Integrated geotourism in Dieng

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ABSTRACK

Geotourism is one of the most popular concepts in the tourism sector. Geotourism is a broad concept that covers many aspects of various tourism activities, such as transportation, accommodation, destination facilities, recreation, planning, and management. Along with the growth of geotourism, there has been an explosion in the number of geotourism sites in the world. Dieng is an example of an area that has geotourism potential. Dieng has unique geology and dynamic natural scenery which has long attracted many tourists to the area. Most of Dieng's people live from agriculture and tourism. The main agricultural commodity in this area is potatoes, while the tourist objects are volcanic craters, surface manifestations, caves, and temples.

This study begins with a literature study and mapping the existing geotourism in Dieng, especially that related to existing facilities surrounding Dieng area. This summary of the results of geotourism in the geothermal prospect area will later explain the problems in the utilization and development of geothermal energy in the agricultural industry which can provide long-term improvements for development in Dieng.

BACKGROUND

Indonesia is a country with the highest potential of geothermal energy in the "Pacific Ring of Fire" which is characterized by the spread of geothermal manifestations around Sumatera, Java, Nusa Tenggara, Sulawesi, Maluku and Papua. The utilization of geothermal area could be direct-use and indirect-use. Indonesia began developing geothermal direct utilization (non-electricity) more than 10 years ago. The most common and traditional use is for balneology, heated swimming pool, and hot springs. Direct utilization is a utilization form of heat energy for various purposes such as heating swimming pools, drying agricultural, plantation products, heating fish cultivation, and utilizing heat for other purposes. These direct-use utilizations are able to keep growing and vary depending on the innovations made. In 2010 Newsome & Dowling proposed one of the most commonly used definitions of geotourism: "Geotourism is a form of natural area tourism that specifically focuses on geology and landscape.
It promotes tourism to geosites and the conservation of geodiversity and an understanding of earth sciences through appreciation and learning. This is achieved through independent visits to geological features, use of geo-trails and viewpoints, guided tours, geo-activities and patronage of geosite visitor centres."

The Government of the Republic of Indonesia had announced the implementation of Constitutions No.22 and 25 that basically regulate the regional government autonomy. Based on these two constitutions, the regional governments are now continuously doing preparation and activities as its implementation. One of the development sectors that require responsibility and ready to be handled by regional government is the development and utilization of natural resources owned or under authorization of regional government.

Wonosobo regency and the surrounding areas has various natural resources potential. One of the natural resources found abundantly in Wonosobo regency and the surrounding is geothermal energy resources. During the past 20 years, i.e. before the implementation of those two constitutions, geothermal resources in Wonosobo regency has been developed mainly for electricity generation, for example, the resource found in Dieng geothermal field. The geothermal power plant is surrounded by a local community that lives from agriculture and tourism. The main agricultural commodity in the area is potato, while tourism objects are volcano craters, thermal manifestations, caves, and temples. Geothermal energy can also be utilized directly for various purposes including in the area of agriculture industry.

GEOTHERMAL DIRECT-USE UTILIZATION

There is not much effort of direct utilization of geothermal energy in Indonesia. The most common and traditional but in a very small use of geothermal energy in Indonesia is for balneology and hot swimming pool purposes. Although other uses in other area such as in agricultural industry has wide potential, however, the work is still in infancy that is only in research and development stage.

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Direct-use is applied on different stages of scales, ranging from heating and cooling households, large industrial, and institutional building. It also can be classified into different commercial uses, for example aquaculture, resorts/ spas, and greenhouses. Geothermal direct-use utilization is very suitable for Indonesia community's needs, especially for industrial use, agriculture, bathing and spa resorts, which all require heat. Direct heat use is one of the oldest, most versatile and also the most common form of utilization of geothermal energy (Porkhial & Yousefi, 2015)

Geothermal direct-use utilization is represented in Lindal Diagram. Through this diagram, the utilizations of geothermal energy were classified based on the temperature sequence, so we could get the brief overview about the best geothermal fluid utilization according to the suitable temperature. Based on Lindal Diagram, the limit utilization of direct-use geothermal heat is 200°C

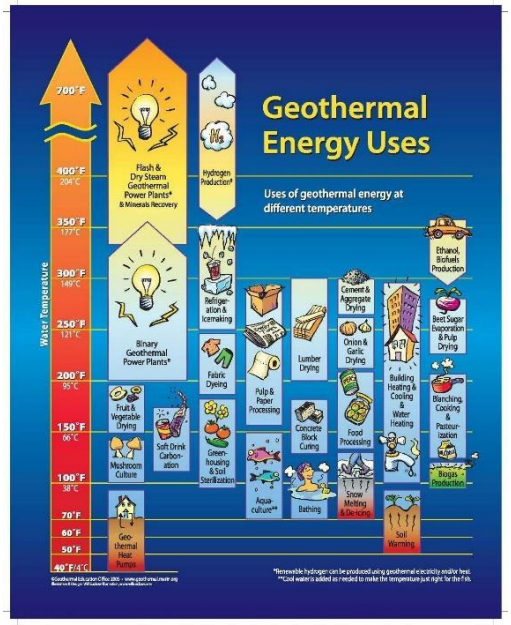

Figure 1: Diagram Lindal

1.1 Existing Direct—Use in Dieng Geothermal Area

Dieng geothermal field, located in the Dieng Plateau area in Central Java, is currently installed with a geothermal power plant with capacity of 60 MW, which has been operated since 2002. Located at around 2,000 masl, the geothermal power plant is surrounded by a local community whose lives depend on natural resources.
Dieng Plateau was formed due to a volcanic explosion. Instead of leaving ruins, such natural disaster created an amusing tourist area. These include lakes, hot springs, mountains, etc. Even there is Sikidang Crater in Dieng Kulon Village. Sikidang and Dieng Plateau are examples of direct use which will be explained in this paper

1.1.1 Sikidang Crater

Sikidang Crater is a volcanic craters area with crater hole in a low relief terrain, so that the craters could be seen directly from the crater rim. One of the advantages of visiting Sikidang Crater is the location. The crater resides in a highland with a flat landscape. That means visitors can observe and witness the crater clearly. On the other hand, regular craters are mostly located on the top of a mountain, which are difficult to reach. The next benefit is the number of craters, which are many. Not only is there the main crater, but travelers can also observe the small ones, scattered on the site.

Sikidang Crater provides the beauty of natural phenomena, one of it is alternating hot and moving mudflows that resemble deer leaps. Access to Sikidang Crater was very easy because of the availability of transportation facilities and infrastructure. Around the surrounding area, there was a fairly complete complementary infrastructure for a tourism area,

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eg: food stalls,handicraft sellers, and Dieng traditional souvenirs. But it was not as organized as it should be so it caused some of visitors to feel uncomfortable. Around the crater area the management of the tourism object has built tourism support facilities (eg: parking lots, toilets, gazebos (rest areas) and others).

The economic impact created around Sikidang Crater was creating job opportunities, residents not only earned a living as farmers, but also had side jobs as traders or entrepreneurs in the Dieng tourist attraction area. This could increase the income of local residents who were around the area of tourist attractions. Residents not only earn income from selling their agricultural produce, but also from selling in the Dieng tourist attraction area whether it's as a street vendor or handicraft food, also from the results of his business in the form of homestay or food stalls.

Figure 2: Sikidang Crater

1.1.2 Dieng Plateau Theater

Dieng Plateau Theater is a building located in the upper hills of Telaga Warna. This building was built by the Wonosobo Regency Tourism and Culture Office together with related agencies for the development of the Dieng tourist destination.

Dieng Plateau Theater is like a cinema, where tourists can enjoy watching a complete documentary about Dieng Plateau. The theme of the documentary that can be watched at the Dieng Plateau Theater is discussing the geography of Dieng, access to Dieng, and the origin of the Dieng Plateau. Visitors will also be introduced to some of the most beautiful places on the Dieng Plateau which have become popular tourist destinations.

Dieng Plateu as people know it is equipped with Audio Visual which is very adequate to play documentation with the title "Dieng Negeri Khayangan" or "God Adobe". Documentation about the arts, culture, and customs of the local people is also the main feature of the show, such as the documentation about the dreadlocks of Dieng. From the documentation, it is known that the dreadlock of Dieng is believed to be a deposit from Kyai Kolo Dete (a retainer during the Islamic Mataram period in the 14th century) and it is believed that the number of dreadlocked children correlates with the welfare of the community. The more dreadlocked children, the Dieng people believe their welfare will be better.

Figure 3: Dieng Plateu

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1.2 Other Prospect of Direct-Use in Dieng Geothermal Area

The existence of geothermal energy resources that is commonly found in mountainous and inland regions has its own benefit. In Indonesian mountainous and inland regions there are found agricultural, plantation, forestry areas in which their products require processes such as drying, preservation, heating, sterilization, pasteurization, etc. The agricultural and plantation products requiring such process are for examples: potato seeding, carica (papaya) cultivation, milk pasteurization, etc.

As an agricultural country in which its economy had used to depend on natural resources (natural resources-based country), Indonesia also relies on the foreign exchange from agricultural products particularly at the economic crises time. At the time when non-agricultural industry was undergoing stagnancy, the agriculture industry was able to survive. Hence, it has to gain support in order to be able to help assist the whole economic process.

Agriculture, plantation, and forestry commodities that need processes such as sterilization, pasteurization, and drying such as potato, "carica", tea, and milk are found in mountainous regions where several geothermal fields have been developed and utilized. In such regions, the application of sterilization and pasteurization technology using geothermal energy would be helpful to the farmers, plant growers, and agriculture entrepreneurs in the cultivation, preservation, and growing the plants and agricultural products.

With simple heat exchanging principle, the heat from geothermal fluids can be utilized for sterilization equipment of agricultural and plantation growing media.

Especially in Dieng, the main livelihood is provided by farmers, who cultivate crops such as fruits and vegetables. The Dieng plateau is no exception, the livelihoods of the people here are potato and carica fruit farmers. Carica trees are easy to find in hillside fields, people's yards, and gardens there. Most of Carica is then processed by local residents into new culinary products such as jams, juices, and sweets. therefore we can develop a more integrated carica production using direct use of geothermal energy. Moreover, it is also possible to develop existing geotourism to be more integrated or create integrated geotourism potential. Figure 4 illustrates the results of direct utilization that can be developed with good integration in Dieng.

No	Sector	Business	Purpose
1.	Industry	Processed candied carica (papaya)	Blanching, soaking, sterilization
2.	Tourism	Hotel/ Home stay	Space heating and water heating
3.	Tourism	Balneology/ Swimming pool/ Spa	Water heating

Figure 4: direct-use prospect in Dieng

Introduction of new technology in the agricultural industry process will increase people's earning, economic performance as a whole, and improve the learning capacity and curiosity of the people. The simple technique will be easily digested and enabling people to operate the plant without much learning and training process.

Therefore, the implementation of direct utilization Research will be expected to:

a. Reduce environmental problems because of the reduction of oil fuel consumption, reduction of deforestation problem due to concentrated activity in the industry

b. Alleviate economic and social problems by providing jobs and new activities of higher economic and export value (compared to traditional non-mushroom agricultural activities).

c. Improve technological awareness and competence of the people in the surrounding geothermal field. The technology is not a complicated one, making people capable to operate the industry on their own

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CHALLENGES OF DIRECT-USE IN DIENG

After research and development, there appeared problems related to the direct utilization of geothermal energy at Dieng geothermal field. Among the problems are:

1. There is no clear process for licensing and concessions from local governments and it takes a long time due to various facilities to be installed, so it may require different licensing processes from more than one office or agency at the provincial or district level.
2. Lack of support from stakeholders as geothermal companies or the government as the first commercial geothermal user to allocate funds or human resources to build not only this kind of facility, and moreover the develop continuous development programs. This mainly triggered by the large funds requirement to develop the program.
3. Suitable locations near surface thermal manifestations with sufficient space and access to construct facility complexes may be problematic. Improvement of access roads may need to be initiated earlier to support these facilities. And if the project is to be developed for various applications such as geothermal energy for the purpose of drying agricultural products, then there must be a means of transportation for the products from the harvest site to the drying plant site. This will require additional production costs. Piping of geothermal fluids available for direct use to farms and farmers' living areas can solve this problem
4. The difficulty of acquiring land belonging to local communities (privately owned). The process of negotiating land acquisition with traditional or local land owners can be complicated because the owners want high compensation because they will see that their land contains a very valuable resource.

RESULT

Indonesia is a country rich in geothermal energy. Although the use of geothermal energy for electricity purposes has developed, its utilization for non-electrical purposes (direct use) is still in its early stages. Research conducted in the Dieng geothermal field reveals lessons for future development so that it can integrate existing geotourism. For this reason, stakeholders must actively participate and be committed in the development of direct use from the surrounding community, government, and geothermal companies in Dieng.

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