

Development of Landscape Architecture through Geo-eco-tourism in Tropical Karst Area to Avoid Extractive Cement Industry for Dignified and Sustainable Environment and Life

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Abstract. Karst areas in Indonesia amounted to 154,000 km², potentially for extractive cement and wall paint industries. Exploitation of karst caused serious problems on the environment, health and social culture of the local community. Even though, karst region as a natural and cultural world heritage also have potential environmental services such as water resources, carbon sink, biodiversity, unique landscapes, natural caves, natural attractions, archaeological sites and mystic areas. Landscape architectural management of in the concept of blue revolution through the empowerment of *land* resources (soil, water, minerals) and biological resources (plant, animal, human), not only have adding value of economy aspect but also our dignified and sustainable environment and life through health, environmental, social, cultural, technological and management aspects. Geo-eco-tourism offers the efficiency of investment, increased creative innovation, increased funding, job creation, social capital development, stimulation of the socio-entrepreneurship in community. Community based geo-eco-tourism in Gunung Kidul Yogyakarta rapidly growing lately due to the local government banned the exploitation of karst. Landscape architecture at the caves, white sand beaches, cliffs in karst areas that beautiful, artistic and have special rare natural architecture form of stalactite and stalagmite, become the new phenomenal interested object of geo-eco-tourism. Many hidden nature objects that had been deserted and creepy could be visited by many local and foreign tourists. Landscape architectural management on hilltops with a wide view of the universe and fresh, sunset and sunrise, the clouds country are a rare sight for modern community. Local cultural attractions, local culinary, home stay with local communities will be an added attraction, but the infrastructure and human resources should be developed. Traveler photographs that widespread rapidly through social media and mass media became a great and effective promotion. With geo-eco-tourism, people can empowering natural resource to gain harmonization of economic, environment and social-culture aspect, without destroy it.

1. Introduction

Indonesia is located in equator and represents a series of equatorial emerald with huge potential of natural resources [1]. Over exploitation of natural resources that are deposited deep in earth by open mining causes serious degradation of living and environmental things on the earth [2]-[5]. Karst area in Indonesia covers huge natural landscape of about 154,000 km². The karst area in Java Island is 11,000 km² and it becomes the target of extractive industry such as cement factory [6]. It has vital economic, environmental, social and cultural functions because it produces calcium carbonate, natural water reservoir, climatic change mitigation, habitat of swallows, bats and other flora and fauna and



also human being. Therefore, it is necessary to rearrange green karst area by putting the emphasis on the harmonization of all of the existing aspects.

Gunung Sewu that has been officially announced as UNESCO Global Geopark in September 2015 stretches across several regencies (Gunungkidul, Wonogiri, and Pacitan) and provinces (Yogyakarta, Central Java, and East Java) [6]. The Gunung Sewu Geopark is a classic tropical karst landscape in the south central part of Java Island that is dominated by limestone, which is well-known in the world. Tectonic activity still occurs in the region because it is situated in front of an active subduction zone between the Indian Ocean, Australian and Eurasian plates. Active uplifting has been taking place for 1.8 million years and results in the emergence of river terraces at Sadeng dry-valley and also coastal terraces along the southern coast of the Global Geopark [6], [7]. Approximately 805,000 people inhabit the area., with the economy of the local people is driven by agriculture and service sectors [6]. In addition to its aesthetic and recreational values, the area is also rich of biodiversity, archeology, history and culture.

It is necessary to develop the Gunung Sewu Geopark in the effort of venerating earth legacy for the purpose of the prosperity of the local people. Geopark represents a geographic area in which geological legacy sites are parts of the concept of conservation, education and sustainable development that puts three elements in harmony, which are geodiversity, biodiversity and cultural diversity [7]-[9]. The synergy among the natural diversity should be managed in an integrated and sustainable manner by empowering local people in a sustainable development that gives economic, environmental, social and cultural added values [9].

2. Materials and methods

The study uses descriptive method and qualitative approach with naturalistic paradigm. Data are collected using in-depth interviews, observation and documentation. The objective of the triangulation data collection technique is to examine the validity of the data using other objects in comparing the results of the interviews about the object of the study. The data are analyzed inductively and qualitatively and the results of the study put more emphases on meaning than on generalization. The concept of integrated bio-cycles system is implemented through holistic and sustainable landscape ecological management in the development of the geopark that is based on education for sustainable development. Other paragraphs are indented (BodytextIndented style).

3. Results and discussions

3.1. New paradigm in karst management

The massive transformation necessary to do in the management of karst is to change extractive economy that causes environmental degradation into productive conservation activity that improves the prosperity of the local people in a holistic and comprehensive development. The karst area should be managed in harmonious, holistic, integrated and sustainable manner for qualified (i) biomass production, (ii) living environment, (iii) biological habitat, (iv) infrastructure, (v) mineral resources, and (vi) aesthetics and culture [3], [5]. Each of the elements of the landscape should not compete for its own sectoral interest, but they should be in mutual and harmonious supporting relation. The output and the outcome of the system are given more emphasis than the output of each constitutive elements [1], [2], [3], [5].

The management program of the karst area should be implemented on the basis of three main pillars of personality, community and institutional empowerment. It is expected that empathy, care, multidisciplinary cooperation, personality, the contribution of local/national competitiveness and learning community/society. The empowerment program should also be implemented in co-creation, co-finance, and in sustainable and flexible ABCG (academician, business, community, government) network [4]. The empowerment program of 6M (men, money, material, machine, method, and management) should be implemented in a synergetic and optimal manner that all of the existing stakeholders have the ability, the willingness, the chance and the authority to really contribute and to gain optimal merit [5].

Gunung Sewu geopark has been successful in improving the prosperity of the local people, though it is still necessary to make further effort to gain maximal results. The lack of the cooperation among the stakeholders and the lack of the regional zoning are the main obstacles in the development of the area. It is necessary to make a zoning of the geopark into three zones, including main zone, supporting zone, and service delivery zone [9], [10]. The main zone (Blue) is managed by putting the emphasis on the development of the core tourist attraction of geo-tourist objects of flora and fauna. The supporting zone (Green) is managed by putting the emphasis on the construction and the maintenance of supporting facilities that prevent the tourists from doing any harm to the nature and its beauty and set the threshold of the supporting capability of the environment. The service delivery zone (Yellow) consists of the areas with the facilities necessary for the tourists, which are developed by considering the requirements of the geo-tourism.

It is necessary to formulate different strategies in developing the geopark area that are specific for each area considering that there are many emerging tourist destinations. People participation-based development strategy for the geo-tourism area should include economic, social, customary and cultural, environmental and political aspects. The managers of the geo-tourism may organize themselves in association that enabled them to improve their managerial capability and their capability in delivering tourist services in addition to the development of the integrated facility in the geopark area.

Gunung Sewu contributes only about IDR 800 millions to the local original income in the area of tourism in 2011. However, a year after the official announcement of UNESCO Global Geopark (UGG) its contribution increases to IDR 22.5 billions [8]. The Gunung Sewu Geopark is undergoing the tourism development phase that involves local people and even the managers of some geo-tourism objects that have been at overcapacity level begins to explore other areas with huge potential of the geo-tourism objects in the hope that they could be as successful as the prior locations [7], [8]. Therefore, it is necessary to accelerate the consolidation phase to open access for external investors while keeping the strong roots of the local potentials that must be managed in an integrated and sustainable manner. According to United Nation [10], the development of the sustainable natural tourism should follow the following principles: (a) the participation of a community, (b) community goals, (c) stakeholder involvement, (d) lokal ownership, (e) establishing lokal business linkages, (f) cooperation, (g) sustainability of the resource base, (h) carrying capacity, (i) monitoring and evaluating, (j) accountability, (k) training, and (l) positioning. The contribution of the UUG in the sustainable development goals (SDG's) includes some goals, which are goal 1 (poverty alleviation), 4 (education), 5 (gender quality), 8 (sustainable economic growth), 11 (sustainable cities), 12 (sustainable consumption and production), 13 (climate change), 17 (global partnership) for sustainable development.

The development of the cultural landscape represents the reflection of the relationship of human being and its culture and natural environment in a wide and integrated time and spatial unity. The natural environment may include mountain, mountains, forest, dessert, and rivers, while the culture may include the outcomes of reason, emotion, and intention and human works such as traditions, beliefs, the way of life, and so on. The results of the engineering of physical landscape by human being include among others settlements, roads, houses, rice fields and non-irrigated land that are formed on the basis of geomorphologic condition and its ecological values. The Gunung Sewu Geopark in Indonesia has many outstanding cultural landscape heritages with strong historical values, heirloom resources, typical geographical conditions, natural system and biogeophysical transformation process that continuously occurs.

Considering the unique principles and locality, Indonesian tourism should be based on the national philosophy of life, which is the concept of harmonious and balanced life, meaning that there must be a good balance relationship between human and God and also between human and its natural environment. The concept teaches us to uphold the noble religious values and to actualize the values, to respect humanity values, tolerance, equality, togetherness, brotherhood, and the importance of maintaining natural environment. It also stimulates the awareness of the balance between material and spiritual needs, the balance between the use of the resources and the conservation of them in order to prevent greedy behavior.

3.2. *Integrated bio-cycles system*

Integrated bio-cycle system (IBS) manages the resources of land (including land, water, air, temperature, etc.), biological resources (flora, fauna, human and other living things) and environmental resources (the relationship among living things, etc.) in an optimal manner [3], 4, [5]. The program pays special attention to the increase in economic value, environmental conservation, social justice and culture in a synergetic and optimal manner that the regional unity can produce food, fodder, shelter, fertilizer, water, herbal medicine, tourism and so on. The IBS program in the karst area will be very useful in improving the quality of the environment and the life through the development of living environment and livelihood for the households of the local people. It is expected that the program would continuously increase the income of the people. The continuously increasing income will in turn cause the improvement of the prosperity of the people and finally the poverty would decrease. It will help people lead independent life and manage local natural resources in a wise manner. The IBS enables the local people to earn daily, monthly, and annual and decade incomes in short, medium and long terms. It is useful for those with small, medium and big capitals and very prospective in continuously establishing sustainable economy, environment, and social and culture that subsequently serve as leverage and locomotive of the prosperity of the local people [4], [5].

It is necessary for the managers of the natural resources to manage the natural resources in an integrated and sustainable manner with 9R principles (reuse, reduce, recycle, refill, replace, repair, replant, and reward) to make optimal use of the natural resources for all of the living things and our living environment. The integration of the upper stream and the lower stream of the land should be established from input, process, output and outcome with 9A (agro-production, -technology, -business, -industry, -infrastructure, -marketing, -management, -structure and infrastructure, and -tourism) [3], [5].

The agro-production intends to produce multiple products in an entity of land and the products represent the real “golds” that has been being ignored and given less value, including “brown gold” (timbers), “yellow gold” (grains rich of carbohydrate necessary for human life), and “black gold” (organic fertilizer, compost, etc.) in addition to “blue gold” (biomass and biogas energies), “green gold” (green vegetables, fodder, environment, temperature, and humidity), “white gold” (milk, fish, food), “red gold” (animal protein of cattle meat, pork, chicken, ducks, etc.), “transparent gold” (water for life and oxygen) and “colorful gold” of herbal medicine that plays very important role in maintaining human health and dignity human life [5].

3.3. *Geo-eco-tourism*

Caves in the karst area that have been long being considered as desolate and spooky places actually have special architecture of stalactites and stalagmites that are rare, beautiful, artistic and phenomenal and formed naturally by drops of water and calc solution. All of the caves may be managed as very interesting natural geo-eco-tourism objects that are very attractive for both domestic and international tourists. White sand beach and limestone ravines represent beautiful and virgin natural architecture with huge attraction for the tourists [5].

Tops of high rising hills with huge, beautiful and fresh natural sceneries are very rare for modern people who begin to be bored with modernity. New spectacular and interesting icons with wooden viewing places, tree bridges, tree houses or other artistic and typical constructions such as wooden canoes, bamboo rafts with artistic ornamentation of butterflies, birds or wild animals and gigantic sculpture as background for selfie photography will provide the tourists with beautiful and rare place to take memorable pictures [5]. Even when the situation is foggy and cloudy the tops of the hills still provide the tourist with amazingly beautiful sceneries that give them a sensation of flying somewhere over the cloud. Beautiful sunrise and sunset sceneries become the most wanted ones with premium beauty of natural phenomena that provides the tourists with the most beautiful moment to take photographs. The selfie photographs of the tourists that are rapidly distributed in social media and become viral are special attraction for people to visit the emerging natural tourist objects. The selfie photographs in the geo-eco-tourism become a must in the present life style and even people feel very strong eagerness to experience the nature and take their own selfie photographs and they consider the

experience as the proof that they have conquered nature and no need to cause any harm to the nature and no need to unearth something from it.

The dramatic increase in the number of the tourists of the karst area for weekend in Gunung Kidul give the local people many blessings that has positive impact on the economy of the people [5]. However, it seems that the infrastructure and the human resources have not been ready to meet the increasing demand of the tourist for the tourist objects. There has not been any sufficient network of wide and smoothly paved roads to the tourist objects and traffic jams still represent serious problem in addition to parting areas and good lodging houses with good facilities such as clean and decent bathrooms. Additionally, the local people seems to react to the increasingly demand for the tourist object in a wrong manner by drastically increasing the renting rate of the basic facilities for the tourists. The more demand for the tourist objects, the higher they set the renting rate and the price of the items necessary for the tourist during their visits. Consequently, many tourists get disappointed because of the crowded situation during certain visiting season despite of those with strong eagerness to experience it themselves [5].

Even, seriously damaged ex-limestone mining area may be managed for the geo-eco-tourism by establishing certain buildings with artistic carvings, such as breccia ravine in Yogyakarta and Garuda Wisnu Kencana (GWK) in Bali that become natural tourist attraction. The geo-eco-tourism provides human with the change to enjoy the nature and no need to cause any harm to the nature. The attraction of local cultural events, local culinary, home stay in the family of the local people plays an important role in the implementation of the concept of the geo-eco-tourism.

It is expected that the integrated land management based on the local people and environment would be able to establish a harmonious relationship among economic value, environment and social aspects. Blue Earth revolution, a revolution in the paradigm of karst area management, may be national and international reference in improving the quality of the environment and the prosperity of the local people that they may lead dignity and sustainable life [5].

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