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IMPLEMENTATION OF DIGITAL TECHNOLOGY IN GREENING AND TREE PLANTING PROGRAMME

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Abstract

Afforestation and tree planting are important programmes for climate change mitigation and environmental conservation. However, the effectiveness of these programmes is often constrained by a lack of monitoring, documentation, and community involvement. The implementation of digital technology is an innovative solution to overcome these challenges. This community service aims to integrate digital technology in reforestation and tree planting programmes through the use of map-based applications, social media, and environmental sensors. This community service activity includes training on the use of location marker applications, monitoring tree growth with sensors, and digital campaigns to increase community participation. With the digital system, data related to tree conditions can be updated in real-time and easily accessed, so that it can help related parties in conducting evaluations and counselling that is more targeted. The results of this service show that digital technology increases community involvement, makes it easier to track the development of plants, and strengthens the transparency of the greening programme. This implementation is expected to become a model of sustainability in a wider community-based greening project.

Keywords : ***Digital Technology in Greening, Tree Planting Programme, Model of Sustainability***

1. Introduction

Environmental degradation and deforestation are global problems that threaten the sustainability of Earth's ecosystems. Human activities such as illegal logging, intensive agriculture, urbanisation and industrialisation have caused significant forest destruction. As a result, air quality decreases, biodiversity decreases, and extreme climate change occurs. Climate change caused by increased greenhouse gas emissions has led to a variety of natural disasters such as floods, droughts and increasingly frequent storms. Afforestation and tree planting are considered as one of the natural solutions to mitigate climate change, as trees are able to absorb carbon dioxide (CO2) from the atmosphere and store the carbon in the form of biomass. The role of digital technology has experienced rapid development and opened up new opportunities to improve the efficiency and effectiveness of various programmes, including greening and tree planting. Some relevant digital technologies include: Geographic Information System (GIS), Drones, Mobile Apps, and Internet of Things (IoT). The use of digital technologies in greening programmes can also increase community engagement. Mobile applications and digital platforms can be used for environmental education, greening campaigns, and reporting of tree planting activities by the community. The active involvement of the community is crucial to ensure the sustainability of the reforestation programme.

The implementation of digital technology in greening programmes requires collaboration between various parties, including the government, non-profit organisations, technology companies, and local communities. Support from the government and international organisations in the form of regulations, funding, and policies are needed to support the success of the programme. While digital technology

offers many benefits, there are some challenges that need to be overcome, such as high implementation costs, limited technology infrastructure in remote areas, and the need for training for local labour. Creative funding strategies, partnerships with technology companies, and comprehensive training programmes can be solutions to overcome these challenges. The implementation of digital technology in the reforestation programme is expected to provide significant long-term benefits. In addition to assisting in climate change mitigation and environmental conservation, the programme can also improve the quality of life of the community through improved air quality, reduced risk of natural disasters, and the provision of employment in the environmental sector.

This community service involves multinational companies including PT Mahkota Group, Tbk, PT Mark Dynamics and Lions Club. This cooperation that has been established provides several objectives to create a green and beautiful environment with the help of digital technology as a way to increase the role of technology in greening the area around the Deli River. Silalas Village is located in Medan City, North Sumatra, and is one of the areas travelled by the Deli River. The banks of the Deli River in this area are often the location of community settlements with various social and economic backgrounds. The community in Kelurahan Silalas generally consists of various ethnicities and cultures, with the majority of residents coming from Batak, Malay and Javanese ethnic groups. Many residents work in the informal sector, such as street vendors, labourers, fishermen, and casual workers. Some also work in the service and industrial sectors. Most people have low to middle income levels, which often makes them vulnerable to economic and social change. The banks of the Deli River in Kelurahan Silalas are often densely populated, with simple and often uninhabitable housing conditions. Poor sanitation facilities and lack of access to clean water are major problems. This has an impact on the health of the community, which is often exposed to diseases related to environmental hygiene. The Deli River is often used as a dumping ground for rubbish by the local community, causing water and environmental pollution.

The implementation of the reforestation and tree-planting programme on the banks of the Deli River faces various challenges related to the local community. Here are some of the main issues that need to be addressed:

1. Low Environmental Awareness: Communities along the Deli River may have a low level of awareness about the importance of reforestation and environmental conservation. Education and environmental awareness campaigns need to be improved to encourage their active participation.
2. Lack of Participation: People's motivation to get involved in reforestation programmes is often low. This could be due to a lack of understanding of the long-term benefits of the programme or distrust of the programme's effectiveness.
3. Irregular Land Use: Riverbanks are often used for various activities such as settlement, agriculture, and trade, which can lead to conflicts in land use for afforestation.
4. Land Ownership: Unclear or insecure land ownership rights can be a barrier. Communities may be reluctant to participate in afforestation programmes if they feel the land will not provide direct benefits to them.
5. Economic Dependence on Riverbank Activities: Many people depend on riverbank activities for their livelihoods, such as fishing, farming or trading. Afforestation that does not consider this economic aspect may lead to resistance.
6. Economic Prosperity: Afforestation programmes should consider ways to improve the economic well-being of communities, for example by providing jobs related to afforestation projects or developing an environment-based local economy.
7. Limited Access to Technology: The implementation of digital technology in greening programmes may face constraints if local communities have limited access to technology or lack the necessary technical skills.

8. Infrastructure Limitations: Inadequate infrastructure along the Deli River may hinder programme implementation, such as poor road access or lack of electricity.
9. Lifestyle Changes: Greening programmes may require changes in people's lifestyles and habits. For example, a ban on littering along the riverbanks or restrictions on land use.
10. Resistance to Change: Communities may show resistance to change, especially if they feel that the programme threatens their traditional way of life or livelihood.

The objectives of this community service activity are to: (1) Reduce Environmental Degradation: a. Greening: Planting trees to restore ecosystem functions and improve environmental quality on the banks of the Deli River; b. Climate Change Mitigation: Reducing carbon dioxide emissions through increased vegetation, (2) Improving the Quality of Life of the Community: a. Environmental Health: Improve air quality and reduce pollution, thereby improving public health; b. Sanitation and Clean Water: Improve river water quality by reducing pollution and providing vegetation that aids natural filtration, (3) Community Empowerment and Participation: a. Environmental Education: Increase community awareness and knowledge on the importance of protecting the environment, b. Active Participation: Involving the community in the planning, implementation, and maintenance of reforestation projects, (4) Utilisation of Digital Technology: a. Efficiency and Accuracy: Use technologies such as GIS, drones, and mobile applications to effectively monitor and manage afforestation activities, b. Data Collection: Recording and analysing environmental data to make better, data-driven decisions, (5) Local Economic Development : a. Employment: Create employment opportunities for local communities in reforestation projects, b. Eco-friendly Products: Developing local products that support environmental sustainability.

2. Methodology

The implementation of this research has stages in its implementation, among others: (1) Mechanism for Implementing Community Service Activities: The implementation of community service refers to the implementation as usual which is held every period of implementation of community service activities; (2) Preparation Material and Debriefing: The materials that will be given to service participants during debriefing are general material and technical material in accordance with the title of the service. Implementation of activities (Partner Participation in Community Service Activities). The implementation of community service activities in an effort to increase the development of Human Resources (HR) community awareness and in the campus environment of Mahkota Tricom Unggul University, Perintis Village, East Medan District will implement the Implementation of Digital Technology in the Greening and Tree Planting Programme on the Deli Riverbank, Silalas Village, as follows:

1. Initial Planning
   a. Site and Needs Analysis
      - Site Survey: Using drones and GIS to map the area along the Deli River that will be greened.
      - Soil Analysis: Using IoT sensors to collect data on soil conditions, moisture, and nutrients.
   b. Feasibility Study
      - Ecological Feasibility: Assesses the ecological feasibility of the area for tree planting based on soil type, climate, and local vegetation.
      - Socio-Economic Feasibility: Identifies the potential social and economic impacts of the programme on the local community.
   c. Community Participation and Consultation
      - Discussion Forum: Organise meetings with residents to obtain inputs and ensure community support and participation.
      - Stakeholder Consultation: Work with government, non-profit organisations, and the private sector to gain support and collaboration.

2. Technology Development and Implementation

a. Use of GIS and Drone Technology
   - Digital Mapping: Create accurate digital maps of planting areas using GIS and aerial images from drones.
   - Periodic Monitoring: Using drones to conduct regular monitoring of tree growth and environmental conditions.

b. Mobile and IoT Applications
   - Mobile Application: Develop a mobile application for recording and reporting tree planting and maintenance activities by the community.
   - IoT Sensor: Install sensors in planting areas to monitor soil moisture, temperature, and other conditions in real-time.

3. Implementation of Planting Activities
   a. Land Preparation
      - Land Clearing: Clearing the land of rubbish and materials that hinder planting.
      - Soil Processing: Tilling the soil to make it ready for tree planting, including the addition of fertilisers and nutrients if required.
   b. Tree Planting
      - Tree Species Selection: Selecting tree species that suit the environmental conditions and needs of the local ecosystem.
      - Simultaneous Planting: Organising a simultaneous tree planting event with the participation of the community, students, and volunteers.

4. Maintenance and Monitoring
   a. Tree Care
      - Watering and Fertilisation: Conduct regular watering and fertilisation to ensure optimal tree growth.
      - Pruning and Pest Control: Conduct regular pruning and pest control.
   b. Periodic Monitoring
      - Use of Technology: Using drones and IoT sensors to conduct periodic monitoring of tree and environmental conditions.
      - Reporting and Evaluation: Using mobile applications to periodically report and evaluate the progress of the programme.

5. Community Education and Empowerment
   a. Training Programme
      - Technical Training: Provide technical training on planting, maintenance, and use of technology for local communities.
      - Environmental Education: Organise environmental education campaigns to raise community awareness on the importance of afforestation.
   b. Community Involvement
      - Community Working Group: Establish a community working group to manage and maintain the reforestation area.
      - Active Participation: Encourage active community participation through gotong royong activities and volunteer programmes.

6. Continuous Evaluation and Development
   a. Programme Evaluation
      - Periodic Assessment: Conduct periodic assessments of programme successes and challenges.
      - Community Feedback: Collect feedback from the community to improve and develop the programme.
   b. Sustainable Development
      - Sustainable Management Model: Develop a sustainable management model to ensure the sustainability of the programme.
      - Technology Development: Continue to develop and update the technology used to improve the efficiency and effectiveness of the programme.

3. Result and Discussion

Based on the description of the problems and arguments as described above, a solution must be given to the problems that exist in the Deli Riverbank of Silalas Village. Based on the description of the problems and arguments as described above, a solution must be given to the problems that exist in the Deli Riverbank of Silalas Village. Solutions and approaches to overcome these problems include conducting intensive education and socialisation campaigns on the importance of afforestation and its benefits to the environment and community welfare, providing training programmes for communities on tree planting techniques, plant maintenance, and the use of relevant technologies, engaging communities in dialogue and consultation from the planning stage to ensure that their interests and needs are taken into consideration, working with local governments to clarify and secure ownership rights of land to be used for afforestation, developing sustainable local economic programmes, Develop sustainable local economic programmes, such as ecotourism or non-timber forest products, create jobs associated with afforestation projects, such as labour for tree planting and maintenance, ensure better access to technology through the provision of technical tools and training, work with government and other organisations to improve basic infrastructure that supports programme implementation, involve communities throughout the programme planning and implementation process to ensure that proposed changes are in line with local values and needs, and develop inclusive and equitable programmes that consider the social and cultural impacts on all levels of society. By addressing these issues through a strategic and inclusive approach, the reforestation and tree planting programme along the Deli River can be successful and provide long-term benefits for the environment and local communities.

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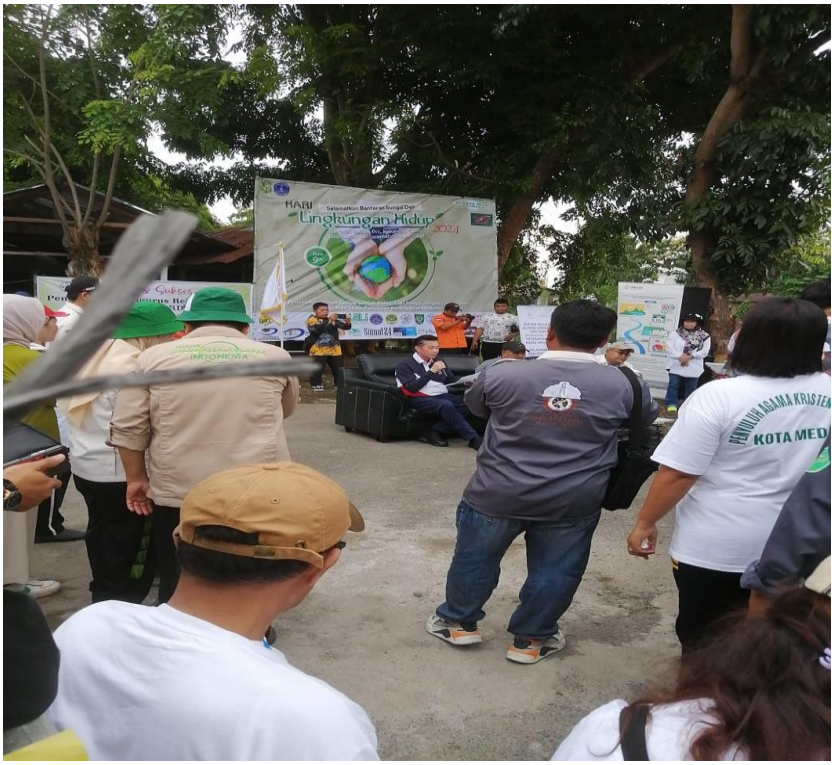

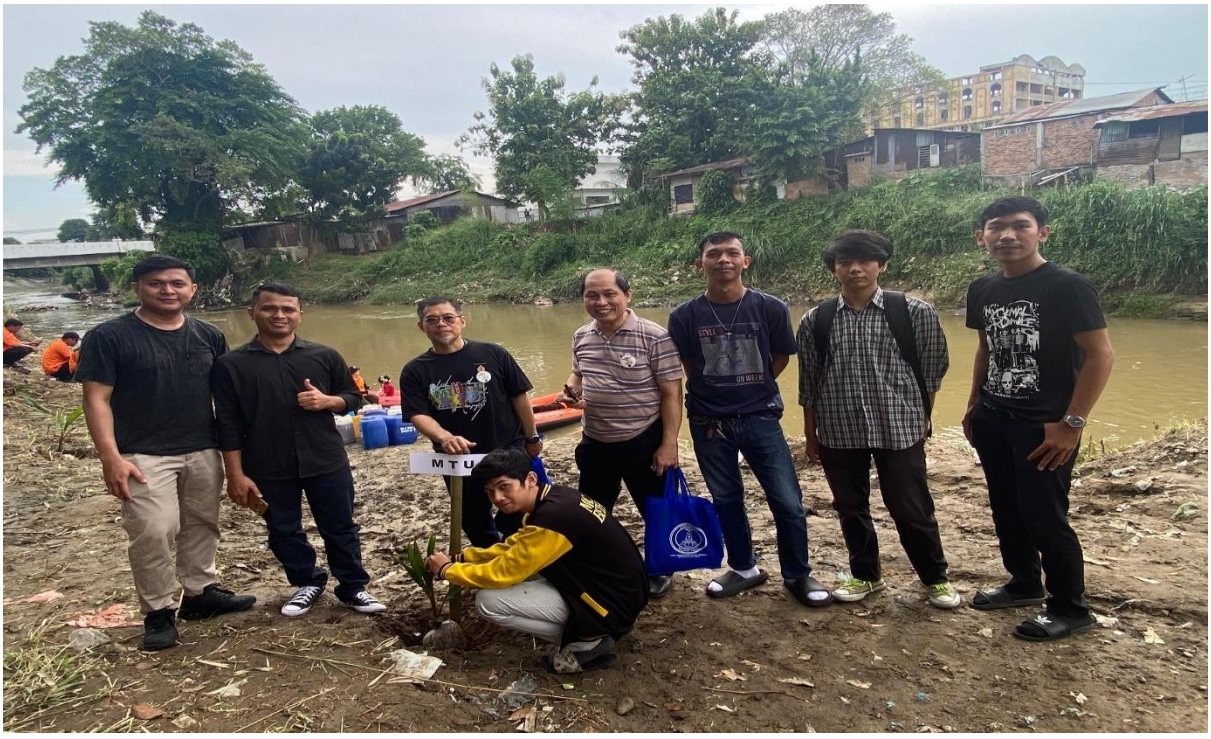

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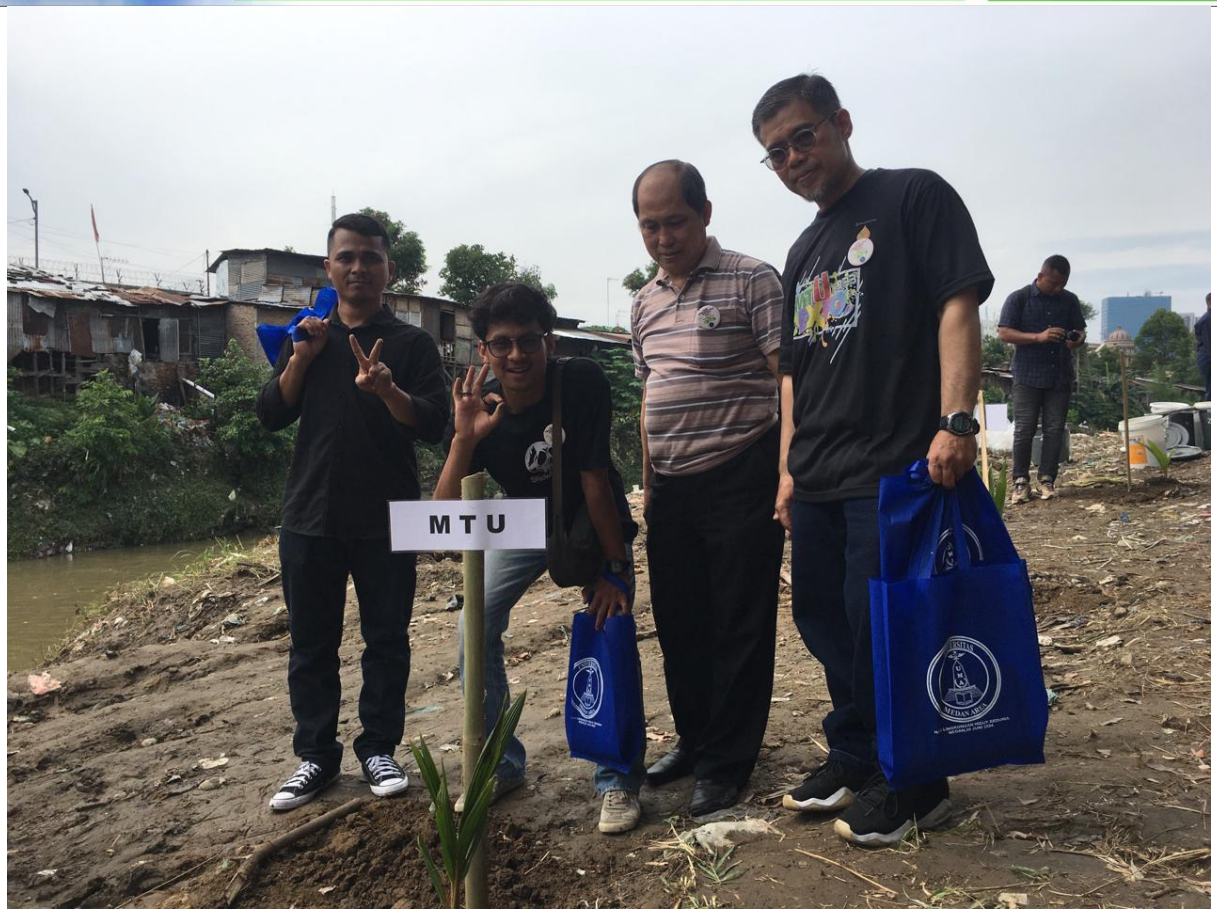

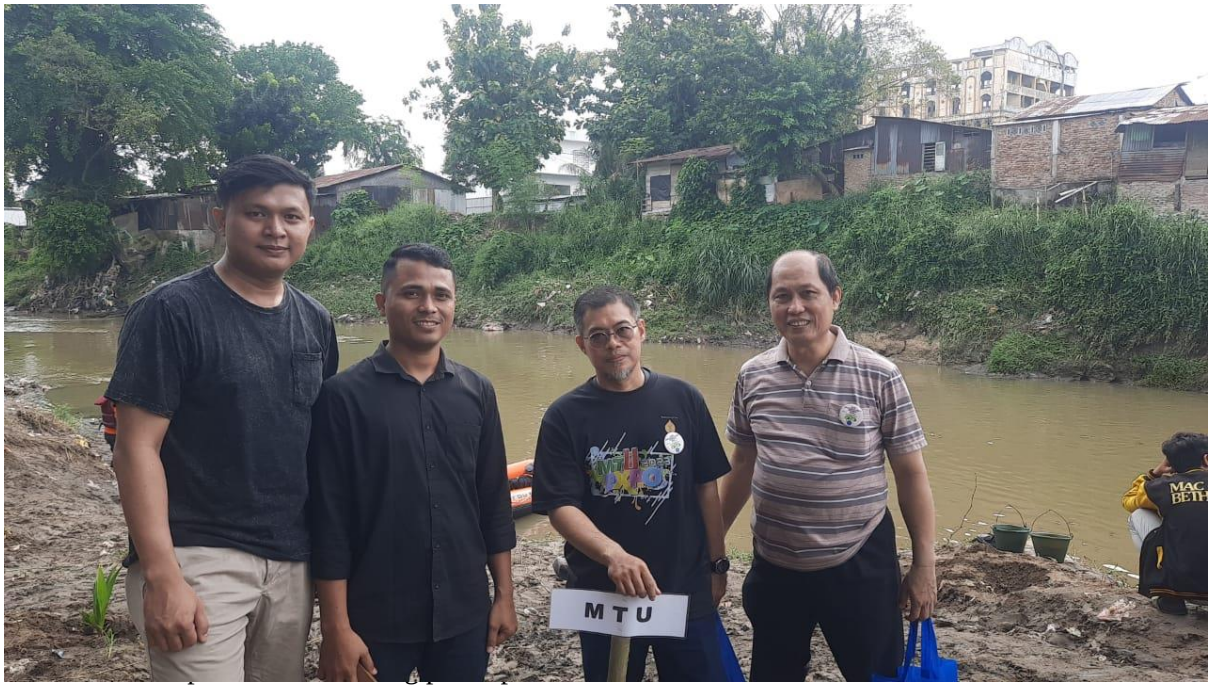

The response of the trainees will be measured through observation during the training and by providing a questionnaire concerning the impressions, suggestions, criticisms and proposals of the trainees towards this community service programme.

2. Improved skills of the participants after the training
   Trainees' skills will be observed during the training by giving assignments on design application examples.

4. Conclusion

The activity of implementing digital technology in the reforestation and tree planting programme on the banks of the Deli River, Silalas Village, has a clear objective to reduce environmental degradation, improve the quality of life of the community, and utilise technology for programme sustainability. The benefits generated from this activity include environmental, social, economic, and technological aspects, all of which contribute to the sustainable development and welfare of the local community.

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