

The Potential of Wonorejo Pamurbaya Mangroves As A Geography Learning Resource To Improve Student Creativity

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ARTICLE INFO

Article history:

Received 27 April 2023

Accepted 15 August 2023

Available online 31 August 2023

Kata Kunci:

Proyeksi kebutuhan;
Ketersediaan beras;
Ketahanan pangan;
Konsumsi beras

Keywords:

Need projection; Rice
availability; Food security;
Rice consumption

ABSTRAK

Dekade terakhir ini, keberlanjutan ekosistem mangrove dipertanyakan padahal menyimpan jutaan potensi dan manfaat. Pandemi COVID-19 menghasilkan krisis pembelajaran. Penelitian ini bertujuan untuk menggali potensi mangrove wonorejo, pantai timur Surabaya (Pamurbaya) sebagai sumber belajar geografi untuk meningkatkan kreativitas siswa. Potensi yang ada diharapkan mampu memberikan dampak bagi siswa secara edukatif, rekreatif, dan kreatif. Pemberdayaan siswa ke lingkungan mangrove dilakukan sebagai bentuk implementasi pembelajaran ke lapangan. Metode penelitian yang digunakan yaitu kualitatif deskriptif dengan menggunakan pendekatan ekopedagogis. Data dikumpulkan melalui focus group discussion, observasi, dokumentasi, dan lembar kerja peserta didik (LKPD). Parameter kreativitas siswa dilihat dari proyek siswa yang tertuang dalam LKPD. Data yang diperoleh akan diolah menggunakan teknik analisa interaktif menurut Miles dan Huberman. Hasil penelitian ini adalah mangrove wonorejo, Pamurbaya memiliki potensi sebagai sumber belajar Geografi untuk meningkatkan kreativitas siswa melalui proyek lingkungan (1) aspek geografis melalui gerakan satu siswa satu pohon (Sawahon), (2) aspek sosiologis melalui barcode education (Bardu), dan (3) aspek ekonomis melalui coklat mangrove (Cokro) di kawasan hutan mangrove Pamurbaya. Pemberdayaan siswa di lingkungan merupakan praktik kreativitas sebagai wujud konservasi mangrove agar tetap lestari. Kegiatan belajar di lingkungan mangrove mendukung program Sustainable Development Goals terutama sektor pendidikan berkualitas, ekosistem lautan dan daratan.

ABSTRACT

In the last decade, the sustainability of mangrove ecosystems has been questioned even though they have millions of potentials and benefits. The effects of the COVID-19 pandemic are producing a learning crisis. This study aims to explore the potential of the Wonorejo mangroves, east coast of Surabaya (Pamurbaya) as a source of learning geography to increase students' creativity. The existing potential is expected to have an impact on students in an educative, recreational, and creative way. Empowerment of students into the mangrove environment is carried out as a form of implementing learning in the field to create creativity. The research method used is descriptive qualitative using an ecopedagogical approach. Data was collected through focus group discussions, observations, documentation, and student worksheets (LKPD). The parameters of student creativity are seen from the student projects contained in the LKPD. The data obtained will be processed using interactive analysis techniques according to Miles and Huberman. The results of this study are that the Wonorejo, Pamurbaya mangroves have the potential as a source of learning Geography to increase student creativity through environmental projects (1) geographical aspects through the one student one tree movement (Sawahon), (2) sociological aspects through barcode education (Bardu), and (3) economic aspects through cacao mangroves (Cokro) in the Pamurbaya mangrove forest area. Empowering students in the environment is a creative practice as a form of mangrove conservation so that it remains sustainable. Learning activities in the mangrove environment support the Sustainable Development Goals program, especially in the quality education sector, life below water and life on land.

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1. Introduction

Mangrove forest is one of the useful ecological landscapes in the learning process. Ecosystem development must have environmental interaction together with local wisdom (Susanti, 2021). The mangrove ecosystem cannot be separated from the local government and the community as stakeholders (Damastuti & de Groot, 2019). Developing mangrove ecosystems through communities is a strategic step in increasing potential. The use of mangroves as a vehicle for education has an influence on improving people's welfare (Restu et al., 2017). The Wonorejo mangrove forest ecosystem, on the east coast of Surabaya (Pamurbaya) is managed by the City Government through the Food Security and Agriculture Service. Ecosystem management is good even though the vehicle has not been utilized optimally. This is indicated by the support from the surrounding community and the capital required to develop a very large mangrove ecosystem (Murtini, 2015). Therefore, the mangrove forest ecosystem needs to be developed gradually and sustainably.

Empowerment through positive activities to support the creativity of students in the Wonorejo mangrove forest becomes an urgency. Learning that accustoms students to love mangroves supports sustainable ecosystems in the Wonorejo mangroves be a hope in the post-pandemic period of COVID-19 (Rukmana & Handiwati, 2020). This learning can be believed to be a form of student empowerment in sustainable ecosystem conservation in the Wonorejo mangroves, Pamurbaya. This learning indirectly invites to protect and preserve the existence of the Pamurbaya mangrove ecosystem so as to increase student creativity. In addition, through the enthusiasm of students who love mangroves, they can play an active role in caring for the environment.

Mangroves, salt-resistant wetland vegetation that can form small patches or large forests and are found along tropical and subtropical coastlines. Coastal ecosystems, such as mangroves, have been significantly altered by human activities. Urban mangroves are mangroves that are in urban areas and residential areas. Urban mangroves provide important ecosystem benefits to urban communities. (Reyes et al., 2022). In fact, the location of the mangrove ecosystem protects cities from the dangers of seawater intrusion and tidal waves.

The area of the Wonorejo mangrove area, East Coast of Surabaya (Pamurbaya) is about 200 hectares and is located 2 km from Surabaya. Mangrove land is getting narrower in most areas in Indonesia, including in Surabaya. Reduced mangrove land on the coast threatens the mainland with ecological hazards from the sea such as intrusion, reduced fish, water pollution (Seva et al., 2022). Eco system Mangrove forest Wonorejo, Pamurbaya has a unique charm and potential from natural scenery and biodiversity.

Mangrove forest, Pamurbaya has characteristics conservation and cultivation which is located in the eastern region of Surabaya City. Conservation and cultivation of mangroves in brackish waters is directly adjacent to the Madura Strait (Rukmana & Handiwati, 2020). The characteristics of the Wonorejo mangrove ecosystem are having ecotourism-based conservation efforts and cultivating various types of mangrove plants. The diversity of mangrove ecosystems in Wonorejo, Pamurbaya which are located in the eastern region are formed naturally and artificially, where these ecosystems have the potential to be delivered as a source of learning Geography for students in Surabaya City (Murtini, 2015). It is hoped that this will support students' knowledge in Surabaya considering that many students do not know well the potential of the Wonorejo mangrove ecosystem, Pamurbaya. Identification of mangrove ecosystems in Pamurbaya, especially the Wonorejo area, is the initial stage of this research.

Mangrove ecosystems can be used as a source of learning observation to spur students' abilities (Rimbun & Sriyati, 2018). Based on the study, geography learning resources can be created through environmental observation into a project as an output of learning outcomes. The results of previous research studies focused on practical theoretical studies, utilization and use of mangroves in learning geography. Thus, this article aims to examine the potential of the Pamurbaya mangrove ecosystem to become a source of learning geography through environmental projects to increase student creativity in the post-COVID-19 pandemic.

2. Method

The research method used is qualitative with a case study in the Wonorejo Mangrove, East Coast of Surabaya (Pamurbaya). Data collection techniques used are observation, documentation, FGD and student worksheets (LKPD). Observations were made on the potential of Wonorejo's mangroves as a source of learning geography to increase creativity. Parameters of the potential of the Wonorejo Mangrove as a source of learning geography using validated instruments (Murtini, 2015). Meanwhile, the parameters of student creativity are seen from the projects produced students to succeed in learning using validated instruments (Murtini et al., 2018). Student collaboration in geography learning at Mangrove Wonorejo Pamurbaya resulted in an environmental project. Environmental projects have 3 indicators as follows:

Table 1.
Environmental Project Indicators

Project	Indicator	Ecopedagogical Problems	Assessment
1	Students plant mangroves as a form of love for the environment according to geographical aspects	Pamurbaya's mangrove areas are starting to be critical to housing developments	The activities of the Pamurbaya mangrove planting project began with the introduction of seeds, seeding, and ready for planting.
2	Students make innovations to introduce mangroves to visitors (nature-human interaction) according to sociological aspects	There is no informative vehicle in the Pamurbaya mangrove area	The project activity connects android technology with informative creative works about mangroves, such as: making information barcodes on mangroves in Pamurbaya.
3	Students make creative products originating from the mangrove environment as a form of culinary processing according to economic aspects	The absence of culinary products typical of Pamurbaya mangroves	The project activity is making chocolate culinary preparations from lindur plant extracts in the Pamurbaya mangroves.

Respondents in this study used class XI students Social Science-1 in SMA Wachid Hasyim 2 Taman Sidoarjo for the academic year 2022/2023 odd semester. This research was conducted from September to December 2022. The data obtained through will be processed using a qualitative descriptive analysis .

3. Results and Discussion

Based on the results of *focus group discussions* and observations with students in outdoor geography learning regarding the Wonorejo Mangrove ecosystem, Pamurbaya produced three problematic studies that needed to find solutions through environmental projects namely geographical, sociological, and economic conditions. The mangrove ecosystem of Wonorejo, Pamurbaya is included in the protected area by the Surabaya City Government through the Department of Agriculture (Wahyuni et al., 2015) . From time to time, the Wonorejo Pamubaya mangrove area has changed . Primary sources believe that the area of the Wonorejo mangroves is around 500 hectares (Hasanah & Nawiyanto, 2020) but what has happened is that there has been a decline. Since the beginning, the Pamurbaya Mangrove area has been developed with the aim of protecting the City of Surabaya from damage to the coast from the effects of abrasion and sea water intrusion. In 2008 the Wonorejo Mangrove was opened for ecotourism purposes for the general public. Common activities carried out are mostly exploring mangrove forests and carrying out planting actions to improve or care for the environment. In recent years, the mangrove ecosystem in Wonorejo, Pamurbaya has been managed by the Surabaya City Food Security Service in collaboration with the mangrove-loving community. The Mangrove Forest of Wonorejo, Pamurbaya has been named a world pilot in the *Mangrove Ecosystem Conservation and Sustainable Use (MECS)* project. In the Pamurbaya mangrove forest there is also a lot of vegetation such as *Avicennia alba sp*, *Bruguiera cylindrical sp*, *Rhizophora apiculatu sp*, *Sonneratia Caseolaris sp*, *Exocoecaria agallocha sp*, *Terminalia catappa sp*, *Ziziphus mauritiana sp* (Food Security Service, 2019).

After the revitalization from the Surabaya City Government, the Wonorejo Mangrove ecosystem has vehicles that can be used as alternative natural attractions. The rides in Mangrove Wonorejo include jogging tracks, tour boats, coastal gazebos, inns, and several other public facilities. Such conditions have turned the Wonorejo Mangrove into a magnet destination for residents of the city of Surabaya and its surroundings, including students. The rides in the Wonorejo mangroves can be used as learning media for students (Murtini, 2015) .

The utilization of the Wonorejo , Pamurbaya mangroves is a habitat for brackish water ecosystems, avifauna, and recreation areas. Such conditions have the potential to become a source of student learning. Potential learning resources include geographical, sociological, and economic conditions. The natural and social potential of mangrove objects can provide unique learning experiences for students (Restu et al., 2017; Seva et al., 2022) . Learning activities in the Wonorejo mangroves, Pamurbaya provide space to improve student learning outcomes. A map of the Wonorejo Mangrove Location area, Surabaya City, can be seen in Figure 1.

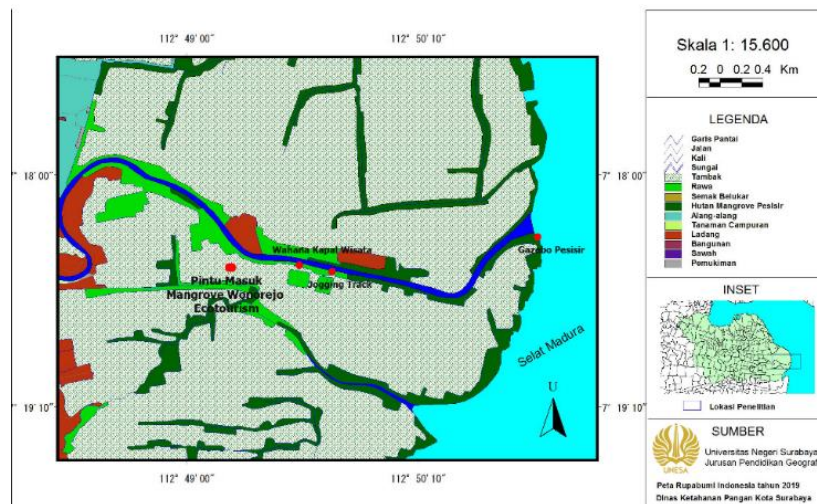


Figure 1. Map of Wonorejo Mangrove Location, Surabaya City

The first observation, geographical conditions. The Wonorejo Mangrove Ecosystem, Pamurbaya has an area of about 9 hectares consisting of coastal forest with biodiversity and the Wonorejo river which is 8 km long. The geographical potential of mangrove coastal forests produces biodiversity. However, the condition of the Mangrove forest ecosystem in Wonorejo, Pamurbaya is decreasing due to land clearing for housing. So, the results of observations to protect mangroves need a planting movement. The One Student One Tree Movement (Sawahon) emerged one of the activities to preserve mangrove forests is to encourage the active role of students to plant mangrove trees through environmental activities. This activity begins with a *fundraising event* or devoted donation to mangroves by donating school pocket money. Funds of approximately 1.5 million rupiah were collected to buy seeds and carry out activities to plant mangroves. After that, students get an understanding and practice of planting mangrove seedlings (*Rhizophora Stylosa*). This planting uses mangrove seeds and selectively selected in order to grow the best and most fertile mangrove trees.

Sawahon activities are carried out in areas that are still empty or areas that look dry . The planting activity is carried out to maintain the mangrove trees in the area and is aimed at visitors so that they can enjoy this mangrove forest area even more. *Sawahon's* activities are as shown in Figure 2 below.



Figure 2 . Sawahon Movement Activities (One Student One Tree)
(Source: Doc. Author, 2022)

Sawahon activity foster the active role of students to love mangroves. Implementation of the *Sawahon activity* , students can invite visitors to participate in planting mangrove trees . In the future, it is hoped that there will be empowerment for anyone who comes as an effort to preserve mangrove forests.

The second observation is sociological conditions. The Wonorejo Mangrove Ecosystem, Pamurbaya, which is located on the eastern outskirts of Surabaya City, cannot be separated from urban activity. The sociological potential of mangrove coastal forests produces area interactions that are commonly used as recreational vehicles and *jogging tracks* . However, there is not much that visitors can do because of the lack of information about the mangrove area. So, the results of observations to introduce mangroves need an education that involves visitor *gadgets* . *Barcode Education* (Bardu) activities emerged is an educational activity which utilizes technology in the form of *barcoding* . In the era of the *Internet of Thing* and 4.0, this was put to good use through new activities The aim is that visitors can find out information on the types of mangrove vegetation by *scanning* the barcode. *Bardu* activities made by Wachid Hasyim 2 Taman High

School students by attaching paper in the form of a barcode ready to be scanned using the QR Code . *Bardu* activities as shown in Figure 3 are expected that visitors can find out information about the characteristics and benefits of mangrove vegetation .



Figure 3. *Bardu* activities and information that appears when using a barcode scanner as a result of student creativity (Source: Author's Doc., 2022)

Advantages of activities *Barcode Education* (*Bardu*) is that visitors get an explanation so that they can learn to preserve mangroves . This activity is very interesting because it is a new vehicle that visitors can do for free . In the future, it is hoped that the manager will be able to provide other education such as *bardu*, to add to the treasures of knowledge from the Pamurbaya Mangrove Forest . The form of the *Bardu* activity (educational barcode) is one of the solutions for empowering students in the Pamurbaya Mangrove Forest Ecosystem area in an effort to increase conservation while carrying out learning. Through *bardu* optimization , tourists can utilize and show the general public that the Pamurbaya Mangrove Forest Ecosystem area is worthy of being used as an ecosystem destination as well as learning education that is worth considering visiting.

Last observation, economic conditions. Most of the people in the Wonorejo Mangrove, Pamurbaya are generally middle and lower class people. Mangrove coastal forests are able to provide economic potential for its citizens. However, very few innovations have been made by residents regarding what can be sold to get additional income in the Wonorejo Mangrove area, Pamurbaya. So, the results of observations to increase the income of residents around mangroves need culinary innovation. The Chocolate Mangrove (*Cokro*) activity emerged , one of the developments from the utilization of lindur fruit extract (*Bruguiera gymnorhiza sp*) which is used as a mixed ingredient to make processed chocolate products. *Cokro* development activities are carried out at home . *Cokro* himself is meant to introduce to visitors that we can use mangrove trees, especially the fruit of the mangrove trees, one of which is processed chocolate as shown in picture 4. Apart from that, it can also be used as a souvenir when visiting the Pamurbaya Mangrove Forest Ecosystem .



Figure 4. Products brown mangrove (*Cokro*) students and utilization for visitors at the site (Source: Doc. Author, 2022)

The development of lindur fruit extract made by Wachid Hasyim 2 Taman High School students has gone through a series of trials in the school laboratory. Visitors were very enthusiastic about the new processed chocolate product which was very popular. 9 out of 10 visitors said that this *Cokro* product could be marketed. Therefore , *cokro* products can be developed by local communities to improve their welfare.

Cokro 's activity also aims to open minds, especially to the local community around that business opportunities can come from anywhere depending on whether we are able or not to take advantage of the environment around us and is also aimed especially at students to be even more creative in preserving and using nature. around. At first glance, this activity is not very attractive to some people who are not nature lovers or business people. However, if you take a closer look, actually this *cokro activity* is very intriguing to study more deeply because it can be used as a future business opportunity. *Cokro's* form is one of the solutions to empower students in the Pamurbaya Mangrove Forest Ecosystem area in an effort to increase

conservation and utilization. Through optimizing *Cokro*, students can take advantage of this activity as a learning tool that is quite interesting by using mangrove fruit directly.

The idea of learning outside of school starts from a problem that happened in the Pamurbaya Mangrove Forest area and wanted to create a joint conservation project. The Mangrove Forest Ecosystem Area does require new tourism support facilities/facilities (Murtini, 2015). Empowerment activities are very good for the purpose of preserving mangrove trees through the active role of students (Gitgeatpong & Ketpichainarong, 2022). While activities to nature are carried out because of efforts to increase conservation while carrying out learning (Prastiyono et al., 2021). So, student empowerment activities which has carried out for conservation purposes Mangroves generate an understanding of the importance of preserving the environment.

The active role and creativity of students is needed in realizing projects in the Wonorejo mangrove ecosystem. Student collaboration activities as shown in Figure 5 in the concept of creativity and supporting sustainable ecosystems in mangrove forests according to the Sustainable Development Goals (SDG's) program, especially quality education, living on land and water. Important efforts to preserve mangrove ecosystems use students to be creative in building sustainability (Rukmana & Handiwati, 2020) to become an important learning resource (Widiastuti, 2017). Activities in mangroves, students actively and creatively develop good behavior contained in positive social activities (Febriansyah, 2021; Rahimi & Shute, 2021). The creative activities carried out by students are believed to contribute to an effort to increase the preservation of the attractiveness of the natural tourist attraction of the Pamurbaya Mangrove Forest (Rukmana & Handiwati, 2020; Seva et al., 2022; Wahyuni et al., 2015).



Figure 5. Empowerment of High School Students in Mangrove Wonorejo, Surabaya
(Source: Doc. Author, 2022)

Outdoor learning in the Wonorejo mangrove ecosystem it is very effective in increasing students' creative abilities. The results of student projects in environmental conservation of the Wonorejo mangroves can be used as learning outcomes. Projects produced by students in conservation really help the quality of learning (Gitgeatpong & Ketpichainarong, 2022). Conservation projects require processes that are supported by facilities and infrastructure in mangrove ecosystems. Wonorejo mangrove management support for learning activities can support the process to achieve the expected results. Knowledge of mangrove forest conservation from the age of students is very helpful in preserving the environment and its ecosystem (Damastuti & de Groot, 2019; Susanti, 2021; To-im & Chaiboonchoe, 2012). Activities in nature can be developed in a massive, structured and systematic manner so that they require active and creative participation from all students (Rahma Tanti et al., 2021; Saputra et al., 2022). In the future, in order to strive for conservation and utilization potential in building ecosystem destinations and make it one of the programs (Marni, 2023; Rasmilah, 2016). The implementation of the Wonorejo mangrove ecosystem learning has an impact on the results of students' creative abilities increasing. Student empowerment activities in participating in conservation projects can be realized in outdoor learning models. Teachers can develop project learning models that suit students' needs and learning goals (Cahyani, 2021; Febriansyah, 2021).

4. Conclusions and suggestions

Mangrove ecosystem has high potential to become a source of learning geography through environmental projects to increase student creativity. The Wonorejo Mangrove, the east coast of Surabaya (Pamurbaya) has geographical, sociological, and economic conditions that can be used as an outdoor learning study. The Wonorejo mangrove ecosystem has problems that can be used as a *baseline* for learning Geography. Problems that need to be found solutions to realize the creativity of empowering students through environmental conservation projects in the concept of building and supporting sustainable

ecosystems in Wonorejo Mangrove, Pamurbaya . The environmental conservation project is able to increase student creativity in supporting the sustainability of the Wonorejo Mangrove ecosystem, Pamurbaya according to the SDG's program. Student creativity efforts as a form of mangrove forest conservation in order to remain sustainable are very good. Students collaborate, play an active, creative role and have breakthroughs in the development of sustainable ecosystems. So, the Mangrove ecosystem of Wonorejo, Pamurbaya can be used as a media or learning based on environmental conservation .

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