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Environmental Politics: Grassroots Innovations in Conserving Geopark Environment (Study in Gunung Sewu UNESCO Global Geopark)

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Abstract
Environmental damage is the real threat to natural resources where the economic motives (utility) are often contrary to the conservation motives (protection). However, there are some efforts to reduce the damage. One of them is called bottom-up innovation, which is also known as grassroots innovation. This study aims to identify and analyze the innovations that are emerging in society in order to preserve the environment in the geopark areas that are used as tourist objects. It is a qualitative descriptive study conducted on 3 objects; Nglanggeran Ancient Volcano Geosite, Pindul Cave Geosite, and Siung Beach Geosite. The results of this study show that grassroots innovations are not purely initiated by local communities but by some people who are members of tourism awareness groups or Pokdarwis. The innovations are carried out independently without the help of experts or the government, they are developed by a "trial and error" process, and they are temporary and sometimes only solve the current problems within their local scope. Based on the implication, grassroots innovations can be divided into two categories: direct influence or indirect influence.

Keywords:
Grassroots Innovation; Geopark; Environment

INTRODUCTION

The exploitation of natural resources tends to raise conflicts. Natural resources are treasures that can be exploited economically, but on the other hand, their exploitation has the potential to destroy the environment itself and endanger the existence of human beings. It is common that there is always friction or conflicts of interest between the exploitation of natural resources, which are often based on Using qualitative research, this article traces the modalities that led the candidates to the 2015 local government election's Using qualitative research, this article traces the modalities that led the candidate to the 2015 local government election's electoral victory, despite his economic motives (utility), and the efforts to protect them or preserve them (protection). However, apart from exploiting natural resources, conflict can also arise in the form of a struggle over natural resources. This happened due to limited natural resources on Earth.

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Environmental conflicts have a complex dimension and involve the interests of many parties, including development stakeholders (Baiquni & Rijanta, 2007). One of the most common exploitations of natural resources is in the form of tourism, where nature becomes a tourist object. The economic aspect obtained from tourists who visit are the entrance fees, parking, facilities or vehicles, foods, accommodation, and so on. In this context of tourism, Kort et. al. (2002:1) state that in reality, it is impossible to imagine that any kind of tourism activity is developed and then operated without, in some way, reducing the quantity of natural resources somewhere.

The phrase "reducing the quantity of natural resources somewhere" can be implied as environmental damage as a consequence of tourism activity. One of the natural resources that is often ulitized as a tourist object is the geopark.

Geoparks are territories with a sustainable development strategy based on the conservation of geoheritage, and its use for educational purposes and geotourism activities, together with other natural and cultural resources of the territory. Within the geopark, at least three (3) important activities must take place. They are conservation, education, and geotourism (Kevin et al., 2014). Geotourism is one of the activities carried out with the economic aspect as its main goal. As stated above, there is always a potential conflict between environmental utilization with economic motives and the environmental threats as the consequence of the exploration.

The environmental damage caused by exploitation for economic purposes involves many parties for sure. Like a business, the environment is an object that is sold. Of course, there are sellers and buyers, and those who determine the regulations regarding the sale and purchase. In this perspective, the political aspect cannot be separated because it relates to the political interest. There are many parties who have an interest in the exploitation of geoparks as tourist objects. For example, the local community has economic interests and they are supported by the government (tourism board), tourists or visitors interested in enjoying the tourism objects, while the government, through the environmental preservation board, also has an interest in preserving the geopark's environment.

As a response to the conflict, the stakeholders are forced to come up with policies to keep the balance between exploitation and conservation. These policies are generally made by the government that has authority to make any regulations. However, not all policies made by the government are effective, right on target, and, in the end, solve the problems. Therefore, the community or other parties directly linked to the utilization of natural resources raise their own policies. Policies or innovations are usually in accordance with the circumstances. These innovations are known as grassroots or bottom-up

innovations. According to Mulgan and Albury (2003), policy innovations can occur at the local, inter-organizational, or national levels. It shows that the scope of policy innovation is not only at the government level but also in all organizations or institutions. Those innovations can be in many different forms and aspects, including economic development, social welfare, and environmental protection. This paper wants to know more and analyze the innovations that have been raised from the bottom up, also known as "grassroots innovation," as an effort to preserve the environment of geosites that are used as tourist objects.

This paper will discuss how the grassroots innovations were initiated, the characteristics of the innovations, and other aspects that are related to the implementation of the innovations. In this study, Gunung Sewu UNESCO Global Geopark is chosen as the object of the research. Since the area of the geopark is very large, the researcher chose 3 geosites as the samples. They are Geosite Nglanggeran Ancient Volcano, Geosite Pindul Cave and Geosite Siung Beach.

METHODS

This research is qualitative research with a descriptive approach. According to Bogdan and Taylor (Moleong, 2010), the qualitative method is "a research procedure that obtains descriptive data in written and spoken form from the people and their behavior that is being observed." The method contains descriptions and analysis of a particular phenomenon or event. Meanwhile, Suryabrata (1998) states that descriptive qualitative research involves field research to study intensively the current situation and social unit interaction. It can be said that qualitative research is the opposite of quantitative research. It involves collecting and analyzing non-numerical data such as text, video, or audio to understand concepts, opinions, or experiences. This type of research is commonly used in the humanities and social sciences, in subjects such as anthropology, sociology, education, health sciences, history, etc. In this study, the researchers used interviews as the data collection method. The stakeholders in the 3 tourism objects were interviewed. To support the validity of the data, the researchers also observed the location. The researcher also used literature review to analyze the data.

The policy innovations that occurred will be assessed to determine whether they are classified as grassroots innovations or not. This step is done using parameters from Lakitan (2014) which assess the grassroots innovation based on the initiator, development process, main characteristics and the target user. Furthermore, grassroots policy innovations will be judged based on their impact on the environment. These innovations will be divided into 2 categories: direct and indirect influence. All these categories fall under the scope of environmental politics. This research is expected to be an input for policy

stakeholders, especially the government, in designing appropriate policies to deal with environmental problems. Environmental politics offers various options and alternatives that can be taken in dealing with natural resource management. One of them is to "cultivate and nurture" the grassroots innovations that are rising in local communities.

As mentioned above, the area of Gunung Sewu UNESCO Global Geopark covers 3 regencies; Gunungkidul (Yogyakarta Special Region), Wonogiri (Central Java) and Pacitan (East Java). The research was conducted in Gunungkidul. This regency was chosen for some reasons; (1) it has the largest area in Gunung Sewu UNESCO Global Geopark; (2) it has 13 geosites ranging from beaches, caves, and hills; (3) it has the greatest number of geopark concepts included in the regional development plan; and (4) it has the highest number of visitors or tourists compared to the other regencies. Based on the reasons, it can be said that Gunungkidul is the most developed area in the tourism sector. However, from the 13 geosites in Gunungkidul, the researchers focused on 3 geosites. They are Nglanggeran Ancient Volcano, Pindul Cave and Siung Beach.

The three locations were chosen because they are the main tourist destinations in Gunungkidul Regency. Based on the Gunungkidul Central Statistics Agency (BPS), the number of tourists who visited the objects was 777,177 (BPS, 2018). In addition, the three locations were chosen based on the consideration that those locations represent the geographic structure of the geopark in general. The Nglanggeran Ancient Volcano represents the hills and mountains. Goa Pindul represents caves and rivers. whereas Siung Beach represents the beaches and coastal area.

The data was obtained through observation and interviews. Interviews are the most important tool in qualitative research, since the data in this study is in the form of descriptive explanations. The researcher used an in-depth interview method to collect the data. An in-depth interview is one of the qualitative data collection methods that aims to collect detailed information. According to Moleong (2005), an in-depth interview is a process of collecting deep information (beyond initial and surface-level answers), is open, and often quite long since it uses an unstructured or semi-structured approach. This technique was chosen because researchers need complete and detailed information about the respondents' attitudes, views and knowledge about the research topic. In addition, based on preliminary observations, the topic of conflict in conservation and development policies of Mount Sewu UNESCO Global Geopark is quite complex and sensitive. It involves many stakeholders. However, the researchers have prepared the questions as a guide in conducting interviews (semi-structured interview). A purposive sampling technique is used to determine the informants of this study.

Nasution (1992) states that qualitative methods have a small sample or a small number of informants. They are selected based on the purpose of the study. The informants of this research are the Chairperson of Kelompok Sadar Wisata (Pokdarwis) or Tourism Awareness Group in the geosites (Nglanggeran Ancient Volcano, Pindul Cave, and Siung Beach), the village chief of the geosites (Nglanggeran, Bejiharjo, and Purwodadi villages), public figures or community leaders, and the government stakeholders.

In general, this study uses an interactive analysis model from Miles and Huberman (2007). They state some steps in analyzing research data. They are data collection, data reduction, data display, and conclusion or verification. The data obtained is then reduced to whether they are in accordance with the grassroots innovation criteria or not. After the reduction process, the data is then displayed or classified. The same or similar data will be classified as one topic. Data analysis was then done. This analysis is supported by other findings, such as the results of observations made by researchers and studies done by other scholars. In this case, the researcher conducted a literature review. In the final stage, based on the results of the discussion, conclusions are drawn as the main content of this journal paper.

FINDINGS AND DISCUSSION

According to UNESCO, a geopark is a unified area that advances the protection and use of geological heritage in a sustainable way and promotes the economic well-being of the people who live there. It is not only about geology but also archeology, ecology, and culture.

Whereas the term of UNESCO Global Geoparks refers to single, unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development. This is a new concept initiated by UNESCO in the early 2000s which was followed up in 2004 by the establishment of the Global Geopork Network (GGN). The Global Geopark Network is a network under the auspices of UNESCO which was established in 2001 with the aim of seeking and promoting the conservation of geological heritage and encouraging sustainable research and development in communities (Amelia, 2016).

Republic Indonesia Presidential Regulation No.9 of 2019 concerning the Development of Geopark, Geopark is defined as a single or combined geographical area, which has a Geological Heritage Site or Geosite and valuable landscapes called Geological Heritage (Geoheritage), Geodiversity, Biodiversity, and Cultural Diversity. They are well managed for conservation, education, and community economic development in a sustainable manner with the active involvement of the community and local government. Thus, it can be used to give an understanding of and concern for society's attitude towardsthe earth and

the surrounding environment. A Geological Heritage Site, or Geosite, is defined as an object of geological heritage in a Geopark area with certain characteristics, both individually and multi-object. It cannot be separated from the whole story of area formulation.

Based on the guidebook of UNESCO, the purpose of a UNESCO Global Geopark is to explore, develop and celebrate the links between that geological heritage and all other aspects of the area's natural, cultural and intangible heritages. To achieve the goals, a geopark has to clearly define the boundaries of the area. Within the geopark, at least 3 important activities should be supported. They are conservation, education, and geotourism (Kevin et al., 2014). The explanation below is taken from the geopark guidelines and criteria published by GGN (Global Geopark Network) UNESCO in 2007.

Size and Setting

A Geopark is a geographical area where geological heritage sites are part of a holistic concept of protection, education and sustainable development. The Geopark should take into account the whole geographical setting of the region, and should not solely include sites of geological significance. The synergy between geodiversity, biodiversity, and culture, in addition to both tangible and non-tangible heritage, is such that nongeological themes must be highlighted as an integral part of each Geopark, especially when their importance in relation to landscape and geology can be demonstrated to the visitors. For this reason, it is necessary to also include and highlight sites of ecological, archaeological, historical and cultural value within each Geopark. In many societies, natural, cultural and social history are inextricably linked and cannot be separated.

If the area of a Geopark is identical to, or partly or wholly overlaps with an area already inscribed, (for example, on the World Heritage List or registered as a Biosphere Reserve of the Man and the Biosphere Program of UNESCO), it is necessary to obtain prior clearance from the appropriate national bodies of the said initiatives in their Member State before submitting the application. Geoparks may be located on the territory of more than one country.

Management and Local Involvement

A prerequisite to any geopark proposal being approved is the establishment of an effective management system and program of implementation. The presence of impressive and internationally significant geological outcrops alone is not sufficient to be a geopark. Where appropriate, the geological and non-geological features inside the geopark area must be accessible to visitors, linked to one another, and safeguarded by a clear-cut responsible management body or partnership that has demonstrable local support. The management body or partnership should

have an effective management infrastructure, adequate qualified personnel, and sustainable financial support.

The establishment of a geopark should be based on strong community support and local involvement, developed through a "bottom-up" process. It should demonstrate strong support from local political and community leaders, including in relation to the provision of necessary financial resources. The geopark should have effective and professional management structures, deliver policy and action for sustainable regional socio-economic and cultural development across the territory where it is located. Success can only be achieved through strong local involvement. The initiative to create a geopark must therefore come from local communities/authorities with a strong commitment to developing and implementing a management plan that meets the community and economic needs of the local population whilst protecting the landscape in which they live.

Economic Development

One of the main strategic objectives of a geopark is to stimulate economic activity within the framework of sustainable development. A geopark seeking UNESCO's assistance serves to foster socio-economic development that is culturally and environmentally sustainable. This has a direct impact on the area involved by improving human living conditions and the rural and urban environment. It strengthens identification of the population with their area, and stimulates "pride of place" and cultural development, which in turn aids direct protection of geological heritage. For example, the establishment of innovative local enterprises, small businesses, cottage industries, initiation of high-quality training courses and new jobs by generating new sources of revenue (e.g. geo-tourism, geo-products) while protecting the geo-resources of the park (e.g. encouraging casting instead of the sale of fossils). This provides supplementary income for the local population and should attract private capital. "Geo-tourism" is an economic, success-oriented, and fast-moving discipline, a new tourist business sector involving strong multidisciplinary cooperation.

Education

A Geopark must provide and organize support, tools, and activities to communicate geoscientific knowledge and environmental and cultural concepts to the public (e.g. through museums, interpretive and educational centres, trails, guided tours, popular literature and maps, and modern communication media). It also allows and fosters scientific research and cooperation with universities, a wide discipline of scientists and the local populace. The success of Geopark educational activities depends not only on the content of tourism programs, competent staff and logistic

support for the visitors, but also on the personal contact with the local population, media representatives, and decision-makers.

The aspects of wide community participation and capacity building on the local level (e.g. training of visitor guides) help to develop a broad range of acceptance of the Geopark philosophy and the transfer of knowledge and information within the community. It cannot be repeated often enough that the involvement of local people is of primary importance for the successful establishment and maintenance of a geopark. Geoparks should be major educational tools at local and national levels.

Protection and Conservation

A geopark is not specifically a new category of protected area or landscape and can be quite different from what is sometimes an entirely protected and regulated National Park or Nature Park, and the branding of an area as "geopark" does not necessarily affect the legal status of the land. For legal protection for certain geosites within the geopark, however, the authorities responsible for the geopark must ensure its protection in accordance with local traditions and legislative obligations. It is the government of the country where the geopark is situated that decides on the level and measures of protection of certain sites or geological outcrops.

Global Network

The Global Geopark Network provides a platform of cooperation and exchange between experts and practitioners in geological heritage matters. Under the umbrella of UNESCO and through cooperation with the global network partners, important local, and national, geological sites gain worldwide recognition and benefit through the exchange of knowledge and expertise, experience and staff between other geoparks. This international partnership, developed by UNESCO, brings the advantage of being a member of, and profiting from, this worldwide network, as compared to a local, isolated initiative. It allows any participating geopark to benefit from the experience and knowledge of other members of the network. The network comprises all regions of the world and brings together groups that share common values, interests, or backgrounds, to develop a specific methodology and management practices.

Based on the explanation above, it can be concluded that geopark is natural wealth or inheritance that must be utilized and also protected. According to Indonesian regulations, the main use of the geopark is in the tourism sector. However, as it is stated above, the utilization has some bad impacts on the environment. Local people in the research area or 3 geosites have made some efforts to reduce the threat of environmental damage. The efforts that arise from local residents are called grassroots

innovation. The grassroots innovations made in the subjects of this study are listed below;

1. Providing alternative tourist objects to reduce the crowd of visitors, which has the potential to damage the environment.
2. Managing the waste and trash for animal feed and also establishing a specific unit for waste management under BUMDES (Badan Usaha Milik Desa), or Village-Owned Enterprises. Adding more environmental signs with unique and interesting writing The government had put the sign made from iron with formal writing such as "Keep Clean", "Do Not Littering" etc.
3. Putting objects with magical/sacred nuances such as offering utensils or incense in certain places to scare visitors/tourists from littering there
4. Conducting community service cleaning the environment on a regular or non-routine basis. Usually, they do it just a day before any event.
5. Posting information about geoparks in the residents' houses which are used as homestays.
6. Limiting the number of visitors.
7. Building tourist photo spots and other rides without destroying the rock, just placing it on top of the rock.
8. Limiting the number of local sellers in the geosite area will ensure there is no trash or waste.
9. Prohibiting the number of investors and also persuading local people not to sell their land to buyers outside their village.

In general, the grassroots innovations in the 3 geosites were not purely initiated by local communities but by the members of Kelompok Sadar Wisata (Pokdarwis) or Tourism Awareness Group. It is an organization whose members are those who work in the tourism sector, such as tour guides, food sellers, parking men, souvenir shop assistants, ticketing staff, motel owners and staff, and others. They initiated the innovations without expert assistance and without government facilitation. The organization usually holds weekly or monthly meetings. During the meeting, they share their problems or issues, and most of the innovations are raised based on suggestions from the members. These proposals or ideas were then discussed together and often improved so that they could be applied. One example is the waste management innovation carried out by Village-Owned Enterprises (Bumdes) in Geosite Pindul Cave.

At the beginning, people around the cave had a problem regarding the waste/trash that were not properly managed. Then they paid someone to pick the trash up and deliver them to the landfill. Slowly the volume of trash was getting higher than the capacity of the landfill. The garbage man complained and asked for higher payment because it took more time and cost to dump the garbage/waste to another village. On the other hand, the local people realized that there are actually some trash that can be sold such as paper, bottle, and others. During the monthly meeting, they

discussed it and finally they had an innovation to manage the trash by themselves. They established the waste management unit under the authority of BUMDES. The unit then contributed additional income to the organization and provided employment for local people.

The development process of innovation through direct experience, "trial and error" and learning from mistakes. Not all of these grassroots innovations are implemented perfectly. Not all of them stayed long. There is always a process of improvement. Some innovations were implemented shortly, then disappeared.

It shows that there is a natural selection process for grassroots policy innovation. In this case, the local community determines whether the innovations will be maintained or not. The grassroots innovations that appeared in the research locations strengthen the argument that there is a process of development of the innovations. The example is the innovation of putting mystical objects in certain places. Why do they do that? What's for? Maybe some of us will not believe it when they answer that the mystical objects were used to scare the visitors or tourists, so they would not throw the trash over there. Instead of putting up prohibition signs telling people not to litter, this innovation has proved to be more effective.

The installation of the sign in a public area is actually not a new thing because it has become a common practice, even officially financed by the government. It becomes innovation when local people write the board with their own creativity. Previously, the signs were made from iron, well painted, and permanently installed. They said "No Littering," "Use Bins Provided," and "Keep Clean." First, the local people realized that the signs did not work well. They did not see significant results. The visitors were still littering. So, they discussed the issue and took the initiative to change the signs into the more interesting ones. They made new signs or warning boards using local wood and reusable goods. Then they changed the sentences with different and unique sentences such as:

> *"Jangan buang apa-apa di sini kecuali mantan" (Don't throw away anything except your ex) or "Hanya Sampah Masyarakat yang Membuang Sampah di sini" (only scum may dispose the trash here). They found out that the amount of trash was getting less. Then, after a few months, came up with the new idea of putting mystical objects or things such as offerings for ritual, incense sticks, and others, which then gave the impression that the places were haunted. This innovation has proven effective because visitors are afraid to throw trash all over the place.*

The main characteristic of the grassroots innovation that was found at the research location is the efforts to support environmental cleanliness. It will have an impact on environmental sustainability. Bergman et al (2010) stated that grassroots innovation can be divided into 4 types based on the focus of the

innovations. They are new technologies, new products, new models of using technology, new institutions, and new practices. Based on those types, below is the explanation based on the data:

a. *New Technology*

There are some changes in the use of technology. Of course, it is adjusted to the new technology. If previously the visitors came directly to the tourism object, now they can contact the Pokdarwis directly through the cellphone number written on the website. This happened in all of the geosites: Nglanggeran, Pindul cave and Siung beach.

b. *New Product*

Innovations in creating new products were also carried out in the 3 geosites. At Geosite Nglanggeran, the booming number of visitors forced Pokdarwis to make an innovation by providing "new products." They opened new destinations for visitors. They are Nglanggeran reservoirs and fruit garden tours. In Geosite Pindul Cave, the Pokdarwis also provided new products, such as Oya river rafting and other cave tours around the cave, so that the visitors did not only enjoy Pindul Cave. At Geosite Siung Beach, local people also created new objects. They are selfi-spots or tourist rides, and there are 'new' beaches to the west of Siung Beach, such as Nglambor and Jogan beaches.

c. *New Models of Using Technology*

According to the observation done by the researcher, it only happened in Geosite Nglanggeran when the Pokdarwis had a new innovation how to enjoy the object by virtual tour model.

d. *New Institutions*

The establishment of new institutions was carried out in Geosite Pindul Cave and Geosite Nglanggeran. In Pindul Cave, they established a new institutiona. It is called Unit Pengelolaan Sampah Terpadu, or integrated waste management unit. The new institution is in charge of managing waste in the tourism industry. They also established new small institutions or groups from the big group (Pokdarwis). The new groups then were directly connected to the visitors. Among the groups, they compete positively to attract visitors and provide the best service. The waste management unit was also established in Geosite Nglanggeran.The innovations were temporary, local and narrow scope.

It is in accordance with the statement of Lakitan (2014) that the character of grassroots innovation is still oriented towards fulfilling one's own needs, not business-oriented yet. In addition, based on the definition, grassroots innovation occurs locally in a community. The scope of the innovations is not broad. However, it is possible that the innovations cannot be applied in other areas or they need certain conditions. For example, the innovation to limit the number of visitors and sellers

of tourist objects is possible in other regions, of course, in accordance with existing situations and conditions. Furthermore, while Lakitan stated that grassroots innovations were not generally business-oriented, there were business-oriented innovations in the research sites, such as the waste management unit developed by BUMDES. It was not profitable at first, but when it was managed more professionally and expanded its scope, this innovation could support the village income.

The targeted users are local communities. In this tourism context, those who become the targets are, first, the community itself and then the visitors or tourists. For example, the community was asked to obey the policy of not cutting trees and destroying existing rocks. They also had to participate and support the weekly community service, to install geopark information boards at their houses, to maintain the condition of stones by not destroying or removing them, and to manage reusable waste. Meanwhile, visitors, or tourists, are the targets of these policy innovations. They are supposed not to litter, not to scribble on rocks, not to move and destroy rocks in the geosite area, to respect local customs and culture and to follow the procedures that have been prepared.

Direct and Indirect Influence

The grassroots innovation done by local people in Gunung Sewu UNESCO Global Geopark can also be classified into 2 categories based on the impacts or influences. They are direct influences and indirect influences on the environment of the geosite. Direct influence means that the innovation touches the target audience and tries to get the thing done. Indirect influence means that the innovation only encourages the results they want, but can't control them or even push for a result. Hunter & Cushenbery (2011) stated that leaders or innovation initiators shape the behavior of their subordinates (employees) in two ways; direct processes and indirect processes. They also offered a model of the influence of leadership in the innovation process, which is divided into two; direct leadership influences and indirect leadership influences.

The innovations are categorized as Direct Influence when they have a direct impact on the geosite or the results are immediately seen, such as cleaning the environment, using bamboo for making tourist rides, establishing community waste management and so on. Meanwhile, indirect innovations are those grassroots innovations that have indirect impact or require time to know and see their impact on the geopark environment, for example, creating alternative tourism objects, limiting the number of sellers, prohibiting investors, and others. The following is a detailed table of grassroots innovations based on these categories.

Table 1. The Classification Based on the Influence

Direct Influence	Indirect Influence
1. Carrying out community service to clean the geosite routinely, which involves all tourism actors. 2. Creating tourist rides or attractions without destroying or altering the rock's composition. 3. Managing the organic waste to as animal feed. 4. Managing integrated waste through BUMDES. 5. Putting magical/sacred objects such as offering utensils, incense, etc. in certain places so that visitors are afraid to throw trash in that place. 6. Installing environmental protection boards. 7. Closing the geosite to visitors every Monday. 8. Limiting the number of visitors.	1. Providing alternative tourism for visitors In Ngglanggeran geosite, they provide alternative tourism objects so that visitors can not only climb the mountain and enjoy the scenery but also do other activities such as outbound, live-in, or homestay. 2. Building alternative tourism objects such as Embung Nglanggeran and Fruit Gardens 3. Limiting the number of sellers and tour operators in the geosite area. 4. Prohibiting the investors and persuading local people not to sell their land. 5. Posting information about geoparks in residents' houses which are used as homestays.

Source: obtained from primary data (2020)

In general, those grassroots innovations arise due to a lack of good tourism management. The geosites that have become tourist objects are well-known and popular because of technology, especially social media and the internet. They were not prepared properly as tourist objects, especially related to planning, design, and management. Hall (2000) states that the relationship between tourism and the environment is a complex one. Poor tourism planning and management may have a significant or bad impact on environmental deterioration. At this point, it shows that tourism and tourists have the ability to change or destroy natural and cultural attractions. Therefore, government intervention and private-community collaborative efforts are often required to maintain the long-term sustainability of tourism. The facts found in this study can be used as an initial indication or indicator in determining other macro policies.

One of the components of sustainable tourism is community participation. The environmental aspect is very important for tourism development. Tourism investment must be connected to environmental aspects since, in reality, it is impossible for tourism to be developed without reducing the quantity of natural resources. As it is mentioned by Kort et al. (2002), nowadays the tourism industry has to deal with the following dilemmas: on the one hand, tourists are attracted both by a clean environment and a good touristic infrastructure; on the other hand, the tourism industry is one of the main polluters in the relevant regions. According to this research, the tourism industry is in a dilemma. On the

one hand, tourists are attracted by the clean environment and good tourism infrastructure, but on the other hand, the tourism industry is one of the main polluters in several regions. Therefore, tourism managers must increase their investment in developing special services to attract tourists. Another policy that can be done is to reduce tourism activities to provide opportunities for nature and the environment to improve itself or 'recovery'.

CONCLUSION

Based on the discussion above, this study shows that grassroots innovations are not purely initiated by local communities but by some people who are members of tourism awareness groups or Pokdarwis. It means that only those who have an interest in finding solutions to the problem at hand. The solution is then called innovation. All of the grassroots innovations were carried out independently without any support or help from experts or the government. It makes sense since they were developed by a "trial and error" process, temporary and sometimes only solving the current problems and local scope. Based on the implication, grassroots innovation can be divided into two categories: direct influence or indirect influence. However, both of them have the same goals.

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