TI3) to measure Zero Waste construct, variables (Sp1, Sp2, Sp3) to measure Production Cycles System construct, variables (In1, In2, In3, In4, In5) are valid for latent construct measurements of Innovation and Adaptation. The indicators used for variables (P1, P2) to measure the construct of Sustainable Blue Economy Management, variables (Ef1, Ef2, Ef3, Ef4, Ef5, Ef6, Ef7, Ef8, Ef9) for latent construct measurement of Resources Efficiency, variables (Ks1, Ks2, Ks3) to measure Social Concern, and Indicators to measure for institutional variables (L1, L2) are valid as well.

3.2. Reliability Test

A variable is said to be valid if the composite reliability value and cronbach alpha bigger than 0.6. The result of reliability test is presented in **Table 2.**

Table 2 shows that the exogenous latent variables, Resources Efficiency, Zero Waste, Social Concern, Production Cycle System, Innovation and Adaptation, and Institutional, have the composite reliability values bigger than 0.6. Endogenous latent variable, Sustainable Blue Economy Management, has composite reliability value bigger than 0.6 as well. The indicators used in the variables (Ef1, Ef2, Ef3, Ef4, Ef5, Ef6, Ef7, Ef8, Ef9, TI1, TI2, TI3, Ks1, Ks2, Ks3, Sp1, Sp2, Sp3, In1, In2, In3, In4, In5 and P1, P2) have sufficient reliability to measure the construct. The Institutional variable, however, has cronbach alpha value smaller than 0.6 indicating that the indicators used in the Institutional variable is less reliable or not sufficient to measure the construct.

Figure 1 shows the influence of the relationship between the exogenous latent variables and the endogenous latent variable (Sustainable Blue Economy Management). Based on the path parameter coefficient, the structural equation model will be:

Sustainable Blue Economy Management = 0.913 Resource Efficiency + 1.495 Zero waste + 1.992 Social Concern + 5.717 Production Cycles System + 2.607 Innovation and Adaptation + 8.984 Institutional.

Table 1. The output value of AVE with Smart PLS Software

	Original Sample (O)	Sample Mean (M)	Standard Error (STERR)	T Statistics (|O/STERR|)	Remark
Resource efficiency	0,521	0,519	0,028	18,439	Valid
Innovation and adaptation	0,575	0,573	0,024	23,740	Valid
Institutional	0,635	0,634	0,027	23,327	Valid
Social concern	0,600	0,595	0,046	13,128	Valid
Management of blue economy	0,842	0,843	0,020	43,175	Valid
production cycles system	0,711	0,710	0,025	28,271	Valid
Zero waste	0,683	0,679	0,037	18,613	Valid

Source: Data Processed (2015)

Table 2. The Result of Reliability Test of Each Latent Variable with Smart PLS Software

Variable	*Composite Reliability*	Remark	*Cronbach Alpha*	Remark
Resource efficiency	0,906	Reliable	0,881	Reliable
Innovation and adaptation	0,870	Reliable	0,813	Reliable
Institutional	0,770	Reliable	0,476	Reliable
Social concern	0,818	Reliable	0,675	Reliable
Management of blue economy	0,914	Reliable	0,813	Reliable
production cycles system	0,880	Reliable	0,799	Reliable
Zero waste	0,865	Reliabel	0,772	Reliabel

Source: Data Processed (2015)

Based on the above equation, it can be described:

1. Path Parameter Coefficient of the relationship between Resources Efficiency and Sustainable Blue Economy Management is 0.913, meaning that the higher the Resources efficiency is, the better Sustainable Blue Economy will be. Positive value of the Resources Efficiency coefficient indicates that the communities of Sidoarjo coast have better understanding on mangrove fruits utilization for food and the use of mangrove environmental services as silvofishery, abrasion prevention, habitat of crabs, shrimps, and milkfish, and ecotourism.

Implementation of blue economy concept in relation with resources efficiency in Sidoarjo district is reflected in the following government programs: training on mangrove fruits processing, mangrove rehabilitation in the pond embankment area and coastal area, and establishment of eastern Sedati district as conservation area.

Sidoarjo district government is recommended to manage mangrove resources based upon blue economy concept in relation with resources efficiency, and it could encourage the use of mangrove fruits for food, such as crackers, syrup, chips, candy, and cookies, so that mangrove resources could hold a function as source of food. This process should be supported by the availability of mangrove fruits. These raw materials come from Bruguiera Gymnorhiza, Rhizopora Apiculata, Avicennia Alba, Avicennia Marina, Sonneratia Alba, and Achantus Illicifolius. The training program on mangrove fruit processing should also be followed with accompaniment that blue economy concept implementation in this area could succeed.

The government should also makes effort to utilize mangrove environmental services to support friendly pond environment through mangrove rehabilitation program in the pond embankment area. Furthermore, mangrove rehabilitation in the area of Jabon and Sedati is still needed. To make this program be successful, the government should involve the local community to manage the program.

Mangrove rehabilitation in the coastal area to prevent abrasion and to support habitats for shrimps, milkfish, and crabs is still important to do. It includes not only plantation activity, but also maintenance and management programs. The government could also involve Pokmaswas (monitoring community group) in mangrove forest management. The government's support in ecotourism in Sedati district should be accompanied by facilities and infrastructure improvement. It could collaborate with private sectors to build ecotourism management, and in turn, improve the community's well-being.

2. Path Parameter Coefficient gained from the relationship between Zero Waste and the Management of Sustainable Blue Economy is 1.495. It indicates that Zero Waste and of Sustainable Blue Economy management gets better. The coefficient of Zero Waste has positive value due to the increased social understanding on mangrove waste utilization so that it could improve economic value. It could be done through the training program on mangrove waste processing to produce compost, fodder, and as raw product for other production process. The implementation of the Blue Economy Concept in relation with Zero Waste in Sidoarjo is reflected in the government programs, such as training program on mangrove waste processing to produce liquid soap, briquettes, and compost.

In this case, the district government of Sidoarjo should give in term of mangrove resources management based on the blue economy concept in relation to Zero Waste is the presence of accompaniment through community's involvement in the creative product exhibition events that could reinforce mangrove waste utilization grow fast. This sort of effort can build good business opportunities. For instance, from the milkfish pond, the use of fish bone and head to produce high calcium meatball, crackers, fish bone flour, and handicraft. Fish intestine and gill could also be used as materials for fish silage and the fish skin as crackers. Previous finding showed that 100 kg of milkfish wastes could earn IDR. 155,000,-. [16]

3. Path Parameter Coefficient obtained from the correlation between Social Concern and Sustainable Blue Economy Management is 1.992, which means that high social concern could make better sustainable blue economy management. Social concern coefficient is found positive, since people's understanding in Sidoarjo coast is increasing on mangrove environmental services utilization as ecotourism, equitable and accessable distribution of resource utilization, and mangrove utilization as food supply, energy resources, disaster impact prevention, and bad effect prevention of the climate change.

The implementation of the Social Concern-related Blue Economy Concept in the district of Sidoarjo is reflected in the government programs, such as conservation area establishment in the jabon and Sedati districts, training program on mangrove fruits processing, and mangrove waste processing. Therefore, the government of Sidoarjo needs to encourage local communities in any mangrove management-related government programs. It should also support the 'Pokmaswas' by providing more monitoringfacilities.

4. Path Parameter Coefficient from the relationship between Production Cycles System and Sustainable Blue Economy Management is 5.717, indicating that better Production Cycles System could improve Sustainable Blue Economy management. The positive value of Production Cycles System could result from better communities' understanding about the implementation of Minimum Waste or Less Carbon Emission through the efficient Production Cycles, Distribution Cycles, and Consumption Cycle, the resources utilization which not exceeds the resource capacity, the internalization of cost, benefit, and risk (resource economical valuation), and investment and pro-growth policy making.

The implementation of the Production Cycle System-related blue economy concept in Sidoarjo Regency is reflected in the government's programs, such as training program on mangrove fruits waste utilization as raw materials for other production process, such as liquid soap, briquettes, and compost, and mangrove forest area establishment in the coastal area of Jabon and Sedati districts.

The government of Sidoarjo needs to give community an accompaniment. It could be done product promotion and marketing activities. In the policy making of mangrove resources processing which has economic value, the government may establish rehabilitation programs for the damaged mangrove forest by considering the benefit of mangrove species which supports food security for society.

5. Path Parameter Coefficient obtained from the relationship between Innovation and Adaptation variable and Sustainable Blue Economy Management is 2.607, which means that better innovation and adaptation could improve the sustainable blue economy management. The positive value could result from better understanding on product innovation of mangrove fruits, innovation of mangrove environmental services utilization as ecotourism, crab, shrimp, and milkfish habitats, mangrove processing waste utilization, and mangrove fruits product adaptation as food source food to establish business opportunities.

The implementation of innovation and adaptation-related blue economy concept in Sidoarjo is reflected in the government's programs, such as establishment of conservation area and mangrove forest in coastal area, rehabilitation of pond embankment and coastal area, establishment of nature conservation, and training program on mangrove waste processing.

Sidoarjo government should to support private sectors and nearby communities to involve in mangrove resources management, particularly for mangrove forest rehabilitation and utilization of mangrove environmental services as ecotourism. Ecotourism development can enhance the growth of food processing business with the raw material of mangrove fruits and wastes.

6. Path Parameter Coefficient obtained from the relationship between Institutional variable and Sustainable Blue Economy Management is 8. 984, meaning that better institutional will improve the management of sustainable blue economy. The positive coefficient indicates increased community understanding on good governance and sustainable resources.

The implementation of institutional-related blue economy concept in Sidoarjo is shown in the establishment of Kelompok Usaha Bersama (KUB-Sharing Business Group) to develop fish cultivation, and the KUB consists of 30 up to 50 members in each district. There is also Pokmaswas formed by the community. The Pokmaswas members are the fishermen and fish farmers. In this case, government and non-government collaboration is crucial in order to support the effort to manage sustainable mangrove resources. The collaboration between the government and non-government could be in the form of:

1) Community empowerment in mangrove resources management. Mangrove resources monitoring is recentlyconducted by the community itself, in the form of Pokmaswas consisting of the fishermen and fish farmers. Each group has 30-50 members. Low government's attention makes the mangrove rehabilitation effort not succeed, or live mangrove population is less than 50%, so that government's support to mangrove resources monitoring and controling efforts is needed. It could be done by providing some incentives for the Pokmaswas, monitoring facility improvement, such as handy talky, boats and specialized personnel, because to date, monitoring activities are only conducted by Marine and Fisheries Services of East Java Province.

Empowerment involves an effort to build power or potential through support, motivation, and increased awareness on the potential capability and attempts to develop it so that one becomes autonomous, independent, free from poverty and retardation. [17] Sedati and Jabon district societies have not utilized mangrove fruits yet. Hence, the government role is very important to support the community to use them;

2) Optimization of fisheries product marketing. Our results showed that the products came from ponds, such as tiger shrimps, milkfish, and seaweed Gracilaria polyculture as typical products of Sidoarjo Regency. Meanwhile, seaweed products for the last few months were difficult to distribute, and thus up to 400 tons per month were piled up in the warehouse. Poor infrastructures to the warehouse in Jabon district should also get more attention from the government. Marketing information is also needed by the farmers to be able accelerate the market product absorption at competitive prices;

3) Fisheries product development. This study found that fish farmers needed more equipment to increase seaweed production, such as waring, harvesting net, and buoys to increase the selling value of the dried seaweeds. The concept of environmentally friendly aquaculture is more commonly referred to as aquaculture that conserve mangroves as green belt or mangrove planting in the pond (Silvofishery) should be done.

Structural model was tested by looking at the squared R as goodness-fit model test. The squared R (**R^2**) value was calculated using Smart PLS software. (**Table 3**)

Table 3. Squared R value

Variable	Squared R (R^2) Value
Management of blue economy	0.548

Source: Processed Data (2015)

R^2 value for the variable management of sustainable blue economy is 0.548, which means that the variation of sustainable blue economy management could be explained by the construct variables (Resource Efficiency, Zero Waste, Social Concern, Production Cycle System, Innovation and Adaptation and Institutional) as much as 54.8 percent, and the rest 45.2 percent is influenced by other variables that are not included in the research model.

Based on the result, it can be concluded that the model of mangrove resources management in the coast of Sidoarjo covers institutional aspect, system of the production cycle, innovation and adaptation, social concern, zero waste, and resource efficiency, in which zero waste, production cycle system, innovation and adaptation, and institutional give positive impact on the sustainable management of the blue economy. The higher the zero waste, the production cycle systems, innovation and adaptation, resource efficiency, social concern and institutional, the better sustainable management of the blue economy will be.

Moreover, Institutional coefficient has the highest value reflecting that institutional variable affects the most to the sustainable management of the blue economy, and the most influential indicator is good governance. Based on institutional theory, to solve the model problem of common pool resources in Sidoarjo coast, the policy is not just executed by the goverment itself, or management of natural resources directed to community participation/group of people, but also the mechanism of resource management should involve the government and non-government (good governance), including Pokmaswas monitoring activities on mangrove resources. Thus, good governance is expected to build a synergy between the community and the government, including providing facilities and supporting infrastructures for Pokmaswas activities, such as motor boats and communication equipment, such as handy talky (HT).

The key for the management model success of good governance is a partnership / joint action. Good institutional governance, in an effort to realize the blue economy in Sidoarjo is indispensible. The coordination among the agencies in the management of mangrove resources, the division of duties and responsibilities, and the enforcement of the rules are highly needed for the success of the program. The success of marine development requires a comprehensive planning and supports the interests of both the society and the environment. This should be based on the geographical alignment, ecological integration, inter-stakeholders integration, sectoral integration, and the integration of sciences.

Recommendations for blue economy concept implementation effort in Sidoarjo cover 1) resources efficiency, in which the government should encourage people to utilize mangrove fruits for food production, such as crackers, syrup, chips, candy, and cookies, so that it could become food source for the community; 2) zero waste, in which the community should be mentored to participate in creative product exhibition event that may push the use of wastes to grow. This effort could become a business opportunity; 3) Social concern, in which the community is involved in government program implementation in mangrove resources management. Government's support to the existence of monitoring comunity group could be done through the provision of facilities and infrastructures needed in relation with their duties; 4) production cycle system in the form of people's assistance. Government could aid the product development through promotion and marketing. In the policy decision of the mangrove resource management yielding an economic value, the government could carry out mangrove rehabilitation program by taking account of the benefit of mangrove species that can support the community's food security; 5) Innovation and adaptation, in which private sector's and local communities' involvement in mangrove resource management efforts need to be encouraged, especially in the mangrove ecosystem rehabilitation and the utilization of mangrove ecosystem services as ecotourism. For this, ecotourism development could help accelerating the growth of food processing business with raw materials of mangrove waste and fruit; and 6) Institutional, in which the collaboration or joint action between government's and non-government's efforts are used to support the sustainable management of the mangrove resources.

In this study, problem issues were still limited. Model preparation with PLS method has also some limitation including the model analyzed with reflective indicators. Further research needs to focus on the development of more comprehensive models to explore the variables potential to affect the sustainable management of the blue economy that could better contribute to the mangrove resource management in Sidoarjo, mainly the blue economy model of economic development territory in limited area, the conservation-based distinctive economic area.

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