

SOCIAL CONSTRUCTION OF KARST AREAS BY FARMER HOUSEHOLDS IN INDONESIA

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Abstract

Karst areas have an important role in ecology. Therefore, protection efforts are needed so the karst area can still play a role in life. This study aims to determine the social construction of farmer households in the surrounding karst areas. The study was conducted in three villages in Tuban Regency with a qualitative approach. The social construction of farmer households towards karst areas can be mapped into three typologies, namely (1) Typology 1: karst areas as marginal land; (2) Typology 2: karst areas which have economic potential in mining; and (3) Typology 3: karst areas which have an important role in ecology. Each social construction typology has an impact in constructing a livelihood strategy that farmer households take. Conservation efforts should pay attention aspects of sustainability of the farmer households livelihood in surrounding the karst areas.

Keywords: Social Construction, Karst, Farmer Household

INTRODUCTION

Karst areas in Indonesia cover an area of 15.4 million hectares and are evenly distributed throughout Indonesia. The Karst area has an essential role in ecology. One of role is an absorber of rainwater, storing and changing it as a spring. Millions of cubic meters of rainwater each year are well absorbed by karst areas. As much as 15% of the world's land area is karst, which can meet 25% of the clean water needs of the world's population. In addition to water resources, karst areas also have a variety of resources that have great potential to be developed, such as land resources, biological resources, and potential landforms both above the surface and below the surface (Ford, 1988; Ford & William, 2007; Brinkmann & Jo, 2011).

Another vital role is to absorb carbon dioxide (CO₂) and store it in carbon reserves (C). An exciting finding presented by Liu and Zhao (2000) is that the world's karst region, within one year, could absorb as much as 0.41 billion tons of carbon. However, in the process of forming, karst released as much as 0.3 billion tons of carbon, so the role of carbon sequestration in the world karst area is 0.11 billion tons.

The karst area in East Java stretches across the northern coastal area, covering Tuban, Bojonegoro, Lamongan, and Gresik to Madura Island. The northern coastal area of Java is known as the karst area of the North Kendeng Mountains. In the Tuban Regency itself, the exploitation of the karst area has become massive since the 1990s, with the establishment of the Gresik Cement plant expansion. Until 2016, PT. Semen Indonesia (formerly Semen Gresik)

has a *mining* area in Tuban Regency covering an area of 1,650 hectares, consisting of 1,250 hectares for limestone and 400 hectares for clay.

Mining activities are a factor that causes vulnerability in the form of ecological changes and changes of agrarian structures in rural areas. Widodo's research (2011); Betcherman and Marschke (2013), Forster *et al.* (2014); Liu and Liu (2016); Tian *et al.* (2016), showed that changes in ecology and agrarian structure are the driving factors for households to play with the formulation of the use of assets or capital that they are good at. Changes in the livelihood base are a common symptom, primarily the phenomenon of migration being one of the leading forms of strategy in areas near the development of industrialisation. The pattern of adaptation strategies is almost similar, namely reactive adaptation. It means that adaptation patterns are only carried out after a process of change and vulnerability occurs. However, there is the expectation of using the study's results as policy input for authority holders to arrange a livelihood strategy to anticipate future ecological changes. Based on the reviews above, this study aims to determine the social construction of karst areas by farmer households.

METHODOLOGY

This research uses a qualitative approach with a case study method. According to Babbie (2012), qualitative research methods are well suited for exploratory analysis that seeks to understand certain phenomena better. Referring to Yin (2009), the case studies in this study are included in the *single case method*. If based on the typology of case studies of Stake (2005); Lune and Berg (2017), this research is included as an instrumental case study.

The research was carried out in Tuban Regency, taking into account that in this area, the karst area has been exploited along with the establishment of cement factories. Tuban has 123 thousand hectares of karst landscape in the form of Limestone Mountains. Until now, the zona of *mining areas* owned by the cement plant in Tuban has reached 3,500 hectares. This research was conducted in three different ecological settings, namely: Case (1) Karst areas where there is still no mining activity; (2) Karst areas where mining activities are ongoing; and (3) Karst areas whose mining activities have been ended.

Table 1: Research Location

Ecological Settings	Research Location	
	District	Village
Karst areas where there is no mining activity	Semanding	Bektiharjo
Karst areas where mining activities are ongoing	Merakurak	Tuwiri Kulon
Karst areas where mining activities have been ended	Palang	Leran Wetan

The informants in this study include (1) government officials; (2) limestone mining entrepreneurs; (3) environmental activists; (4) limestone mine workers; (4) the head/village apparatus of the research site; (5) community leaders of each village where the study is located; and (6) households around the karst area.

Data collection was carried out using *in-depth interviews* and observations. This research uses qualitative analysis methods, systematically and accurately describing the facts, properties and relationships between the phenomena faced (Neuman, 2014; Babbie, 2012).

RESULTS AND DISCUSSION

Social construction is the process of creating knowledge as well as social reality through the process of interaction that occurs within a social group. Such knowledge and social reality arise from human perception. Social reality is the result of human creation through the power of social construction of the social world around it (Berger & Luckmann, 1991).

Berger and Luckmann (1991) stated that there is a dialectic between the individual and society. On the one hand, it is the individual who creates culture and vice versa, and it is the society that makes the individual. This dialectic has three processes: externalisation, objectification, and internalisation. Externalisation is an attempt at the outpouring or self-expression of man into the world, both in mental and physical activities. This process is a form of self-expression to strengthen the individual's existence in society. *Objectification* is a result from human externalisation activities in the form of objective reality. This reality will probably face the producer as a state outside and different from the human being who produces it. In contrast, internalisation is the re-absorption of the objective world into consciousness, so that the structure of the social world influences the subjective individual.

Experts have used a variety of concepts to be able to describe the social construction of reality. Images representing social buildings include perspectives, thinking styles, paradigms, mental maps, frames, filters, habitus, schemes, and models. These diverse concepts can be put together because each has something in common that discusses the vital role of social expectation in shaping patterns of thought and perception (Friedman, 2013). The perception of the actors involved is one of the essential methods in conducting an institutional analysis of a problem. The actions and behaviours of each actor are strongly influenced by social constructs or perceptions of each actor him/herself.

Karst; Marginal Agriculture

The karst hills in Tuban are primarily on dry land. This moorland is cultivated as agricultural land by relying on rainwater as a source of irrigation. As rainfed land, it can be planted only once or twice a year. The commodities cultivated are maize and peanut.

Agriculture in Leran Wetan is divided into two types of land: paddy fields and moorland. Moorland dominates with an area of 227.15 hectares, while paddy fields have an area of 121 hectares. Paddy fields are very productive throughout the year, so they can be harvested three times with the rice-rice-maize/peanut planting pattern.

Irrigation of rice fields use a water source from a well with a diesel pump engine. In each stretch of rice fields, dug wells are made. Some also use drilled wells. In each of these wells, a pump house was built on it. This pump house is used as a place for diesel pump engines to protect them from heat and rain. The building of the pump house is simple, just a wooden or

bamboo frame with a roof of tiles, open without walls. The pump machine is installed under the pump house and left alone daily. This is contrasted with the 1990s when pumping machines were still a luxury. At that time, the pump machine was always brought back home daily. Pump engines at that time were small in size and not diesel engines, but 2-stroke or 4-stroke motor engines were fueled by gasoline. Given its small size, it is easy if you have to take it home every day. Of course, in addition to the reason for the safety from theft, considering the still rare existence of this water pump.

The ease of obtaining water allows this rice field to be adequately cultivated throughout the year. A drought period only can threaten the farming process. The depth of the well in Leran Wetan has range from 2-4 meters, so its manufacture is easy and inexpensive, especially the soil condition that is not rocky.

The condition of agricultural land in Bektiharjo is also almost the same as in Leran Wetan. The agricultural land in Bektiharjo is mostly moorland, with 867.30 hectares, while the rice field area is only 51.20 hectares. The dominance of moorland in Bektiharjo is due to its area of limestone hills.

Unlike the rice fields in Leran Wetan, the rice fields in Bektiharjo rely on irrigation from rivers and irrigation canals. This is because, in Bektiharjo, a water source is used for drinking water needs and agricultural irrigation. Rice fields in Bektiharjo can produce all year round, with the primary commodities are rice and maize. As for moor, irrigation relies on rainfed, with the main commodity is peanut.

Similar conditions also occur in Tuwiri Kulon. Most of the land is limestone hills, so it is only cultivated during the rainy season, with the main commodity is maize. Meanwhile, rice fields can produce all year round with irrigation derived from irrigation and drilled wells.

Arid and barren soil conditions make it impossible to plant agricultural commodities, especially during the dry season. The lack of productive agricultural land around the limestone hills becomes a reality or fact that, from year to year, is experienced, observed, and felt by the community. Their decades of farming experience became an internalisation process. In the end, the community formed a social construction of the karst area as an economically unprofitable area.

The commodities cultivated in the moor of the karst area are maize and peanut, both grown in monocultures and polycultures with 1-2 plantings during the year. The dependence on rainwater as a source of irrigation in the moor is very high. The harvest's success largely depends on the pattern and precipitation.

The first planting is conducted at the beginning of the rainy season. Usually, farmers choose maize either planted in a monoculture or intercropped with peanut. Meanwhile, in the second growing season, farmers grow peanut in monocultures.

Table 2: Planting patterns and productivity of agricultural products

Village	Cropping pattern	Productivity (t/ha)	
		maize -- peanut maize + peanut – peanut	maize peanut
Bektiharjo	maize -- peanut maize + peanut – peanut	maize peanut	4.95 2.00
	maize -- peanut	maize peanut	6.58 2.46

Although economically considered unprofitable, they still run the farming business. The karst area is assumed as a gift from God with all its limitations. As a gift from God, it must still be thanked and managed, especially as agricultural land. For farmers and farmworkers in all three villages, farming has become part of their identity, culture and *way of life*. Hamyana (2017) stated a cultural-base motive that encourages a person to farm, in addition to *the structural-base* motive. Cultural-based motives are a vocation of the soul and moral responsibility, so farming is not only a matter of profit and loss (*structural base*) alone.

The two motives intertwined are the agricultural system and economic development. In the past, when agriculture was still subsistence, farming is more a *cultural-based* to meet household needs. The moral responsibility of the head of the family is to meet his household's food needs. As the shift from subsistence to commercial agriculture has emerged, a *structural-based* motive speaks about profit and loss. Surviving in the agricultural sector *structurally based* can be seen from the absence of other alternative livelihood strategies. It is very different from the present day, where various alternative livelihood strategies are existing outside the agricultural sector. The lack of alternative livelihood strategies other than farming is supported by the moral demands of supporting the family, make the surviving in the agricultural sector, even if it is considered unprofitable.

Karst areas for farmers are a social reality that each individual then interprets. This meaning will be closely related to the experiences they have had so far. As a farmer with a very long farming experience, it will undoubtedly have consequences for the farmer's perspective on the surrounding nature. This process takes place continuously and is even passed on to the next generations. Nevertheless, at the moment, there is a decrease in the interest of the younger generation in agriculture. Several factors cause this phenomenon, including (1) the assumption that the agricultural sector is less prestigious; (2) the agricultural sector is a high-risk business; (3) lack of income security; (4) narrow land tenure so that it is less efficient; (5) the succession of farm business management between parents and children is low; (6) there is still no special incentives for young farmers; and (7) the changing way of youth view agriculture (Susilowati, 2016; Arvianti *et al.*, 2019; Maihani *et al.*, 2021).

The phenomenon of *aging farmers* also occurred at the study site. Today, the the existing agricultural land is heritage from their parents or ancestors. The succession or transfer of farm business management from parent to child is also low. Parents do not expect their children to work in the agricultural sector. For them, agriculture cannot provide guarantees of well-being and the future. Therefore, it is enough for the parents to try to farm while their children will try

or work in other sectors. One of the parents motivations in sending their children to school is not cultivating like their parents. One of the indicators of success in school is not working as a farmer. These factors cause the succession of farm business management to be low and reduce the symptoms of farmers aging.

On the side of the younger generation itself, there is also an ingrained assumption that agriculture is a sector that is less promising and not prestigious. Early on, it was instilled that agriculture is more unprofitable for the future. Parents' admonitions and advice always contain the value that children must go to school to a high level, so that future economic conditions are not like their parents'. This internalisation process from an early age has been carried out in the family sphere. As we get older, the internalisation process is getting faster by seeing, observing, and even feeling the lack of farm results in meeting the needs of life.

This symptom is very contradictory. Parents and previous generations viewed farming as part of the culture and *way of life* but did not pass on this view to their children. This meaning shift of agriculture also affects the meaning of karst areas and the forms of livelihood strategies carried out.

Karst; Mining Potential

The content of lime (*dolomite*) in karst areas is the potential of high economic value. Not surprisingly, limestone mining activities have rapidly grown in Tuban, including in all three case villages. This mining is carried out by individuals and companies, both legal and illegal. Individually run mines are usually only intended to produce limestone as a building material. Unlike mines managed by large companies, they will usually be sold to meet industrial needs.

The second typology in the meaning of karst areas is to interpret it as an area that can produce economic benefits from the protection of mining materials. Actors who have this meaning include mining entrepreneurs, mining workers, and some government officials. According to these actors, karst is an area that will generate economic benefits if managed as a mining area. Aulia *et al.* (2019) found similar symptoms in the karst area in Puger, Jember. People consider mining activities in the karst area become a single source of their income, because there is no alternative income that can be obtained.

This social construction is formed from their experience, knowledge, and insights. Some actors, such as mining entrepreneurs and government officials have a relatively high level of education. This higher education level caused them to gain access to industrial development and their need for mining materials. Market information and technology led to the formation of social constructions where karst areas have great economic potential.

Mining entrepreneurs have an experience in doing business, so the provision of this experience that results in the meaning of the karst area must be distinct from the business aspect. Moreover, some mining entrepreneurs come from families of businessmen or traders. The values they internalise and socialise with since childhood will undoubtedly differ from those with a family background as farmers. Outsios and Outsios & Kittler (2018) found a relationship between habitus in the family environment and the development of an entrepreneurial or business spirit.

Karst; Important Regions in Ecology

In addition to the two social constructs related to karst meaning that has been reviewed before, there is one more typology of importance. Karst is an area that has an essential role in ecology, especially in hydrology. As reviewed in the introduction, the results of many studies have been carried out that reveal the role of karst areas. At the community level, some understand and ultimately form a social construction related to the ecological role of karst areas.

This three-layer typology is evenly distributed across all layers of actors, with both actors occupying the upper layer and the lower layer. Of course, the causative factor of the internalisation process distinguishes between the layers of such actors. In the upper layers, the internalisation process occurs through the educational process. The high educational background causes the actors to be able to internalise the values related to environmental conservation. Najmi *et al.* (2020) stated that the increasing level of education influences public awareness of the importance of managing resources appropriately.

This third typology is embodied in the form of various actions accordance with the status and role performed by each actor. In the lower layers, this meaning is manifested in rejecting mining activities. This form of rejection certainly varies, either openly or overtly or behind closed doors.

In the lower layers, consciousness is formed due to the presence of experiences that are felt directly by the actors. The natural symptoms that have emerged over the past few years have led to awareness regarding the improper management of karst areas. The flash floods that have hit several villages in the karst region in the last fifteen years have become a new reality, and mining is then interpreted as the cause of karst damage. Similarly, drought and the decrease in the discharge of water sources have also triggered community changes in solving karst areas.

In addition to closed rejection, there is also open rejection. This refusal was carried out by rejecting mining activities around their village. The form is through demonstrations to stop mining activities, especially the opening of new and expanding mining areas.

Currently, efforts are also underway to reproduce the meaning related to the role of karst in ecology, especially in the hydrological cycle. This reproduction effort is in the form of conveying information to the younger generation through learning in schools. Hayati and Dewi (2020) found a relationship between people's perceptions and formal and informal education levels. The relationship between perception and informal education level is most substantial with moderate categories. To improve the perception of the functioning of karst, it is necessary to socialise on the importance of maintaining the existence of karst for the community. The fulfilment of household economic needs drives destructive behaviour, so the concept of empowerment to realise sustainable living for households around the region Acharya *et al.*, 2019; Screwdriver *et al.*, 2021; Birendra, 2021; Meyer & Börner, 2022).

CONCLUSIONS AND RECOMMENDATIONS

The karst area can be viewed as a social reality that the surrounding community interprets through social construction. Referring to Berger and Luckmann, the process of social construction is a dialectic of internalisation, externalisation, and objectification. Three typologies of meaning can be mapped, namely (1) Typology 1: karst areas as marginal land; (2) Typology 2: karst areas have economic potential, namely mining; and (3) Typology 3: karst areas have an important role in ecology. This research recommends to look for efforts to improve the welfare of farmer households around the karst area through empowerment efforts, so that they can realise sustainable living. This improvement in livelihoods will impact the conservation efforts of karst areas.

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