Rap-Tourism Method to Assess Tourism Objects Sustainability

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Abstract. Kampung Pelangi Semarang was originally a slum settlement that became artificial based tourism destination by City Government project. It has a positive impact on the tourist attractiveness of Semarang City. It is necessary to maintain its existence by evaluating the status of tourism object sustainability. The purpose of this research is to assess the sustainability status of tourism destination based on the sustainability index and provide recommendations for improvements based on the most sensitive indicators. Data processing used Rap-tourism method and multidimensional scaling (MDS) approach. This research using ordinal scale 1-5 with samples from stakeholders of the tourism objects. Sustainability status of Kampung Pelangi Semarang is a less sustainable category with sustainability index of 35.29. The index consists of four-dimensional value. The first is environmental dimension which has index 36.58 (less sustainable), the next is economic dimensions 32.40 (less sustainable), socio-cultural dimensions 35.15 (less sustainable) and institutional dimensions 34.65 (less sustainable). Improvement recommendations from each dimension are provide restroom facilities and water installation, training the community on the paper floral skill, organizing fishing festivals, provide information facilities related to mitigation of seasonal changes and risk of disaster threats.

1. Introduction

Sustainable tourism is a tourism that consider current and future impacts of economic, social and environmental dimension, to meet the needs of visitors, industry, environment and the local community and can be applied to all forms of tourism activities in all types of destinations, including mass tourism and various niche tourism segments. The implementation of sustainable tourism needs more attention from governments and all involved tourism elements, including tourism destination management and the tourists. By implementing sustainable tourism in the management of tourism destination, the negative impacts such as damage to environments increased development costs, and damage to existing cultures could be avoided [1].

Kampung Pelangi Semarang was originally a slum settlement that improved by City Government project and became an artificial tourist destination in 2017. It was seen the residential housing was painted in colors. Since the inauguration of Kampung Pelangi tourist destination in April 2017 had a positive impact on the tourist attractiveness of Semarang City. Tourists from inside and outside this region also visit the destination, including visitors from abroad. The existence of Kampung Pelangi also encouraged other regions to participate in making changes in their respective regions which had more value. The people of Kampung Pelangi began to changing their habit such as start to caring the cleanliness of the environment, increasing social attitude of community than before, business development also began to be implemented in these tourist destinations. Based on the description above,
to maintain the existence of a tourist village, it needs to evaluate the status of sustainability. This step as a method to detect or identify the important environment, ecology and social problem which threatens tourism sustainability. This research aims to measure the sustainability status of Kampung Pelangi Semarang using Rap-tourism method and Multidimensional Scaling (MDS) approach and provide recommendations for improving tourism sustainability based on the results of the most sensitive indicator of each sustainable dimension.

2. Literature Review

2.1. Sustainable Tourism Dimension and indicators

Sustainable tourism is defined by the United Nations World Travel Organization as tourism that takes full-account of current and future economic, social and environmental impacts, responds to visitor needs, industry (tourism), the environment and host communities [2]. The scope of sustainable tourism is (1) Management of sustainable tourism destinations; (2) Economic use for local communities; (3) Preservation of culture for the community and visitors; and (4) Environmental preservation [1].

Sustainable tourism triangle emphasizes the balance of 3 pillars: the economic, social, and environmental dimensions of the tourism industry. Other research used 5 dimensions for assessment on natural-based tourism: the institutional, infrastructure, social culture, environment, and economy [3]. Research on sustainability assessment of a natural resources used indicators attractions, facilities, transportation, and hospitality. The result was found that among the dimensions in the tourism indicator, the hospitality dimension turned out to get the highest average score, followed by facilities, attractions and then finally transportation. This shows that the hospitality and acceptance of stakeholders must be well managed although in natural tourism [3].

There are many different types of tourism, according to Spillane there are 7 kinds of tourism based on tourism destination. They are pleasure tourism, recreational tourism, cultural tourism, culinary tourism, sports tourism, business tourism and convention tourism [5]. Another classification is from McIntosh and Goeldner which summarize previous studies on travel motivation, separating them into four categories of tourism: (1) physical motivators, including those related to physical rest, need for recreation, and those motivations directly connected with a person’s bodily health; (2) cultural motivators concerning the desire to gain knowledge about other countries in term of cultural activities; (3) interpersonal motivators, including a desire to meet new people, get away from routine conventions of life or to make new friendships; and (4) status and prestige motivators, related to self-esteem and personal development [6].

The process of choose the indicator that would be used in the research need a certain method. Kožić used factor analysis to determine the weight of indicators in evaluating the sustainability of coastal areas. The indicators construct the dimension of social dimensions, environmental dimensions, and economic dimensions. The indicators with the highest weights indicate that these indicators have a major influence on the sustainability index of the tourism sustainability dimension [7].

After find out the most important or the most sensitive indicator, then the recommendation formulation must be focus on that indicator. One method to formulate recommendation is Product-service system (PSS). The method also can be used to measure the sustainability level of a unit business or some unit business as a single unit. Product service system consists of three dimensions: (1) Environment, (2) Socio-cultural and (3) Economic. This research guided by a check-list form and has a portfolio diagram used to select these recommendations according to its feasibility to be implemented and its importance for the industries [8].

2.2. Multidimensional Scaling (MDS)

The next stage after define the dimension and indicators is define the method to processing the data resulted from questionnaires. MDS is a multivariate analysis method which used to process an ordinal or nominal data scale. The results from MDS proved to be more stable than other multivariate analysis methods such as factor analysis and multi-attribute utility theory [9]. MDS is possible to analyze
leverage (sensitivity of reducing indicators to sustainability scores). Leverage analysis describes the sensitivity of each indicator to the value of sustainability and used to identify sensitive indicators. The greater the change in the value of Root Mean Square (RMS), the more sensitive the indicators to sustainability.

Rap-fish is a statistical technique for rapid assessment of entity status (fisheries), assessed quantitatively on a set of predetermined indicators that are grouped into evaluation or discipline fields [10]. Rap-fish (rapid appraisal for fisheries) has been developed by the Fisheries Center University of British Columbia to assess the sustainability status of fisheries. In Rap-fish, indicators are chosen to reflect sustainability in each dimension and the indicator can be corrected or replaced when new information is available. The Rap-fish method used to assess tourism is known as Rap-tourism. The Rap-tourism method uses the Multidimensional Scaling approach in coordinating its indicators. Ordination is a process of plotting object points along axes arranged according to a certain relationship or in a graph system consisting of two or more axes [3]. The ordination technique (determination of distance) in MDS is based on Euclidian Distance with dimensionless space or called ALSCAL algorithm.

3. Research Methods

This research is a study that analyzed descriptively and quantitatively. The results of calculating data processing in the form of quantitative data and will be analyzed descriptively to determine indicators that are sensitive to the sustainability level of tourist destinations. The recommendations for improvement will be analyzed for the development of tourism.

The sampling technique using purposive sampling, which means that the sample which became an assessor of tourism object was deliberately chosen according to the specified criteria. The samples from this study were stakeholders of the Kampung Pelangi Semarang tourist destination, consisting of the government (Department of Culture and Tourism, Department of City and Spatial Planning, and Department of Housing and Settlement Areas), location managers, tourist or visitors, and surrounding communities, with total respondent was 36 person.

Rap-tourism developed in Microsoft Excel software for data processing. The study was carried out through the following steps [3]:

1. Determine the scale range for each indicator using ordinal scale 1-5. This scale is arranged according to the level and the arrangement is sequential from the lowest to the highest.
2. Calculating the sustainability index value and define the category or sustainability status of the tourism object
3. Conformity Test by looking at stress values and coefficient of determination (R²).
4. Analysis of leverage factors to find out indicators which the existence has a sensitive effect on increasing or decreasing sustainability status.
5. Monte Carlo analysis at a 95% confidence interval.
6. Formulate the recommendation to improve the sustainability status

The sustainability status of a tourism destination defines use the sustainability index range value [11] shown in Table 1.

| No. | Sustainability Index | Status             |
|-----|----------------------|--------------------|
| 1   | 0.00-25.00           | Bad (unsustainable) |
| 2   | 25.01-50.00          | Less (less sustainable) |
| 3   | 50.01-75.00          | Enough (quite sustainable) |
| 4   | 75.01-100.00         | Good (very sustainable) |

Based on the results of data processing and analysis will be formulating recommendations for improvement. The recommendations based on the results of leverage analysis which shows indicators sensitive to the sustainability index. Assessment of alternative recommendations by giving a minus sign.
Table 2. shows the criteria to choose the recommendation based on the feasibility to implement (period and cost) and the significance of the program to increase sustainability [12].

| Feasibility/Ease of implementation | Duration of Implementation | Value | Meaning |
|-----------------------------------|---------------------------|-------|---------|
| Difficult                         | Short                     | -     | Bad     |
| Difficult                         | Long                      | =     | Same    |
| Easy                              | Short                     | +     | Better  |
| Easy                              | Long                      | ++    | Much Better |
| Difficult                         | Short                     | -     | Bad     |

4. Result and Discussion
The measurement of sustainability index used four dimension, each dimension consist of some elements. Table 3 shows the element of sustainability dimension and its definition. The definition become a description of the concept of the dimensions that will be measured. Each element measure by the condition of some indicators. Assessment of tourism object sustainability will be carried out using 33 relevant sustainable tourism indicators shows in Table 4. The indicators generate by a literature study from the previous study and then validate by an expert questionnaire to tourism expert and site location managers.

Table 3. Sustainability Element Definition

| No | Element                             | Definition                                                                                                                                                                                                 |
|----|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Environmental Protection            | Environmental protection covers how to deal with the risk of arising environmental damage and the management of waste from tourism activities.                                                               |
| 2  | Flora protection                    | Protecting flora and fauna is important as a form of management and preservation the diversity on existing flora and fauna, both rare and not.                                                               |
| 3  | Energy Management                   | Energy management is important as a form of monitoring and measuring energy consumption in tourism activities, to decrease waste of energy.                                                             |
| 4  | Participation and Access for Communities | Community is part of stakeholders in tourism. Aspirations and other opinions from the local community must be received and collected to be taken into consideration in tourism activities. |
| 5  | Job Opportunities and Supporting Local Businesses | To contribute to the welfare of local communities, there needs to be supported by providing employment and supporting micro, small and medium enterprises by local communities. |
| 6  | Economic Sustainability             | In maintaining tourism economic sustainability, it is necessary to monitor and collect financially related data from tourism activities and holding tourist attractions or programs that adapt to local culture. |
| 7  | Visitor Management & Public Relations | Relations with visitors and community are important in achieving sustainable tourism, and there is needed for interaction with various stakeholder                                                                 |
| 8  | Interpretation Service              | a tourist destination is a form of community or culture interpretation, so the relevant information is needed to maintain the authenticity of tourist destination characteristics |
| 9  | Destination Management Organization | The existence of an effective, coordinated management organization is one of the important foundations that also determine the sustainability of a destination.                                                      |
| 10 | Safety and Security                 | Safety and security are associated with the existence of a system to monitor, prevent, inform, report and handle issues related to safety and security.                                                       |
| 11 | Visitor satisfaction                | Visitors are an important part of tourism, so it must have clear management related to visitor satisfaction and responsiveness to all visitors' aspirations or complaints.                                           |
| 12 | Planning Arrangement                | Planning arrangements are related to the existence of guidelines, regulations, policies regarding planning that include zoning, resources, and facilities owned, to protect natural and cultural resources. |
| No | Element | Indicator | Reference |
|----|---------|-----------|-----------|
| **Environmental Dimension** | | | |
| 1 | Environmental Protection | 1. System for handling environmental risks | [1];[3];[7]; [13];[14]; [15] |
| | | 2. Environmental management and protection systems | |
| | | 3. Waste recycling program | |
| | | 4. Transportation planning and programs to improve environmentally-friendly transportation | [1]; [3];[7] |
| 2 | Flora protection | 1. Inventory of flora | [1];[13];[14] |
| | | 2. Destruction Prohibition of flora | |
| 3 | Energy Management | 1. Reporting on energy consumption | [1];[13];[15] |
| | | 2. Water quality and safety management system | [1];[13];[14] |
| **Economic Dimension** | | | |
| 1 | Participation and Access for Communities | 1. Communication to accommodate the aspirations of residents | [1];[13];[14] |
| | | 2. Communication about tourism issues | |
| 2 | Job Opportunities for Local Communities & Supporting Local Businesses | 1. Employing residents | [1];[13];[14]; [15] |
| | | 2. Involving and supporting local businesses | |
| 3 | Economic Sustainability | 1. Reporting and monitoring regularly related to expenses, income, and investments | [1];[15] |
| | | 2. The existence of attractions and tourism destination programs (related to culture) | [13];[14] |
| **Social & Culture Dimension** | | | |
| 1 | Visitor Management & Public Relations | 1. Visitor management system | [1];[13];[15] |
| | | 2. tourism and culture directions | |
| | | 3. Volume and type of traveler's trip to the destination | |
| | | 4. Relations with the local community | [14];[15] |
| 2 | Interpretation Service | 1. Accurate interpretive information | [1];[13] |
| | | 2. Information availability in various forms of media | |
| | | 3. Management system to protect natural and cultural sites | |
| **Institutional Dimension** | | | |
| 1 | Destination Management Organization | 1. Development Strategy for sustainable tourism destinations | [1];[3];[15] |
| | | 2. The involvement of the community, government, private sector, and entrepreneurs as stakeholders | |
| | | 3. The responsible organization which coordinates clearly | |
| | | 4. Tourism destination management system | |
| | | 5. Tourism promotion strategy | |
| 2 | Safety and Security | 1. Emergency handling and response systems for safety and security | [1];[7];[13]; [15] |
| | | 2. Hazardous and preventive inspection and systems | |
| | | 3. Mitigating seasonal changes policies | [1] |
| 3 | Visitor satisfaction | 1. Responsive management to visitor satisfaction | [1];[13] |
| | | 2. Level of visitor satisfaction | |
| 4 | Planning Arrangement | 1. Periodic asset inventory | [1] |
| | | 2. Destination regulations and policies which include analysis of resources, infrastructure, zoning, facilities and services provided | |
| | | 3. Accessibility that supports accommodation for tourists including persons with disabilities and special needs | [1];[14] |
4.1. Sustainability Index

4.1.1. Environmental Dimension.
Result of Rap-tourism software related to sustainability index of the environmental dimension with an index of 36.58 which categorize as less sustainable. Figure 1 is a leverage factor of the environmental dimension. Figure 1 shows the RMS value of the environmental dimension indicators. Leverage analysis is used to see sensitive indicators that influence the sustainability index value of a dimension. The greater the RMS value, the greater the role of the indicator on sensitivity to sustainability status. Leverage factors of the environmental dimension are the inventory of flora with an RMS value of 6.07 and water quality and safety management system with RMS 6.39.

![Leverage Attributes of Environmental Dimension](image)

**Figure 1.** Leverage factor of Environmental Dimension

4.1.2. Economic Dimension.
Result of Rap-tourism ordination on sustainability index of the economic dimension is 32.40 which is categorize as less sustainable. Increasing the sustainability index of a dimension can be done by managing sensitive indicators. Figure 2 shows the leverage factor of the economic dimension.

![Leverage Attributes of Economic Dimension](image)

**Figure 2.** Leverage factor of the Economic Dimension
The economic dimension has 5 indicators with each RMS value as a dimension analysis of leverage. Increasing the sustainability index of a dimension can be done by managing sensitive indicators. Leverage factors of economic dimension with the highest RMS values were the existence of attractions and tourism destination programs (related to culture) and supporting local businesses with a value of 7.19 and 7.76.

4.1.3. Social & Culture Dimension.
Result of Rap-tourism ordination software related to sustainability index on the social culture dimension is 35.15 which means less sustainable. Figure 3 is a leverage factor of the social culture dimension. It shows that the socio-cultural dimension has 7 indicators with the sensitive indicator is volume and type of traveler's trip to the destination which has the RMS value 4.43.

![Figure 3. Leverage factor of Social & Culture Dimension](image)

4.1.4. Institutional Dimension.
Result of Rap-tourism ordination software related to sustainability index in Institutional dimension is 34.65 which means less sustainable. Figure 4 is a leverage factor of the Institutional dimension.

![Figure 4. Leverage factor of Institutional Dimension](image)
Institutional dimension has 13 indicators with RMS values to see sensitive indicators on the sustainability dimension. The leveraging factor with the highest RMS is mitigating seasonal changes policies with the value of RMS is 2.71.

4.2. Multidimensional Sustainability Index

Multidimensional sustainability index of Kampung Pelangi Semarang was obtained through weighting of each dimension. The ranking method was used to determine the weight of each dimension uses. This weighting is carried out by Kampung Pelangi Semarang tourism manager. Table 5 is the result of weighting and the final value of the sustainability status of Kampung Pelangi Semarang with a final index of 35.29.

Table 5. Weighting Index

| Dimension         | Rank | Sustainability Index | Weight (Wj) | Weighting Index |
|-------------------|------|----------------------|-------------|-----------------|
| Environmental     | 1    | 36.58                | 0.4         | 14.63           |
| Economic          | 4    | 32.40                | 0.1         | 3.24            |
| Social & Culture  | 3    | 35.15                | 0.2         | 7.03            |
| Institutional     | 2    | 34.65                | 0.3         | 10.39           |
| **Sustainability Index Value** |     | **35.29**           |             |                 |

The value from Table 5 then visualized as a kite diagram. Figure 5 is a visualization of the 4-dimensional sustainability index.

Figure 5. The Kite Diagram of Kampung Pelangi Sustainability Index

Besides the index, another result of rap tourism is $R^2$ or stressed value to find out whether the indicators reviewed in the MDS analysis are quite accurate and can be scientifically accountable. Low-stress values indicate high accuracy, while high $S$ values indicate otherwise. A good model is indicated by a stress value smaller than 0.25 and for the coefficient of determination, it approaches the value of 1.0 or 100%. While for stress values and $R^2$ can be seen in Table 6.

Table 6. Stress and $R^2$ Value

| Parameter | Environmental | Economic | Social Culture | Institutional |
|-----------|---------------|----------|----------------|--------------|
| Stress    | 0.206         | 0.243    | 0.209          | 0.193        |
| $R^2$     | 0.895         | 0.875    | 0.924          | 0.899        |

Based on the results of the conformity test in Table 6, the results of stress values are less than 0.25 and $R^2$ values are close to 1 so that indicators in the dimension of sustainability have accuracy in describing their sustainability status.
The results of the Monte Carlo analysis show that the tourism sustainability index of Kampung Pelangi Semarang at the 95% confidence level does not much difference with the results of rap-tourism analysis (Multi-Dimensional Scaling = MDS). The differences in the MDS and Monte Carlo analysis sustainability index values are shown in Table 7.

Table 7. Differences in Monte Carlo & Rap-Tourism Analysis

| No | Sustainability Dimension | Sustainability Index | Differences |
|----|--------------------------|----------------------|-------------|
|    |                          | Monte Carlo | MDS |         |
| 1  | Environmental            | 37.28       | 36.58 | 0.7    |
| 2  | Economic                 | 33.35       | 32.40 | 0.95   |
| 3  | Social & Culture         | 35.83       | 35.15 | 0.68   |
| 4  | Institutional            | 35.61       | 34.65 | 0.96   |

4.3. Improvement Recommendation of Kampung Pelangi Semarang Tourism

Alternative recommendations also assessed in terms of feasibility to be applied, other than in terms of their impact on system improvement if implemented [16]. At this stage, a feasibility analysis of recommendation is used to find out whether the overall alternative recommendations have been compared with the current conditions of Kampung Pelangi Semarang, which difficult to implement or not. Table 8 is an assessment of alternative recommendations for each dimension.

Based on Table 8 the selection of recommendations for environmental dimension is prioritized on the indicators of water quality and safety management systems because their impact on sustainability is considered to be greater than changes in the inventory of flora indicator if improvements are made. The recommendation of environmental dimensions is the availability of restroom facilities and installation of PDAMs. It can have a far better effect on tourism sustainability because restroom facilities have not been provided by the destination. Installation of PDAMs is also needed to get clean water because most of Kampung Pelangi’s population still use groundwater. In the economic dimension, recommendations for paper floral skill training for the community can have a far better effect, because they can increase the income of the local community.

Table 8. Alternative Recommendation

| Dimension         | Sensitive Indicator                                      | RMS | Recommendation                                           | Value | Meaning       |
|-------------------|----------------------------------------------------------|-----|----------------------------------------------------------|-------|---------------|
| Environmental     | Water quality and safety management system                | 6.07*| Availability of restroom facilities around the main spot | ++    | Much Better   |
|                   |                                                          |     | Public socialization about clean and healthy behavior    | +     | Better        |
|                   |                                                          |     | Installation of PDAMs                                    | ++    | Much Better   |
| Economic          | The existence of attractions and tourism destination programs (related to culture) | 7.76*| Developing the potential of Jathilan traditional dance   | =     | Same          |
|                   |                                                          |     | Children’s dance creations                               | +     | Better        |
|                   | Involving and supporting local businesses                 | 7.19*| Paper floral skill training for the community             | ++    | Much Better   |
| Social & Culture  | Volume and type of traveler’s trip to the destination    | 4.43*| outbound and flying fox tour                             | =     | Same          |
|                   |                                                          |     | Water tour and games                                     | +     | Better        |
|                   |                                                          |     | Fishing festival                                          | ++    | Much Better   |
| Institutional     | Mitigating seasonal changes policies                      | 2.71*| Information facilities (poster/banner) for mitigating seasonal changes & risk of disaster threats | ++    | Much Better   |
|                   |                                                          |     | SOP for handling emergencies                              | +     | Better        |
|                   |                                                          |     | Potential disaster socialization                          | +     | Better        |
Kampung Pelangi Semarang is located behind Kalisari flower market and giving opportunities to exploit its potential in developing skills in making floral arrangements. Whereas the other recommendation such as Jathilan dance performances and children's dance creations still have several obstacles when implemented.

Selected recommendations on the socio-cultural dimension are fishing festivals that can have a far better effect. In 2017, the spreading of thousands of fish seeds was carried out by the Semarang City Government on the Kampung Pelangi River. This makes much fish that grow and develop on the river so that the festival has the potential to be held. While for recommendations for outbound & flying fox rides and water rides are still difficult to be implemented.

In the institutional dimension, recommendations which selected are Information facilities (poster/banner) for mitigating seasonal changes & risk of disaster threats. One feature of sustainable tourism is having a disaster risk management system. At present Kampung Pelangi Semarang still does not have an information facility as an effort to overcome seasonal changes or disaster risk. This recommendation is considered to have a far better effect on tourism sustainability.

5. Conclusion

Based on the discussion above, it can be concluded that sustainability status of Kampung Pelangi Semarang is categorized as less sustainable with sustainability index of 35.29. The index consists of four-dimensional value. The environmental dimension 36.58 (less sustainable), the economic dimensions 32.40 (less sustainable), socio-cultural dimensions 35.15 (less sustainable) and institutional dimensions 34.65 (less sustainable). MDS analysis also give the stress and $R^2$ values and leverage factor analysis to determine the focus on recommendation formulation. Recommendations for improvements that have been prepared for the development of Kampung Pelangi Semarang are (a) Availability of restroom facilities around the main spot of the tourist attraction; (b) installation of PDAMs in the destination area; (c) paper flower skill training; (d) organizing fishing festivals, and (e) making information facilities related to seasonal change mitigation actions & disaster risk.

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