

Implementation of a Comprehensive Eco-Riparian Concept to Landscape Design of Water Source Area in Macari Village, Batu City

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ABSTRAK

Penerapan konsep eco-riparian pada tepian sungai merupakan salah satu program Kementerian Lingkungan Hidup dan Kehutanan Republik Indonesia. Sumber air di Desa Macari merupakan salah satu penyuplai debit air baku di DAS Brantas. Keberadaan kawasan pemukiman dan industri saat ini di sekitar sumber air Dusun Macari ditengarai menurunkan kualitas air di lokasi tersebut, serta sering ditemukan pencemaran pada area sumber akibat pencemaran limbah industri dan rumah tangga. Penelitian ini bertujuan untuk menemukan solusi desain konsep eco-riparian yang komprehensif untuk melestarikan sumber daya air. Dengan menggunakan metodologi gabungan antara studi kasus dan tinjauan literatur, dalam penelitian ini dihasilkan kriteria desain eco-riparian lingkungan yang komprehensif, seperti restorasi lahan basah dengan menggunakan kolam bertingkat, pengelolaan vegetasi badan air, rekonstruksi penutup tanah, pembuatan penahan tebing, vegetasi pendukung estetika, pengelolaan air limbah, dan rencana drainase sehingga tidak mencemari area sumber air. Pengembangan untuk menunjang visi kawasan diwujudkan dalam desain arsitektur yang bercirikan ekologi dan sejarah. Kriteria desain ini diterjemahkan ke dalam visualisasi kawasan secara holistik sehingga menghasilkan desain yang koheren, fungsional, dan estetis. Dengan hasil desain tersebut diharapkan seluruh visi pembangunan daerah dapat terwujud di lokasi tersebut.

Kata kunci: Eco-riparian, Kawasan lansekap, Konservasi Sumber Air

ABSTRACT

The eco-riparian concept application on the riverside is one of the programs of the Ministry of Environment and Forestry of the Republic of Indonesia. The water source in Macari Village is one of the suppliers of raw water discharge in the Brantas watershed. Residential and industrial areas currently surround Macari Village Water sources, so it decreases the water quality, and pollution is often found due to industrial and household waste contamination. This research aims to find comprehensive eco-riparian concept design solutions to conserve water resources. By using a combined methodology between case studies and literature reviews, comprehensive eco-reparation design criteria were found, such as wetland restoration by using the terraced pond, vegetation management of the water bodies, ground covers, cliff retaining, aesthetic support vegetation, wastewater management, and drainage plans so it will not pollute the water sources. The development to support the area's vision is manifested in architectural design with ecological and historical characteristics. This design criteria is translated into a holistic visualization of the area to produce a coherent, functional, and aesthetic design. With the design result, all regional development visions are expected to be realized at the location.

Keywords: Eco-riparian, Landscaping area, Water Sources Conservation

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1. Introduction

The development of a city encourages the growth of settlements and businesses in the city area. Batu City is one of the new cities in Indonesia, which has recently developed very rapidly. Since 2001, the city of Batu has grown by branding itself as an agro city, which, along with its development, has grown into a tourist city, so it is currently famous for its branding (BPS et al., 2023). With the city of Batu's rapid growth,

areas previously water source areas, agricultural and plantation areas are starting to change into business areas and community settlements. This has a very massive impact on the natural environmental conditions of the city of Batu. Many water sources that residents previously could use for their daily needs are starting to dry up and become polluted by industrial and household waste. This is a highlight for the Batu city government through the environmental

service to move towards conserving sustainable water resources that still have high land use value.

The ecotourism concept, which is currently being initiated in Indonesia, is a concept that is quite interesting to develop because this concept focuses on environmental sustainability and the sustainability of natural resources, especially water bodies (Khatulistiyawati et al., 2021). The eco-riparian concept is an attempt to restore the function of the river to its natural state, namely flowing river water continuously. Applying the eco-riparian concept also reduces the pollution load entering rivers or water sources, so that water quality can improve (Maulana et al., 2022). Macari Village has a spring that has existed since ancient times. Formerly, the spring area was used by residents for their daily needs. Around the spring, it has also been used as an Islamic boarding school from the past until now. The location is east of Among Tani City Hall, Batu City, making this area close to community activities. This water source is also one of the water sources that flows into the Metro River and the Brantas River. Due to the location being in a densely populated area, it is essential for the water source of Macari Village to be conserved and maintained so that it remains in good condition when it empties into the Brantas River and is suitable for daily use by local residents.

The Batu City area is an upstream area that is the primary source of the longest river in East Java, namely the Brantas River. It is from small springs around Batu that it will empty into the Brantas River. To support the improvement of the water quality of the Brantas Watershed itself can be done from the upstream area. The water sources in the Batu City area must be appropriately conserved so that they are not polluted before flowing into the watershed flow. In this case, we can review research on constructing wetland ecology in mountainous regions (Stentella et al., 2023). This research discusses several technical efforts to improve the ecological quality of land with several mechanisms and cultivating specific vegetation that can bind nitrates in water, create a terraced pond system in which the decontamination process is carried out, and protect water bodies from water seepage from contaminant areas. The eco-riparian concept certainly cannot stand alone to increase the use value of the area and the environment. A similar concept is often used in several world regions to restore several water bodies. For example, in several developed countries, water conservation is supported by beautiful landscape designs to increase the use value of the land. Wetland areas can be used as living park areas, so apart from being a conservation area, the area is also a tourist area (Zhang, 2022).

Residential and industrial areas currently surround Sumber Macari, so there is the potential for waste to pollute the environment. Meanwhile, this water source is also used for daily needs by local residents and is one of the spring suppliers of the

Brantas watershed. So, if sustainable conservation is carried out, it will benefit local residents and the Batu City government. Based on the results of interviews with community leaders, several obstacles were found on the land, including if heavy rain occurs, the land is irrigated by overflowing rainwater from drainage in residential areas, the impact of which can pollute water sources. The government's involvement in managing water resources is substantial, because the government manages the majority of these areas, so the government's role becomes vital and central. However, without public cooperation, these efforts will not easily succeed (Maulana et al., 2022). This is because the interaction between the community and the area is quite intense, and the community often accesses these resources for their daily needs (Daisy et al., 2020).

At present, there has been a lot of research focusing on eco-riparian studies, but very few can provide a comprehensive conceptual overview regarding the technical implementation of this concept for areas as is done (Daisy et al., 2020; Prastiyo et al., 2018; Wu, 2023) With a case study at the Macari Village source, This research aims to find comprehensive eco-riparian concept design solutions to conserve water resources. Comprehensive eco-riparian concept planning, namely, by restoring and improving the quality of areas based on environmental, social, economic, and educational value. For this reason, an eco-riparian concept integrated with the government is needed to provide more long-term benefits for the sustainability of existing water resources (Jia et al, 2021).

2. Research Methods and Literature Review

This research is design-by-research-based. In research like this, two main methods are used: the research method and the design method. Research methods are used to find design criteria that will be applied. These design criteria can be sourced from literature reviews, precedent studies, observation surveys, stakeholder interviews, etc (Patton, 2002). After obtaining the design criteria, an application is carried out on the studied object using a specific design method.

2.1. Research Methodology

A combined strategy is used in this research, with the core strategy Case Study combined with a Literature Review with a qualitative approach (Groat D., 2013). The research stages begin with determining the case study, scoop study approaches, and design concepts adopted. Then, continue with a literature study of previous research (Lucas, 2016). Design criteria data and design methods will be obtained from here according to the case study. Apart from conducting a literature study, a field survey was also conducted to collect initial data regarding the study location and interviews with stakeholders, local communities, and policymakers. Then, the results of the literature review and interviews are elaborated to

produce appropriate design criteria. This data will later be translated into the design. The design method used to apply the eco-riparian concept to the landscape of the water source area of Macari Village is the Pragmatic method. This method was chosen because it requires several stages to produce a comprehensive design that fits the surrounding environmental context so that each design process can be analyzed qualitatively and adaptively to the surrounding environmental conditions (Loucks et al., 2017).

The design stages used in this study refer to the design process (Seymour et al., 1980). The first stage is the preparatory stage. At this stage, a location survey is carried out, mapping the location, potential problems, and basic information regarding the required site. Then, the data inventory stage was carried out, this stage was carried out to collect data on existing field conditions. There were two types of data collected, namely primary and secondary data. Primary data was obtained through surveys and field observations to collect physical, biophysical, and social data. At this stage, discussions are also held with the surrounding community regarding the social and historical conditions of the study object. Secondary data is also needed in literature studies regarding the location and concepts that will be applied. After all the data has been obtained and inventoried, proceed to the data analysis stage. The results of identifying the data obtained, both primary and secondary data, are then described in a qualitative descriptive manner to determine a comprehensive planning concept and follow the research location (Miles H.A.M et al, 2014).

2.2. Literature Review for Finding Design Criteria

A literature review was also carried out at this stage to determine the design criteria for the eco-riparian concept that will be developed (Colquhoun et al., 2014). Table 1. A comparative literature review of several previous studies was carried out to obtain a coherent and comprehensive concept of design criteria. Then, the design criteria will be synthesized in the form of an integrated area design at the location of the study object. Spatial and formal analysis is carried out to process physical, biophysical, and social data to discover and describe spatial patterns and shapes. The results of this analysis will be synthesized in the design process to obtain problem-solving, producing a basic concept of zoning on the site and a concept for the form of area supporting facilities, which will then be developed in the design stage.

The Design Stage consists of the basic concept, landscape concept, shape concept, space concept, visual concept, circulation concept, and vegetation concept. The final result of this stage is made in the form of a block plan. This block plan is then developed into a site plan. The site plan will be translated into two-dimensional and non-dimensional visual form at this stage.

Based on the results of previous literature studies in Table 1, it is possible to synthesize the design criteria for a comprehensive eco-riparian concept from a theoretical and practical perspective. The aim of the eco-riparian concept that will be applied later is wetland restoration and construction activities, as stated (Speiles, 2022; Stentella et al., 2023; Sun et al., 2019). Strategy and design methods are carried out simultaneously through collaborative activities with the community around the location, as stated (Khatulistiwa et al., 2021; Maulana et al., 2022), carrying out data collection and analysis techniques, as well as synthesizing the design process as stated (Daisy et al., 2020; Prastiyo et al., 2018). Meanwhile, the design criteria were elaborated based on previous research results (Speiles, 2022; Stentella et al., 2023; Zhang, 2022). Then, for translating the design criteria into a design, the digitization method is used, as was done by (Daisy et al., 2020).

2.3. Case Study Overview

This research focuses on a case study of the water source area of Macari Village, Pesanggrahan District, Batu City. Topographically, the location is in a land basin on a 5-10% slope.



Figure 1. Macari Village Research Location, Pesanggrahan District, Batu City, source: Google Earth 2023

The location is in Macari Village, which has a varied topography in a land basin flanked by settlements, as seen in Figure 2. The potential for land around which bamboo trees have been planted has existed for a long time, so it is hoped that it can be maintained. The land currently has a secondary function as a natural boarding school area that residents use for learning Al-Qur'an.

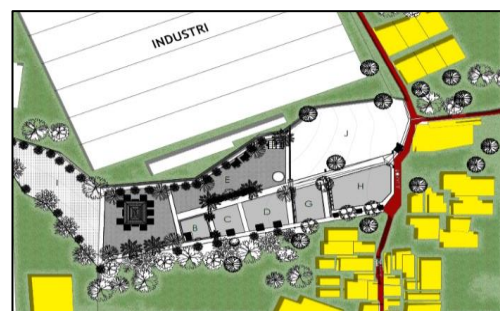


Figure 2. Case study location surrounded by industrial areas and dense residential areas. Source: 2023 Location Survey Analysis

A demonstration plot area from the Environment Department of Batu City is needed to pilot a hydroponic farming system. Historically, this land is believed to have often been used for repentance baths for the local community. Islamic and Javanese architectural concepts characterize this location because this location was an old *Punden* area in the past. Based on these results, design criteria are formulated according to the problems and characteristics of the area.

3. Results and Discussion

Based on the results of the literature study that has been carried out, several design criteria must be accommodated to apply a comprehensive eco-riparian concept. Besides literature studies, surveys and field discussions were conducted with the surrounding community and stakeholders. Several comprehensive eco-riparian design criteria need to be applied to the case study, namely, applying restoration and constructed wetland principles to conserve water resources at the location, emphasizing improving the quality of the natural, social, economic, and educational environment, and highlighting the historical value of the location where it is located. is a social and religious area for the community. Apart from that, infrastructure design also needs to accommodate eclectic vernacular and biophilic architectural approaches. These criteria will be applied using pragmatic methods to case study objects. Then, the results will be discussed with stakeholders and the community to obtain feedback and suitability. The design produced in this manuscript has gone through this discussion process.

Following the research method that has been determined, the analysis stage process is divided into several stages. Several design approaches can be applied in this case, such as the eco-riparian landscape concept, the Islamic concept of vernacular eclectic architecture, and biophilic architecture. This approach will be further developed according to the context and design stages. This discussion explains the design transformation process from the macro concept to the final design process in the form of a 3D visualization of the area. The design process was carried out by applying two main concepts for the landscape and supporting facilities: the Eco-riparian Landscape Concept and the Islamic design concept of Contemporary Vernacular Architecture and Bio Folia Architecture.

3.1. Application of the Ecoriparian Landscape Concept

The eco-riparian concept being developed includes the following criteria: Eco-riparian development based on wetland restoration and construction, which will be developed without

massively destroying the existence of the land, Prioritizing selection of landscape cover elements that can protect the preservation of water resources, Selection of vegetation to be maintained and added referring to several literatures. According to existing conditions and the results of stakeholder discussions, a zoning concept was obtained in the initial stage, as in Figure 3.

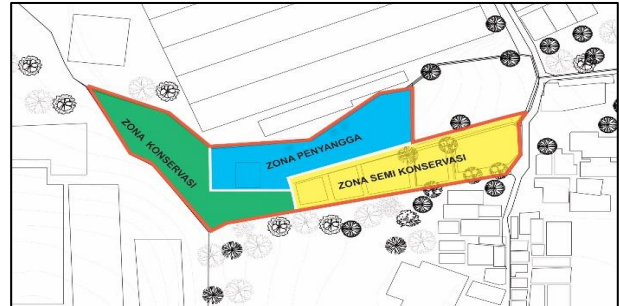


Figure 3. Case study location surrounded by industrial areas and dense residential areas. Source: Author's analysis and results of discussions with stakeholders in 2023

Wetland construction in the case study is carried out by creating drainage that can stem the overflow of rainwater from the surrounding environment so that the water source is not disturbed, such as by making earth retaining embankments and the concept of *Grojogan Telu* and *Grojogan Pitu* terraced ponds to increase the clarity of the spring water source and capacity. water resource pool as can be seen in Figure 4.

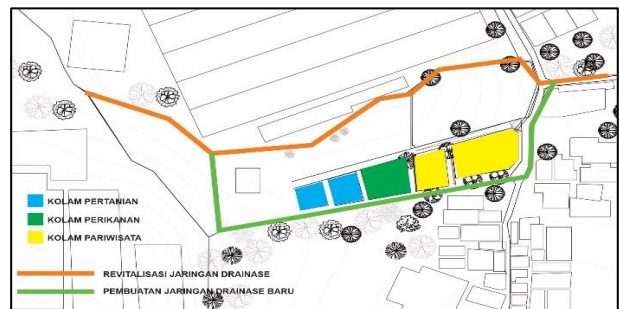


Figure 4. Wetland construction and restoration, Source: Author's analysis and results of discussions with stakeholders in 2023

Wetland restoration in the case study was done by treating water bodies using pollutant-binding vegetation, both above-water and terrestrial. Wastewater management is also done around the location by building communal IPALs for residential areas and existing tourist locations (Tondera et al., 2018). It is also supported by regular watering of eco enzymes in water bodies contaminated by human activities, as seen in Figure 5.

Table 1. Literature Review of Ecoriparian Concepts and Water Resources Conservation Study

Author/Year	Title	Theory	Research Methods	Research Finding	Research Contribution
(Khatulis tiyawati et al., 2021)	Kolaborasi Stakeholder dalam Pengembangan Kampung Wisata Ekoriparian Geblak Jambangan Stakeholder	Stakeholder collaboration in planning eco-riparian areas	Post Positivistic, qualitative approach descriptive	Forms of government collaboration are: 1) Policy and development strategy planning through work plans and RDTRK 2) Establishing tourism institutions and organizational structures, which can be done in collaboration with the community to manage the area into a tourism area 3) Acting in an entrepreneurial role, collaborating with industry parties and companies in developing locations.	Data collection activity schemes and strategies for finding design concepts through a collaborative process can be used in developing design criteria.
(Daisy et al., 2020)	Desain Lanskap Ekoriparian Babakan Pasar, Bogor.	Landscape design theory	descriptive method and spatial descriptive method and spatial	The eco-riparian concept is an effort to utilize the area around water bodies for tourism activities and water resource conservation, to create environmentally friendly landscape designs and protect water bodies from being polluted, through the creation of IPALs, the creation of good drainage sanitation networks, and the use of land.	The design method can be adopted and applied in the research design output.
(Wu, 2023)	The digital landscape design and layout of wetlands based on green ecology	Integration of biodiversity conservation and scientific plants, Integration of water purification and plant-community diversity of wetlands, and leisure	Parametric Simulation	Integrating artistic and ecological values, Parametric plant landscape design using 3D Max plant landscape modeling, ArcGIS, and Grasshopper software. Wetland environmental restoration and development focuses on the following factors: 1. Creating diverse waterbird habitats conducive to restoring biodiversity. 2. Attract tourists and build a natural, harmonious, rich, diverse wetland landscape pattern. 3. Plant communities are designed to improve water quality and purify the air.	Determine the design strategy to be developed and the 3D modeling method.
(Spieles, 2022)	Wetland Construction, Restoration, and Integration: A Comparative Review	Construction Wetland, Restoration Wetland, Integration Constructed Wet Land	Comparative Review	Wastewater treatment, long-term habitat development, functional diversity, and additional ecosystem services	Integrated constructed wetlands can be used as in developing criteria for the eco-riparian concept.
(Zhang, 2022)	The Ecological Environment Art Design of Urban Wetland Park: Taking the Landscape Design of Muye Lake Park in Xinxiang City as an Example	BIM-Based model for sustainable Building design	Hierarchical Comprehensive Index Analysis Quantitative Methods	Ecological criteria emphasize ecosystem diversity and wetland species diversity. Strategies to increase the aesthetics of wetlands include: 1. Reeds and calamus are planted in rivers, 2. Cover crops, forest plants, and tall trees are planted proportionally, and the plant community is well distributed. 3. Artificially constructed ponds are divided to form a network and agricultural land; 4. Persimmon trees, Mingshui, and mulberry bushes are randomly distributed in the wetland garden.	Existing ecological criteria can be adopted in landscape design strategies in research.
(Prastiyo et al., 2018)	Analisis Ekologi Lanskap Agroforestri Pada Riparian Sungai Ciliwung Di Kota	Ecological Landscape	Qualitative descriptive, Spatial Analysis	The existence of the Bogor Botanical Gardens supports the conservation of the Bogor area's reparation. The greater the number of settlement and housing patches in a landscape, the greater the number of garden patches in the area.	Qualitative descriptive methods and spatial analysis can be adopted in research.
(Stentella et al., 2023)	Ecological design of constructed wetlands in cold mountainous region: from literature to experience	horizontal subsurface flow (HSF), vertical subsurface flow (VSF), and free-water surface flow (FWS)	Literature Review, Case study, Meta-analyses	Significant results from floristic-vegetation monitoring and ecological indicators indicate that <i>D. Cespitosa</i> is excellent for most warm environments, and provides more environmental compatibility.	The type of vegetation and characteristics of the case study can be used in formulating a design strategy.
(Sun et al., 2019)	Emergy and eco-exergy evaluation of wetland restoration based on the construction of a wetland landscape in the northwest Yunnan Plateau, China	Sintesis emergy dan eco-exergy	Lorenz Curve Methods	In the case study, plants in the wetland increased rapidly from 26 species to 52 species after two years, with a gradual decline in pollutant-tolerant species and the reappearance of swamp plant communities of <i>Sparganium simplex</i> and <i>Batrachium bungee</i> that had disappeared over the years, condition of the wetland after restoration improve environmental quality and be more sustainable. Wetlands, after restoration, have a higher level of complexity and become independent and resilient natural systems.	The research results can be used as a reference that it will be possible to increase biodiversity in the environment and make it more sustainable in designing wetland restoration.

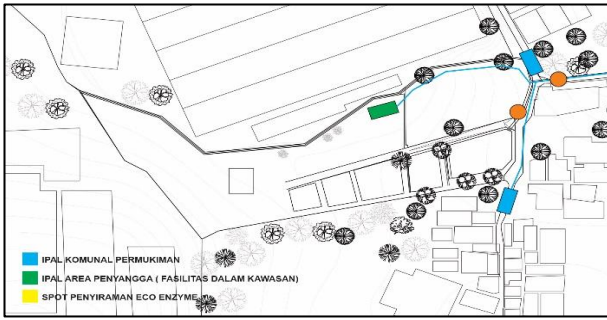


Figure 5. Position of Communal IPAL, Area Specific IPAL and Eco Enzyme Watering Spot. Source: Author's analysis and results of discussions with stakeholders in 2023

In addition, to support the soil quality around the site, several types of plants can be developed: shrubs, ground cover, shrubs, and trees. Representative trees for eco-riparian include jackfruit (*Artocarpus heterophyllus*), Lamtoro (*Leucaena Leucocephala*), Guava (*Psidium Guajava L*), Avocado (*Persea Americana*), Waru tree (*Hibiscus Tiliaceus*), Cempaka flower (*Magnolia Champaca*), Bamboo varieties (*Bambusa vulgaris*), Flamboyant flowers (*Delonix regia*). For groundcover plants, three types of plants can be used to hold up cliffs, namely vetiver grass (*Vetiveria Zizanioides*), elephant grass (*Pennisetum Purpureum*), and bamboo (*Bambusa sp.*) increasing the amount of vegetation in support (Zhang, 2022), where the quality of the wetland landscape can give full play to the wetland's ecological value and reflect the wetland's beauty. The distribution of this vegetation can be seen in Figure 6.

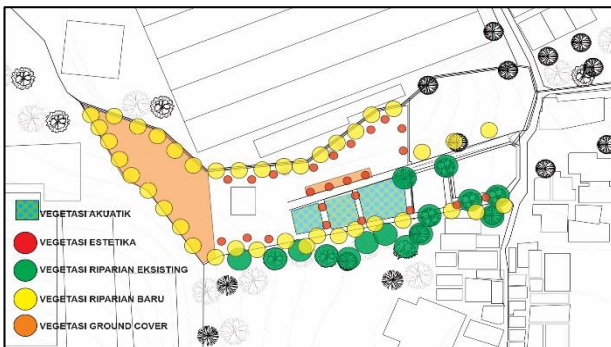


Figure 6. Distribution of riparian landscape vegetation and aquatic vegetation. Source: Author's analysis and results of discussions with stakeholders in 2023

As for the vegetation in the buffer zone, there are agricultural plant vegetation, including tomatoes (*Solanum Lycopersicum*), types of shallots (*Allium Cepa*), various types of chilies (*Capsicum Frutescens*), lettuce (*Lactuca Sativa*), mustard greens (*Brassica Rapa*) (Stentella et al., 2023). can be cultivated in aquaponics, hydroponics, or through conventional soil media. The buffer zone on the site is in the Batu

City Environment Service demonstration plot area, as shown in Figure 7.

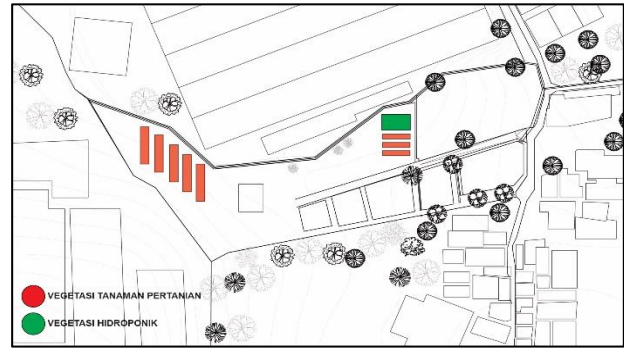


Figure 7. Distribution of agricultural plant vegetation and hydroponic vegetation. Source: Author's analysis and results of discussions with stakeholders in 2023

In the Landscape Scope concept, the activity area will use concrete grassblock material to increase the rainwater absorption area. Apart from that, in the landscape contour, several sediment catch basins are also made in the drainage area so that soil sediment is not carried directly into the drainage channel. Repairs were made to the water source pool area so that it remains strong and erosion does not occur by adding a parapet to the pool wall, as seen in Figure 8.

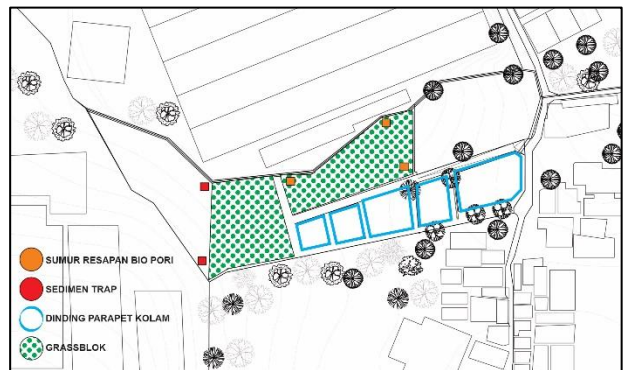


Figure 8. Work points for installing concrete grass blocks, infiltration wells, sediment traps, and pond embankment parapets. Source: Author's analysis and results of discussions with stakeholders in 2023

For the design of regional aesthetic support facilities, the design concepts of BioInspiration (ideas) are used, as biometrics (dimensions), Biomorphology (process), Bio mimetics (systems), and Biomechanics (adaptation). The bio concept produces a design that blends in with the environment around the location and gives a natural and natural impression (Justice, 2021). Several supporting buildings use existing materials around the site to reduce embodied energy in the construction process. The distribution of facilities can be seen in Figure 9.



Figure 9. Location of distribution of regional supporting facilities. Source: Author's analysis and results of discussions with stakeholders in 2023

3.2. Application of Islamic Concepts in Contemporary Vernacular Architecture and Bio Filia Architecture

In addition to the eco-riparian landscape concept, the development of the area is also balanced with the application of the concept of vernacular Eclectic Islamic Architecture to give the historical character of the location and area and protect the cultural values of Macari Village as a *Pesantren* area since the past (Widi & Prayogi, 2020). The concept of vernacular eclectic Islamic architecture is taken as a style for regional supporting buildings, this is because the existing location has a pavilion with a *Joglo* character, as shown in Figure 10.



Figure 10. Location of distribution of regional supporting facilities. Source: Author's design results based on discussions with stakeholders in 2023

The concept of activities at the location will include enjoying local culinary and UMKM, walking along the waterside path, taking photos of hidden and exciting spots, carrying out urban farming activities, gathering in public spaces along the water, passing by and enjoying the flora and fauna at the location, studying

eco-riparians, enjoying the waterfront park. water body. The distribution of activities can be seen in Figure 11.

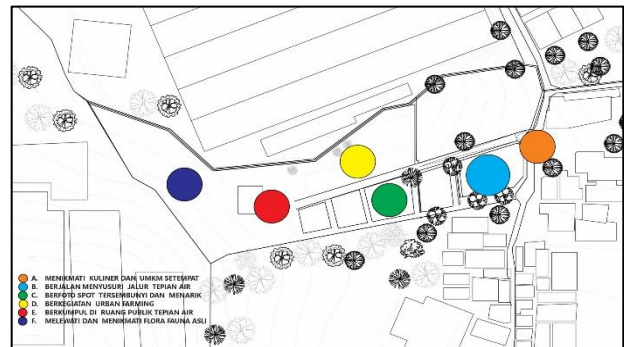


Figure 11. Location of activity distribution in the area. Source: Author's design results based on discussions with stakeholders in 2023

This activity was initiated to realize four main visions in regional development based on community collaboration. This area will become an area for environmental, educational, social, and economic-based facilities. Where the environment of this area functions as an area for the preservation and utilization of areas along the banks of springs and rivers, and also to maintain the environment according to its initial function. Socially, this area is programmed to improve its residents' health and prepare natural spaces in Batu. Apart from that, this area is also designed to provide a new social place for residents to carry out activities so that it becomes a new public space. This area will also support the regional economic vision by developing local UMKM and transforming settlements into educational tourism areas on the banks of springs and rivers. Apart from that, it will also support the educational vision of the area as an application of the "Biophilic" design approach to support natural health or well-being and also as an educational area and new reference for urban farming techniques for certain plants (Soderlund et al, 2016).

3.3. Design Visualization

After the analysis and synthesis process, the design stage continues in creating a 3D visualization of the planned area design. In the design of the main gate area, an open gate design was created, indicating that this area is a public area used by the public. This area applies the vernacular eclectic Islamic architectural design concept to the gate on either side of the main access as in Figure 12.



Figure 12. Visualization of the main gate area with the concept of Islamic eclectic architecture. Source: Author's design results based on discussions with stakeholders in 2023

The next area is a semi-public area with a 2nd gate, which has a canopy with a typical Joglo roof, as shown in Figure 13. The 2nd gate is designed to symbolize the historical value of the area to enhance the sacred impression of the area. Hierarchy in space is a characteristic of vernacular architecture, this should be maintained as a form of cultural heritage (Ira Mentayani et al., 2017).



Figure 13. Design of the 2nd gate in the area. Source: Author's design results based on discussions with stakeholders in 2023



Figure 14. Design of public water tourism area. Source: Author's design results based on discussions with stakeholders in 2023

The public tourist area is in a tourist water pool designed with the bio-philial architectural concept using natural materials to create a natural impression and blend with the surrounding environment (Zhong et al., 2022). In Figure 14 we can see that the gazebo area is designed using a dynamic curved shape

following the pattern of curved leaves. Apart from that, the water reservoir area has been redesigned with leaf shapes using bamboo material, and this building can also be used as a viewing tower for tourists. This area is also called the Grojogan Pitu area, where seven streams of water come from the holding pool above. Visitors can bathe and swim in this public pool.



Figure 15. Location of distribution of regional supporting facilities. Source: Author's design results based on discussions with stakeholders in 2023

The next area is a semi-public area where to enter the location, you have to go through the 2nd gate. This area has several facilities, including the *Grojogan Telu* pond, and the Environment Department of Batu City demonstration plot area for education on hydroponic farming and agricultural plants. There are also toilet facilities, particularly wastewater treatment plan areas, parking areas, and visitor gathering areas. Here, there are also activities to walk around the pond and enjoy the diversity of flora and fauna, as shown in Figure 15 and Figure 16.



Figure 16. Floating gazebo area agricultural pond and conservation pond. Source: Author's design results based on discussions with stakeholders in 2023

Figure 17 shows the design of the penitential bathing area and the conservation pond, where the water source is purer than the pond below. This pool area is also drained as a water source for toilets and a hydroponic area. In this area, chemicals such as detergent, bath soap, shampoo, and the like are prohibited. This area can only be accessed to carry out the repentance bathing ritual, which is only for specific times, and must ask permission from the location manager.



Figure 17. Pool area for penance bathing with an eclectic design. Source: Author's design results based on discussions with stakeholders in 2023

The next area is the main activity area for the Islamic boarding school, where there is a pavilion with a *Joglo* concept used by the community to share religious knowledge, such as recitations and other Islamic religious events. The existing *Joglo* is currently maintained and revitalized by adding several canopies made of bamboo, which have transparent roof coverings so that it does not damage the original shape of the existing *Joglo*, as seen in Figure 18.



Figure 18. shows the distribution of regional supporting facilities. Source: Author's design results based on discussions with stakeholders in 2023

4. Conclusion

In the case study of the spring area in Macari Village, Batu City, the application of a comprehensive Eco-riparian Concept can be carried out in several stages in order to obtain unified results and realize the regional development vision, which consists of four visions, namely, environmental, economic, social and educational visions. To make this happen, hierarchical stages must be carried out, such as conducting location surveys, conducting interviews with local communities regarding history and needs, holding discussions with stakeholders, conducting comprehensive literature studies regarding the eco-riparian concept, creating design criteria, and determining what supporting concepts are needed. will be developed, so that at the final stage, a unified design can be obtained that can be accepted by all stakeholders.

A comprehensive ecotourism concept in the design of water source areas must meet several

criteria, including restoration activities and wetland construction which can be created using a terraced pond concept so that treatment can be carried out in water source storage areas. The application of repair landscaping takes the form of vegetation management strategies in water body areas, ground cover vegetation, cliff-bearing vegetation, and vegetation that supports the area's aesthetics. Apart from that, wastewater and drainage management plans must also be implemented not to pollute the water source area. A comprehensive ecotourism concept must also be supported by main activity functions that support the area's vision so that regional supporting facilities are needed in architectural designs with an ecological and historical character. In the case study of the springs in Macari Village, the supporting concepts used are vernacular eclectic Islamic architecture and bio-philicia architecture. This concept is translated into a holistic visualization of the area design to produce a unified, functional, and aesthetic design for the area to accommodate the activities of space users. With the resulting design, it is hoped that all regional development visions can be realized at the location.

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