

# SAGEA KARST HALMAHERA ISLANDS: THE MAGNIFICENT BOKIMORURU CAVE AND ITS THREAT

**H**almahera Island has many natural wonders – volcanoes, small islands, and a rainforest ecosystem with endemic biodiversity. One of these wonders is the Sagea Karst Ecosystem which stretches over 5,174 hectares to the east of Weda Bay, Central Halmahera Regency, Eastern Indonesia. This ecosystem has unique features that have not yet been revealed.

## KARST

The hills to the north of Sagea Village were formed from limestone during the Paleocene - Eocene period, around 65 to 38 million years ago. This hill is exposed almost 1000 meters above sea level with a tropical climate, so the karstification process is developing well. This is characterized by the development of karst landscape morphology on the surface (exo karst) and below the surface (endo karst).

In the hills of the Sagea Karst Ecosystem, many sinkholes (water drainage holes - or it called collapse dolines) are found. These sinkholes are visible to the naked eye from satellite imagery and have a fairly large diameter of around 100-350 meters. Its location in the middle of the forest makes it difficult to access these holes. Until now, not many have studied its depth and revealed the secret that lies at the bottom of the sinkhole.

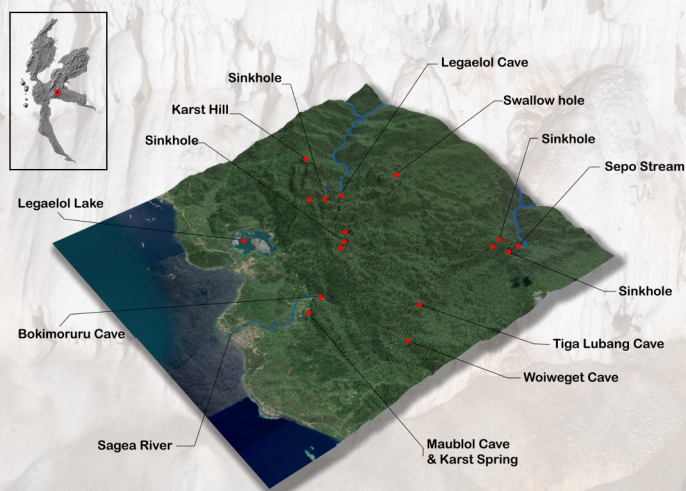


Figure 1. Distribution of the Sagea Karst Landform morphology, Halmahera Islands



Figure 2. Legaelol cave entrance in Sagea Karst, Halmahera Islands (©Akiko Oka, 2019)

The Sagea karst has the potential to store enormous water resources. There are at least several allogenic rivers in the north - which stream southward and enter the cave system in the Sagea karst, and have a very wide water catchment area.

## GIANT CAVES

Sagea Karst has caves with long passages and large, spacious chambers, and it also has a network of underground rivers. The organisms in this cave have not been explored much or revealed scientifically, so it has the potential to have a high level of endemism.

Batu Lubang Bokimoruru Cave is one of the underground river cave systems found in the Sagea karst ecosystem. Explorations carried out by APS France between 1986 and 1990 succeeded in mapping the Bokimoruru cave which is 8,685 meters long. Until now, it is recognized as the longest cave system on Halmahera Island.



## THE LARGEST UNDERGROUND RIVER IN INDONESIA?

The Sagea River is part of the underground river system of the Batu Lubang Bokimoruru Cave, with the water resurging through the entrance of the cave. The water is crystal clear and it flows throughout the year with a discharge of around  $7.3 \text{ m}^3/\text{second}$  (APS, 1988). This is sufficient to meet the basic water needs of around 1 million people per day, equivalent to the water needs of the population of North Maluku Province.

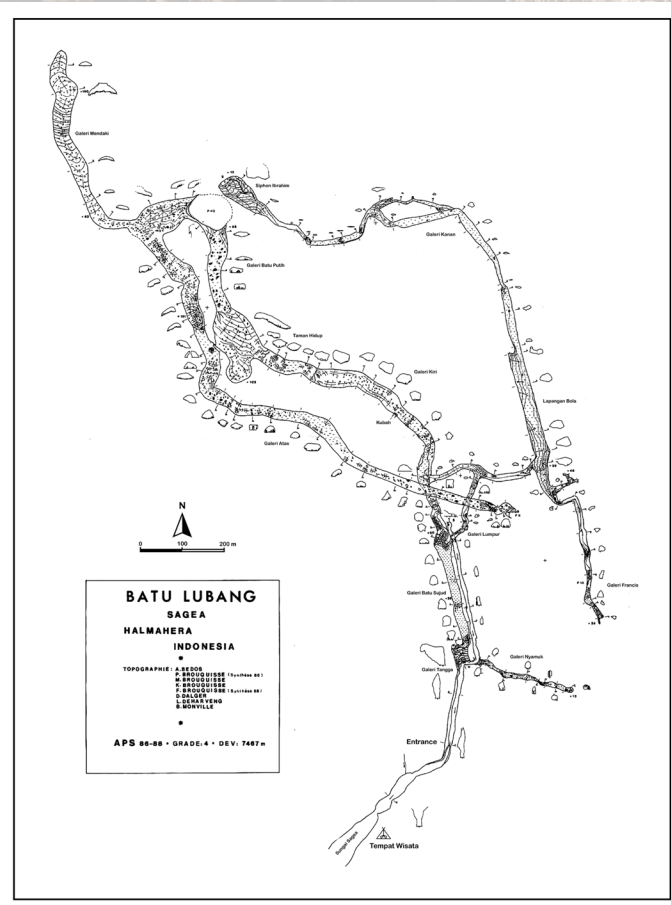


Figure 3. Plan view map of Batu Lubang Bokimoruru Cave by APS Expedition 1986-1988

The passages and chambers in the Bokimoruru cave are very large, Bokimoruru cave has a very large size, which may exceed the size of an airplane hangar. The roof and floor of the cave are decorated with various giant white ornaments. Water drops from each ornament indicate that the process of forming the ornament is still ongoing.

Several other caves such as Lagaelol and Woiweget Caves also have the potential for quite strong underground rivers. The water recharges of underground river in Legaelol Cave from an allogenic river that enters the cave.



Figure 5. Underground river stream in Batu Lubang Bokimoruru cave, Sagea Karst, Halmahera Islands - ©Azizfardhani, 2023

Although there have been no studies that directly reveal the source of the underground river stream of Bokimoruru Cave, it is believed that most of the water discharges from the Yonelo and Sepo Rivers in the north. These two allogenic rivers flow south-southeast and enter the cave system in the Sagea Karst area, then reappear six kilometers away in Bokimoruru Cave.

On the other hand, the Sagea River has important value for the Sagea people. Since ancient times, the Sagea River water has been used by local communities as the main source for drinking, bathing and washing. The Sagea River and Bokimoruru Cave became the route and location of *Arwahan*, a community ritual carried out by the locals every year to honor their ancestors.



Figure 4. One of the large chambers in Batu Lubang Bokimoruru cave - ©Azizfardhani, 2023





Figure 6 Tourist activities using paddle boats at the Bokimoruru cave tour, Sagea Village - ©Media

## THREAT

In the past year, the Sagea River - downstream of the underground river from Bokimoruru Cave - experienced a temporary change in its color since the stream mixed with thick soil sediment. The turbid flow of the Sagea River shows that the water discharges from outside the karst area which is called *allogenic recharge*. One has to understand that the water quality from outside the karst area is greatly influenced by the conditions of the river basin.

The results of an interpretation of satellite imagery and field inspections by Forest Watch Indonesia in 2023 found that in the Sagea watershed area, 392 hectares of deforestation have occurred, caused by an opening of hauling roads and mining exploration camps. Most of Sagea Watersheds and karst areas have been burdened with mining business permits. There are around 3 mining licenses (IUP) currently seeking to operate in the Sagea karst area, namely PT First Pacific Mining covering an area of 2,080 hectares, PT Karunia Sagea Mineral covering an area of 1,225 hectares, and PT Gamping Mining Indonesia covering an area of 2,538 hectares. These companies planned to mine nickel and limestone around the Sagea Watershed.

## TOURISM

Around three decades ago, the Bokimoruru Cave area started to become a recreation area visited by many local tourists around Weda Bay. The beauty of the cold, turquoise water of the river, tempted everyone to swim there. Plus the cool breeze due to the dense forest trees, this place is such an exceptional attraction for visitors.

The Bokimoruru Cave Tourist Area is managed by the Sagean community. Generally, visitors do activities such as swimming, paddle boating, relaxing on the river bank, and even went caving into the Bokimoruru Cave. Nowadays, various facilities have been built here to support these activities. Moreover, the average weekly visit of 500 tourists can increase to 10,000 visitors during the long holiday. With an entrance fee to the area of Rp. 10,000/person, the Bokimoruru Cave tourist area and its beauty have provided great economic benefits for the village and community.

Figure 7. Map of the threat situation of mining business permits (IUP) in Sagea karst - ©FWI, 2023





## CALL OF ACTION !

Many things about Karst Sagea have not been revealed yet. The main focus is studying karst systems to find suitable geotourism management models. Currently, there are efforts to make the Sagea Karst Ecosystem a national geopark area. Opportunities to collaborate and conduct research are wide open.

The Save Sagea Coalition, which consists of communities, speleology activists, academics, and CSOs, is fighting to defend the Sagea Karst Ecosystem from mining threats. They petitioned the Minister of Energy and Mineral Resources and the Regional Government of North Maluku Province to evaluate mining permits in the Sagea Karst Ecosystem and designate it as a protected area.



**#SAVESAGEA #SAVEBOKIMORURU  
#SAVEKARSTSAGEA**

SCAN HERE !



Support the protection efforts carried out by the Save Sagea Coalition by signing the petition below!

<https://www.change.org/LindungiKarstSagea>

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