Disaster and Tourism: How Tourism Responds to Disasters in Magelang District

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Abstract. Disasters can occur anytime and anywhere. Potential disasters can occur not least in the tourism area. This study aims to determine the potential of disasters and response to disasters in the tourism area. This study uses a spatial geography approach with the theme of spatial patterns. The research method used is qualitative descriptive and additional statistical spatial data is average nearest neighbor to support qualitative statements. The results of the study show that natural disasters dominate threats to tourism areas in Magelang Regency. Potential catastrophic disasters include tectonics, volcanic and landslides. The manager, the merchant community in the tourism area, and tourists do not know the potential for disasters in the tourism area because there is no notification in the form of information boards, signs or maps. Accessibility in tourism areas is in the form of asphalt and cement roads. The asphalt road has good quality and is quite good. The cement road has good quality. The results of spatial statistical analysis show the distribution of tourism and health centers have a random spatial pattern.

1. Introduction

Tourism is largest industry in the world (Hall & Page, 1999: 1). In addition, tourism is a series of trips within the country and abroad that have three elements, namely human, place and time (Karyono, 1997: 15). Tourism is a variety of tourism activities that are supported by various facilities and services provided by the community, entrepreneurs, government and local governments (Undang-Undang Nomor 10 Tahun 2009 Tentang Kepariwisataan). Tourism is one of the sectors and activities that are experiencing rapid growth. Tourism contributes economically to many sectors including society, entrepreneurs and government. Tourism is considered to be increasingly important in its sustainability and dynamism in daily social and economic life. Tourism involves many residents as workers and tourists. Tourism in Indonesia begins to develop towards better.
Tourism and sustainable tourism according to the United Nations World Tourism Organization (UNWTO) are, Tourism comprises the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes. Tourism consists of the activities of people who travel in places outside the ordinary environment for no more than one consecutive year for holidays, business and other purposes. People who make tourist visits look for a different place from the neighborhood. Tourists visit with a variety of purposes such as eliminating fatigue, exercise, family meetings, research and education. Visiting tourists have different styles such as traveling alone, small groups and large groups. Tourists make visits with various time zones depending on the distance of the place of residence with the tourism location and the purpose of the visit, such as a short visit, an overnight stay, and staying for a few days. Tourists who visit not far from the location of residence usually make short visits, while tourists who live far from tourism sites will stay overnight or several days. Tourists who visit with the aim of research and education generally choose to stay at a tourism location for several days.

Sustainable tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities. Sustainable tourism takes into account current and future economic, social and environmental impacts, meeting the needs of tourists, industry, the environment and surrounding communities. Tourism is a concentration of various activities both social, economic, cultural and environmental. Sustainable tourism is developed given the constraints as development that guarantees the fulfillment of the needs of the present generation without risking the ability of future generations (Djafar, 2015: 49). Tourism is influenced by several things including the public sector, completeness of basic infrastructure (energy, roads, airports, water availability, etc.) and strong promotion from the government and tourism developers (Robinson & Picard, 2006). Tourism activities interact directly with environmental conditions, so the quality of the environment needs to be maintained. Sustainable tourism is developed aiming to maintain and avoid decreasing environmental quality. Environmental quality is very important to support tourism activities. Environmental quality that is damaged will affect tourism activities. Disrupted tourism activities will have an impact on decreasing tourist visits so that the socio-economic conditions of the community also decline.

Indonesian tourism is increasingly popular with domestic and foreign communities. Tourism is the center of the gathering of people who visit the local people who trade. Tourism is the center of the gathering of people and tourists so that there is a mutually beneficial interaction. However, tourism is an industry that is vulnerable to issues, crises, disasters and even triggers disasters (Putra, 2008: 42; Dalidjo, 2015). Tourism besides presenting beautiful panoramas is also potentially affected by disasters. Disasters occur because of a combination of danger and vulnerability (Kelman, Gaillard, & Lewis, 2016: 130). Disaster is a situation in which requires help from outside (Nagai, 2012: 7). According to Undang-Undang Nomor 24 Tahun 2007 tentang penanggulangan bencana, isastar is an event or series of events that threaten and disrupt people’s lives and livelihoods caused by both natural factors and / or non-natural factors as well as human factors resulting in human casualties, environmental damage, property losses and psychological impacts. Disaster is an event or series of events that result in victims of human suffering, loss of property, damage to the environment, facilities and infrastructure and can cause disruption to the life and livelihood of the community (Sudibyakto, 2011: 1).

Disaster potential in tourism areas includes natural, non-natural and social disasters. Potential disasters can occur at any time in the tourism area. Tourists will still come to visit even though the tourism area has the potential to be affected by the disaster because tourists are motivated to know the
impact of the disaster and the efforts for post-disaster recovery (Rittichainuwat, 2008). Various tourist destinations are more or less vulnerable to certain types of natural disasters than others (Faulkner, 2001). Disaster studies in this study focused on natural disasters. Throughout history, natural disasters claimed many deaths and suffering (Noji, 2005: 29). Natural disasters that often hit Indonesia's tourist destinations are a series of events that create high levels of uncertainty and threat (Kurniasari, 2017: 178). As a result of natural disasters a tourist area was devastated (Suhartini & Arifiyanti, 2018: 42).

According to Undang-Undang Nomor 24 Tahun 2007 tentang penanggulangan bencana, natural disasters are disasters caused by events or series of events caused by nature, including earthquakes, tsunamis, volcanic eruptions, floods, droughts, hurricanes, and landslides. One of the most threatening natural disasters in Indonesia is volcanic eruption (Setyowati, Hadi, & Ashari, 2013: 139). Natural disasters are disasters that occur due to disruption of the balance of natural components without human intervention (Wesnawa & Christiawan, 2014: 14; Hermon, 2015: 1). an addition to volcanic eruptions that threaten the earthquake, because Indonesia experienced an average earthquake twice a year (Sunarjo, Gunawan, & Pribadi, 2012: 2).

Tourism as a center of mass concentration has the potential to be affected by disasters. Disasters in tourism areas such as bridges are broken, buildings collapsed due to earthquakes, landslides, fallen trees and so on. Disasters are unpredictable and unpredictable events (Wickramasinghe, 2008). The negative economic and social impacts of natural disasters are greater in local businesses in tourism areas due to decreasing tourist visits (Murphy & Bayley, 1989: 38; Aguirre & Ahearn, 2007). Disaster events in tourism areas can cause material and mental casualties. Disasters in tourism areas that are not handled properly will affect the sustainability of tourist visits. Identification of disaster potential and manager and tourist responses should be carried out in the tourism area so that appropriate disaster management can be carried out so that the disaster occurrence in the tourism area has little impact. Disaster management is the science that studies disasters and all aspects related to disaster risk (Nurjanah et al., 2013: 42).

Indonesia has a very high potential for disaster. Based on data Badan Nasional Penanggulangan Bencana (BNPB) there are 60 people who died as a result of 438 disasters in early 2018. Magelang District has multi-disaster potential such as earthquakes, landslides, volcanic eruptions, etc. Badan Penanggulangan Bencana Daerah (BPBD) stated that Magelang district had a Disaster Emergency Alert status (DEA). Emergency status is implemented from the beginning of January until the end of February 2018. Therefore, the Magelang district has the potential to be affected by disasters including the tourism area.

Disaster potential and capacity (physical and non-physical) are very important, but no less important is transportation to tourism locations. Transportation has an important role in human life (Adisasmita, 2011: 8). This role consists of transporting and moving from one place to another. Movements made by humans have different objectives such as for work, travel, education, evacuation routes and others. Transportation to tourism is important because the ease of transportation facilities and infrastructure affect the quantity of tourists. Tourism that has the potential to be affected by a disaster needs to know transportation facilities and infrastructure to go to a health service center. The road becomes the main support of transportation so identification of road conditions needs to be carried out.

The pattern of distribution of tourism objects and health services affects the accessibility of an area. The use of geographic information systems is considered more able to answer spatial problems effectively and conceptually (Prahasta 2001: 71). The spatial analysis used is average nearest
neighbor. Average nearest neighbor is one analysis that is used to explain the pattern of distribution from the points of location by using calculations that take into account, distance, number of points of location and area (Pujayanti et al., 2014). The nearest neighbor's value is known for the comparison of the average observation value with the average expectation value, to determine the distribution pattern based on the z-score value (Kurniati, Vikriyah, & Ardana, 2016). Average nearest neighbor is used to determine the distribution pattern of tourism and health service centers (health centers and hospitals). Average nearest neighbors have three criteria: clustered, random, and dispersed (Arc Gis Pro, 2018).

2. Location of study area and Data

The research location is the tourism area in Magelang Regency. The tourism areas that were sampled included Borobudur (Maju) temple complex, Asu temple complex (Undeveloped), Ketep Pass complex and the Kedung Kayang complex (in Progress).

![Figure 1. Location of study area](image)

3. Method

This study uses a spatial geography approach with the theme of spatial patterns. The research method used is qualitative descriptive and additional statistical spatial data, namely average nearest neighbor to support qualitative statements. Data collection techniques in this study use technical triangulation. Triangulation is defined as a data collection technique that is a combination of various data collection techniques and existing data sources (Sugiyono, 2017: 125). Triangulation technique uses a combination of three data collection techniques namely observation, in-depth interviews and documentation to obtain data from the same source (Figure 2) (Djamal, 2017: 93-94; Sugiyono, 2017: 125-126).
Figure 2. Triangulation Technique

This study analyzes the potential for disasters in tourism areas and tourism responses to disasters. Disaster potential is obtained from historical data and documents as well as direct observation of traces of disaster events. While the record of tourism response to disasters is obtained from in-depth interviews with tourism managers, merchant communities in tourism areas and tourists. Key person is chosen based on consideration of direct involvement in the tourism area. Samples related to tourism responses to disasters refer to Table 1.

Table 1. Parameters for rating tourist safety against disasters in tourism zones

| No | Indicator | Parameter |
|----|-----------|-----------|
| 1  | Official rules in tourism places | There are legal provisions / official rules that apply |
|    | Law enforcement | |
| 2  | Standard Operating Procedure (SOP) | SOP for all related units |
|    | Guarantee and evaluation of SOP implementation | |
| 3  | Administration | Availability of documentation / archive systems in visitor safety systems |
| 4  | Budget allocation | Availability of a budget for safety guarantees |
| 5  | Human Resources | Availability of personnel responsible for disaster prevention and assistance |
| 6  | Infrastructure, infrastructure and facilities | The existence of special care rooms or other facilities related to evacuation |
| 7  | Transparency of safety guarantees | Clarity of information and claim procedures in the event of a disaster |
| 8  | Access reaches location | The level of vulnerability to the location and ease of transportation |
| 9  | Control of disaster impacts | There is a routine inspection of all aspects of tourism support |
|    | Clear announcements and appeals | Profile of potential disasters |
| 10 | Improved safety management | Have a safety improvement work plan |
|    | Availability of corrective SOPs | Availability of recovery process |

Source: Yudistira & Susanto, 2012; Analisis, 2018.
Additional data to support qualitative statements include slope conditions, altitude, accessibility (road conditions), distance of health care centers from tourism areas, patterns of distribution of tourism areas and health care centers. Sample slope conditions, altitude, and accessibility (road conditions) are obtained by direct observation in the field. Sample distance of health service centers from tourism areas and patterns of distribution of tourism areas and health care centers using Geographic Information System (GIS) analysis. Samples related to accessibility (road conditions) refer to Table 2.

| Type of Road | Asphalt Road | A1 | A2 | A3 |
|-------------|--------------|----|----|----|
| Cement Road | B1           | B2 | B3 |    |
| Stone Road  | C1           | C2 | C3 |    |
| Soil Road   | D1           | D2 | D3 |    |
|             | Good         | Fair | Damaged | |

Source: Mei et al, 2013.

4. Results and Discussion

Borobudur Temple Complex

Borobudur temple complex includes Borobudur temple, Pawon temple and Mendut temple. The three temples form a symbolic unity which refers to the symbolic meaning based on the concept of Buddhism in the Old Mataram era of the 9th century AD (Wirasanti, Haryono, & Sutikno, 2015: 77). Borobudur temple complex is in a lowland surrounded by mountains and mountains. The Borobudur temple complex is on average 227 meters above sea level, and the average slope is 0-13%. Borobudur temple complex tends to be flat, except the area of Borobudur temple which stands on a hill so it is slightly tilted. The location of temples in Central Java is almost entirely located at the meeting point of two rivers, such as the Borobudur temple complex which has a large river, Progo and Elo (Degroot, 2009: 97).

Based on the results of interviews with employees of Borobudur Tourism Park on March 20, 2018, at 09.50 WIB stated that:

“Borobudur temple complex includes Borobudur temple, Pawon temple and Mendut temple. Borobudur temple complex in one management system namely Taman Wisata. Borobudur temple complex already has a Standard Operating Procedure (SOP) in disaster management. I and the Borobudur temple complex employees have already done simulations against catastrophic eruptions and earthquakes, but only once”

The explanation of the informant showed that the Borobudur temple complex was aware of the potential for disasters. The manager has conducted research on potential disasters at the Borobudur temple complex. Borobudur temple complex has prepared preparedness through simulation in disaster
management of eruptions and earthquakes. From the informant who said "Employees of the Borobudur temple complex have done simulations against catastrophic eruptions and earthquakes” shows that simulation is not often done. It is estimated that the earthquake accompanied the tectonic movement and partially damaged the Borobudur temple complex which was built in the 9th century. This tectonic activity is followed by the eruption of Merapi and a large eruption whose eruption product is thought to close the temples (Andreastuti, Newhall, & Dwiyanto, 2006: 202). While around the 11th century the activity of Merapi increased which resulted in larger volumes of sediment as a result of the flooding of water in the Borobudur region dried up in 470 years ago (Mulyaningsih, 2006: 111). The magnitude of the potential that threatens the Borobudur temple complex is the light of the government to make a disaster management SOP. Disaster management SOP at Borobudur temple complex consists of SOP for rescue and evacuation due to volcanic eruption disaster, SOP for rescue and evacuation due to earthquake, first aid SOP for disaster accident, SOP for temple protector installation, rapid assessment SOP, SOP for monitoring progress due to eruption disaster volcanoes, and SOPs monitoring the development of earthquake disasters (Ministry of Education and Culture Borobudur Conservation Center, 2015).

The results of interviews with tourists on March 20, 2018, at 10.23 WIB in Borobudur stated that:

“I visited the temple aiming to see its beauty, not knowing that there was a disaster in the Borobudur temple complex because there was no disaster information board. I just know that the temple is prone to collapse because it is composed of stones”

Explanation of tourists can be concluded that the manager has not provided services in the form of information about potential disasters at Borobudur temple complex. Based on observations in the field, there are no clear signs related to disaster information. Tourists travel to seek pleasure and satisfaction through beauty without thinking about the potential disasters at Borobudur temple complex. Tourists remain vigilant when visiting because the temple consists of a composition of stones so that it easily collapses.

Borobudur temple complex is visited a lot so it is profitable in terms of economy but in terms of environmental hazardous because it can cause soil and rock erosion (Soeroso, 2010). Borobudur temple complex has the potential to be affected by natural disasters. The puzzle of the collapse of Borobudur could be related to environmental factors and disasters (Baiquni, 2009: 32). Borobudur temple complex has the potential to be affected by volcanoes, such as Mount Merapi which has a four-year cycle and Mount Kelud in 2014 (Balai Konservasi Borobudur, 2015). Merapi, merbabu, Sumbing and sindoro mountain deposits are found in Borobudur temple complex so that they are vulnerable to volcanic disasters (Degroot, 2009: 61). Borobudur temple complex is susceptible to tectonic activity due to the structural conditions of the temple from the arrangement of stones. Borobudur temple complex on the south side there is a fault that causes tectonic activity so that the removal and enlargement trigger landslides (Muruwanto, Purwoarminta & Siregar, 2014). Whereas according to Philip (2009: 2) Borobudur is vulnerable to earthquakes and volcanic ash. Potential volcanic, tectonic and landslide disasters threaten the Borobudur temple complex. A series of natural disasters that hit can have an impact on the decreasing level of tourist visits to the Borobudur temple complex (Fitriana, 2014).
Asu temple complex

Asu temple complex is located in two villages namely tlatar and sengi. The Asu temple complex is located on the west and east sides of the Pabelan River, which originates from Mount Merapi. The Asu temple complex consists of three temples namely Lumbung, Pendem and Asu. Lumbung Temple is located in the hamlet of Tlatar, Tlatar Village, Sawangan Subdistrict, Magelang District. The Lumbung Temple is located west of the Pabelan River. Pendem and Asu temples are administratively located in the temple post, sengi village, sawangan sub-district, magelang district. Pendem and Asu temples are located east of the Pabelan River. The Asu temple complex is on average 664 meters above sea level, and the average slope is 0-2%. Asu temple complex tends to be flat. Asu temple complex is potentially low due to landslides, because the topography tends to be flat.

Based on interviews with managers of the Asu temple complex on January 27, 2018 at 10.10 WIB, stated that:

“The Asu temple complex has not been managed well for tourism purposes. The Asu temple complex is currently not subject to tariffs for tourists who come. Asu temple complex is provided with a guest book for tourists visiting. The Asu temple complex is guarded by two people, namely ancient officers from Central Java and local residents. Officers guard and clean the temple complex”

The manager's explanation can be concluded that the Asu temple complex has not been officially used as a tourist attraction. Tourists have not been charged tickets when entering the Asu temple complex. Tourists certainly have not obtained a guarantee of safety when a disaster occurs from the manager of the Asu temple complex.

The potential disasters in the Asu temple complex include eruption and tectonic disasters. Eruption in the form of ash and lava rain. Ash rain disrupts tourism activity because it damages plants and causes shortness of breath. Rain lava causes the river walls to erode, threatening the existence of the temple complex. The results of interviews with the guardians of the Asu temple complex, on January 27, 2018 at 10:50 a.m., stated that:

“In 2010 the impact of Merapi eruption was to erode the walls of the Lumbung temple. The erosion of the river wall can bring down the temple so that the Lumbung temple is moved to the Tlatar hamlet”

The manager’s explanation can be concluded that the threat of lava produced by Merapi eruption has the potential to be a disaster at the Asu temple complex. In addition to volcanic disasters, the potential for tectonic disasters can occur because the temple is composed of stones so that it can easily collapse. Tectonic disasters cannot be predicted when and how large they occur. At present tourists can climb up to the temple so that when a tectonic disaster occurs the temple can collapse and affect tourists. Therefore, there needs to be supervision by the manager, regarding the ability of the environment to support the temple and the condition of the temple structure.

The results of interviews with tourists of the Asu temple complex, on January 27, 2018, at 11:20 WIB stated that:

“We visit for photos. Currently the Asu temple complex is clean, not like it used to be. We just play so we don't know the potential of threatening disasters, maybe the eruption of Merapi”
Tourists have not been fully aware of the potential disasters at the Asu temple complex. Tourist answers about the potential for disasters that threaten “possible eruptions of Merapi” can be concluded that tourists are doubtful about the potential for known disasters. Tourists are already comfortable with the improvement of the arrangement and cleanliness carried out by the managers at the Asu temple complex.

The Asu temple complex is located at the confluence of two rivers which originate from Mount Merapi, namely Pabelan and Tlising (Degroot, 2009: 97). The existence of a river that originates from Merapi, the potential for eruption is very likely to occur. At the Asu temple complex is found tephra mountain deposits of Merapi (Gertisser et al., 2012: 1218). Asu temple complex was also found pyroclastic deposits resulting from the eruption of Merapi before 1822 (Murwanto, Siregar & Purwoarminta, 2013: 139). The Asu temple complex, which was built at the foot of the western Merapi Volcano, is based on geomorphological and lithofacial analysis included in the medial facies. In the past this region has experienced disasters due to lava flows, hot clouds and ash rain. Pendem temple and lumbung temple are even buried 3 to 7 meters by volcanic material (Ashari, 2013: 137).

Ketep Pass Complex

The Ketep pass complex includes ketep pass tours and strawberry gardens. The Ketep pass tour is located in the Ketep village, sawangan district, Magelang district. Strawberry garden tours are spread around Ketep pass, which is along the road from Blabak to Kopeng. The average Ketep pass complex is at an altitude of 1145 meters above sea level, and the average slope is 13-25%. The ketep pass complex tends to be rather steep. Ketep pass complex is potentially landslide with moderate hazard level (Nurhadi et al., 2015). Landslide events still often occur when heavy rains. So that the potential for landslides can occur in the Ketep pass complex.

The results of interviews with managers on June 10, 2018, at 13.30 WIB in the pass pass stated that:

“Ketep pass has been working with the village government regarding the Merapi eruption disaster, we managers are waiting for an appeal when there is an increase in Merapi eruption activity. For evacuation efforts there is no special place or building. In addition, in the event of an earthquake there are no plans for evacuation”

The explanation of the manager regarding the response in dealing with disasters in the pass pass can be concluded that it is still not well planned and maximal. Evacuation planning is still limited to the threat of volcanic disasters while tectonic disasters have not been prepared. Volcanic disasters can be predicted in advance, but tectonic disasters come so suddenly that the potential for impact is even greater. Physical and non-physical capacity needs to be improved in the tourism complex of the Ketep pass complex.

The results of interviews with tourists on August 26, 2018, at 13:23 WIB in the pass pass stated that:

“I went to Ketep Pass to see the mountain scenery, I don't know that in the Ketep pass complex there was a disaster because there was no disaster information board. In addition there are no evacuation instructions when a disaster occurs”

Explanation of tourists shows that most do not know the potential for disasters that can occur in the pass complex. Travelers regret the absence of information boards and disaster evacuation routes.
Ketep pass complex has the potential to erupt with a moderate level of danger (Nurhadi et al., 2015). Based on data from BPBD Magelang district (2018) the area of the Ketep pass complex is included on Kawasan Rawan Bencana III (KRB III). Kawasan Rawan Bencana III (KRB III) Potentially affected by pyroclastic flows, flares of incandescent rocks and toxic gases. Recommendations from the government at the time of the eruption of the eruption with the status of “alert” the community is required to evacuate immediately. From several historical disasters that have struck the region, the pass complex has to be used as a foundation in the management of tourism activities.

**Kedung Kayang Waterfall Complex**

Kedung Kayang waterfall complex includes tours of Kedung Kayang waterfall and Wonolelo Campground. Kedung Kayang Waterfall tour is located in Wonolelo village, Sawangan district, Magelang district. The Wonolelo campground is located in the Klampahan hamlet of Wonolelo village. Kedung Kayang waterfall complex is located at an altitude of 1130 meters above sea level, and the average slope is 25-55%. Kedung Kayang waterfall complex tends to be steep.

The results of interviews with managers on 1 May 2018, at 10.10 WIB in Kedung Kayang stated that:

“Kedung Kayang has not cooperated with the village government or even Organisasi Pengurangan Risiko Bencana (OPRB). Regarding the Merapi disaster, we are waiting for an appeal when an eruption activity increases. For evacuation efforts there is no special place or building. In addition, in the event of an earthquake there are no plans for evacuation. While the campground is rarely noticed. We managers have not received special training in dealing with disasters in the tourism area”

Explanation from the manager can be concluded that the Kedung Kayang complex is managed in a group, not yet managed by the village. Kedung Kayang complex is not ready to respond to the disaster. Managers are still awaiting direction from the related disaster agency even though disaster management must be fast and accurate. Tourism actors have not independently responded to disaster events.

The results of interviews with tourists on 1 May 2018, at 12:10 WIB in Kedung Kayang stated that:

“Playing to Kedung Kayang to see the waterfall. Walk from the parking lot to the location of the far waterfall. After arriving at the location, you still have to go to the river and under the waterfall, if it goes down steeply and if you ride heavily because it is too steep, for toddlers and the elderly it seems that you cannot go to the bottom of the waterfall. It is unimaginable if suddenly there is a lava flood, or landslides are all rocks, steep cliffs and narrow roads so do not know where to evacuate”

Explanations from tourists can be concluded that the readiness of managers in responding to potential disasters has not been considered. The absence of information boards and disaster evacuation routes makes it difficult for tourists to evacuate. Tourists focus on the accessibility of roads that are not yet standard, so that they cannot be passed by all ages of tourists.

Potential disasters that threaten the Kedung Kayang tourist complex are eruptions and landslides. Kedung Kayang waterfall complex is included in the medial facies of Mount Merapi with potential catastrophic disasters namely hot clouds, ash rain and lava flows (Widodo, 2017: 92). Ash
rain caused tourism activities to be closed because many trees fell and concentrated dust disturbed breathing. Lahar had caused the death of three tourists in 2012 (Kompasiana, 2012). Mount Merapi is the most active volcano that has natural resource potential and natural hazards (Ashari, 2017: 190). The chronology of the events in the Kedung Kayang complex did not occur rain, but the upper reaches of the river were heavy rain. Rainy lava suddenly hit the Kedung Kayang complex so that tourists could not save themselves.

Kedung kayang complex has the potential to be landslide with moderate and potentially erupting hazard with high hazard level (Nurhadi et al., 2015). Kedung Kayang complex is dominated by rocky cliffs with a height of 200 meters. Tebing has experienced landslides during heavy rains. Landslides do not cause casualties but close access to the waterfall so tourism activities are disrupted. Kedung Kayang complex was also found pyroclastic deposits resulting from the eruption of Merapi before 1822 (Murwanto, Siregar & Purwoarminta, 2013: 139). Disaster history of eruptions and landslides has the potential to occur again. Tourism development efforts with regard to disaster mitigation need to be done in order to avoid and reduce disaster victims in the Kedung Kayang complex.

Discussion

Conditions of tourism activities in the event of a disaster

Magelang Regency has the potential to be affected by the catastrophic eruption of Merapi (Murwanto, Siregar & Purwoarminta, 2013). The danger of volcanoes includes hot clouds, lava avalanches, flares of incandescent rocks, ash rain, lava and lava flows (Noor, 2006: 122-123). According to Pramono, (2011) the southern zone of Central Java (Magelang regency, including the southern zone of Central Java) was affected by tectonic activity. Tectonic activity in the form of earthquakes can occur by volcanic eruptions, meteorite collisions, landslides, bomb explosions, and many other causes; but generally they are caused by sudden movements of the Earth’s crust along the fault plane (Abott, 2004). Earthquakes cannot kill, but buildings can kill (Husein, 2016: 9). Volcanic and tectonic activities can trigger landslides, so that Magelang Regency has the potential to be affected by natural disasters. The best experience in developing tourism is to increase the prosperity of local communities (Stevens, 2003). However, tourism activities are closed when a disaster occurs.

The negative impact of natural disasters is divided into two, namely direct damage including damage to buildings, infrastructure, forests and agricultural land while indirect damage effects include changes in the conditions of the area caused by natural disasters (Nothiger & Elsasser, 2004). Close tourism activities have an impact on the people who trade. From the results of interviews with people trading in tourism areas, on average when a disaster occurs, tourism is closed so that people do not get income because there are no tourists. Traders depend on their family's economy in the tourism sector. Therefore, when tourism closes due to a disaster, the expectations of the merchant community are managers and the government can pay attention to the welfare conditions of traders.

There are people who have other jobs as farmers. However, agriculture is disturbed when affected by natural disasters. Tourism activities are closed due to the disaster, the community is still a little helped by the economy from the agricultural sector. The agricultural sector does not fully help when tourism activities are closed due to an eruption disaster. Eruption disasters cause tourism to close and agricultural environmental conditions are damaged. Therefore the government needs to develop tourism with disaster mitigation insight.
Road Conditions

Table 3. Road conditions in the Tourism Area

| Type of Road | Asphalt Road | Cement Road | Stone Road | Soil Road | Road Quality |
|--------------|--------------|-------------|------------|-----------|--------------|
|              | A3           | B2          | C1         | D1        | Good         |
|              |              | B3          | C2         | D2        | Fair         |
|              |              |             | C3         | D3        | Damaged      |

Source: Analysis of 2018

Tourism activities depend a lot on transportation and communication (Tambunan, 2009: 40). Hall (1999) divides four roles of transportation: one, transport from residence to get to the destination, two, transport ensures mobility in achieving goals, three, mobility in tour shows and four, travel along recreational/tourist area. Transportation is closely related to accessibility. Accessibility in tourism areas is in the form of asphalt and cement roads. The asphalt road has good quality and is quite good. The cement road has good quality. Accessibility affects the image of tourism objects (Abdulhaji & Yusuf, 2016: 146). The factors that influence the comfort and security of tourism are environmental factors, economic activity factors, and road access factors to tourism (Khalik, 2014: 29). The better accessibility will increase the attractiveness of tourists to visit. In addition to the attraction of the existence of road accessibility, it will increase security for tourists to drive. Motor vehicle accidents leading to injuries to tourists (Wilks, Watson & Faulks). Good quality asphalt road conditions should be improved towards good quality. Good road quality will provide comfort and safety for drivers. Development is still ongoing to date to support tourism activities in Magelang Regency.
Distance and pattern of tourism distribution to health care centers

Distance

**Table 4.** Distance of Tourism Areas to Health Service Centers Ketep Pass Complex & Kedung Kayang Complex

| Name                        | Ketep Pass Complex | Kedung Kayang Complex |
|-----------------------------|--------------------|-----------------------|
| Puskesmas Sawangan 1        | 5.691644           | 8.284767              |
| Puskesmas Sawangan 2        | 11.53716           | 12.81121              |
| RSU Daerah                  | 16.170144          | 18.763267             |
| RSU Aisyiah                 | 17.06785           | 19.66097              |
| RSU Padmalalita             | 18.24585           | 20.83898              |
| RSU N21 Gemilang            | 21.275099          | 25.943935             |

Source: Analysis of 2018

**Table 5.** Distance of Tourism Areas to the Health Service Center Asu Temple Complex

| Name                        | Asu Temple | Pendem Temple | Lumbung Temple |
|-----------------------------|------------|---------------|----------------|
| Puskesmas Sawangan 1        | 0.65954    | 0.818822      | 0.186594       |
| Puskesmas Sawangan 2        | 5.18598    | 5.514926      | 6.016728       |
| Puskesmas Dukun             | 3.181107   | 3.510053      | 4.011855       |
| RSU Daerah                  | 9.81896    | 10.147906     | 10.649708      |
| RSU Aisyiah                 | 10.71667   | 11.045611     | 11.547413      |
| RSU Padmalalita             | 11.89407   | 12.223614     | 12.725416      |
| RSU N21 Gemilang            | 14.92392   | 15.25286      | 15.754663      |

Source: Analysis of 2018

**Table 6.** Distance of Tourism Areas to Health Service Centers Borobudur Temple Complex

| Name                        | Mendut Temple | Pawon Temple | Borobudur Temple |
|-----------------------------|---------------|--------------|------------------|
| Puskesmas Mungkid           | 1.860244      | 1.424253     | 2.762831         |
Distance affects the time needed to go to the tourism location and from the tourism location to the health service center. Distance also affects accessibility and costs incurred. Thus, accessibility is often associated with transportation costs, and locations that are rarely visited usually have more expensive costs (Pike, 2004: 150). The closest distance to the puskesmas is the Asu temple complex while the furthest distance to the puskesmas, the Kedung Kayang complex. The closest distance to the hospital access is Borobudur temple complex while the one that has the furthest distance from the Kedung Kayang complex. Public hospitals must be able to provide health services in all fields and types of diseases (Peraturan Menteri Kesehatan Republik Indonesia Nomor 340/MENKES/PER/III/2010 tentang Klasifikasi Rumah Sakit).

Source: Analysis of 2018

The distribution pattern uses the analysis of the nearest neighbor

The results of spatial statistical analysis show that the distribution of tourism and health centers has a random spatial pattern. The average distance between locations is 1131.4282 Meters. Random spatial patterns show tourism locations with health service centers far apart. The tourism area is closer to the health center than going to the hospital. Tourism areas of several samples in Magelang Regency do not have evacuation sites, evacuation routes from multi-disaster potential and utilization of Geographic Information Systems (GIS) to support disaster management in tourism areas. Utilization of GIS that is not maximized is a natural thing because in developing countries the use is still thinking about the costs incurred and the benefits gained (Coppock, 1995: 31). Therefore tourism areas need to consider accessibility to evacuation sites and health care centers.
Tourism & Disaster

Tourism areas have the potential to be affected by disasters. Currently focusing more on the size of tourist visits by increasing tourism, but not integrating theory and application of natural hazard management and emergencies (Becken & Hugley, 2013: 84). Tourism that coexists with disasters needs to be developed. The focus of disaster planning is not on residents who live permanently but on tourism actors and tourists, because tourists and tourists are relatively unfamiliar with the surrounding environmental conditions so that they have a high risk of being affected by disasters (Murphy & Bayley, 1989). However, the participation of the population is also important in providing the latest information on guarantees of safety in tourism areas to prevent tourists from canceling their visits (Hajibaba & Dolnicar, 2017). Governments and tourism managers can meet to develop disaster management effectively in tourism areas (Jiang & Ritchie, 2017: 71). The concept of disaster management in tourism areas is based on potential disasters, tourism potential, disaster management, human resources, infrastructure and facilities. Tourism goals require knowledge in three stages of disaster management - pre-disaster prevention and planning, disaster situation management and post-disaster phases of resolution and return to normality. The public sector model of tourist destinations from the knowledge management system for the first two stages of planning prevention and disaster management - the knowledge framework for disaster management in learning objectives (Mistilis & Sheldon, 2006). Tourism samples in Magelang Regency do not yet have three stages of disaster management so that they can be said to be still unprepared when responding to disaster events.

Disaster risk management is very important to do in the Magelang Regency tourism area. Tourism destinations should show real action rather than ideals in doing management (Pike & Page, 2014: 8). Tourism risk management strategies should be linked to disaster management plans and include actions in which tourism managers and organizations can supplement work from disaster management agencies (Ghimire, 2016: 47). Disaster management should also implement education regarding behavioral rules to recognize the natural environment (Danko, Kuzmin, & Snytko, 2000: 319). There are four steps that can be taken in disaster planning in the tourism area namely assessment, warning, impact and recovery (Murphy & Bayley, 1989: 37). Increasing physical and non-physical capacity must be carried out immediately in Magelang District. Physical capacity in the form of a refuge during a disaster has not been owned by tourism samples in Magelang Regency. In fact, a refuge is an important aspect of disaster prevention and preparedness efforts (United Nations Environment Program (UNEP), 2008: 28). Further improvement in human resources, due to many events and emergencies that require people trained in disaster management (Gasnold & Dacruz, 1989). Government / tourism owners must recognize the importance of training for employees (Johnston et al., 2009: 8). Knowledge of disaster mechanisms related to injuries and illness is a prerequisite for an effective plan for treatment reactions for disaster victims (Du et al., 2009: 389). The history of catastrophic events has the potential to threaten tourism activities in Magelang regency, therefore there is a need for disaster risk management plans for tourism. Risk management plans for tourism must provide, according to and to a minimum, for: One, the safety of tourists and employees. Two, a safe system for communicating with everyone in the facility and in tourism destinations. Three, security of buildings, facilities and equipment from the effects of disasters. Four, contributing trained contact personnel to disaster management agencies during emergency response and recovery operations, as needed. Lima, provides resources to support emergency response and recovery operations, and procedures for returning to normal business activities after the cessation of disaster operations (Ghimire, 2016). In addition, according to Murphy & Bayley (1989, 38-39) tourism facilities and activities should pay attention to the assessment and warning steps because the location that attracts
tourists is relatively high risk. When affected by a disaster the media should not overestimate the news, so it does not cause misinformation. Then tourism can take recovery steps by clarifying international information and persuading tourists to come back to tourism areas affected by the disaster.

**Mitigation Efforts**

Tourism is an international trade commodity (Travis, 1985). Therefore, the government is trying to provide services to tourists well. Tourists who do not know the potential for disasters in the tourism environment are at risk for being affected. Government efforts provide a simple information board, in the form of signs posted on each road to the tourism area.

![Figure 4. Volcanic disaster information board](image)

![Figure 5. Information boards for landslides](image)

Information boards present warnings of potential disasters, but there is no notification of attempts to evacuate early. According to Dalidjo, (2015) information boards or potential disaster signs are not enough. Tourism information should be packed in detail and cover the spatial distribution of tourism objects so that they are easy to understand. Tourism information can be realized in the form of maps (Effendi & Sujali, 1989: 5-6). The vulnerability map can present an overview of the potential impact of disasters (United Nations Environment Program (UNEP), 2008: 25). In addition to physical aspects, the community should have to obtain disaster mitigation education from an early age. Disaster mitigation education from young people to parents is the task of the government (Leroy, 2006: 9). Therefore, the government is expected to be more concerned about the issue of disaster in the tourism area.

Potential disasters can occur in the tourism environment. According to Henderson (1999) tourism is an industry that is always "haunted" by crises and disasters. The potential for disasters can adversely affect tourism activities in the form of casualties, damage to tourism infrastructure, and the economy of people who trade around tourism is disrupted. Tourism development strategies are
constrained and fail due to natural disasters (Zaenuri, 2016). Disaster potential in the tourism area needs to be conveyed to tourists. The need for easy access to information about disasters in tourism areas provided by the government, tourism managers and travel agents to the general public and tourists (Rindrasih & Mujiasih, 2015). After knowing the potential for disasters, disaster management efforts in tourism areas need to be done to reduce the magnitude of the affected victims. Tourism managers need not worry about reducing traffic after tourists know the potential for disasters in the tourism area because by providing marketing implications related to how to attract tourists who want to visit a place in the middle of a disaster and how to encourage those who are not interested in visiting to be interested in visiting tourism then visit tourists remain stable (Walters, Mair, & Ritchie, 2015). Tourists come to visit places that are interesting and directly connected to dangerous events or extreme phenomena such as natural hazards and disasters (Rucinska & Lechowicz, 2014: 20). As in Bali during the eruption of Mount Agung, tourists choose to stay and perpetuate the incident because, tourists have a sense of curiosity about the disaster phenomenon rather than worry about the impact of volcanic eruptions (Bhaskara, 2017: 39).

Disasters cannot be avoided but can be reduced by the impact. Reducing the impact of disasters is done by introducing and monitoring disaster risk (Nurjanah et al., 2013). Good observations and monitoring are carried out on time so that victims can be avoided (Noor, 2006). Observation and monitoring of potential disasters and transportation will provide good information to the community. Disaster risk reduction requires spatial information such as evacuation routes, refugee gathering points, destination refugee locations, and various community service facilities that support disaster management (Setyowati, Hadi, & Ashari, 2013: 147). According to Dalidjo, 2015 disaster management efforts can be done by gathering information on potential disasters, increasing the capacity of managers and tourists, as well as physical / material readiness. Disaster potential is obtained from a history of disaster events. History of disaster events is obtained from the analysis of document history and data history (Yi, Yu, & Li, 2012: 973). The capacity of managers and tourists can be known from interviews and readiness of physical / material aspects through observation. After knowing the potential for disasters can be given direction in making efforts to reduce the impact of the disaster. After knowing the potential disasters, physical and non-physical capacities, the efforts that can be done by managers by using disaster signs in tourism areas and disaster information leaflets to be given to tourists (Marchiavelli et al., 2012). At present, disaster signs do not exist in tourism areas and roads leading to tourism areas.

5. Conclusions and Suggestions

Conclusion

The potential for threatening disasters in tourism areas in Magelang Regency is dominated by natural disasters. The history of disasters that have struck the tourism area includes tectonic, volcanic and landslide disasters. Managers, people who trade in tourism areas, and tourists do not know the potential for disasters in the tourism area. So that disasters can be affected at any time in the tourism area. Readiness in responding to disasters needs to be owned by every tourism industry, both human resources and physical resources such as environmental conditions and infrastructure. Unexpected natural disasters such as tectonic activity in the form of earthquakes can occur at any time in the tourism area. So, the potential for unpredictable natural disasters can even minimize the negative impacts caused by preparing resilient human resources and possessing wisdom, sustainable environmental conditions, and standardized infrastructure.
Accessibility conditions towards tourism have good quality. Accessibility is supported by road conditions with asphalt and cement types. The asphalt road type has good quality and is quite good while the cement road type has good quality. Good road conditions and quality make smooth accessibility even though the pattern of spatial distribution of tourism areas with health service centers has a random pattern.

**Suggestion**

The government and managers should conduct studies on the potential and management of disasters in tourism areas, so that they can be known as tourism accessible to tourists. The government and tourism managers need to carry out routine disaster management training activities so that when a disaster does not cause casualties. Managers can provide disaster information in tourism areas through information boards, signs, and leaflets attached to tourist tickets and online media based.

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