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Ikeu Tanziha, Sri Awalia Febriana, Katharina Oginawati, Yessi Crosita Octaria, Risti Rosmiati

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Analysis of regional sustainability status of the healthy Batik Village from social, economic, and ecological perspectives

Ikeu Tanziha*

Faculty of Human Ecology,
IPB University,
16680, Bogor, West Java, Indonesia
Email: ikeu_jamilah@apps.ipb.ac.id
*Corresponding author

Sri Awalia Febriana

Faculty of Medicine,
Universitas Gadjah Mada,
55281, Sleman, Yogyakarta, Indonesia
Email: awalia_febriana@ugm.ac.id

Katharina Oginawati

Faculty of Civil and Environmental Engineering,
Institut Teknologi Bandung,
40132, Bandung, West Java, Indonesia
Email: katharina.oginawati@ftsl.itb.ac.id

Yessi Crosita Octaria

Centre for Public Health Innovation
Universitas Udayana
80361, Bandung, Bali, Indonesia
Email: yessicrosita2@gmail.com

Risti Rosmiati

Faculty of Engineering,
Universitas Negeri Medan,
20371, Deli Serdang, North Sumatera, Indonesia
Email: ristirosmiati@unimed.ac.id

Abstract: This study aimed to determine the regional sustainability of the healthy Batik Village from social, economic, and ecological perspectives. It was conducted in July 2019 in Kulon Progo, Special Region of Yogyakarta. Furthermore, the survey data were analysed using the RAPFISH ordination technique through the multidimensional scaling (MDS) method. The index and regional sustainability status of the healthy Batik Village were accessed using these methods. It also identified sensitive attributes affecting the sustainability index of social, economic, and ecological dimensions through the leverage analysis. The analysis results showed that the ecological dimension had the

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lowest index value (23.9) or in the poor category. The social and economic dimensions showed sufficient status with indices of 62.92 and 61.13, respectively. The policy implications for improving the sustainability status from 'sufficient' to 'good' need to manage the sensitive attributes of these three dimensions.

Keywords: regional sustainability; multidimensional scaling; MDS; healthy batik.

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Biographical notes: Ikeu Tanziha is a Professor in Community Nutrition from the IPB University, Indonesia. For 35 years, she has worked in the community nutrition field. She worked as a Lecturer and researcher in Department of Community Nutrition, Faculty of Human Ecology, IPB University. She has conducted many researches in collaboration with national and global institution. Currently, she is a consultant in Ministry of Women Empowerment and Child Protection. She is a steering board in Indonesian Lecturer Association, as well as. She has participated in many conferences and workshops both in community nutrition, food security and child protection.

Sri Awalia Febriana currently is a researcher and Lecturer in Department of Dermatology and Venereology, Faculty of Medicine UGM Indonesia and Assistant Vice Dean in Collaboration, Alumni and Community Empowerment UGM. After completing her PhD in University of Groningen, she continues her work and currently as a principal investigator in a collaborative research group on occupational and environmental health which developed a policy brief, a manual book, barrier cream, protection mask and a mobile wastewater treatment for batik home industry. She has participated in numerous conference and workshop in dermatology and venereology also allergy immunology.

Katharina Oginawati received her Doctoral, Master, and Bachelor on Environmental Health aspect from Environmental Engineering Department, Civil and Environmental Engineering Faculty, Institute Technology Bandung. Indonesia. She has been working as a Lecturer in Environmental Engineering. Civil and Environmental Engineering Faculty, Institute Technology Bandung, Indonesia. She has been doing research about environmental health, environmental health and safety, environmental toxicology, human risk assessment and environmental management. Currently, she is the Head of Safety Health and Toxicology Laboratory in the same institution. She is a member of Indonesian Environmental Engineering Association and International Water Association. She attended international and local seminar. She attended some international conference Setac North America, Setac Asia Pasific and Air, Water and Waste Management Organization. She published her research in international journal.

Yessi Crosita Octaria received her Medical degree in Airlangga University in 2004. Right after graduation, she worked for Aceh's Tsunami Relief Program, delivering vaccinations and medical services for disaster's victims. Henceforward, she decided to work in the field of public health. She pursued her Master's in Royal Tropical Institute, Amsterdam, The Netherlands and earned her Master's in International Health in 2008. She is currently enrolling

in the doctorate program in community nutrition at Bogor Agricultural University. She has been working closely in the field of community nutrition especially for school-based nutrition service such as the weekly iron and folic acid supplementation.

Risti Rosmiati received her SGz (Bachelor) and MSi (Master program) in Nutritional Science from IPB University, Indonesia. Being a Lecturer at Universitas Negeri Medan, besides lecturing and tutoring, she is actively involved in research especially those related to community nutrition. She attended international and local seminars. She published her research in international peer-reviewed journals.

1 Introduction

Batik has been recognised by UNESCO as a masterpiece of the oral and intangible heritage of humanity since October 2, 2009 (Prasetyo, 2010). Initially, it was a limited product for customary interest but has now shifted to be part of modern clothing products. The domestic or international demand for batik products has increased with high economic value. Therefore, many batik industry centres are developing, especially in Java. The company consists of small and medium industries (SMIs), and it needs support to become a business that is increasingly powerful, sustainable, and providing benefits to people. SMIs (including the batik industry) have an essential role as a source of employment opportunities. They are also a major driving force for economic development in rural areas, outside the agricultural sector, and also for the increase in non-oil exports (Tambunan, 2012).

The minister of industry affirmed that the Indonesian batik has a relatively high economic value and a positive contribution to the national gross domestic product (GDP). There were 48,287 business units of batik industry in 2006 that spread across 17 provinces with 792,300 workers. The production and export values reached IDR 2.90 trillion and USD 110 million. From 2006 to 2015, the export value has increased to USD 185 million. However, it has decreased until 2017 by about 53% or USD 73.8 million (Central Bureau of Statistics, 2017). The most important markets were Japan, the USA, and Europe. SMI Batik has been distributed in 101 centres, for example in Central, West and East Java as well as the Special Region of Yogyakarta. The number of workers in batik SMI centres reached 15,000 people (Ministry of Industry, 2017).

Considering the importance of the existence of the batik industry, it is also necessary to ensure the benefits and sustainability. Optimal benefits are obtained when industrial management meets the criteria of sustainable development. This development should consider economic, sociocultural, and ecological sustainability (Saragih and Sipayung, 2002). Furthermore, it is necessary to analyse the state of sustainability of Yogyakarta based on the analysis of its potential in the batik industry. The results of the state of sustainability analysis provide sensitive characteristics that need to be corrected by stakeholders. Therefore, they should be effective and efficient regional development policy references for the development of healthy Batik Village areas in Yogyakarta and other industrial areas.

Healthy Batik Village is a home-based industry area fostered by UGM in the Lendah Subdistrict, Kulon Progo. The management has not yet applied the concept of sustainable development. Measurement was conducted by the Department of Forensic and Medicolegal, and Biochemistry of the Faculty of Medicine, Public Health, as well as Nursing UGM on waste and water samples in several locations in Lendah Subdistrict. The study reported an increase above the standard threshold, i.e., 18.1–35.8 μg/dL for lead (Pb) and < 0.12 μg/dL for chromium (Cr). The heavy metal levels in blood samples of batik workers in three locations in Kulon Progo ranged from 52–82 μg/dL (Pb) and 15–33 μg/dL (Cr) (Hastuti et al., 2018). The absorption of the metals is affected by nutritional problems and may cause growth and development disorders (Kordas, 2017). Some nutritional issues related to exposure of Pb and Cr, among others, are anemia, stunting, and deficiencies of divalent micronutrient metals (Wani et al., 2015). These problems have an impact on the non-optimal benefits obtained from the development of the batik industry. Similarly, for the economic factors, issues regarding batik businesses' contribution to regional economic sustainability and food availability for the families of workers need to be examined. Also, the social factors in the form of conflicts of interest, community involvement, and empowerment need to be studied. Based on these problems, the batik industry-based regional sustainability levels should be explored. This is because it is necessary to identify the key factors that determine the sustainability of the region to put policies concerning the development of the healthy Batik Village on the right target. Therefore, this study aimed to examine the status and sustainability of the business areas in the healthy Batik Village by considering economical, ecological, and social dimensions. It should be a reference for increasing regional sustainability by managing sensitive attributes affecting the dimensions.

2 Methods

The study area was in the batik centre in Lendah Subdistrict, Kulon Progo Regency, Special Region of Yogyakarta Province. It was the healthy Batik Village fostered by UGM.

Primary quantitative and qualitative data were collected from July 2019. The primary quantitative data were stakeholders' scores of perceptions on the dimensions and attributes of sustainability at the village or regency levels. On the contrary, the primary qualitative data were the results of in-depth interviews on topics related to the sustainability attributes of the healthy Batik Village areas and the stakeholders.

A structured survey method with closed questionnaires and in-depth interviews for qualitative data was used. Furthermore, a total of 12 respondents were determined purposively to represent stakeholders at the village and regency levels as well as several points of view from different agencies. The respondents were the Head of Ngentak Renjo and Guluh Rejo Village, as well as the association of batik entrepreneurs, the health office, the environmental office, the office of community and village empowerment, population control, and family planning. Other respondents include the office of social, women's empowerment, and child protection, cooperatives and small-medium enterprises, tourism, trade, and puskesmas (public health centre).

2.1 Quantitative data analysis

The analysis method used was the leverage analysis performed using the multidimensional scaling (MDS) approach. MDS is a modified approach from the rapid assessment techniques for fisheries (RAPFISH) program developed by the Fisheries Centre, University of British Columbia (Kavanagh, 2001). It is a multivariate statistical analysis technique using the SPSS software, and it performs a transformation in each dimension and the multidimensional sustainability of women's participation in the development of fisheries business (Kavanagh, 2001). The RAPFISH ordination approach using the MDS method was performed through several stages. The first stage was the determination of attributes that included three dimensions (i.e., ecological, economic, and social dimensions). Meanwhile, the second stage was scoring the sustainability criteria for each dimension, followed by assessing the index and regional sustainability status of the healthy Batik Village. A sensitivity analysis (leverage analysis) was performed to determine the variables that affected sustainability. The third phase was to conduct a Monte Carlo analysis for the aspect of uncertainty. The MDS approach in RAPFISH gave stable results (Pitcher, 1999) compared to other analysis methods for double variables (e.g., factor analysis). All data from the attributes considered were analysed multidimensionally to determine points that reflected the position of sustainability.

The review produced 30 attributes, which consisted of ten in each dimension. The assessment attributes for the ecological dimension include business and regional-scale liquid waste management. Others include business-level and regional-level air pollution management as well as utilisation of rainwater, business-scale wastewater pollution level, regional-scale wastewater pollution level, business-scale management of toxic and hazardous waste, and efforts to protect biodiversity. The assessment attributes for the economic dimension were financial feasibility, contribution to population income, market size, business access to financial institutions. Others include workers' access to financial institutions, the amount of production and marketing cost, efforts to improve product quality, and the level of employment in the region. The assessment attributes for the social dimension were community empowerment, the workers' age range, and organisations, their health education, the frequency of conflicts with the surrounding population. Others include the frequency of conflicts nutrition issues, food problems, health insurance, and food allowance. The scores ranged from one to four. One was the worst score while four was the best score, and the sustainability index scale was between 1 and 100. The interval for the sustainability index was as follows: 0–25 (poor status), 26–50 (insufficient status), 51–75 (sufficient status), and 76–100 (good status).

2.2 Qualitative data analysis

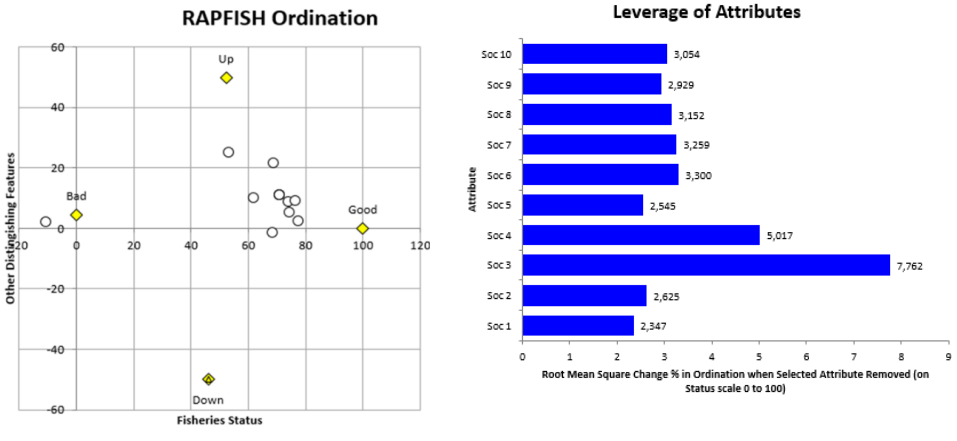
The qualitative data were analysed thematically concerning the theme of the sustainability dimensions (ecological, economic, and social dimensions) by using open coding in Microsoft Excel 2013. Furthermore, the results of in-depth interviews were mapped according to theme columns, and selected quotations were presented as representations of qualitative findings.

3 Results

3.1 Sustainability status of the social dimension

The results of MDS showed that the sustainability index value of the social dimension was 62.92 or classified as sufficient status. The leverage analysis showed three sensitive attributes affecting the sustainability index value in the social dimension. They include workers' organisations – social 3, frequency of conflicts with workers – social 4, and health education for workers – social 6 (Figure 1). Workers organisations and health education have positively affected the index. Their function is to strengthen the bargaining position of workers. Furthermore, health education increases awareness to maintain health, which affects the increase of work productivity and business sustainability. In contrast, the frequency of conflicts has negatively affected the index. Increased frequency of conflicts with workers causes a decrease in work productivity and business sustainability.

Figure 1 Results of MDS analysis on social dimension attributes (see online version for colours)

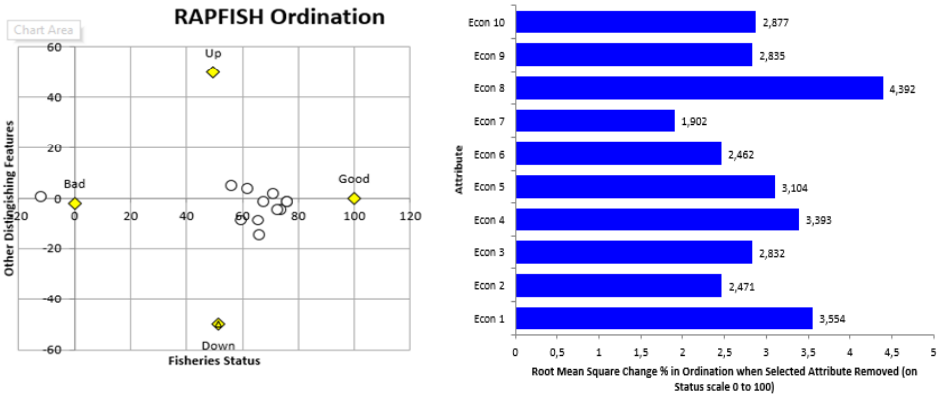


Note: MDS score (social dimension) = 62.92, R^2 = 0.972, stress = 0.15.

3.2 Sustainability status of the economic dimension

The MDS results showed that the sustainability index value of the economic dimension was 61.13 or classified as sufficient status. The leverage analysis showed sensitive attributes affecting the sustainability index value in the economic dimension. This includes the quality of batik business management – economy 8, the financial feasibility – economy 1, and the access of batik business to the financial institutions – economy 4 (Figure 2). They positively affect the index, and when they are good, the batik business's sustainability will increase. Aspects of management quality, which are sensitive, need to be considered to improve the batik business's sustainability. This can be seen from qualitative data (R6, male): "……However, the management of the batik business needs to be improved."

Figure 2 Results of MDS analysis on economic dimension attributes (see online version for colours)



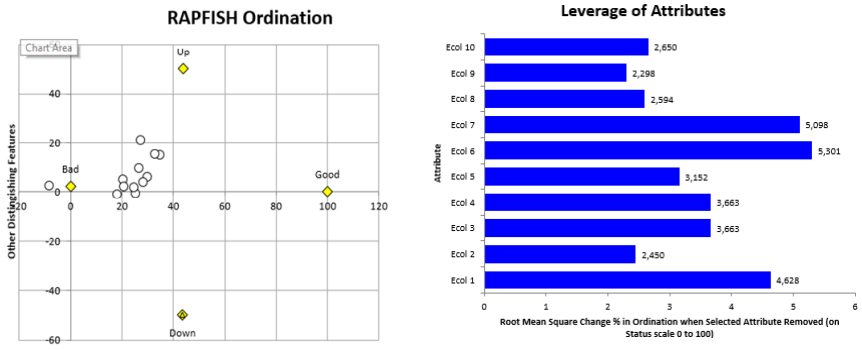
Note: MDS score (economic dimension) = 61.13, R^2 = 0.952, stress = 0.19.

3.2 Sustainability status of the ecological dimension

The results of MDS showed that the sustainability index value of the ecological dimension was 23.29 or classified as poor status. The leverage analysis showed three sensitive attributes affecting the sustainability index value in the ecological dimension. This includes business-scale wastewater pollution level – ecology 6, regional-scale wastewater pollution level – ecology 7, and the quality of business-scale liquid waste management planning – ecology 1 (Figure 3). Business-scale and regional-scale wastewater pollution levels negatively affected the index. When their level is high, environmental damage and low sustainability. When there is a conflict, the problem is amicably settled by the workers in the community. In comparison, the quality of business-scale liquid waste management planning has positively affected the index. This is because of the ability to eliminate environmental damage and pollution as well as increase sustainability.

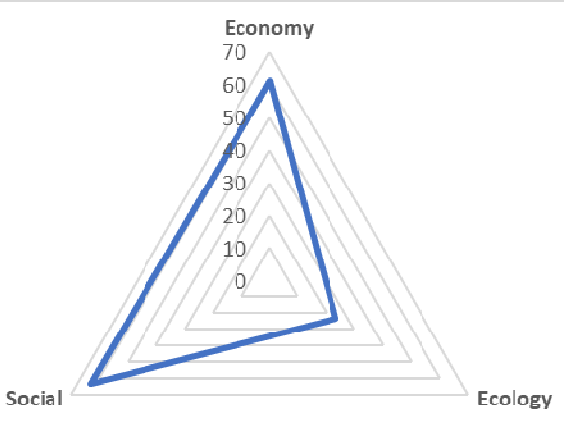
The results of MDS analysis showed that the attributes were quite accurate and are seen from the stress scores ranging from 0.15 to 0.19 (good when < 0.25). Furthermore, the value of determination (R2) obtained ranges from 0.95 to 0.97 (good when getting closer to 1). The kite diagram in Figure 4 showed that the social and economic dimensions have the highest score while insufficient' status. Meanwhile, the ecological dimension has the lowest score with 'poor' status. These results are supported by observational data at the same study location. Febriana et al. (2015) showed that the batik BOD's industrial wastewater is 160 mg/L and COD is 360 mg/L above the standard set of 60 mg/L for BOD and 150 mg/L for COD (Ministry of Environment and Forestry, 2019). Besides, Oginawa et al. (2019) showed that the air environment around the batik workers contains gases and PM2.5 particulates. These are heavy metal elements from the batik-making process with synthetic dyes, steam from the stamping process, and the furnace using firewood. The highest concentration of PM2.5 in the wax removal room was 40.03 µg/m^3, which is above the WHO threshold. In addition, hydrocarbons such as toluene, ethylbenzene were found. Xylene was also found but the concentration was below the threshold set by Labour Regulation No. 5 of 2018.

Figure 3 Results of MDS analysis on ecological dimension attributes (see online version for colours)



Note: MDS score (ecological dimension) = 23.29, R^2 = 0.961, stress 0.18.

Figure 4 Kite diagram of sustainability dimension scores (see online version for colours)



To maintain the sustainability status from 'sufficient' to 'good', there is a need to improve the sustainability of the ecological and economic dimensions of control by managing sensitive attributes.

3.3 Qualitative findings

The existence of the batik industry was very helpful in empowering citisens, especially batik workers. Concerning nutrition issues, the existence of the industry guarantees food availability for workers. However, it was reported that the intake of nutritious food was still not a consideration, as illustrated from the following quote:

> "The social empowerment for residents is quite good. There is direct empowerment since the residents work in the batik industry. Furthermore, there is also a donation from batik entrepreneurs for activities or providing skills training to residents. The food problems do not seem to exist anymore, and the workers are quite helped because they get lunch while working. The nutritional content of the food is unclear but the workers are now fat." (R3, male)

Conflicts between entrepreneurs, batik workers, and residents were also infrequent. Most of the conflicts were resolved due to the social closeness between batik workers, entrepreneurs, and the surrounding population. However, this condition may be a threat because they are reluctant in expressing their complaints as represented by the following quote:

> "The social conflict occurred a few years ago and caused a stir in the media but rarely occurs now. Bank Indonesia (BI) is used to assist in waste management but workers are usually neighbors and relatives, and thereby it is difficult when problems occur. Problems tend to be solved amicably, but the concern is that there is no openness." (R7, male)

Regarding the economic dimension, while the investment or marketing costs were not low, the industry was quite strong and financially viable compared to the benefit of the national or local market. The main emphasis was the need to improve the quality of business management and sustainability.

> "Production and marketing costs are sufficient, such as for buying fabrics, paying batik workers, including marketing (e.g., galleries in the city). However, the market is always available due to 'the stand up for Kulon Progo product purchasing' program from the regent. Therefore, the uniforms of civil servants and schoolchildren should use Geblek Renteng batik of Kulon Progo. This program has been continuously executed besides the batik production ahead of the feast day and those sold in other cities. The residents (in Kulon Progo) no longer hesitate to wear typical batik in their daily lives or at special events (e.g., as a wedding dress). However, the management of the batik activity still needs to be improved to develop and improve this activity." (R6, male)

There were differences between stakeholders in perceptions about the ecological dimension. From the perspective of batik entrepreneurs, it was reported that the waste was optimally handled especially the liquid types. Meanwhile, stakeholders from other parties have said pollution control efforts can be improved by not falling into business models that do not address environmental sustainability.

> "Efforts (waste management) have been made but still need to be improved, especially the active involvement of entrepreneurs. This is because the residents do not want Kulon Progo to be like other regencies where pollution cannot be controlled anymore (especially river pollution). There is a saying in the regency, "when the river is colorless, the regional economy decreases due to insufficient production of the batik business". Therefore, people are advised to take precautionary measures and prevent pollution before the problem occurs." (R4, male)

4 Discussion

Sustainable development can meet current needs without compromising the ability of the next generation (WCED, 1987). Development activities are declared sustainable when they are economically, environmentally, and socially favourable to the process. The three main pillars of sustainable development are the economy, ecology, and social (Schneider, 2008). However, sustainability dimensions change with differences in environmental management by humans (Daily and Huang, 2001). This study's limitations are the unavailability of data on changes in the sustainability dimensions over time.

Economically sustainability means that a development activity should be able to produce economic growth, capital maintenance, and efficient use of resources and investment. Ecologically sustainable means that the activity should be able to maintain ecosystem integrity and maintain the carrying capacity of the environment. Meanwhile, socially sustainable requires that a development activity should be able to create equitable development results, social mobility, cohesion, community participation, empowerment, social identification, and institutional development.

Efforts to develop a business based on sustainability, especially taking into account environmental factors, are also known as industrial ecological strategies. Many studies emphasise the importance of the strategy by balancing the combination of economic, ecological, and social interests. However, the efforts to prioritise the strategy move very slowly (Vermeulen, 2006). Some theorists accuse entrepreneurs of focusing on their economic interests (Ayres, 1989). This is evident in the mapping of the sustainability dimension scores of healthy Batik Villages in which the economic dimension was very unbalanced. In addition, the high scores on the social dimension also limited the sensitivity or awareness of the evolution of policies related to the environmental dimension. The difficulty of adopting development strategies with an ecological perspective is because democratic societies with weak social control find it difficult to adopt or implement changes without strong motivation (Ehrenfeld, 2000).

The implementation of industrial ecology involves a simultaneous process in which the same actor is involved. The public and the government certainly had different perspectives when viewed from the perspective of entrepreneurs. For example, the existence of batik companies helped solve the diets, nutrition, and health problems by providing lunch or indirectly by increasing their income. However, there have been disagreements about pollution and waste management, not only between entrepreneurs and other stakeholders but agencies. Various government institutions in many countries apply different environmental policies that lead to agenda competition. Ultimately, it will be up to the decision of entrepreneurs to use the most efficient and economical solution that can overcome different external pressures at the same time (Vermeulen, 2006). The acceptance of strategies may be decisions made by people or social organisations in their environment such as suppliers, governments, buyers, non-governmental organisations, and others (Dieperink et al., 2004).

5 Conclusions and policy implications

The results of the analysis showed that the index value of each dimension is different. The ecological dimension had the lowest index value (only 23.9) or belonged to the poor category. The social and economic dimensions showed sufficient status with indexes of 62.92 and 61.13, respectively. The policy implications for maintaining or improving the sustainability status from ‘sufficient’ to ‘good’ should manage the sensitive attributes affecting economic and ecological dimensions. In the economic dimension, the feasibility of batik business is maintained by improving the quality of business management and access to financial institutions. In the social dimension, efforts should be made to form organisations. They should mediate potential conflicts and improve services to workers, such as continuing the occupational health promotion efforts. Meanwhile, in the ecological dimension, it is necessary to improve the quality and implementation of the liquid waste management plan. This will help to control the business-scale and

regional-scale waste pollution. Therefore, the competition between interests should be accompanied by efforts to help business people choose a solid database. This ensures the sustainability of the three main pillars of development to guarantee a healthy Batik Village area.

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