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Research article

Assessing sustainability of coastal tourism based special economic zone (SEZ) in Indonesia: The case of Tanjung Lesung Coastal Area, Banten Province, Indonesia

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Abstract: Special economic zone (SEZ) is one of the economic policies of Government of Indonesia (GoI) to boost economic growth of country. One of the economic sectors which is put as platform of SEZ is the coastal and marine tourism. This paper aims to assess the sustainability of Coastal Tourism SEZ with the case of Tanjung Lesung Coastal Area. We modify Casagrandi-Rinaldi-Lacitignola (CRL Model) by incorporating community model as importance factors as well as tourists, capital, and environmental models. The results show that by incorporating community in the development scenario will increase the sustainability of tourism in the Tanjung Lesung SEZ where income, environmental factors and attractiveness of the tourism are increasing during the simulation period.

Keywords: coastal tourism; social-ecological system; sustainability model; Tanjung Lesung; Indonesia

1. Introduction

The coastal ecosystem with all its uniqueness has become a tourist attraction that is very attractive

to tourists. Coastal Tourism takes location and recreation activities located in coastal and offshore areas. The coastal area is a transition area between land and sea where the most visited by tourists in various coastal tourism areas which describes a very important economic activity [1]. Coastal and marine environments are important areas for tourism and recreation. Increased knowledge about interest in the coast and the ocean due to easy access and technology has had an impact on the growth of activities in the region [2].

With its development, coastal tourism management planning can be developed using Social-Ecological-System (SES). The SES perspective provides a dynamic approach [3]. Tourism and the land cannot be understood only by looking at the conditions of stability and certainty. In addition, SES thinking can contribute to tourism in natural areas as a way to deal with change and uncertainty. Using the SES perspective has implications for tourism and land management, because SES is an integrated system of ecosystems and humans by looking at the reciprocal relationship between the two.

In the context of SES, tourism activities are a form of ecosystem service (ES) in the form of cultural services [4–6]. MEA [7] defines cultural services in terms of "non-material benefits derived from ecosystems," and specifically defines "cultural diversity, knowledge systems, educational values, inspiration, aesthetic values, social relationships, memorable places, cultural heritage values, recreation and ecotourism". Although some cultural values may have little dependence on the ecosystem for example, buildings associated with historical buildings, paintings, and religious relics. Cultural services are certainly related to the community as one of the actors in tourism. Community involvement in tourism is an important part so that tourist destinations remain environmentally, socially and economically sustainable. The purpose of this study is to find a tourism-based coastal area management model so that it can be realized in its management.

2. Modified Casagrandi-Rinaldi-Lacitignola (CRL) model

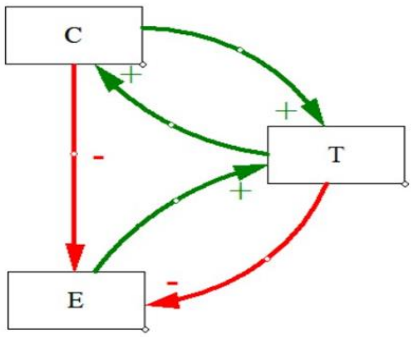

Figure 1. The interactions between the three components of sustainable tourism.

The graph above depicts the three components as a minimal model in assessing sustainable tourism. Tourists (T) and tourist facilities (C) have a negative impact on environ-mental quality (E), but environmental quality and infrastructure are attractive to tourists. The positive arrow from T to C represents the investment of part of the profits associated with tourism into new facilities for visitors [8].

The theoretical model of Casagrandi and Rinaldi [8] was later developed by Lacitignola et al. [9] (CRL Model) by distinguishing Tourist (T) to be eco tourist (T1) and mass tourist (T2). The model

developed by Lacitignola et al. [9] is known as the dynamic eco-mass tourism (DEMT) model which classifies tourists into (T1) and (T2) so as to form an interaction between tourists, the environment (E) and Capital (C) in terms of it is an economic activity related to tourism. This because of their different underlying motivational features and relationships with environment, and accommodation and entertainment [9]. The relationship between components and the DEMT Model is shown in Figure 2.

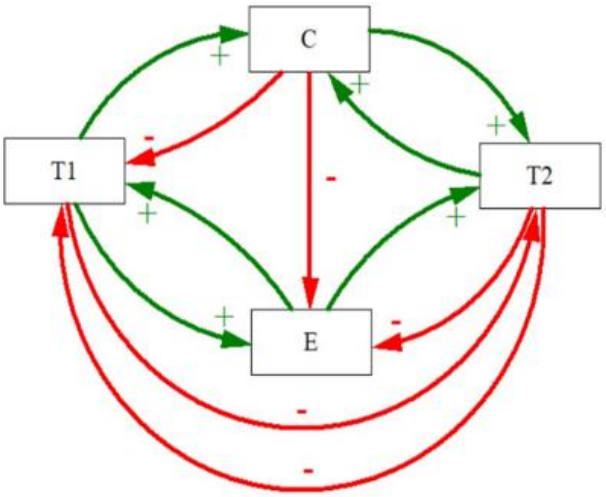

Figure 2. Dynamic eco mass tourist model: interactions among the state variables of the model involving two tourist classes.

In Casagrandi and Rinaldi [8] detailed analysis of the model is performed, providing theoretical results which appear in agreement with conventional wisdom and observations. However, as the authors recognize, the three state variables are not able to convey all social, cultural and political aspects involved in tourism dynamics. Additionally, they suggest that the model could be improved to include some more realistic features of tour-ism. Therefore Lacitignola et al. [9] then perfected it by classifying tourism into 2 typologies, namely eco tourist (T1) and mass tourist (T2).

Based on the development of the two models, this research then tries to conduct a different study on sustainable tourism by adding an element of community (Co) as a balancing of social functions that are directly located at tourist sites. The rationale for adding a local community component as an inseparable part in the growth and development of a sustainable tourism area, because in tourism activities there is an interaction between the four components in the DEMT model (C, E, T1, T2) and the local community both positively nor negatively (Co-DEMT Model). The community is the direct act of tourism activities in terms of natural and cultural resource management so that they have a strong commitment to managing resources in a sustainable manner because it involves the interests of their lives [10].

Destination sustainability and responsible tourism are positive functions of the quality of life of local residents [11]. The real benefits of responsible tourism will be fulfilled only if the local community at the tourist site perceives those activities related to responsible tourism create profitable sustainability and quality of life improvement [12].

3. Co-DEMT model implementation

The model that was built resulted from an in-depth analysis of each variable in the CRL model, supported by the results of a survey conducted in the Tanjung Lesung SEZ tourism area, Banten province, Indonesia (Figure 3). Tanjung Lesung coastal tourism based SEZ which is designated as a tourism area based on government regulation of the republic of Indonesia No. 26 Year 2012 [13].

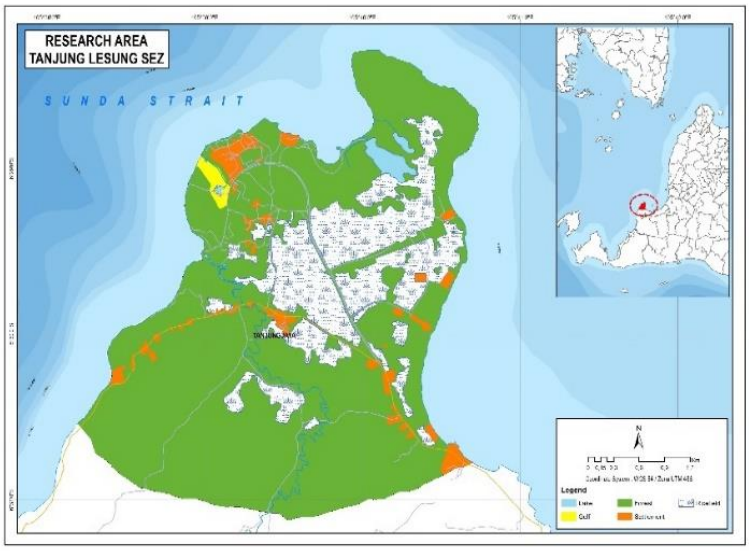

Figure 3. Tanjung Lesung coastal tourism based SEZ which is designated as a tourism area.

With DPSIR/Driver-pressure-state-impact-response analysis [14–20] obtained variables for the community (Co) component, namely the number of residents as drivers and an increase in income and changes in community behavior as the impact of tourism activities that occur. These variables are as follows:

1. Number of Population working in the tourism sector (Em)
2. Increasing Community Income (I)
    - KJA becomes a tourist attraction
    - Residential houses become homestays
    - Growth of IKM (Small and Medium Industries)
    - Become a Tour Guide
3. Changes in Community Behavior (B)
    - The fishermen's lifestyle has changed into a new lifestyle because of working in tourism services
    - Closed culture becomes a society with open culture

The Co-DEMT model thus can be described as conceptual model diagram as shown in the Figure 4 below.

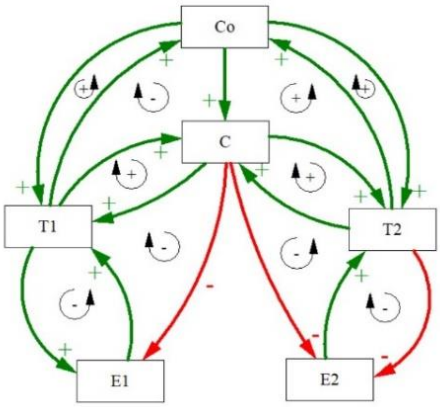

Figure 4. Dynamic eco mass tourist model which has added community (Co-DEMT) components and changes to the environment (E1 and E2) for T1 and T2 which have positive and negative interactions between components.

4. Model formulation

We modify CRL Model by incorporating the community model as added to the component (Co) into the formula. Thus, the Eq (1) for Eco-Tourist $\frac{dT1}{dt}$ is:

$$\frac{dT_1}{dt} = \frac{\mu_{1E}E_1^2T_1}{E_1^2+\varphi_{1E}^2} - \beta_1\frac{CT_1}{T_1+T_2+1} - \alpha_1T_1^2 - \alpha_1^*T_1T_2 - \gamma_1^*T_1^2T_2 - \omega T_1 + CoT_1 \quad (1)$$

Eco tourist visits $\frac{dT_1}{dt}$ are strongly influenced by tourist attraction to the environment which is quite large $\frac{\mu_{1E}E_1^2T_1}{E_1^2+\varphi_{1E}^2}$, but is not affected by attractiveness owned by a tourist attraction $-\beta_1\frac{CT_1}{T_1+T_2+1}$, T_1 visits are greatly affected by the acceptance of the $+ CoT_1$ community, because it has a positive impact on the community. Disinterest in other tourism objects α_1 and the number of tourists visiting γ_1 and a decrease in environmental quality due to degradation ω. Meanwhile, mass tourist (T_2) is expressed by the Eq (2):

$$\frac{dT_2}{dt} = \frac{\mu_{2E}E_2T_2}{E_2+\varphi_{2E}} + \mu_{2C}T_2\frac{C/(T_1+T_2+1)}{C/(T_1+T_2+1)+\varphi_{2C}} - \alpha_2T_2^2 - \alpha_2^*T_1T_2 - \gamma_2^*T_1T_2^2 - \omega T_2 + CoT_2 \quad (2)$$

where the rate of mass tourist visits $\frac{dT_2}{dt}$ is strongly influenced by tourist attraction to the environment which is quite large $\frac{\mu_{2E}E_2T_2}{E_2+\varphi_{2E}}$ and tourist interest in tourist attractions (attractiveness) owned by tourism objects $\mu_{2C}T_2\frac{C/(T_1+T_2+1)}{C/(T_1+T_2+1)+\varphi_{2C}}$, T2's visit is also greatly affected by the acceptance of the CoT_2 community, because they both have a positive impact on the community, tourists are not interested in other tourism objects α_1 and the number of tourists visiting γ_1 and a decrease in environmental quality due to degradation of ω.

The rate of change in environmental quality both $\frac{dE_1}{dt}$ and $\frac{dE_2}{dt}$ is influenced by the carrying capacity of the tourism environment (k), the impact of tourism development (r) and the number of tourist visits (γ), while for $\frac{dE_2}{dt}$ also affected by the increase in tourist facilities (βC) expressed in the following Eqs (3) and (4):

$$\frac{dE_1}{dt} = \frac{r_1 E_1^2}{k_1} - r_1 E_1 + \gamma_1 T_1 E_1 \tag{3}$$

$$\frac{dE_2}{dt} = \frac{r_2 E_2^2}{k_2} - r_2 E_2 - E_2(\beta C + \gamma_2 T_2) \tag{4}$$

The greater the effort to develop βC tourism and the number of tourists visiting, γT will have a greater impact on the decline in environmental quality.

The rate of development of tourism objects $\frac{dC}{dt}$ is strongly influenced by the magnitude of the investment rate ϵ and the number of communities working in the tourism sector (Co) as well as the decline in the quality of tourism objects δ which is stated in the Eq (5):

$$\frac{dC}{dt} = -\delta C + \varepsilon_1 T_1 + \varepsilon_2 T_2 + \varepsilon_3 Co \tag{5}$$

The role of the community in the development of tourist areas $\frac{dCo}{dt}$ is strongly influenced by the number of people working in the tourism sector (E_m) which will lead to an increase in people's income (I) and changes in community behavior (B). The role of the community is expressed in the Eq (6):

$$\frac{dCo}{dt} = \frac{E_m + I + B}{3} \tag{6}$$

Where Em, I and B are index values ranging from 0–1 thus the value $\frac{dCo}{dt}$ also ranges from 0–1 with an interval of 0–0.33: low, 0.34–0.66: moderate and 0.67–1.00: high. While the value of the E_m index is determined by the rate of population $\left[Pop\left(1 + r_{pop}\right)\right]$ multiplied by the productivity of the population in tourism activities and tourism education $Prod_{pop} \cdot \lambda \cdot Ed$, see Eq (7),

$$E_m = \left[Pop\left(1 + r_{pop}\right)\right] \cdot Prod_{pop} \cdot \lambda \cdot Ed \tag{7}$$

The value of the community income index is determined by the number of people working in the tourism sector ($E_m I$ multiplied by the total income in the tourist environment $\left(1 + \frac{I}{k_I}\right)$. Meanwhile the index B value is determined by the number of people working in the tourism sector, which is influenced by the ratio of the number of tourists T_1 and T_2, see Eqs (8) and (9).

$$I = E_m I \left(1 + \frac{I}{k_I}\right) \tag{8}$$

$$B = 1 - \frac{E_m}{E_m + \lambda} \tag{9}$$

Where the value of λ is:

$$\lambda = \frac{T_1 + T_2}{T_{cc}} \tag{10}$$

The Co-DEMT model is implemented in the Tanjung Lesung SEZ as an exclusive area that has a function as a tourism zone. The Tanjung Lesung SEZ in developing its tourism zone has not optimally involved the community around the area as partners to support the realization of a sustainable tourism area. The population of this study is the local community around the Tanjung Lesung SEZ who generally have a livelihood as fishermen. From the results of interviews conducted with the local community around the Tanjung Lesung SEZ, data obtained 93.8% agree and will support the development of SEZ as a sustainable tourism area. After the existence of the SEZ, people began to shift their livelihoods to activities related to tourism to meet the needs of tourists coming to the SEZ. These new livelihoods include being a tour guide, selling souvenirs, opening homestay, and others related to trade and service activities. The involvement of local community in KEK tourism activities, besides being able to improve the community's economy, can also help to protect the environment so that it remains sustainable.

Spenceley et al. [21] conducted a study to find out the various benefits associated with responsible tourism and the results of the study revealed that 66% of respondents stated that tourism had a positive impact on local communities. By providing tourism-related employment opportunities, residents can earn income from tourism and tourism managers should apply the theory of the recreational spectrum in planning routes for tourists so that they retain respect for local natural and cultural resources [22]. Responsible tourism has a positive impact on society and the sustainability of tourist destinations [11]. Based on the facts above, all components and variables in the Co-DEMT model are parameterized and validated with data obtained in the Tanjung Lesung SEZ, Banten Province, Indonesia, both primary and secondary data.

5. Results and discussions

The dynamics that occur in coastal areas link the interaction between ecological systems and social systems. The social-ecological relationship will determine what changes will occur in social-ecological co-evolution [23–25]. Based on the formulation of the Co-DEMT model, a dynamic system modeling simulation [26, 27] was carried out to see the impact of the created scenario.

The scenarios made to simulate the Co-DEMT model for 10 years are:

1. Scenario 1: the current management of the environment and tourism facilities with the community as tourism workers is still low.
2. Scenario 2: better environmental management without the development of tourism objects and facilities with 75% educated tourism worker community.
3. Scenario 3: current environmental management by developing better tourism objects and facilities with 75% educated tourism worker community.
4. Scenario 4: better environmental management accompanied by the development of better tourism objects and facilities with 75% educated tourism workers.

The simulation of the four scenarios are showed in the Figure 5 as follows.

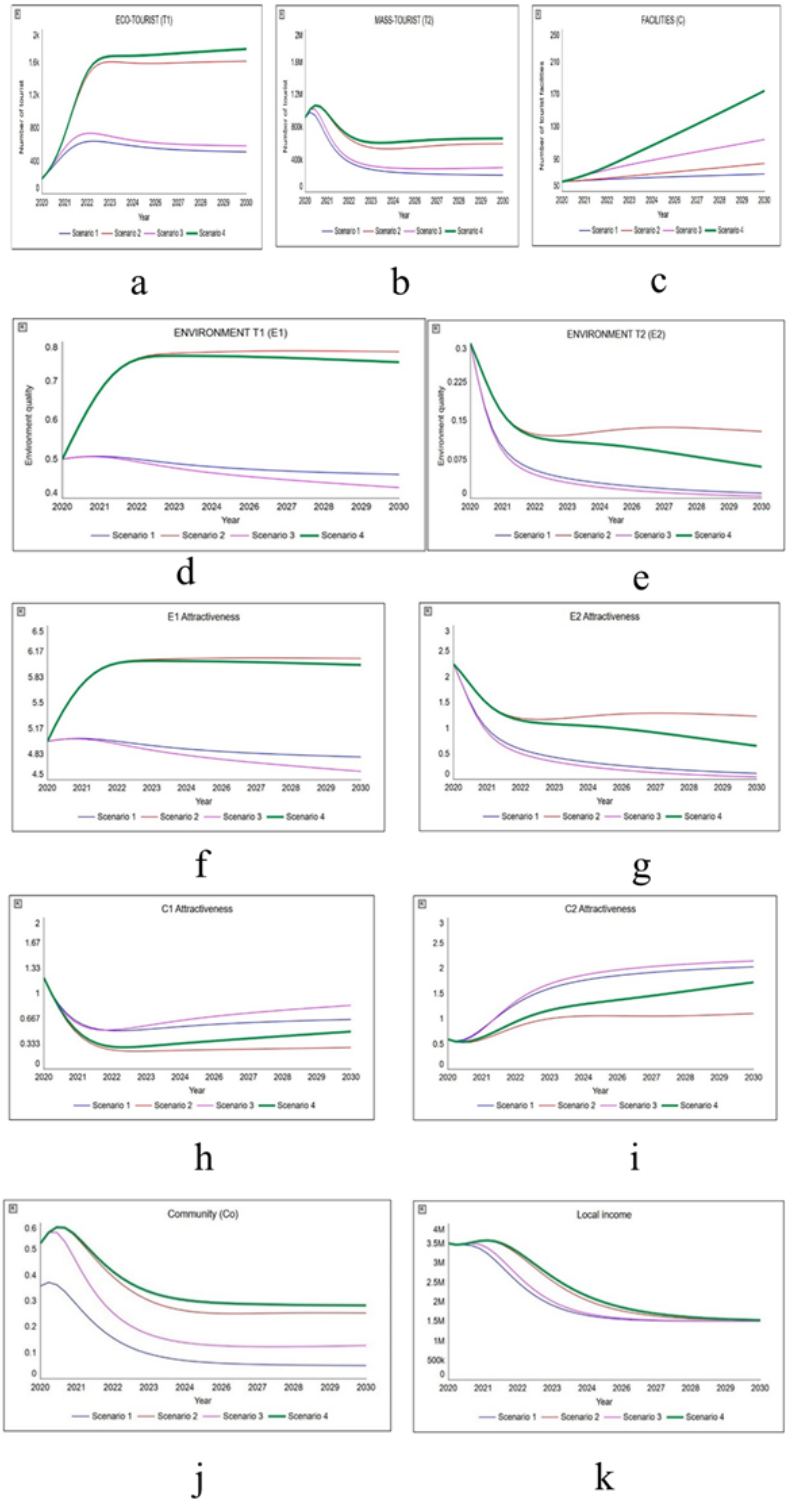

Figure 5. Co-DEMT sustainable tourism management scenario simulation.

From the simulation, it can be seen that the current management is where community involvement is still low (Scenario) showing a tendency to decrease the number of tourists both T1 and T2 as well as tourist facilities (C) environmental quality (E1 and E2). This is shown in Figure 5a–e.

Improvements in environmental management and community involvement with tourism

education by 75% are sufficient to increase the number of tourists on T1, environmental quality in E1 and tourist attraction in E1 (Figure 5a,d,h). Improvement of tourist facilities (C) with 75% involvement of the community with tourism education without environmental management will indeed increase attractiveness because there is an increase in facilities (Figure 5f,g) but over time it will result in a decrease in the number of tourists T1 and T2, Environment E1 and E2, attractiveness travel on E1 and E2 (Figure 5a,b,d,e,h,i).

From Figure 5j, we can reveal that an increase in community involvement in the early development of the area, then decreases and reaches stability in the following years. This is also reflected in an increase in the income of the population (Figure 5k) and it has stabilized in the following year.

Based on the simulation, it can be seen that the most ideal scenario is to improve the environment accompanied by increasing facilities and increasing tourism-educated communities so that sustainable coastal tourism management can be achieved. The implementation and simulation of the Co-DEMT model in the Tanjung Lesung SEZ provides an illustration of how tourism-based coastal management can be carried out and it is very possible for this model to be developed in other coastal areas around the world.

This section is not mandatory but can be added to the manuscript if the discussion is unusually long or complex.

6. Conclusion

Using SES approach, the sustainability of coastal tourism based SEZ are examined using the Co-DEMT model. The model provides an overview of how the community influences the ongoing tourism activities in an area. Community in tourism activities can interact directly with tourists as users of ecosystem services so that they can jointly maintain the environment so that it is well maintained as a tourist attraction. The community can collaborate with tourism managers as a balancing platform of the social functions of ecosystem utilization patterns to create a sustainable coastal tourism based SEZ. As the result of simulation, the sustainability of the coastal tourism based SEZ would be in-creasing.

Conflict of interest

The authors confirm that there is no conflict of interest regarding this manuscript.

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