ARRANGEMENT OF THE CAMPUS AREA OF PANCA BUDI DEVELOPMENT UNIVERSITY IN FLOOD PREVENTION IN THE RAINY SEASON

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ABSTRACT

The arrangement of the Panca Budi Development University (UNPAB) Campus area in preventing flooding in the rainy season is an important issue that must be considered to maintain the smooth running of lecture activities and the comfort of the campus environment. This study aims to analyze and design flood mitigation solutions by applying *the concept of Integrated Water System Management* (IWSM) which can effectively manage rainwater flow. IWSM is a holistic approach that integrates green infrastructure and technology to manage stormwater, reduce runoff, and improve water quality. The method used in this study is a qualitative approach with a descriptive analysis of the existing conditions of the campus and the potential for the application of IWSM. The results of the study show that the implementation of IWSM on the UNPAB campus can reduce flood risk by improving the drainage system, increasing green open space, and utilizing rainwater harvesting technology. In addition, these solutions also contribute to groundwater management and create a greener and more sustainable environment. This study recommends regular maintenance of water infrastructure and increased awareness and participation of the academic community in maintaining the sustainability of the IWSM system on campus.

Keywords: Regional Planning, Panca Budi Development University Campus, Flood Prevention, Integrated Water System Management (IWSM), Rainwater Management, Sustainable Environment

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INTRODUCTION

Panca Budi Development University (UNPAB) is one of the educational institutions located in urban areas, which faces various challenges, one of which is the flood problem. Flooding is a problem that often occurs in many urban areas of Indonesia, especially during the rainy season. The UNPAB campus, which is located in an area prone to waterlogging, is also inseparable from this problem. Flood prevention in the campus area is very important to ensure comfort and safety for students, lecturers, and staff. Moreover, floods that occur in the campus area can disrupt lecture activities, damage facilities, and even endanger health. Therefore, the arrangement of the campus area by considering aspects of water management and flood disaster mitigation is one of the steps that needs to be considered in campus planning and management.

Figure 1.1 Location Plan of Panca Budi Development University (UNPAB)

The arrangement of the Panca Budi Development University (UNPAB) Campus in the context of flood prevention in the rainy season is an important step to create a comfortable, safe, and sustainable environment for the entire academic community. The problem of flooding that often occurs in the rainy season in the campus area requires serious attention related to spatial planning, drainage infrastructure, and rainwater management. Proper arrangement can reduce the impact of flooding and increase campus resilience to natural disaster risks. The campus area of Panca Budi Development University is located in an urban area with topographic characteristics and dense settlements. In the rainy season, high rainfall is often a trigger for local waterlogging and flooding around the campus area. This is due to the lack of green open space that functions to absorb rainwater, as well as drainage infrastructure that is not optimal in draining water into larger channels.

The geographical condition of the campus which tends to be flat and does not have adequate drainage channels is one of the main factors causing floods. What's more, with the development that continues to grow around the campus, green open space is increasingly limited, thus worsening nature's ability to absorb rainwater. Flooding is one of the environmental problems that are often faced by various regions in Indonesia, especially during the rainy season. This phenomenon does not only occur in residential or residential areas, but also begins to affect educational areas, including university campuses. Panca Budi Development University (UNPAB), as one of the universities located in urban areas, is also inseparable from the negative impact caused by floods, especially in the intense rainy season. Flooding in the campus area can cause various problems, ranging from disruption of the lecture process, damage to campus infrastructure and facilities, to increased potential health risks for students, lecturers, and staff in the campus environment. In addition, the long-term impact of flooding can also damage the drainage system, hinder academic activities, and affect the image of the campus in the eyes of the community.

The flood problem at the Panca Budi Development University Campus is mostly caused by several factors, including that the drainage channels on campus tend to be narrow and poorly maintained. Many channels are clogged with garbage or other materials that obstruct the flow of water, so rainwater cannot flow smoothly. The increase in the number of buildings and the lack of green open space cause a decrease in soil absorption to rainwater. The existence of parks and large open areas can help speed up the process of water infiltration into the ground, but in UPPB, this open space is still very limited. The construction of new buildings or facilities without paying attention to

water flow can change the pattern of rainwater flow that was originally able to flow freely into drainage channels. In addition, building materials that are not friendly to water absorption, such as concrete and asphalt, also exacerbate this condition. Good zoning in the campus environment not only serves to beautify the area, but also to maintain the smooth flow of water and prevent flooding. Therefore, more serious efforts are needed in planning and improving campus environmental management, focusing on drainage aspects, the use of green open space, and the use of technology that can support better rainwater management. The arrangement of the Panca Budi Development University Campus in preventing flooding in the rainy season requires a comprehensive and sustainable approach. Improving drainage systems, utilizing green open spaces, designing environmentally friendly buildings, and using technology in rainwater management are strategic steps that can be taken to reduce flood risk. Close cooperation is needed between all related parties to create a safe, comfortable, and sustainable campus for the entire academic community.

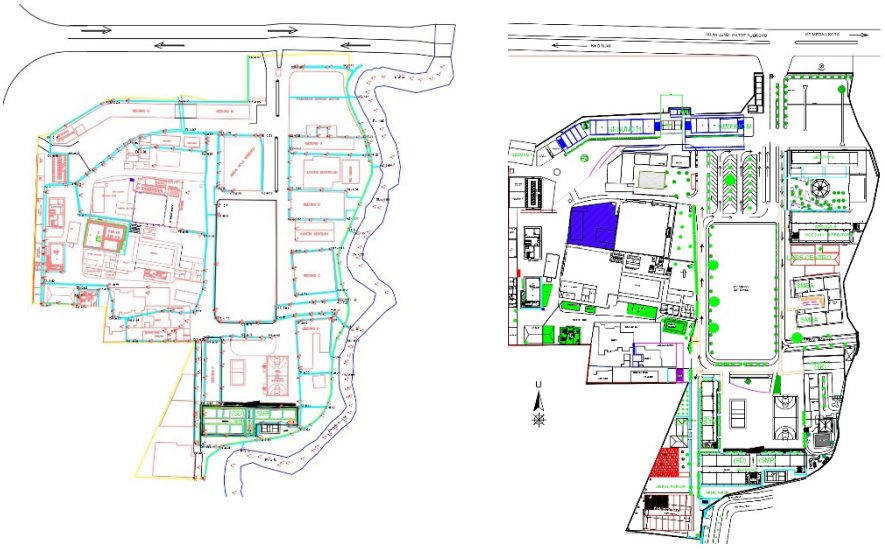

Figure 1.2 Existing Drainage Plan of Panca Budi Development University (UNPAB)

Figure 1.3 BMKG data in Medan Sunggal

LITERATURE REVIEW

Concept of Regional Planning

Regional planning is an effort to plan, manage, and control the use of space to achieve optimal, efficient, and sustainable spatial functions. According to Rahardjo (2020), regional planning aims to create harmony between the built environment and the natural environment in supporting human activities in a sustainable manner. In the context of the campus, regional planning includes spatial management, the use of green open space, and the management of supporting infrastructure such as drainage systems.

Flood Concept and Its Prevention

Flooding is a condition in which an area experiences waterlogging that exceeds the capacity of the drainage system, usually due to high rainfall, poor water management, or changes in land use.

According to Santoso et al. (2020), floods in urban areas are often triggered by uncontrolled urbanization, which leads to reduced water catchment areas and increased surface runoff.

Flood prevention efforts can be carried out through structural and non-structural approaches:

1. Structural Approach: Includes infrastructure development such as drainage, embankments, and retention ponds (Putri & Hadi, 2020).
2. Non-Structural Approach: Involving spatial planning policies, community education, and planting vegetation in catchment areas (Widodo, 2020).

Drainage System Management

Good drainage is a key element in flood prevention. According to Hakim (2020), an effective drainage system must be able to drain rainwater quickly from the ground level to the main channel without causing inundation. Drainage management principles include:

1. Drainage Channel Planning: Design a channel with adequate capacity to collect rainwater.
2. Channel Maintenance: Prevent blockages with regular cleaning.
3. Rainwater Management: Using technologies such as permeable pavements or bioretention.

The Role of Green Open Space in Flood Prevention

Green open space (RTH) is an area dominated by vegetation and has ecological, aesthetic, and social functions. According to Nugroho (2020), RTH can help prevent flooding by:

1. Absorbs rainwater into the soil.
2. Reduces surface water flow.
3. Provides a temporary storage area for rainwater (retention).

On campus, the existence of RTH also supports the comfort of the learning environment while supporting the principles of sustainable development.

Utilization of Technology for Flood Prevention

Modern technology can help in rainwater management and flood prevention. According to Pratama (2020), some of the relevant technologies include:

1. Rainwater Harvesting: Rainwater harvesting systems for reuse.
2. Smart Drainage System: Sensor technology to monitor the capacity of drainage channels in real-time.
3. Permeable Pavement: A material that allows rainwater to seep directly into the ground, reducing surface runoff.

Case Study of Regional Planning for Flood Prevention

Previous research has shown that spatial and environment-based approaches are very effective in reducing flood risk. According to Yulianto et al. (2020), a study on educational areas shows that a combination of adequate drainage systems and increased green space can reduce runoff volume by up to 30%. The results of this study are relevant to be applied on the Campus of Panca Budi Development University in flood mitigation efforts.

METHOD APPROACH

The research approach used is a qualitative descriptive method with the support of quantitative data. According to Sugiyono (2020), the descriptive method aims to describe the phenomenon in detail based on the data collected, while the qualitative approach is used to deeply understand complex problems, such as flooding in the campus environment. A quantitative approach is used to measure physical factors such as drainage capacity and the area of green open space. This research is a case study, as suggested by Yin (2020), which aims to analyze specific problems on the Panca Budi Development University Campus and identify context-based solutions.

The location of the research is the Panca Budi Development University Campus area, which is the subject of this study. Research focuses include:

1. Campus infrastructure: Drainage, building layout, and green open space.
2. Waterlogging data: Locations that frequently experience flooding during the rainy season.
3. Respondents: The academic community, including students, lecturers, and campus staff, to understand their perception of flood problems and solutions.

The data collection technique is carried out by referring to the triangulation approach, as explained by Creswell (2020). Techniques used include:

1. Field Observation Directly observe the physical condition of the campus, including the drainage system, spatial planning, and the existence of green open spaces. Observation is used to record waterlogging areas, rainwater flow patterns, and flood-prone locations.

2. Semi-Structured Interviews Interviews are conducted with campus facility managers, lecturers, and students to explore information about their experiences related to flooding and proposed solutions. This technique allows for in-depth information mining. *(Source: Yin, 2020)*
3. Documentation Studies Documentation such as campus maps, rainfall data, reports of previous flood events, and spatial planning documents are used to support the analysis.

The data were analyzed using relevant methods to answer the objectives of the study:

1. Qualitative Descriptive Analysis The data from interviews and observations were analyzed to describe campus conditions, causes of flooding, and potential appropriate solutions. According to Bogdan and Biklen (2020), this analysis aims to identify patterns and relationships between the observed variables.
2. Drainage System Modeling: Technical analysis was carried out to evaluate the capacity of drainage channels using rainfall data-based simulations.

Research Stages This research is carried out through several stages:

1. Preparation: Collection of documents and research permits.
2. Data Collection: Involves observation, interviews, and questionnaire distribution.
3. Data Analysis: Processing qualitative and quantitative data to produce research findings.
4. Report Preparation: Compile research results in the form of a written report.

Data validation is carried out by triangulation of sources and methods. Creswell (2020) emphasizes that triangulation ensures data accuracy by verifying information from various sources and collection techniques.

DISCUSSION

What is the condition of the Panca Budi Development University Campus in dealing with flood problems

The campus of Panca Budi Development University faces challenges in managing flood risks, especially during the rainy season. This problem is influenced by various factors such as infrastructure layout, drainage system capacity, and green open space management. Overall, flood mitigation efforts in the campus area show the need for strategic improvements to create a safer and more comfortable environment for the academic community.

1. Drainage System
   One of the main causes of flooding at the Panca Budi Campus is the drainage system that is not optimal. Many drainage channels on this campus experience obstacles in draining water efficiently. These channels are often clogged by garbage or sedimentation, reducing their capacity to accommodate high rainwater flows. In addition, drainage designs that do not pay attention to slopes or water flow patterns exacerbate this condition, resulting in inundation in various areas of the campus during heavy rains.
2. Layout and Infrastructure
   The layout of campus infrastructure also affects the region's ability to deal with flooding. The height of built-up areas, such as lecture buildings, parking lots, and paved roads, reduces the space available for water catchment. The remaining open areas have not been fully utilized to support rainwater management. In addition, some campus buildings are in low-lying areas, which are naturally more susceptible to inundation. The lack of adaptation of building design to flood risks, such as low floor heights, also exacerbates the situation.
3. Green Open Space (RTH)
   The green open space on the Panca Budi Campus has great potential to act as a natural catchment area. However, the area is still limited, so it is not able to accommodate large amounts of rainwater. In addition, the existing vegetation has not been optimized for flood mitigation purposes. Plants with high water absorption and ecological-based landscape design, such as rain gardens or retention ponds, have not been widely applied in campus areas.
4. Rainwater Management
   Rainwater management on campus is currently not well integrated. Technologies such as rainwater harvesting to utilize rainwater or permeable pavements to reduce water runoff have not been significantly implemented. As a result, rainwater tends to drain to the surface and cause inundation, rather than seeping into the soil or reused for other needs.
5. Impact on Activities

The flooding that occurred on campus caused serious disruption to daily activities. The flooded roads make it difficult for students, lecturers, and staff to move. In addition, prolonged standing water can damage infrastructure, such as building floors and campus roads. This situation not only reduces comfort, but also reduces the productivity of the academic community.

Overall, the condition of the arrangement of the Panca Budi Development University Campus in dealing with floods requires significant improvements. A strategic approach involving improving drainage systems, increasing green open spaces, and applying rainwater management technology is urgently needed to reduce flood risk. With the right measures, this campus can increase flood resilience while creating a more welcoming and sustainable learning environment.

What are the factors that affect the occurrence of floods around the UNPAB campus

The campus of the Panca Budi Development University (UNPAB) faces flood problems that often occur in its area, especially during the rainy season. This problem is influenced by various factors that can be categorized into natural factors and man-made factors. The following is a detailed discussion of the factors that contribute to the occurrence of flooding around the UNPAB campus:

1. Natural Factors
   a. High Rainfall
      Medan, where the UNPAB Campus is located, is an area with significant rainfall, especially during the rainy season. The high intensity of rain causes rainwater to not be properly absorbed by the soil, thereby increasing the potential for inundation and flooding in the campus area.
   b. Geographical Conditions
      Part of the campus area is in the lowlands which is a natural shelter for water flows from the higher areas around it. This condition increases the possibility of waterlogging, especially when the drainage system is not able to drain rainwater efficiently.
   c. Decrease in soil absorption
      The land around the campus, which used to be land with natural vegetation, has been converted into residential and commercial areas. This process reduces the soil's ability to absorb water, so rainwater flows more on the surface (surface runoff), increasing the risk of flooding.
3. Man-made factors
   a. Suboptimal Drainage System
      Drainage in and around the UNPAB Campus is often inadequate to accommodate high volumes of rainwater. Problems such as sedimentation, garbage blockages, and poor drainage design cause rainwater to overflow into the surrounding area, creating puddles or flooding.
   b. Inadequate Spatial Planning
      Campus spatial planning that prioritizes built-up areas such as lecture buildings, parking lots, and roads, tends to ignore the existence of green open spaces that are adequate for water infiltration. As a result, rainwater runoff increases and triggers inundation in several areas of the campus.
   c. Land Use Transfer Around Campus
      Land use changes around the UNPAB Campus into dense settlements and commercial centers have exacerbated the situation. Areas that once served as catchment areas have now been covered by buildings and roads, reducing rainwater catchment capacity.
   d. Community Habits in Waste Management
      Indiscriminate disposal of garbage, especially into drainage channels, has become a serious problem. Garbage that accumulates in waterways hinders the flow of water, thus exacerbating the risk of flooding on campus and its surroundings.
   e. Lack of Rainwater Management Infrastructure
      Technologies to manage rainwater, such as infiltration wells, retention ponds, or permeable pavements, have not been fully implemented on campus. This causes rainwater to flow directly to the surface without having time to absorb or utilize, worsening inundation.
4. External Factors
   a. Urban Conditions Around the Campus
      The UNPAB campus is located in an urban area that continues to grow. Rapid urbanization has led to an increase in the number of buildings, roads, and other facilities,

which reduces water catchment areas. In addition, water flows from the surrounding area that are also not well managed often end up in the campus area, increasing the risk of flooding.

b. Lack of Coordination with Local Governments
The problem of flooding is not only the responsibility of the campus, but also the local government. Lack of coordination in urban drainage management and regional planning exacerbates flood risks on campus and beyond.

The occurrence of floods around the Panca Budi Development University Campus is influenced by a combination of natural factors, such as high rainfall and geographical conditions, as well as man-made factors, such as poor drainage systems, land conversion, and lack of green open space. To overcome this problem, a holistic approach is needed that involves improving infrastructure, better spatial management, and active awareness and participation from all stakeholders, including the campus, the community, and the local government. Thus, the risk of flooding in the campus area can be minimized in a sustainable manner.

How to plan campus areas that can reduce the impact of flooding in the rainy season

The concept of Integrated Water System Management (IWSM) can be applied at the Panca Budi Development University (UNPAB) Campus to overcome flood problems during the rainy season. This approach integrates water management holistically by considering technical, ecological, and social aspects. The following are the details of the implementation of IWSM on the UNPAB campus:

1. Water-Based Spatial Planning
   a. Flood Risk Mapping Identify areas of campus that are prone to flooding, such as inundation points and waterways. Determine strategic locations for green open spaces and water catchment zones.
   b. Infrastructure Rearrangement Reduce waterproof areas, such as paved roads and concrete, by replacing them with permeable materials. Adjust the elevation of buildings in flood-prone areas to prevent inundation.
   c. Green Open Space Development (RTH) Adding vegetation that is able to absorb water well, such as deep-rooted trees and water-retaining plants. Create rain *gardens* in strategic areas to slow rainwater flow and increase infiltration.

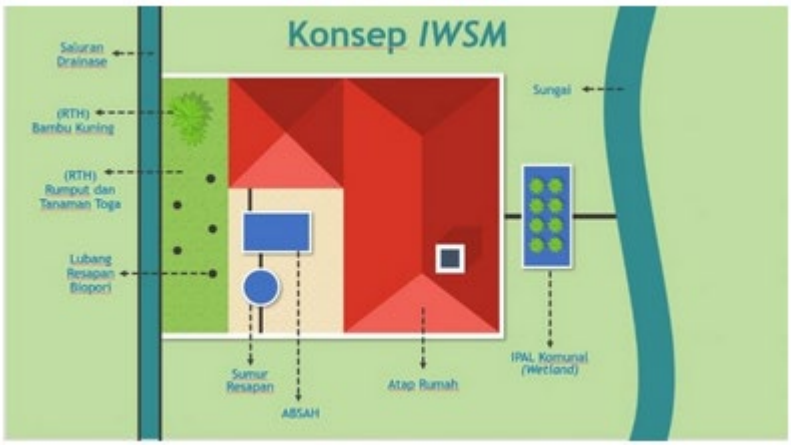

Figure 4.1 Integrated Water System Management (IWSM) Concept

2. Efficient Drainage System
   a. Revitalization of Drainage Channels Increase the capacity of existing drainage channels to be able to drain water smoothly during heavy rains. Added a filter at the mouth of the channel to prevent the ingress of garbage and sedimentation.
   b. Nature-Based Solutions Applying vegetation-based drainage channels, such as bio-swale, to manage rainwater runoff naturally. Integrating infiltration ponds in the campus area as a buffer when high rainfall occurs.

3. Utilization of Technology for Rainwater Management
    a. Rainwater Harvesting Installing a rainwater harvesting system on the roof of a campus building to collect water, which can then be used for garden watering or other non-potable needs.
    b. Artificial Infiltration Creating infiltration wells at inundation points to accelerate rainwater entering the ground. Utilizing permeable pavements in parking areas and campus roads to reduce surface flow.
    c. Monitoring System Uses IoT-based technology to monitor rainfall levels, inundation, and drainage capacity in real-time. Providing early warning to the academic community if there is a threat of flooding.
4. Education and Participation of the Academic Community
    a. Awareness Campaign Holds training and seminars on the importance of sustainable water management. Forming a campus environmental care group to ensure that the implementation of the water management program runs well.
    b. Student Participation Integrate flood mitigation programs as part of the curriculum or extracurricular activities. Involve students in research projects and development of water management technology.
5. Flood Management Infrastructure
    a. Retention and Detention Ponds Create retention ponds in the campus area to collect excess rainwater and drain it gradually into the main drainage system.
    b. Small Embankments and Water Pumps Build small embankments in areas that are often flooded to divert water flow. Install water pumps at critical inundation points to drain water to the main line.
6. Benefits of Implementing IWSM on the UNPAB Campus
    a. Reducing Flood Risk: With a holistic approach, the IWSM system is able to effectively manage rainwater runoff so that flood risk can be minimized.
    b. Improving Environmental Sustainability: This approach supports a greener and greener campus ecosystem.
    c. Providing Education: This concept can be used as an education and research model for sustainable water management in urban areas.
    d. Increasing Comfort and Productivity: By minimizing waterlogging, lecture activities and campus operations can run without interruption.

The implementation of IWSM on the Panca Budi Development University Campus requires strategic planning, technology investment, and collaboration between the campus, local government, and the community. With this concept, the campus can not only overcome floods, but also become an example of sustainable integrated water management.

CONCLUSION

The conclusion in this chapter presents the results of an analysis of research related to the arrangement of the Panca Budi Development University (UNPAB) campus in flood prevention in the rainy season by applying the concept of *Integrated Water System Management* (IWSM). Here are the main points of the conclusion:

1. The arrangement of the UNPAB campus area has several obstacles related to rainwater management, such as an inadequate drainage system, lack of green open space, and the existence of a large waterproof area. This causes waterlogging at several points on campus during the rainy season.
2. The implementation of IWSM has proven to be a holistic solution in overcoming the problem of flooding on campus. This approach involves: Spatial management that integrates green infrastructure such as rain gardens, retention ponds, and permeable surfaces. Technology-based water management systems, such as *rainwater harvesting* and infiltration wells to utilize rainwater while improving groundwater quality. An effective nature-based drainage system to reduce surface runoff and optimize water infiltration.
3. The implementation of this concept not only reduces the risk of flooding, but also creates a greener, more comfortable, and sustainable campus environment. In addition, the existence of green open spaces that are integrated with the IWSM system improves the aesthetics of the campus and becomes an environmental education area for students.
4. The arrangement of the Panca Budi Development University Campus with the application of the IWSM concept is an innovative solution to overcome the problem of flooding in the rainy season.

This approach is able to create a water-friendly, efficient, and sustainable environment, while contributing to the sustainability of water resources in the campus area.

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