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## Development of Maroon Mangrove Education Park (MMEP) in Supporting Mangrove Conservation in Coastal of Semarang City

To cite this article: W A B N Sidiq *et al* 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **747** 012067

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# Development of Maroon Mangrove Education Park (MMEP) in Supporting Mangrove Conservation in Coastal of Semarang City

W A B N Sidiq<sup>1\*</sup>, N K T Martuti<sup>2</sup>, A Irsadi<sup>2</sup> and D P Mutiatari<sup>3</sup>

<sup>1</sup>Department of Geography, Faculty of Social Sciences, Universitas Negeri Semarang, Indonesia

<sup>2</sup>Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, Indonesia

<sup>3</sup>Environmental Social Reseacher and Community Development Officer, Indonesia

\*akhsin1987@mail.unnes.ac.id

**Abstract.** Maroon Mangrove Education Park (MMEP) is a mangrove education site located in the Maroon Coastal of Semarang City. The development of MMEP as a mangrove education tour was carried out by the Mekar Tani Lindung mangrove farmer group (METAL) in 2016 on an area of 64.93 hectares with support from PT Phapros Tbk and. As a MMEP mangrove tourist destination has a variety of attractions such as diversity of mangrove species (12 species), tracking mangroves and some interesting photo spots with aircraft background from the adjoining Ahmad Yani Airport, so many visitors come especially on weekends that contribute to improving the manager's economy and local society. In addition, the development of MMEP also has an impact on the sustainability of mangroves from planting activities both by the manager and the community in collaboration with various parties. Based on the results of monitoring of digital images of the globe in the region, it was seen that there was an increase in the area of mangroves in the period of 2014 - 2018 amounting to 3.5 hectares and experiencing an increase in the area back in 2020 of 0.05 hectares. The increase in mangrove area will certainly have an impact on improving the quality of the city of Semarang which has been damaged.

## 1. Introduction

Mangroves are vegetation in coastal areas with various types of biological resources owned [1]. Mangroves have an important role in maintaining the balance of the coastal environment and protecting the land [2]. Ecologically, the presence of mangroves along the coast serves as a green belt to maintain the stability of the coastline and protect the land from large waves such as tsunamis, where the presence of mangroves with a certain thickness and density can reduce tsunami wave pressure [3]. By contrast, biologically the mangrove ecosystem plays a role in the formation of land, animal dwelling and spawning, wood production and carbon sequestration [4]. In addition, the mangrove ecosystem also has the potential to be developed as an educational tourism destination that can provide educational benefits and increase community welfare [5].

Semarang city is located in Central Java with a coastline length of around 36.63 km currently faces various problems caused by industrialization and land conversion in the coastal area [6] [7]. The high level of development and industrial activity in the region has triggered the conversion of land from open land, ponds and mangroves to built-up land [8] [7]. This phenomenon has an impact on the emergence of problems such as abrasion, accretion, rob, land subsidence that cause environmental degradation [9] [8] [7]. This also has an impact on the decreasing extent of mangroves along the coastline on the coast of Semarang City [10], where currently mangroves that are still growing well are only found in Mangkang Kulon Village, Mangunharjo Village, Tugurejo Village and Trimulyo Village [11]. So that mangrove rehabilitation efforts are needed so that the degradation of the coastal environment doesn't increase.



One of the mangrove rehabilitation efforts can be done based on eco-tourism [5], where the effort has been carried out in the coastal area of Semarang City through the development of the Maroon Mangrove Education Park (MMEP). MMEP is a mangrove eco-tourism developed in 2016 in the Maroon Coast region, Tugurejo Village by the Mekar Tani Lindung (METAL) farmer group [12]. Besides offering mangrove education, MMEP also has several other attractions for visitors such as some interesting photo spots and mangrove tracking which makes this tourist destination visited by tourists especially on weekends. The development of this tourism destination also supports mangrove conservation efforts on the coast of Semarang City [13] [14].

This study aims to determine the effort to develop MMEP that offers mangrove ecotourism, where the efforts to develop tourist destinations are identified from several potentials and attractions offered to visitors. It also analyzed the condition and development of mangrove ecosystems in a time series in support of conservation with remote sensing technology. Remote sensing technology can assess an area in time series [9].

## 2. Methods

This research was conducted in the tourist area of Maroon Mangrove Education Park (MMEP) located in Maroon Beach, Tugurejo Village, Semarang City. The MMEP location is near the runway end of Ahmad Yani Airport in Semarang. The following figure (figure 1) shows the location of MMEP research.



**Figure 1.** Research Location MMEP (Source: Digital Globe Imagery, 2020)

The data used in this study is sourced from field data and digital globe satellite imagery. The method of data collection is done by observation and interviews to get an overview of the development of MMEP tourism areas, while the conditions and development of mangrove ecosystems are obtained from the interpretation of the digital globe satellite imagery in time series in 2014 (before MMEP was developed), 2018 (after MMEP was developed) and year 2020 to find out current conditions.

## 3. Results and Discussion

Mangroves on the coast of Semarang City have dynamic conditions, one of which is due to global climate change [1][15]. Apart from having an impact on environmental degradation, mangrove ecosystem offerings also affect the lives of coastal communities, such as fishermen, mangrove cultivators and pond farmers [1] [3] [2]. Various rehabilitation efforts have been carried out by various parties, including in the rehabilitation area, namely in the coastal areas of Mangkang Kulon Village, Mangkang Wetan Village,

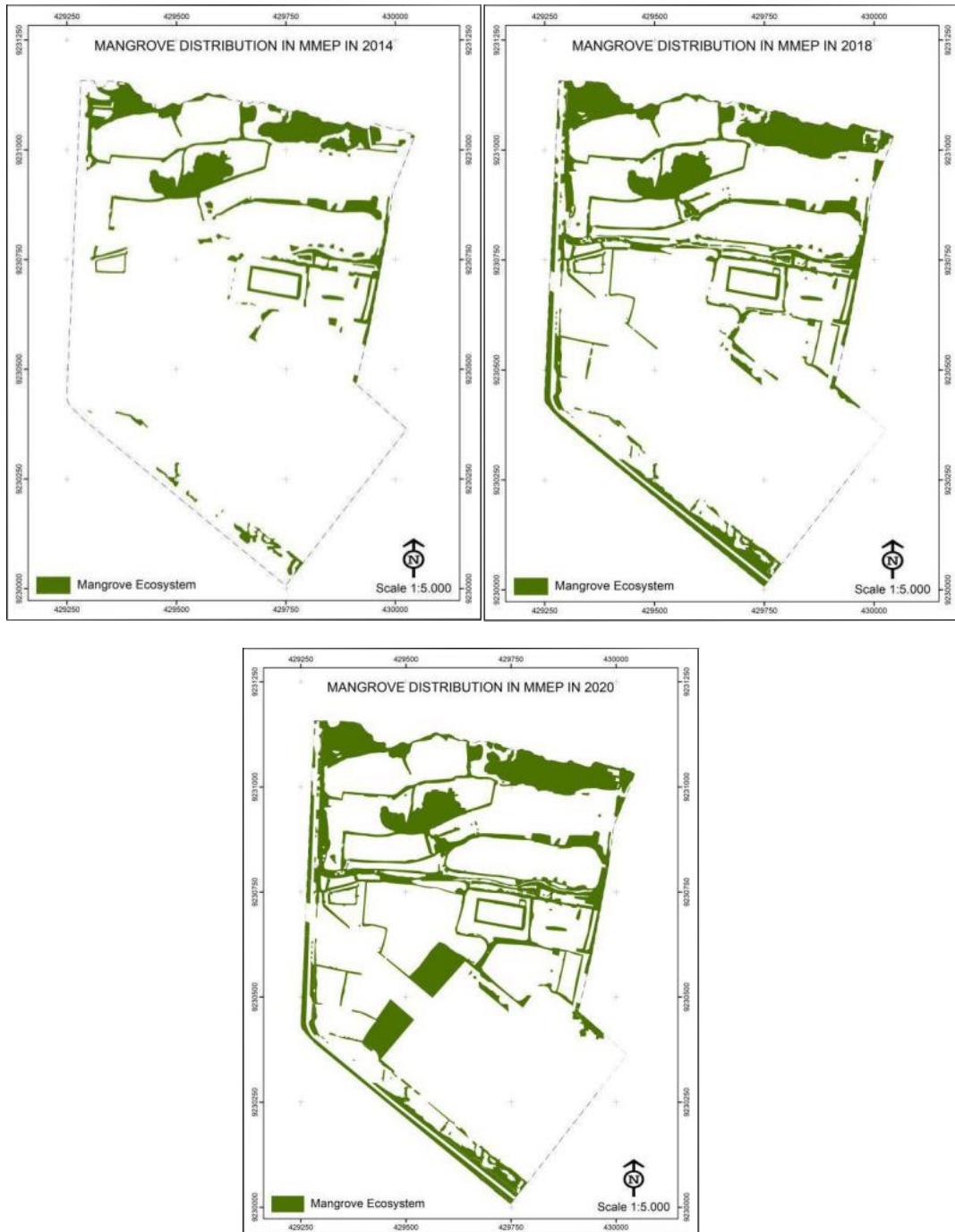
Mangunharjo Village, Tugurejo Village and Trimulyo Village [1]. However, the different conditions in the coastal areas mean that the mangroves planted are not the same [15]. One of the areas for rehabilitation of mangrove ecosystem development is the Maroon Mangrove Education Park (MMEP).

Maroon Mangrove Education Park (MMEP) began to be developed in 2016 on 64.93 hectares of land by the Mekar Tani Lindung mangrove farmer group (METAL) and Bunda Mas women's economic empowerment. Based on its land ownership, the MMEP tourism area is on land owned by the Semarang City Transportation Agency and PT IPU (Indo Perkasa Usahatama), which has been managed and under the supervision of Ahmad Yani's Army Main Air Base (Lanumad). Based in the RTRW Semarang city, the MMEP tourism area that was developed was mostly not in accordance with the land allotment, where around 68% of the area is in the airport area, while 25% of the area is designated for conservation areas and the remaining 7% is for recreation and sports.

As a natural tourist destination, MMEP has an attraction for visitors including 12 species of mangrove in the area, including *rhizophora mucronata*, *avecennia marina*, *ceriops* sp, *bruguiera* sp, *lumnitzera* sp, *rhizophora stylosa* (bakau kecil), *rhizophora apiculata* (bakau minyak), *candelia candel* (pisang-pisang laut), *deceri ceriops* (tengal), *avecennia alba*, fir and ketapang. The diversity of mangrove species can be used as a vehicle for nature education to study mangrove ecosystems. In addition there are also various types of animals that live in mangrove debts, such as herons, finches, monitor lizards, glodok fish, milkfish, crabs, shrimp and various other types of birds chirping that make the tourist area has a high ecological value.

Another attraction of MMEP is tracking mangroves with bridges that make visitors can more closely observe various types of mangroves and make it like being in a mangrove forest without having to get dirty. There is also a viewing post and some interesting photo spots such as the background of the aircraft back and forth behind it and the expanse of green mangrove forests so that the area is often used for pre wedding photography. Some of the attractions offered by the MMEP tourism area were created and developed by the METAL farmer group supported by PT Phapros Tbk through the Corporate Social Responsibility (CSR) program.

The development of the MMEP tourism area as a mangrove tourist destination also has a positive impact on environmental sustainability on the coast of Semarang City, especially in mangrove rehabilitation. One of them can be seen from the planting of 15,000 mangrove seedlings from the genus *rhizophora* at the beginning of the development of these attractions [12]. The planting activities were carried out by METAL farmer groups supported by PT Phapros, Tbk. Based on the interpretation of the digital image of the globe in time series in three different periods, namely 2014 (before MMEP was developed), 2018 (after MMEP was developed) and 2020 (existing conditions) there was an increase in mangrove cover in the tourist area. The results of image interpretation show that the total area of mangroves in the area in 2014 was 7.04 hectares and increased in 2018 to 10.62 hectares or increased by 3.58 hectares, while in 2020 the area of mangrove ecosystems increased by 523.89 m<sup>2</sup>. So it can be concluded that the mangroves planted and cultivated in the tourist area can grow and develop properly. The following figure (figure 2) presents the spatial distribution of mangrove ecosystems in time series at MMEP locations.



**Figure 2.** Spatial Distribution of Mangrove Ecosystem in MMEP in 2014 (a), 2018 (b) and 2020 (c)

(Source: Digital Globe Imagery Visual Intepretation, 2020)

Based on this picture, an increase in the area of mangrove ecosystems has been seen during the period 2014 - 2020. Most of these increases have a longitudinal distribution along pond embankments and river borders, while for mangrove with clustered distribution seen in the northern part of the MMEP tourist area. Mangrove planting activities in the area are not only carried out by the manager, but there are also educational tour packages offered to visitors to plant the seeds that have been provided by the manager. So that the development of the MMEP area is not only aimed at developing natural tourism destinations but also as an effort to rehabilitate mangroves in supporting mangrove conservation efforts on the coast of Semarang City. It is hoped that mangrove rehabilitation on the coast of Semarang City can continue in other areas with a variety of programs that are sustainable and based on integrated coastal management, so that the quality of the coastal environment will improve.

#### 4. Conclusion

The conclusion of this study is the development of MMEP eco-tourism in Marron Beach has supported conservation efforts on the coast of Semarang City. This can be seen from the increasing extent of mangrove ecosystems in the tourist area, where from 2014 - 2018 an increase in mangrove area was 3.58 hectare and increased again from 2018 - 2020 by 523.89 m<sup>2</sup>, one of the mangrove rehabilitation in the area done by planting 15,000 mangrove seedlings of the genus *Rhizophora* by the METAL farmer group and the community supported by PT Phapros, Tbk.

#### Acknowledgments

We would like to thank the various parties who have contributed to the research and preparation of this article, including *Research and Community Service Institute*, Semarang State University UNNES who has provided funding and research permission so that the research objectives can be achieved. We also thank to the Mekar Tani Lindung Mangrove (METAL) Farmer Group and Bunda Mas, as well as our thanks to the Supervision of the Main Army Air Base Ahmad Yani for allowing us to access the research site.

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