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STRENGTHENING DIGITAL VILLAGE TRANSFORMATION THROUGH ASSISTANCE WITH SMART VILLAGE INFORMATION SYSTEMS (SIDESA) AND SALT POTENTIAL MAPPING IN LEMBUNG VILLAGE, PAMEKASAN REGENCY

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Abstract

Digital village transformation in Indonesia is crucial for improving government services, regional economies, and quality of life. The Indonesian government promotes this through policies like Village Regulation No. 8 on the Village Information System (SID). Mapping salt potential is also essential for effective resource management, environmental conservation, and reducing poverty. These initiatives aim to empower communities, enhance services, and foster economic growth. However, The implementation of Village Information Systems (SID) faces challenges due to lack of ICT infrastructure, low digital literacy among village officials, limited network connectivity, absence of electricity, and heavy workloads. Addressing these issues, enhancing digital literacy, and ensuring consistent network availability are crucial for efficient rural service delivery. This community service activity aims to (1)create a web-based Smart Village information system, (2)create a digital map of salt potential, (3)improve the skills of village officials in digital-based archive management and administration, (4)improve management and development of village potential by building an intelligent village information system (SIDESA) and a salt potential map. The output of this activity produces (1) a web-based intelligent village information system (SIDESA), (2) the official Lembung Village website, (3) a digital map of salt potential, and (4) a monograph book: GIS-based intelligent village information system. The Lembung Village, digital village transformation, has been successful, with the Smart Village Information System (SIDESA) and digital maps of salt potential being developed and used by village officials and the community. The average knowledge of SIDESA increased from 30% to 85% after training, and satisfaction with the system reached 90%. The digital map had a 95% accuracy rate, and the training and mentoring increased understanding to 82%. A monograph book was published, achieving 80% reader satisfaction.

Keywords: Digital village, Smart Village information system, Digital map, Salt Potential

INTRODUCTION

The urgency of digital village transformation in Indonesia stems from the potential to enhance village government services, improve regional economies, and elevate the quality of life through smart village development programs.(Alhari et al., 2022). Despite a digital transformation in rural areas, there remains a gap in internet access compared to urban areas, emphasizing the need for Information, Communication, and Infrastructure (ICI) to maintain social resilience in villages.(Irmayani et al., 2022). Furthermore, Indonesia's focus on digital infrastructure and human resource development, particularly in the MSME sector, highlights the necessity for digital adoption and transformation to boost the national economy.(Hamjen et al., 2022). Therefore, accelerating digitalization in villages is crucial for empowering communities, enhancing services, and fostering economic growth in Indonesia.

The Indonesian government has been actively promoting digital village transformation through various policies, including Village Regulation No. 8 of 2021 on the Village Information System (SID)(Hamka et al., 2023). This regulation aligns with the broader trend of developing digital villages to enhance community participation and improve information services.(Ibrahim, 2023). The SID aims to facilitate easy access to information and services for the village community, leveraging technology to increase the efficiency and effectiveness of public services.(Fajar, 2023). Additionally, developing digital villages in Indonesia involves collaborative governance, innovative approaches, and the integration of smart technologies to support local development and address challenges such as spatial vulnerability and depopulation.(Muhtar et al., 2023). By implementing SID and similar initiatives, the Indonesian government seeks to empower villages with digital tools for better service delivery and community engagement.

Mapping salt potential is crucial due to its environmental impact and economic significance. Understanding the distribution and characteristics of salt deposits aids in effective resource management and environmental conservation(Soliman et al., 2021). It is essential for reducing poverty among women in coastal areas by identifying social potentials and barriers to development.(Radjab & Simmau, 2019). In regions like Australia, mapping salt stores helps predict salinity risks and prioritize management strategies.(Zach et al., 2009). Moreover, mapping salt-affected cropland in areas like the Hetao Irrigation District in China is vital for evaluating environmental impacts and ensuring food security.(Wygralak et al., 2001)Mapping salt potential enables better decision-making for sustainable development and resource utilization using advanced techniques like remote sensing and geophysical methods.

However, The implementation of Village Information Systems (SID) faces challenges due to several factors highlighted in the research papers. The lack of ICT infrastructure and low digital literacy among village officials hinder the optimal utilization of village data and technology-based public services.(Fajar, 2023; Gufran et al., 2023). Additionally, issues such as limited network connectivity, absence of electricity, and heavy workloads impact the successful implementation of digital systems in village governance.(Ichsan et al., 2023). These challenges underscore the importance of addressing infrastructure gaps, enhancing digital literacy among village personnel, and ensuring consistent network availability to fully leverage the potential of Village Information Systems for efficient public service delivery and governance in rural areas.

Lembung Village is in the Galis sub-district, Pamekasan Regency, East Java. Geographically, Buddagan Village is located at -7.163094, 113.553977 to -7.170161, 113.574406 and is also located at -7.152533, 113.567109 to -7.182084, 113.565565. Administratively, Buddagan Village is located in Pademawu District, Pamekasan Regency; neighboring villages limit its position. North: Polangan Village, South: Pandan Village, West: Galis Village, East: Madura Strait. The distance from Buddagan

Village to the sub-district capital is 2 km, and it can be reached in about 15 minutes. Meanwhile, the distance to the district capital is 15 km, which can be reached in around 40 minutes.

Figure 1. Map of Lembung Village, Galis District, Pamekasan Regency, East Java

Based on the results of observations and interviews with village officials and the people of Lembung Village, several problems faced by the village were found, including (1)weak archive management and village administration, (2)not yet having a digital map of salt potential, (3)weak skills of village officials in archival management and digital-based administration and (4)Weak management and development of village potential.

To overcome these problems, the proposed community service activities will focus on two main aspects : (1) Development of a Smart Village Information System (SIDESA): SIDESA will integrate various village data and information, such as population data, village potential data, and public service data. SIDESA will also have features that make it easier for the public to access information and services, such as online services, digital maps and discussion forums. (2)Salt Potential Mapping: Salt potential mapping will use Geographic Information System (GIS) technology. The digital map of salt potential will help villages plan the development of village potential in the salt sector, such as building salt ponds, salt processing industries and salt tourism.

This community service activity aims to (1) Build a Smart Village Information System (SIDESA) in Lembung Village, (2)Carry out mapping of salt potential in Lembung Village, (3) Improve the skills of village officials in digital-based archive management and administration, (4) Improve management and development of village potential.

Table 1. Linkage of Specific Solutions with Partner Problems

No	Problems	Specific Solutions	Program Targets	Outcome Indicators
1	Weak management of village archives and administration	• Building a web-based Smart Village Information System (SIDESA).	• Availability of SIDESA, which can be used to manage village archives and administration digitally	• The SIDESA website has been completed and tested. • The SIDESA website has been implemented in Lembung Village and is used by village officials. • The SIDESA website has provided benefits

No	Problems	Specific Solutions	Program Targets	Outcome Indicators
				to the people of Lembung Village, such as easy access to information and improved public services.
2	Does not have a digital map of salt potential yet	• Carry out salt potential mapping using Geographic Information System (GIS) technology	• Availability of a digital map of salt potential that can be used for land use planning and development of the salt sector	• A digital map of salt potential has been completed and published on the village's official website. • Village officials have used digital maps of salt potential to plan land use and develop the salt sector. • Mapping salt potential benefits Lembung Village, such as optimizing land use and increasing salt production.
3	Weak skills of village officials in managing archives and digital-based administration	• Carrying out training and mentoring for village officials regarding SIDESA management	• Increased understanding of village officials regarding SIDESA management	• The test average was 35%, and after training and mentoring, it became a Post-test average of 82%
4	Weak management and development of village potential	• Carrying out workshops and FGDs on the importance of SIDESA and mapping salt potential in the village development process	• Increased motivation of village officials to use SIDESA and salt potential mapping in the village development process	• Increased motivation of workshop participants from 35% to 92%

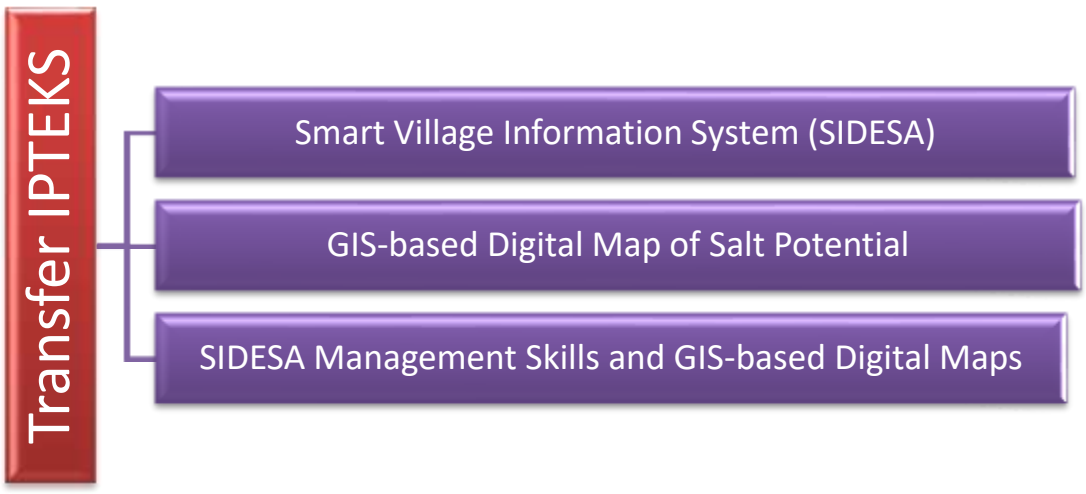

Figure 2. How The Transfer of Science and Technology will Work for Community Partners

This activity is expected to provide benefits to Lembung Village, including (1) Increasing the quality of archive management and village administration, (2) Availability of information and services that are easily accessible and utilized by the public, (3) Increasing village potential in the salt sector, (4) Increasing the skills of village officials in managing archives and digital-based administration and (5) Improved management and development of village potential. It is hoped that the digital village transformation in Lembung Village can become a model for other villages in Indonesia to create advanced, independent and prosperous villages.

METHOD AND PROCEDURES

This community service activity was carried out over **two and a half months**, from July 1 to September 15, 2023, in Lembung Village, Galis District, Pamekasan Regency, East Java. The implementation method for this activity consists of eleven stages, namely (1). Identify problems and survey partner conditions, (2) Coordination with partners, (3) Socialization of activities with partners, (4) Creation of a web-based intelligent village information system (SIDESA), (5) Making a digital map of salt potential, (6) Implementation of village apparatus training for SIDESA, (7) Implementation of a workshop on managing digital maps of salt potential, (8) Preparation of Monograph Books, (9) Evaluation of Activities, (10) Participate in the Community Service Results Seminar and (11) Preparation of Activity Reports. The steps for community service are described in the following diagram:

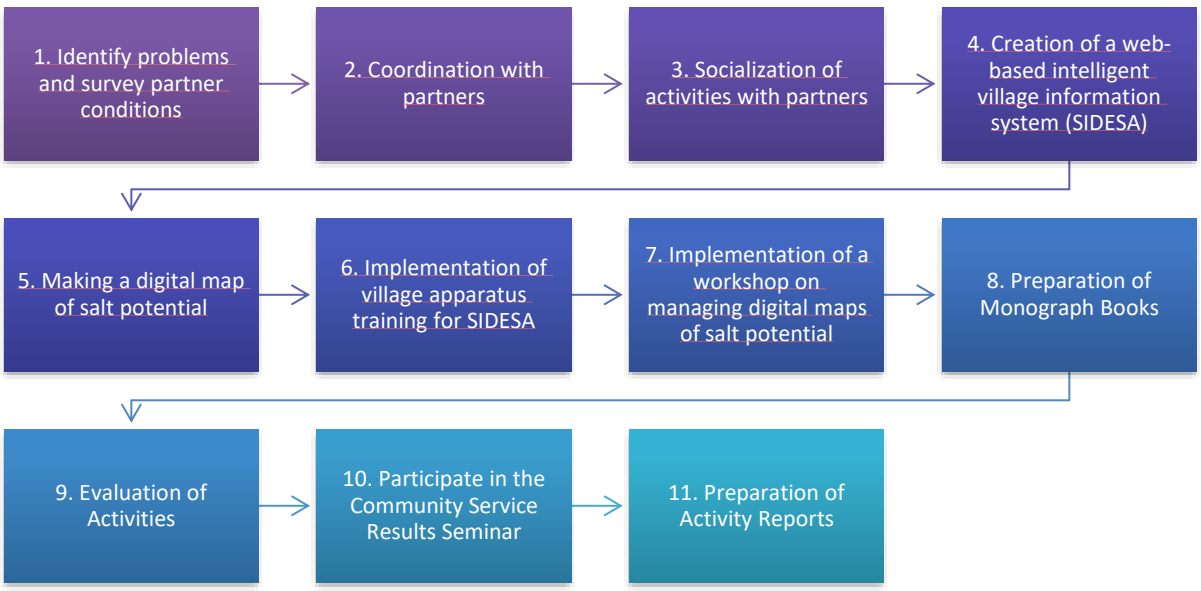

Figure 3. Stages of Community Service Activities: Strengthening Digital Village Transformation through Assistance with Smart Village Information Systems (SIDESA) and Salt Potential Mapping

The community service activity in Lembung Village employs a structured and systematic approach to achieve its goals. (1)The first step involves identifying problems and surveying partner

conditions through observation, interviews, and surveys. The results are then formulated to meet the village's needs. (2) Regular coordination with partners is ensured through meetings, gatherings, and informal communication. The activity also involves outreach to village officials and the community about the aims, benefits, and methods of community service activities to increase community understanding and participation. (3)Socialization of Activities with Partners: This systematic approach ensures that the activities align with the village's needs and expectations.

Figure 4. The Steps of Community Service: (1) Identify problems and survey partner conditions, (2) Coordination with partners, (3) Socialization of activities with partners

Then (4) Creation of a Web-Based Smart Village Information System (SIDESA): SIDESA was built using the Laravel framework and MySQL database. The SIDESA website has several main menus: Home, Village Profile, Population Data Entry, Village Potential, and Village Official Data. This website also has report features, discussion forums, and links to related government sites. (5). Making a Digital Map of Salt Potential: A digital map of salt potential was created using Google Maps technology and the Quantum GIS application. This map contains information about soil type, land type, types of plants

that can be planted, and type of land irrigation. This map provides clear information on salt potential based on land type.

Figure 5. The Steps of Community Service: (4) Creating a web-based intelligent village information system (SIDESA). (5) Making a digital map of salt potential

(6) Village Apparatus Training for SIDESA: This training aims to increase village officials' understanding of the use of SIDESA. The training material includes an introduction to SIDESA, the use of SIDESA features, and the management of village data. (7). Workshop and FGD on Managing Digital Maps of Salt Potential: This workshop and FGD aims to increase village officials' understanding of the benefits and how to use digital maps of salt potential. This workshop and FGD also became a discussion forum for village officials to exchange ideas and experiences regarding the development of the salt sector in Lembung Village.

Figure 6. Steps (6). Implementation of village apparatus training for SIDESA (7). Implementation of a workshop on managing digital maps of salt potential

Step (8) Preparation of Monograph Books: This monograph book contains the concept, design and implementation of SIDESA in Lembung Village. It is hoped that this book can be a guide for other villages that want to implement SIDESA. (9). Evaluation of Activities: Activity evaluation is carried out to determine the level of success of community service activities. Evaluation is done through observation, interviews, and surveys of village officials and the community. The results of this evaluation will then be used to improve community service activities in the future. (10). Attend Community Service Results Seminar: The results of this community service activity are published through seminars. This seminar aims to disseminate information about community service activities and their benefits for the village. (11). Preparation of Activity Reports: This activity report contains the objectives, methods, results and discussion of community service activities. This report is then submitted to parties such as LPPM and the Pamekasan Regency Government.

Figure 7. The Steps of Community Service: (8). Preparation of Monograph Books, (9). Evaluation of Activities, (10). Participate in the Community Service Results Seminar (11). Preparation of Activity Reports

RESULTS

This community service activity has produced several outcomes and provided benefits for Lembung Village. The main outputs of this activity are a web-based smart village information system (SIDESA), the official Buddagan Village website, a digital map of salt potential and a monograph book: a GIS-based digital village information system.

1. Web-based Smart Village Information System (SIDESA)

The development and testing of the SIDESA website have been successfully concluded. This website has been deployed in Lembung Village and is utilized by village administrators and the local populace. The SIDESA website has facilitated advantageous outcomes for the residents of Lembung Village, including convenient information accessibility and enhanced public services. The resulting SIDESA program is a digital platform for village management, allowing village officials to oversee and control various aspects of village information. The presentation of SIDESA is as follows:

Figure 8. The program is called the Digital Village Information System (SIDESA)

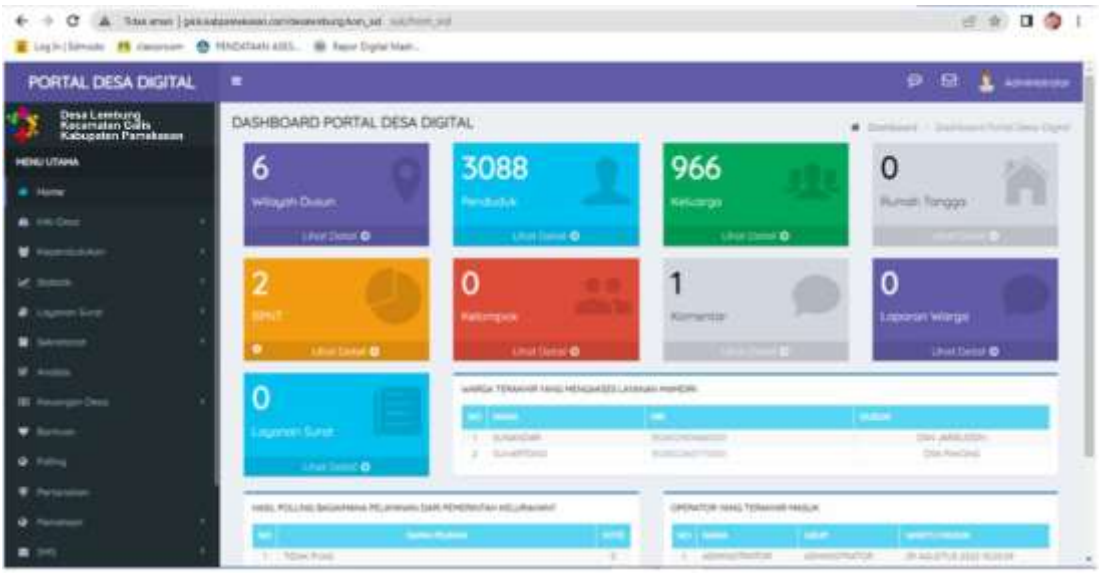

Figure 9. The display of the Digital Village Information System (SIDESA) Dashboard

The SIDESA Teaching Module guides village officials in implementing the previously developed SIDESA. This module was once utilized to educate and provide direction to village leaders. The monograph book has been drafted and is currently undergoing final editing before being submitted to the publisher. The monograph is titled "Development of a Digital Village Information System (SIDESA-DIGITAL) and GIS-based Salt Potential Mapping."

2. Lembung Village Official Website

Lembung Village has launched an official website, http://lembungmaju.my.id/, providing vital village information like profiles, news, and activities. This website is the village's official communication platform, enhancing transparency and accountability.

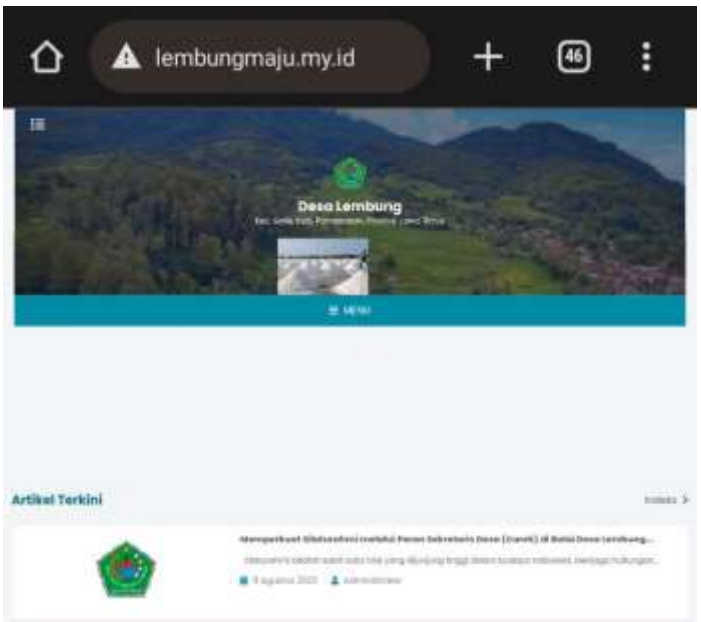

Figure 10. Lembung Village Official Website Display

3. Digital Maps of Salt Potential

A digital map of salt potential has been created using Google Maps and Quantum GIS application. The map provides soil, land, plant, and irrigation types information. It is crucial for developing the salt sector in villages, aiding in identifying potential, planning land use, managing resources, monitoring salt production, and developing infrastructure. The digital map of salt potential has been completed and published on the village's official website. Village officials have used digital maps of salt potential for land use planning and development of the salt sector. Mapping salt potential benefits Lembung Village, such as optimizing land use and increasing salt production. The resulting digital map display is as follows:

Figure 11. Digital Map of The Salt Potential of Lembung Village, Galis Subdistrict, Pamekasan District

Figure 12. Digital Map Display of Lembung Village Salt Potential

4. Monograph Books

A monograph book, " Development of a Digital Village Information System (SIDESA-DIGITAL) and GIS-based Salt Potential Mapping," explains SIDESA and digital maps of agricultural potential created in community service activities. It references other villages and related parties aiming to build SIDESA and digital maps. This monograph book contains the concept, design and implementation of SIDESA in Lembung Village. It is hoped that this book can be a guide for other villages that want to implement SIDESA.

Figure 13. Display of Monograph Books

Evaluation of Community Service Activities: Digital Village Transformation in Lembung Village

The evaluation of the digital village transformation in Lembung Village has shown significant success. Village officials and the community have developed and used the Smart Village Information System (SIDESA) and digital maps of salt potential. The average knowledge of village officials about SIDESA before training was 30%, and after training, it was 85%. Village officials' satisfaction with SIDESA was 90%, and the level of satisfaction with the system was 85%. The digital map of salt potential had a map accuracy rate of 95%, and its usefulness for village officials was 90%. The training and mentoring for village apparatus increased the average understanding of SIDESA management and salt potential mapping to 82%, and the motivation level of village officials to use SIDESA was 92%. A monograph book was published; the reader satisfaction level was 80%. The evaluation results suggest that the digital village transformation has successfully achieved its objectives.

Table 2. Evaluation of Community Service Activities in Lembung Village

Indicator	Pre-test	Post-test	Satisfaction Level
Village Officials' Knowledge about SIDESA	30%	85%	90%
Level of Accuracy of Digital Map of Salt Potential	-	95%	-
Level of Usefulness of Maps for Village Officials	-	90%	-
Level of Usefulness of Maps for Society	-	80%	-
Village Officials' Understanding of SIDESA Management and Salt Potential Mapping	35%	82%	-
Motivation of Village Officials to Use SIDESA and Salt Potential Mapping	-	92%	-
Reader Satisfaction with Monograph Books	-	80%	-

Based on the evaluation results, this community service activity has achieved its objectives well. SIDESA and digital maps of salt potential have been successfully developed and used by village officials and the community. Training and mentoring have increased the capacity of village officials. A monograph book has been published and can be a guide for other villages that want to implement SIDESA.

CONCLUSION

This community service activity aims to (1)create a web-based Smart Village information system, (2)create a digital map of salt potential, (3)improve the skills of village officials in digital-based archive management and administration, (4)improve management and development of village potential by building an intelligent village information system (SIDESA) and a salt potential map. The output of this activity produces (1) a web-based intelligent village information system (SIDESA), (2) the official Lembung Village website, (3) a digital map of salt potential, and (4) a monograph book: GIS-based intelligent village information system. The digital village transformation in Lembung Village has been successful, with the Smart Village Information System (SIDESA) and digital maps of salt potential being developed and used by village officials and the community. The average knowledge of SIDESA increased from 30% to 85% after training, and satisfaction with the system increased by 90%. The digital map of salt potential had a 95% accuracy rate, and its usefulness was high at 90%. Training and mentoring increased the average understanding of SIDESA management and mapping to 82%, and the motivation level to use SIDESA was 92%.

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