Lampiran 1
Bukti Korespondensi & Proses Review

1. Confirmation of submitting paper

Ramayanty Bulan <ramayantybulan@gmail.com>   10 Januari 2022 pukul 08.44
Kepada: editor.ijdne@iieta.org

Dear all Editor in Chief IJDNE Journal,

Dear Professor,
I wish to submit a manuscript entitled "*Utilization of a Web-based Geographic Information System for Land Mapping and Some Its Overview: A Case Study in Sukabumi District, Indonesia*" for possible consideration.
Finally, I want to affirm the paper has been prepared following instructions to the authors.
I also, at this moment, declare that the content of this manuscript or a significant portion thereof has not been published in a refereed journal, and it is not being submitted for publication elsewhere.

In addition, this paper has also been registered through the OJS system of the IJDNE journal with **ID 14170**.

Best regards

--
Dr. Ramayanty Bulan, ST, M.Si
Assoc. Prof. in Department of Agricultural Engineering
Faculty of Agriculture | Syiah Kuala University (USK)
Telp-WhatsApp: 0852-6122-5616

2. Reply from editor

editor.ijdne@iieta.org <editor.ijdne@iieta.org>   17 Maret 2022 pukul 08.10
Kepada: Ramayanty Bulan <ramayantybulan@gmail.com>

Dear author,

Your article is under review.

Editorial Board

International Journal of Design & Nature and Ecodynamics

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International Information and Engineering Technology Association (IIETA)

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3. Revisions Required

editor.ijdne iieta.org <editor.ijdne@iieta.org>   2 April 2022 pukul 12.42
Kepada: "ramayantybulan@gmail.com" <ramayantybulan@gmail.com>, "Muhamad.muslih007@nusaputra.ac.id"
<Muhamad.muslih007@nusaputra.ac.id>, "Somantri009@nusaputra.ac.id" <Somantri009@nusaputra.ac.id>,
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<dewisartika@nusaputra.ac.id>, "aguslipi122@gmail.com" <aguslipi122@gmail.com>

Dear author,

We have reached a decision regarding your submission to International Journal of Design & Nature and Ecodynamics, " Utilization of a Web-based Geographic Information System for Land Mapping and Some Its Overview: A Case Study in Sukabumi District, Indonesia".

Our decision is: Revisions Required

1. Revise the current paper according to reviewers' comments. Highlight any change or track changes you make. **Response to reviewers is also required** (Please write a detail reply in response to this comment under each review comment).
2. Typeset your final paper according to the attached template.

Please return your revised manuscript and the response to reviewers to this e-mail before **7 April 2022**. Thanks for your cooperation.

Editorial Board

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TEMPLATE - IJDNE

Instructions for Preparing Papers for *International Journal of Design & Nature and Ecodynamics*

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ABSTRACT

Detailed instructions for preparing your paper submitted to *International Journal of Design & Nature and Ecodynamics* are given as follows. Please be responsible for the quality and appearance of your work. It's strongly recommended that you directly type over the template or just cut and paste from another document and use markup styles. Please keep in mind all the way through the preparation: do not modify page setup in this template, such as font, line spacing, margin, uppercase and lowercase, and the order of sections. The abstract section is mandatory, with a word limit of 200 words. The purpose, methodology, results & conclusions, and implications should be summarized here. Avoid inserting any reference in this section. In the Keywords section, please enter words or phrases in alphabetical order. There is a maximum of 8 keywords.

1. INTRODUCTION

Throughout the main text, please follow these prescribed settings: 1) the font is mostly Times New Roman; 2) almost all the words are typed in 10 points; 3) each line throughout the paper is single-spaced; 4) in most cases, 10 pts spacing shall be left above and below any heading, title, caption, formula equation, figure and table.

As mentioned in the abstract section, it will be rather easy to follow these rules as long as you just replace the "content" here without modifying the "form".

2. PAGE SETUP

The book size should be in A4 (8.27 inches × 11.69 inches). Do not change the current page settings when you use the template.

The number of pages for the manuscript must be no more than ten, including all the sections. Please make sure that the whole text ends on an even page. Please do not insert page numbers. Please do not use the Headers or the Footers because they are reserved for the technical editing by editors.

3. SECTION HEADINGS

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Level 1: Times New Roman, 10, bold, all letters capitalized, 20 pts spacing above heading and 10 pts below, Example: "**3. SECTION HEADINGS**"

Level 2: Times New Roman, 10, bold, only the first letter as well as proper nouns capitalized, 10 pts spacing above heading, 10 pts spacing below heading. However, when a

Level 2 heading is directly above a Level 1 spacing, just leave 10 pts spacing between them instead of 20 pts. Example: "**4.1 Paper title**".

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The heater tube. This device is used as the electrical resistance for providing heat input. D.C. voltage is applied at the…

Do not begin a new section directly at the bottom of the page, instead, move the heading to the top of the next page.

4. MORE DETAILS ABOUT PAPER TITLE AND AUTHOR INFORMATION

4.1 Paper title

Paper titles should be written in upper-case and lower-case letters, not all upper-case, e.g., "Instructions for preparing papers for *International Journal of Design & Nature and Ecodynamics*". Do not use capital letters for prepositions, articles or conjunctions unless one is the first word.

Avoid writing long formulas with subscripts in the title; short formulas that identify the elements are fine (e.g., "Nd–Fe–B").

4.2 Author information

4.2.1 Name

Full names of authors are required. The middle name can be abbreviated.

4.2.2 Affiliation

Different affiliations shall be listed in separate lines. Do not insert any punctuation at the end of each affiliation. If all the authors are affiliated to the same organization, type that affiliation just once.

4.2.3 Superscripts

To match authors and their own affiliations, please insert numerical superscripts, i.e., "[1, 2, 3, 4 ...]" followed by a space, after name and, correspondingly, before affiliation. If all the authors are affiliated to the same one organization, any number is no need.

Do not forget to denote the corresponding author with a superscript asterisk ([*]). You may offer emails of all co-authors. But in the final version of your manuscript, only one valid email of the corresponding author will be kept.

5. MATH

5.1 Equations

(1)   Tool: You are strongly recommended to use MathType (http://www.mathtype.com) to edit equations. Microsoft Equation Editor is also acceptable. (Insert | Object | Create New | Microsoft Equation *or* MathType Equation). "Float over text" should *not* be selected.

(2)   Format: The size of equation is 10 pts. Remember to leave 10 pt spacing both above and below an equation. Set the equation flush left, without indenting it.

(3)   Numbering: Make sure that placing and numbering of equations is consistent throughout your manuscript. References to the equations should be as Eq. (1). Make the number of an equation flush-right. For example:

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \tag{1}$$

5.2 Measurement units and numbers

Please use the SI set of units as much as possible. Wherever the application domain uses a different set of units widely, please minimize the use of non-standard units or non-standard symbols for those units. For example, the use of "a" for year (annum) is depreciated and the use of "y" is encouraged instead. Similarly, "h" should be used for hours instead of "hr" and "t" instead of "ton" or "tonne". It is important to take care of the case in which the measurement units are typed. E.g. "Km" does not mean "kilometres", but "Kelvin-meters".

When providing numerical values followed by measurement units, please leave a regular space or non-breaking space between each value and the measurement unit. This also includes percentages and degrees Celsius (e.g. 42% or 35%, 234°C, 504 K). This rule also applies to the unit for litre, which is recommended to be capital "L".

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i.e. 1,000,000 and not 1000000 or 1 000 000.

6. TABLES AND FIGURES

6.1 General

(1)   Briefly and descriptively title each table and caption each figure. Place figure captions below the figures whereas table titles above the tables. Please do not include captions as part of the figures or put them in "text boxes" linked to the figures. Also, do not place borders around the outside of your figures.

(2)   All the table titles and figure captions should be centered, Times New Roman font and 10 pts in size. Just capitalize the first letter of words, phrases and sentences which are included in tables and figures.

(3)   Reference each table and figure within the text by writing: e.g., Table 1 or Figure 1 (instead of Tab. 1 or Fig. 1). If possible, place tables and figures in the order mentioned in the text, at top or bottom of page, as close as possible to text reference.

(4)   Allow 10 pts spacing between the table title and the table (or between the figure and its caption). The equal spacing is allowed between the table or figure and the following text.

6.2 Tables

Words within a table should use 9 pts. The table number should be in bold type.

In general, if a table is too long to fit one page, the table number and heading should be repeated on the next page before the table is continued. Alternatively, the table may be spread over two consecutive pages (first an even numbered, then an odd-numbered page) turned by 90, without repeating the heading. Here is an example:

Table 1. Table title

Heading1	Heading 2	Heading 3
Table size	can be	edited

Notes: 1. If you must attach a note for further explaining some data in the table, please use 8 pts font size here. 2. If more than one note is to be attached, please number them with "1, 2, 3 ..." and separate them with a period or a semicolon. 3. The right and left borders of the note area must be aligned in relation to those borders of the table above it no matter what the table size is. 4. Please distribute your notes evenly between the margins.

6.3 Figures

Please make sure that the captions are on the same page with the relevant figures and tables. Please keep captions short – taking preferably one line. If a caption is a complete sentence, place a period at the end of it. If not, then place no punctuation at the end.

Figures and captions must be centered. Any word, number, shape and symbol on figures must be discernible when the page zoom level stands at 120%. We suggest that you use one of the following Open Type fonts: Times New Roman, Helvetica, Arial, Cambria, and Symbol, when preparing your figures.

Various figures can be accepted. Several examples cited from papers published in previous IIETA journal issues are as follows. Please pay special attention to how much line spacing is allowed in different cases:
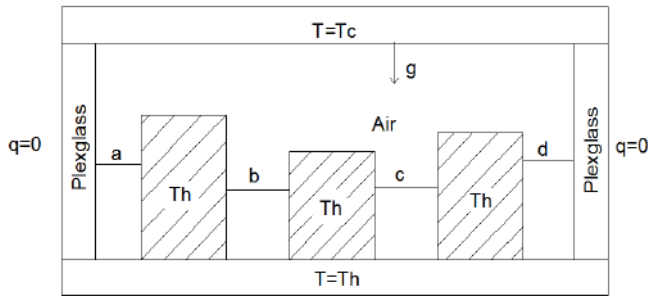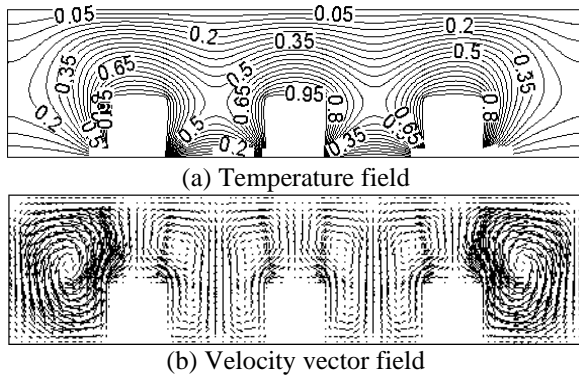
Figure 1. Cavity geometry

(a) Temperature field

(b) Velocity vector field

Figure 2. Three heat sources

7. CONCLUSIONS

It is mandatory to have conclusions in your paper. This section should include the main conclusions of the research and a comprehensible explanation of their significance and relevance. The limitations of the work and future research directions may also be mentioned. Please do not make another abstract.

ACKNOWLEDGMENT

REFERENCES

In order to give our readers a sense of continuity, we encourage you to identify in your papers the articles of similar research published in past issues of the journal. Please do a literature check of the papers published in the journal in recent years.

Literature included in your references list must all be mentioned in the text. Please number all the pieces of literature in the order of their appearance in the text and mark them with Arabic numerals in square brackets, such as [1], [2], [3]. Please do not make these numerals superscript either in the text or in the references list.

The digital object identifier (DOI) should be attached to the end of a reference if the reference has one indeed. You may find DOI at http://www.crossref.org/guestquery/#.

You may imitate the following examples to prepare your references:

[1] Magrini, A., Lazzari, S., Marenco, L., Guazzi, G. (2017). A procedure to evaluate the most suitable integrated solutions for increasing energy performance of the building's envelope, avoiding moisture problems. International Journal of Heat and Technology, 35(4): 689-699. https://doi.org/10.18280/ijht.350401

[2] Bejan, A. (2015). Constructal thermodynamics. Constructal Law & Second Law Conference, Parma, pp. S1-S8.

[3] Chen, W.K. (1993). Linear Networks and Systems. Wadsworth, Belmont, 123-135.

[4] Costa, T., Zarante, P., Sodré, J. (2013). Simulation of aldehyde formation in ethanol fuelled spark ignition engines. In: Sens, M., Baar, R. (eds) Engine Processes. Expert Verlag, Berlin.

[5] Bentley, R.E. (1998). Handbook of Temperature Measurement Vol. 3: The Theory and Practice of Thermoelectric Thermometry. Springer Science & Business Media.

[6] Williams, J.O. (1993). Narrow-band analyzer. Ph.D. dissertation. Department of Electronic Engineering, Harvard University, Cambridge, Massachusetts, USA.

[7] SIMUL8 Corporation. SIMUL8 – Process Simulation Software. http://www.simul8.com/, accessed on Jan. 17, 2015.

[8] Reber, E.E., Michell, R.L., Carter, C.J. (1988). Oxygen absorption in the earth's atmosphere. Technical Report TR-0200 (4230-46)-3. Aerospace Corporation, Los Angeles, California, USA.

[9] Motorola Semiconductor Data Manual. (1989). Motorola Semiconductor Products Inc., Phoenix, USA.

NOMENCLATURE

Each paper should have a separate nomenclature section that lists in detail and unambiguously all the symbols used in the text and their definitions. Do not use the same symbol for two or more different meanings or definitions; similarly, do not use more than one symbol for one variable/parameter. Each dimensional symbol must have SI units mentioned at the end. All dimensionless groups and coefficients must be indicated as dimensionless after their definitions. All Latin symbols (dimensional and dimensionless) should be listed in an alphabetical order. All Greek symbols follow the Latin symbols. Subscripts and superscripts follow Greek symbols and should be identified by a minor heading. Symbols that cannot be typed should be entered in black ink. Symbols should be italicized throughout the text.

Please make a nomenclature originally in a table and then hide all the borders so that the symbol column and the meaning column can be aligned from the top down. A template for nomenclature is as follows.

NOMENCLATURE

B	dimensionless heat source length
CP	specific heat, J. kg^{-1}. K^{-1}
g	gravitational acceleration, m.s^{-2}

| k | thermal conductivity, $W.m^{-1}. K^{-1}$ |
| Nu | local Nusselt number along the heat source |

Greek symbols

α	thermal diffusivity, $m^2. s^{-1}$
β	thermal expansion coefficient, K^{-1}
ϕ	solid volume fraction
Θ	dimensionless temperature
μ	dynamic viscosity, $kg. m^{-1}.s^{-1}$

Subscripts

p	nanoparticle
f	fluid (pure water)
nf	nanofluid

APPENDIX

(1) Appendix. If there is an Appendix section in your paper, please place the section after Nomenclature and follow the format of the text body.

(2) Footnotes. It is recommended that footnotes be avoided.

(3) Permissions. You are responsible for making sure that you have the right to publish everything in your paper. If you use material from a copyrighted source, you may need to get permission from the copyright holder. You need to seek permission to use a figure or table if it has not been changed in any substantive way from the original or if it does not plot or compile data readily available to anyone. You need to seek permission to quote material if you use it in a way competitive with the original material, that is, if your use of the material will harm the rights of the original publisher and/or author. This criterion holds true regardless of the length of the quote. If the quoted material will not be used competitively, you need only to cite the original source. Please consult your own legal adviser if you have any questions about what may need permission.

COMMENTS - IJDNE

Utilization of a Web-based Geographic Information System for Land Mapping and Some Its Overview: A Case Study in Sukabumi District, Indonesia

The study utilized various data and maps included inside aGIS and tandem with web-based to ascertain the appropriateness of various land-use types has been conducted. A case study in Cisande Village, Cicantayan District, Sukabumi Regency, Indonesia, has been used as a pilot project. This paper does not introduce the specific research work in detail, especially the methodology of the second chapter is very confusing. Authors should focus on describing the principles and ideas of the methodology. But unfortunately I don't see this in the manuscript. The results and discussions only briefly introduce some interfaces of the system. Therefore, this manuscript needs to make a major revision. Below are the detailed comments on the article.

1. "Web-based GIS has long been used for many purposes." Compared with pure geographic information systems, what are the advantages and characteristics of Web-based GIS?

2. "However, to date, no research utilizes Web-based GIS for mapping for administrative purposes at the sub-district level." What is the main difficulty in this process?

3. "Evidence of ownership of land rights or letter C document is official proof of land ownership in Indonesia." What does "letter C" refer to? Please give a brief explanation from the author.

4. "… designation of the land within the scope of their work so as to minimize conflicts that exist in the community." What conflicts may exist in the community? What problems can be solved with GIS?

5. "The system development method used in this study uses the waterfall of software development life cycle (SDLC)." Please briefly introduce the relevant situation of SDLC.

6. "The design phase allows a researcher to get effective and interactive search media in a certain location." What does "interactive search media" refer to in this sentence? What is the purpose of this step?

7. "In developing a web-based information system with integration into a GIS, the flow is as shown in Figure 1." Please introduce the process of program development in detail and the key points in it.

8. "The website-based land mapping GIS interface design consists of eight main pages." The author should explain the principle of the program design, and it can also be displayed through the data of an actual case, rather than simply introducing the system interface and Function.

9. "The future work of this research is to study the impact of using this system on the socio-culture of the area" What is the relationship between socio-culture and land use?

10. The conclusion needs to have substantive research results.

4. Replay Revisions Required

Ramayanty Bulan <ramayantybulan@gmail.com>   3 April 2022 pukul 13.53
Kepada: "editor.ijdne iieta.org" <editor.ijdne@iieta.org>

Dear IJDNE Editorial Board,

Our paper has been improved,
Comments from the author to the editor are also attached to this email (see filename: 5.3 Response to reviewers.pdf).

Changes in the MS Word file script have been highlighted (see filename: 5.5 2022_IJDNE_Muslih et al_Rev1.docx and 5.5 2022_IJDNE_Muslih et al_Rev1.pdf).

Plagiarism check using Turnitin (see filename: 5.6 Plagiarism check using Turnitin)

Thank you and best regards

[Kutipan teks disembunyikan]
--
Dr. Ramayanty Bulan, ST, M.Si
Assoc. Prof. in Department of Agricultural Engineering
Faculty of Agriculture | Syiah Kuala University (USK)
Telp-WhatsApp: 0852-6122-5616

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5.3 Response to reviewers

Response to reviewers

Title: Utilization of a Web-based Geographic Information System for Land Mapping and Some Its Overview: A Case Study in Sukabumi District, Indonesia

Authors : Muhamad Muslih, Somantri, Muhammad Reza Firdaus, Rizal Nur Rizki, Dewi Sartika Thamren, Fajri, Ramayanty Bulan

Date Revision Due: 7 April 2022

No	Reviewer	Author
1	"Web-based GIS has long been used for many purposes." Compared with pure geographic information systems, what are the advantages and characteristics of Web-based GIS?	Thanks for the comment. An explanation of the comparison with normal GIS has been added to this paragraph.
2	"However, to date, no research utilizes Web-based GIS for mapping for administrative purposes at the sub-district level." What is the main difficulty in this process?	Thanks for the inquiry. The main challenge of developing this system has been added in that paragraph.
3	"Evidence of ownership of land rights or letter C document is official proof of land ownership in Indonesia." What does "letter C" refer to? Please give a brief explanation from the author.	An explanation about "letter C" has been added in a paragraph in an article.
4	"… designation of the land within the scope of their work so as to minimize conflicts that exist in the community." What conflicts may exist in the community? What problems can be solved with GIS?	Thanks for the ask. Existing conflicts and problems that Web-based GIS can resolve have been added to this paragraph.
5	"The system development method used in this study uses the waterfall of software development life cycle (SDLC)." Please briefly introduce the relevant situation of SDLC.	Thank you for the suggestion. Briefly, SDLC has been added to the article.
6	"The design phase allows a researcher to get effective and interactive search media in a certain location." What does "interactive search media" refer to in this sentence? What is the purpose of this step?	An explanation regarding interactive search media has been added to the paper.
7	"In developing a web-based information system with integration	Thanks for the information. The points related to the flow

	into a GIS, the flow is as shown in Figure 1." Please introduce the process of program development in detail and the key points in it.	chart in Figure 1 have been explained in that paragraph.
8	"The website-based land mapping GIS interface design consists of eight main pages." The author should explain the principle of the program design, and it can also be displayed through the data of an actual case, rather than simply introducing the system interface and Function.	Thank you for the suggestion. The discussion offered by the reviewer has been added to the paragraph.
9	"The future work of this research is to study the impact of using this system on the socio-culture of the area" What is the relationship between socio-culture and land use?	Thanks for the question. Our findings show that there is still a close relationship between socio-culture and land use at the location of this study. For example, borrowing land for social activities such as public facilities can last for years. Therefore, we would like to conduct further studies in this regard.
10	The conclusion needs to have substantive research results.	Thanks for your recommendation. Findings related to the reviewer's suggestions have been added in conclusion.

5.5 2022_IJDNE_Muslih et al_Rev1. Pdf dan .docx

Utilization of a Web-based Geographic Information System for Land Mapping and Some Its Overview: A Case Study in Sukabumi District, Indonesia

Muhamad Muslih[1], Somantri[2], Muhammad Reza Firdaus[2], Rizal Nur Rizki[2], Dewi Sartika Thamren[3], Fajri[4], Ramayanty Bulan[5*]

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Corresponding Author Email: ramayantybulan@gmail.com

ABSTRACT

Land used for residence and agriculture is a source of life, especially in Indonesia. This is because most of the sources of livelihood, especially those living at the sub-district level, are mostly engaged in agricultural activities. Therefore, land data collection is very important, starting at the sub-district level. Unfortunately, the information system that supports this does not yet exist, especially in the Sukabumi district. Hence, this study to overview and use a web-based Geographic Information System (GIS) for land mapping, especially in Sukabumi District, Indonesia. The method used in this study was to conduct interviews with land officials at the sub-district level and several communities in the area. Information system problems from potential users are then addressed by designing a web-based information system and integrating it with GIS applications. The developed information system provides menus and sub-menus adapted to the needs of potential users. So far, the information system has been accessible and can help land officials at the sub-district level and several communities in the area. This will provide the level of detailed information that local communities need in responding to information related to their lands to minimize social conflicts.

1. INTRODUCTION

In recent years, with the accelerated urbanization of rural areas, mapping as a land resource is becoming increasingly important in order to promote the sustainable use of the land environment. Appropriate mapping is not only carried out directly on the ground but can also involve the involvement of currently available information systems such as geographic information systems (GIS). Globally, geographic information systems have become increasingly popular in the management and decision-making processes associated with regional emergencies and urgent issues. The construction of modern urban pipeline network digital management systems, which primarily include sewage network, water supply network, land use balance, sediment prediction on a watershed, and so on, has already been carried out in many countries around the world, including the United States, Europe and also Indonesia, which have already applied mature geographic information technology [1-4].

Since its inception in the 1990s, land change research has emerged as a significant component in the study of global environmental change and sustainability. Changes in land use, land cover, and land cover in urban areas, particularly the conversion of farmland and forest land to urban uses, are among the most significant kinds of global environmental change [5, 6]. Monitoring land-use changes in urban areas can aid in the decision-making process for urban planning and

resource management [7-9]. Remote sensing and geospatial information technology have advanced that they now provide a potential foundation for monitoring land changes in metropolitan settings.

However, only a few studies used the Web to map land by GIS for administrative purposes at the sub-district level. Then, this study aimed to overview and utilise a web-based geographic information system (GIS) for land mapping, especially in Sukabumi District, Indonesia. The outcome of this research is that it is expected that land officials at the sub-district level can quickly check documents from the land.

1.1 Related work

1.1.1 Geographic Information System (GIS)

According to Liu and Yang [10], post-classification change detection provides insight into the nature of land change, and the integration of remote sensing and GIS can be particularly effective for defining spatial patterns of urban land change, according to the researchers.

Mazahreh, et al. [11] described a GIS-based technique for determining the feasibility of land for various land-use choices in Jordan's semi-arid conditions. This study utilized various data and maps included inside a GIS to ascertain the appropriateness of various land use types (LUTs). Suitability maps were generated for each land use to illustrate the suitability classes and visualize the geographical

representation of agriculturally acceptable soils. Suitability investigations produced information about the sort of land use for which the land was suited and the type of constraints that hampered land usage. Optimal land use options scenarios were developed to increase and maximize agricultural productivity in the research region.

Carver, et al. [12] established a GIS model for mapping Scotland's wildness's geographical patterns and distribution. They intend to research a reliable and repeatable approach for mapping wildness in protected landscapes to inform planning, policy, and management choices. They assert that the model is also scalable, capable of being implemented at various geographical scales ranging from local to national, depending on data needs and available computational resources. The work reported here demonstrates that combining local knowledge with the careful application of local-level statistics inside bespoke GIS models may be a strong instrument for assisting in developing specific planning policies and actions for wild land conservation and management.

1.1.2 Web-based GIS

Web-based GIS has long been used for many purposes. A significant advantage of online mapping apps is that they provide efficient distribution of geographical data without extra software [13]. Also, experts can control environmental or contextual (streets, rivers) layers centrally instead of distributing along with software to each end-user [14]. A facilitated soil information system for the United Arab Emirates and its usefulness in agricultural land use planning are among the applications for which Abdelfattah and Kumar [15] employ it. Each component of the system is comprised of multiple parts, including a geographic soil database, a field operating system, and a very intuitive web-based secure application. The UAESIS is described in detail in this document, including its structure, capabilities, functions, advantages, applications, and uses. Two case studies are offered to show the system's applicability to the appraisal of land appropriate for date palm cultivation and the growing of salt-tolerant crops, respectively.

Other research by Rao, et al. [16] indicated that the USDA's Conservation Reserve Program is managed and planned to utilize a web-based GIS Decision Support System (CRP). They assert that the integrated web-GIS DSS is built utilizing a web server and Java Servlet technology on top of an ArcIMS platform to enable remote data access and processing. The prototype DSS was used to model the sediment and nutrient dynamics of a small watershed in the Panhandle of Oklahoma.

In Indonesia, Web-based GIS has been widely used for various purposes. As used by Amalia, et al. [17] for tropical diseases-prone areas in East Java Province. To encourage halal tourism in Bukittinggi, Afnarius, et al. [18] presented information about places of worship. Ginardi, et al. [19] for asset management of land and building of Madiun city government. However, to date, no research utilizes Web-based GIS for mapping for administrative purposes at the sub-district level. The main challenge of developing this system is that each region has its characteristics regarding land management.

1.1.3 Evidence of ownership of land rights

Evidence of ownership of land rights or letter C document is official proof of land ownership in Indonesia. Letter C document is evidence of ownership of land rights in Indonesia [20]. The land is the primary requirement for people, as human existence is inextricably linked to the soil. The Indonesian state is undergoing changes in the way land ownership rights are structured, followed by the issuing of land-related legislation. Recognize the early signs of land rights ownership between community members and government agencies in conflict zones [20].

Letter C of land ownership in Indonesia is very important. According to Suryadi, et al. [21], three community groups and authorized officials are divided by a letter C letter. Even after the first owner passes away, the inheritance such as right over land, which is according to the inheritance division certificate, must be divided together between some heirs; alternatively, if the inheritance division certificate has not yet been issued, the right transfer is listed to the heirs who deserve the joint rights based on the proof as to the heirs or the inheritance certificate. Therefore, a clear land ownership data collection system at the sub-district level is important to avoid conflict. In addition, the system should also be easily accessible by the community.

1.2 Research positioning

Previous literature has shown various after-effects result from GIS and their functional for mapping. Research trends tend to focus more on the technical part of the problem. However, the application of web-based geographic information systems (GIS) has only been briefly covered in earlier studies. Hence, this research attempts to investigate the application of Web-based GIS for administrative purposes at the sub-district level. It also tries to highlight the menu Web-based GIS has been developed and how to used it. Moreover, the existence of this system will greatly assist land officials at the sub-district level to be able to record the area and designation of the land within the scope of their work so as to minimize conflicts that exist in the community. Disputes over land claims and cultivating land in the community occur if the origin of the land cannot be properly and properly archived. Web-based GIS will assist in clarifying and providing data and archives of the history of the existing land. For this reason, this research attempts to define the function of geographic information systems (GIS) in transformation administration at the sub-district level as well. This paper developed a Web-based GIS in accordance with the needs of land officials at the sub-district level and the use is also the surrounding community of the sub-district.

2. RESEARCH METHODOLOGY

As a case study in Sukabumi District (Cisande Village, Cicantayan District), the data collected consisted of village locations, village maps, coordinate points, village profiles, satellite photos, land data, and Letter C data. The data was obtained from various sources, such as interviews and observations with several expert officers about the village.

In developing a web-based information system with integration into a GIS, the flow is as shown in Figure 1. In summary, the first thing to do is analyze potential users' needs. From this point it will be known the expectations of the users of the Web-based GIS that will be developed. Next, do the design for the information system to be developed. After that, carry out the construction of the developed information system. After the system is formed, testing is carried out for all developed menus and sub-menus. In addition, within a certain period after being disseminated to users, system maintenance is important to find out if there are bugs in the system.
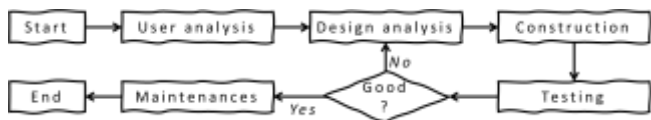
Figure 1. Flowchart of research stages

The system development method used in this study uses the waterfall of software development life cycle (SDLC). SDLC is a process for developing software with the greatest possible quality at the lowest possible cost in the shortest amount of time. SDLC establishes a well-structured flow of stages that enables an organization to rapidly deliver high-quality software that has been thoroughly tested and is suitable for production usage [22]. These are just a few of the reasons why it is critical to create a secure software development life cycle [23]. It appears critical to expand the notion of security and to recognize that security must be a component of every growth.

User analysis is used to investigate problems that occur in the field [24]. It is necessary to identify possible solutions that can be used to address the analytical design.

The design phase allows a researcher to get effective and interactive search media in a certain location. This step requires the programmer to create a design sketch for easy conversion into a specific format. Interactive search media is related to the demand of users who will be involved in using the developed Web-based GIS to be comfortable enough to use this system. In this paper, the Unified Modeling Language (UML) is used in the system design [25], including use case diagrams, class diagrams, and activity diagrams.

Next, construction is the process of writing program code on a computer. The process of coding this design is transforming it into a language that the computer can understand.

A black-box approach conducted system testing [26]. In particular, tests are carried out on the input and output menus of the system to test its functional performance. Therefore, software developers in black box testing can create multiple input condition scenarios to train all the system's functional requirements.

Finally, maintenance focuses on periodic checking of the system, which involves correcting some error menus that have not been found in the previous stage. This is always important to update the system to work properly every time.

3. RESULT AND DISCUSSION

The principle of the program design of the developed web-based GIS is that there are three main users. The first user is a user who can access web-based GIS information from outside without having to log in. These users are people who get general information from Web-based GIS. The second user is a user who must carry out a log-in verification process to view more detailed information on land and add the latest information from certain lands. The third user is the admin, who is in charge of verifying the land proposed by the second user. In addition, the admin will be in charge of maintaining this developed system. Besides that, the website-based land mapping GIS interface design consists of eight main pages. Each main page consists of at least several menus that can be broken down. The system's appearance was developed using Indonesian language because, in general, the users of this system are local people from Indonesia. This follows the

statement of Pan, et al. [27], which states that the development of an information system must be appropriate and in accordance with the user community.

3.1 Login page

The login menu is prepared to perform data management. Login menu is also widely used in various information system developments in an effort to improve the security of the information system [28]. This form consists of filling in the username and password to log in. Figure 2 shows a screenshot of the login page of the developed system.
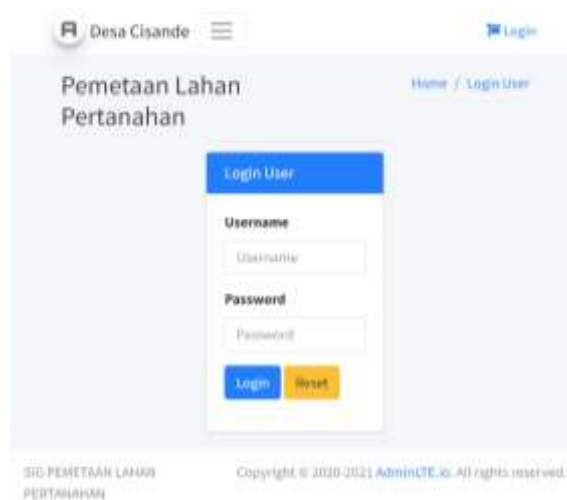

Figure 2. System login page screenshot

3.2 Home page

The dashboard page will appear after the admin has successfully logged in by correctly filling in the username and password. The use of dashboards to display the functionality of a system in real time has been around for quite some time. Dashboard pages are widely used in the development of information systems, especially web-based, to increase the friendliness of the system to the user [29]. On this page, the admin can monitor the history of previous inputs. The input history is in the form of map libraries. Figure 3 displays a dashboard page of the developed system.

Figure 3. Dashboard page of the system

3.3 Land data input page

This page provides a form to input data related to information from the land. The input data provided consists of several fields according to the information on the existing land

categories in the field. A screenshot of the land data input page is presented in Figure 4.
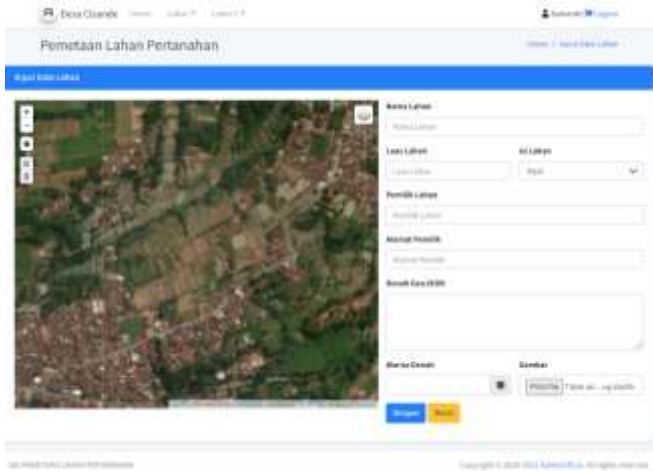

Figure 4. Land data input page

3.4 Photo gallery page

This page provides a photo gallery form consisting of various data that has been inputted from the land data input page. This page also provides a click add photo menu to add supporting data in photos related to the land. The click adds photo menu is also integrated with the add photo gallery page, which provides a form to add photo descriptions and image forms. Screenshots of the photo gallery page and add photo gallery are presented in Figure 5.

Figure 5. Photo gallery page and add photo gallery

3.5 Land data page

The land data page serves to show the input of land data that has been stored. This page consists of land data information, land area, land contents, landowner, and address landowner. Figure 6 shows a screenshot of the land data page of the developed system.

3.6 Land data editing page

Admin can change information related to land data through the land data edit page. This page provides a menu of changing data related to land according to real conditions in the field. For example, if there is a change in land area due to buying and selling activities, this page can change ownership information related to the land. A screenshot of the land data edit page is presented in Figure 7.
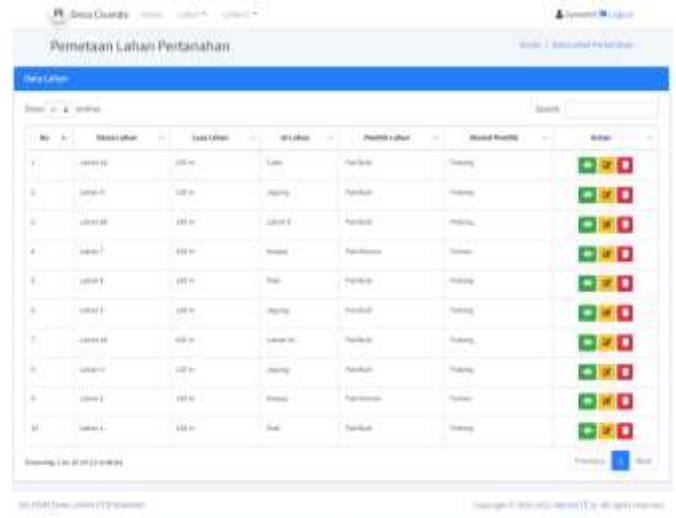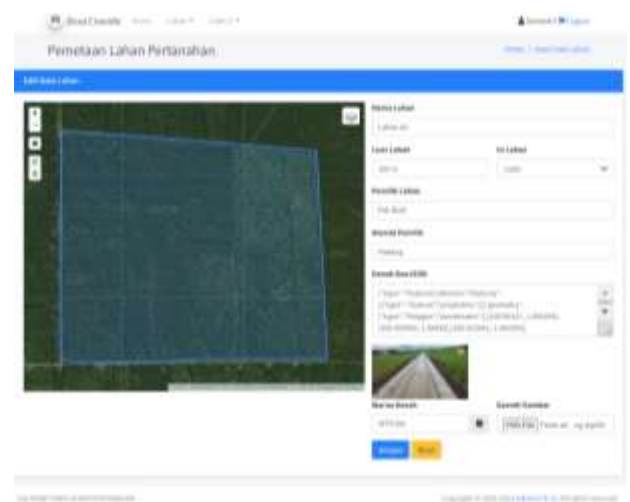

Figure 6. Land data page

Figure 7. Land data edit page

3.7 Land gallery page

This page displays land data that has been inputted and stored in the land gallery. The photos presented in a gallery page are merely thumbnails [30]. Those photographs, which are located in steganogallery, have been linked to their respective full-sized counterparts. The thumbnails are made immediately following the copying and renaming of the full-sized photographs. A screenshot of the land data edit page is shown in Figure 8.

3.8 Letter C of data input page

Land administration, a case study in Cisande Village, Cicantayan District, Sukabumi Regency, Indonesia, has two soil types criteria: dry land (yards, fields, etc.) and wetland (wetland in the form of rice fields). Each of the criteria for the type of land is given a code called a different block number, followed by information related to the date of the change in ownership of the land. Figure 9 shows a screenshot of the developed system's letter C data input page.
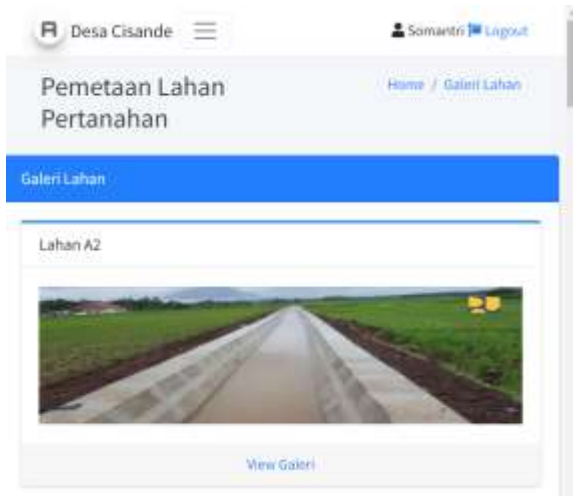
Figure 8. Land gallery page

Figure 9. Screenshot of input data letter C

4. CONCLUSIONS

The study utilized various data and maps included inside a GIS and tandem with web-based to ascertain the appropriateness of various land-use types has been conducted. A case study in Cisande Village, Cicantayan District, Sukabumi Regency, Indonesia, has been used as a pilot project. Appropriate mapping is not only carried out directly on the ground but can also involve the involvement of currently available information systems such as geographic information systems (GIS). Besides, land change science has established itself as a critical component of global environmental change and sustainability. The developed web-based GIS consists of eight main menus (login, homepage, land data input, photo gallery, land data page, land data editing, land gallery, and letter C) that can be accessed online and have provided information related to the land being developed. Monitoring land-use changes in urban areas can aid in the decision-making process for urban planning and resource management. Moreover, the existence of this system will greatly assist land officials at the sub-district level to be able to record the area and designation of the land within the scope of their work so as to minimize conflicts that exist in the community. The future work of this research is to study the impact of using this system on the socio-culture of the area to improve the capabilities of this developed system further.

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5.6 Plagiarism check using turnitin.pdf

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by Muslih Et Al 2022

Utilization of a Web-based Geographic Information System for Land Mapping and Some Its Overview: A Case Study in Sukabumi District, Indonesia

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ABSTRACT

Land used for residence and agriculture is a source of life, especially in Indonesia. This is because most of the sources of livelihood, especially those living at the sub-district level, are mostly engaged in agricultural activities. Therefore, land data collection is very important, starting at the sub-district level. Unfortunately, the information system that supports this does not yet exist, especially in the Sukabumi district. Hence, this study to overview and use a web-based Geographic Information System (GIS) for land mapping, especially in Sukabumi District, Indonesia. The method used in this study was to conduct interviews with land officials at the sub-district level and several communities in the area. Information system problems from potential users are then addressed by designing a web-based information system and integrating it with GIS applications. The developed information system provides menus and sub-menus adapted to the needs of potential users. So far, the information system has been accessible and can help land officials at the sub-district level and several communities in the area. This will provide the level of detailed information that local communities need in responding to information related to their lands to minimize social conflicts.

1. INTRODUCTION

In recent years, with the accelerated urbanization of rural areas, mapping as a land resource is becoming increasingly important in order to promote the sustainable use of the land environment. Appropriate mapping is not only carried out directly on the ground but can also involve the involvement of currently available information systems such as geographic information systems (GIS). Globally, geographic information systems have become increasingly popular in the management and decision-making processes associated with regional emergencies and urgent issues. The construction of modern urban pipeline network digital management systems, which primarily include sewage network, water supply network, land use balance, sediment prediction in a watershed, and so on, has already been carried out in many countries around the world, including the United States, Europe and also Indonesia, which have already applied mature geographic information technology [1-4].

Since its inception in the 1990s, land change research has emerged as a significant component in the study of global environmental change and sustainability. Changes in land use, land cover, and land cover in urban areas, particularly the conversion of farmland and forest land to urban uses, are among the most significant kinds of global environmental change [5, 6]. Monitoring land-use changes in urban areas can aid in the decision-making process for urban planning and

resource management [7-9]. Remote sensing and geospatial information technology have advanced that they now provide a potential foundation for monitoring land changes in metropolitan settings.

However, only a few studies used the Web to map land by GIS for administrative purposes at the sub-district level. Then, this study aimed to overview and utilise a web-based geographic information system (GIS) for land mapping, especially in Sukabumi District, Indonesia. The outcome of this research is that it is expected that land officials at the sub-district level can quickly check documents from the land.

1.1 Related work

1.1.1 Geographic Information System (GIS)

According to Liu and Yang [10], post-classification change detection provides insight into the nature of land change, and the integration of remote sensing and GIS can be particularly effective for defining spatial patterns of urban land change, according to the researchers.

Mazahreh, et al. [11] described a GIS-based technique for determining the feasibility of land for various land-use choices in Jordan's semi-arid conditions. This study utilized various data and maps included inside a GIS to ascertain the appropriateness of various land use types (LUTs). Suitability maps were generated for each land use to illustrate the suitability classes and visualize the geographical

representation of agriculturally acceptable soils. Suitability investigations produced information about the sort of land use for which the land was suited and the type of constraints that hampered land usage. Optimal land use options scenarios were developed to increase and maximize agricultural productivity in research region.

Carver, et al. [12] established a GIS model for mapping Scotland's wildness's geographical patterns and distribution. They intend to research a reliable and repeatable approach for mapping wildness in protected landscapes to inform planning, policy, and management choices. They assert that the model is also scalable, capable of being implemented at various geographical scales ranging from local to national, depending on data needs and available computational resources. The work reported here demonstrates that combining local knowledge with the careful application of local-level statistics inside bespoke GIS models may be a strong instrument for assisting in developing specific planning policies and actions for wild land conservation and management.

1.1.2 Web-based GIS

Web-based GIS has long been used for many purposes. A significant advantage of online mapping apps is that they provide efficient distribution of geographical data without extra software [13]. Also, experts can control environmental or contextual (streets, rivers) layers centrally instead of distributing along with software to each end-user [14]. A facilitated soil information system for the United Arab Emirates and its usefulness in agricultural land use planning are among the applications for which Abdelfattah and Kumar [15] employ it. Each component of the system is comprised of multiple parts, including a geographic soil database, a field operating system, and a very intuitive web-based secure application. The UAESIS is described in detail in this document, including its structure, capabilities, functions, advantages, applications, and uses. Two case studies are offered to show the system's applicability to the appraisal of land appropriate for date palm cultivation and the growing of salt-tolerant crops, respectively.

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Letter C of land ownership in Indonesia is very important. According to Suryadi, et al. [21], three community groups and authorized officials are divided by a letter C letter. Even after the first owner passes away, the inheritance such as right over land, which is according to the inheritance division certificate, must be divided together between some heirs; alternatively, if the inheritance division certificate has not yet been issued, the right transfer is listed to the heirs who deserve the joint rights based on the proof as to the heirs or the inheritance certificate. Therefore, a clear land ownership data collection system at the sub-district level is important to avoid conflict. In addition, the system should also be easily accessible by the community.

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2. RESEARCH METHODOLOGY

As a case study in Sukabumi District (Cisande Village, Cicantayan District), the data collected consisted of village locations, village maps, coordinate points, village profiles, satellite photos, land data, and Letter C data. The data was obtained from various sources, such as interviews and observations with several expert officers about the village.

In developing a web-based information system with integration into a GIS, the flow is as shown in Figure 1. In summary, the first thing to do is analyze potential users' needs. From this point it will be known the expectations of the users of the Web-based GIS that will be developed. Next, do the design for the information system to be developed. After that, carry out the construction of the developed information system. After the system is formed, testing is carried out for all developed menus and sub-menus. In addition, within a certain period after being disseminated to users, system maintenance is important to find out if there are bugs in the system.
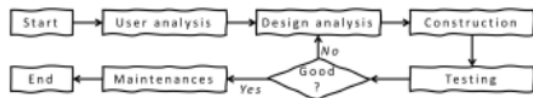
Figure 1. Flowchart of research stages

The system development method used in this study uses the waterfall of software development life cycle (SDLC). SDLC is a process for developing software with the greatest possible quality at the lowest possible cost in the shortest amount of time. SDLC establishes a well-structured flow of stages that enables an organization to rapidly deliver high-quality software that has been thoroughly tested and is suitable for production usage [22]. These are just a few of the reasons why it is critical to create a secure software development life cycle [23]. It appears critical to expand the notion of security and to recognize that security must be a component of every growth.

User analysis is used to investigate problems that occur in the field [24]. It is necessary to identify possible solutions that can be used to address the analytical design.

The design phase allows a researcher to get effective and interactive search media in a certain location. This step requires the programmer to create a design sketch for easy conversion into a specific format. Interactive search media is related to the demand of users who will be involved in using the developed Web-based GIS to be comfortable enough to use this system. In this paper, the Unified Modeling Language (UML) is used in the system design [25], including use case diagrams, class diagrams, and activity diagrams.

Next, construction is the process of writing program code on a computer. The process of coding this design is transforming it into a language that the computer can understand.

A black-box approach conducted system testing [26]. In particular, tests are carried out on the input and output menus of the system to test its functional performance. Therefore, software developers in black box testing can create multiple input condition scenarios to train all the system's functional requirements.

Finally, maintenance focuses on periodic checking of the system, which involves correcting some error menus that have not been found in the previous stage. This is always important to update the system to work properly every time.

3. RESULT AND DISCUSSION

The principle of the program design of the developed web-based GIS is that there are three main users. The first user is a user who can access web-based GIS information from outside without having to log in. These users are people who get general information from Web-based GIS. The second user is a user who must carry out a log-in verification process to view more detailed information on land and add the latest information from certain lands. The third user is the admin, who is in charge of verifying the land proposed by the second user. In addition, the admin will be in charge of maintaining this developed system. Besides that, the website-based land mapping GIS interface design consists of eight main pages. Each main page consists of at least several menus that can be broken down. The system's appearance was developed using Indonesian language because, in general, the users of this system are local people from Indonesia. This follows the

statement of Pan, et al. [27], which states that the development of an information system must be appropriate and in accordance with the user community.

3.1 Login page

The login menu is prepared to perform data management. Login menu is also widely used in various information system developments in an effort to improve the security of the information system [28]. This form consists of filling in the username and password to log in. Figure 2 shows a screenshot of the login page of the developed system.
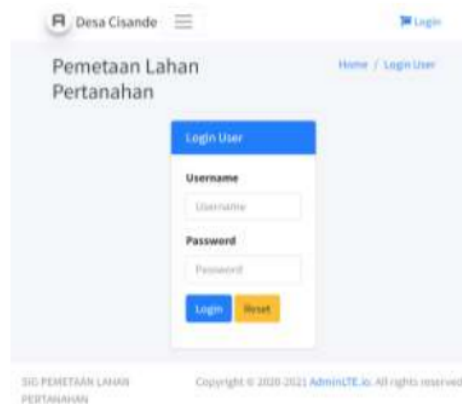

Figure 2. System login page screenshot

3.2 Home page

The dashboard page will appear after the admin has successfully logged in by correctly filling in the username and password. The use of dashboards to display the functionality of a system in real time has been around for quite some time. Dashboard pages are widely used in the development of information systems, especially web-based, to increase the friendliness of the system to the user [29]. On this page, the admin can monitor the history of previous inputs. The input history is in the form of map libraries. Figure 3 displays a dashboard page of the developed system.

Figure 3. Dashboard page of the system

3.3 Land data input page

This page provides a form to input data related to information from the land. The input data provided consists of several fields according to the information on the existing land

categories in the field. A screenshot of the land data input page is presented in Figure 4.
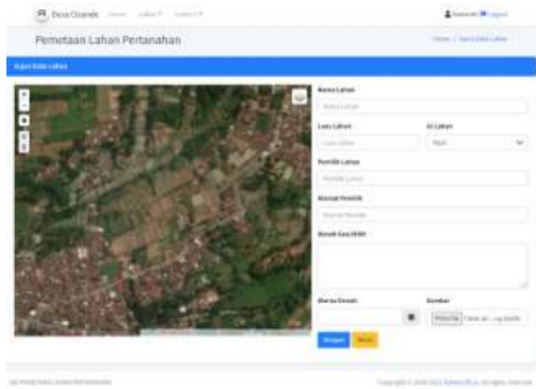

Figure 4. Land data input page

3.4 Photo gallery page

This page provides a photo gallery form consisting of various data that has been inputted from the land data input page. This page also provides a click add photo menu to add supporting data in photos related to the land. The click adds photo menu is also integrated with the add photo gallery page, which provides a form to add photo descriptions and image forms. Screenshots of the photo gallery page and add photo gallery are presented in Figure 5.

Figure 5. Photo gallery page and add photo gallery

3.5 Land data page

The land data page serves to show the input of land data that has been stored. This page consists of land data information, land area, land contents, landowner, and address landowner. Figure 6 shows a screenshot of the land data page of the developed system.

3.6 Land data editing page

Admin can change information related to land data through the land data edit page. This page provides a menu of changing data related to land according to real conditions in the field. For example, if there is a change in land area due to buying and selling activities, this page can change ownership information related to the land. A screenshot of the land data edit page is presented in Figure 7.
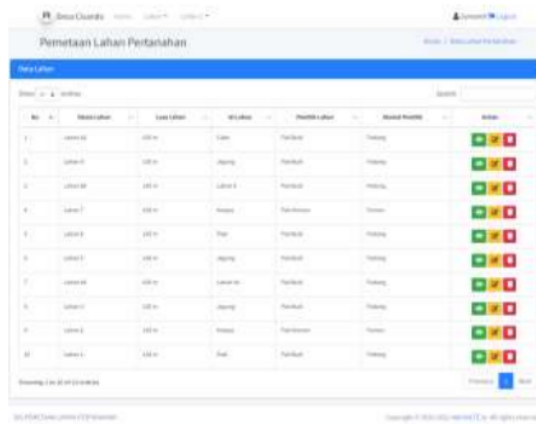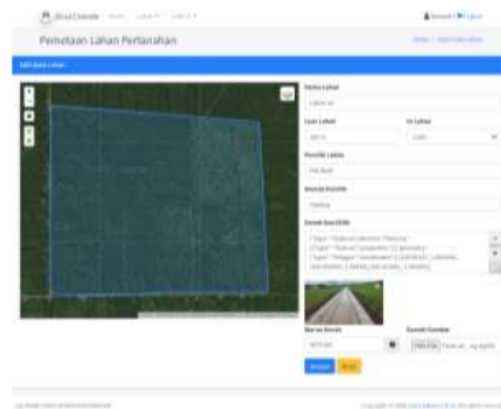

Figure 6. Land data page

Figure 7. Land data edit page

3.7 Land gallery page

This page displays land data that has been inputted and stored in the land gallery. The photos presented in a gallery page are merely thumbnails [30]. Those photographs, which are located in steganogallery, have been linked to their respective full-sized counterparts. The thumbnails are made immediately following the copying and renaming of the full-sized photographs. A screenshot of the land data edit page is shown in Figure 8.

3.8 Letter C of data input page

Land administration, a case study in Cisande Village, Cicantayan District, Sukabumi Regency, Indonesia, has two types criteria: dry land (yards, fields, etc.) and wetland (wetland in the form of rice fields). Each of the criteria for the type of land is given a code called a different block number, followed by information related to the date of the change in ownership of the land. Figure 9 shows a screenshot of the developed system's letter C data input page.
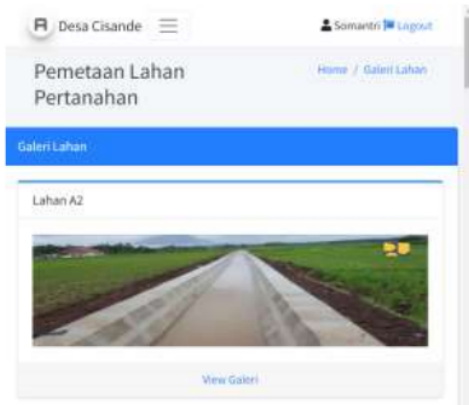
Figure 8. Land gallery page

Figure 9. Screenshot of input data letter C

4. CONCLUSIONS

The study utilized various data and maps included inside a GIS and tandem with web-based to ascertain the appropriateness of various land-use types has been conducted. A case study in Cisande Village, Cicantayan District, Sukabumi Regency, Indonesia, has been used as a pilot project. Appropriate mapping is not only carried out directly on the ground but can also involve the involvement of currently available information systems such as geographic information systems (GIS). Besides, land change science has established itself as a critical component of global environmental change and sustainability. The developed web-based GIS consists of eight main menus (login, homepage, land data input, photo gallery, land data page, land data editing, land gallery, and letter C) that can be accessed online and have provided information related to the land being developed. Monitoring land-use changes in urban areas can aid in the decision-making process for urban planning and resource management. Moreover, the existence of this system will greatly assist land officials at the sub-district level to be able to record the area and designation of the land within the scope of their work so as to minimize conflicts that exist in the community. The future work of this research is to study the impact of using this system on the socio-culture of the area to improve the capabilities of this developed system further.

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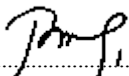
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Utilization of a Web-based Geographic Information System for Land Mapping and Some Its Overview: A Case Study in Sukabumi District, Indonesia

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ABSTRACT

Land used for residence and agriculture is a source of life, especially in Indonesia. This is because most of the sources of livelihood, especially those living at the sub-district level, are mostly engaged in agricultural activities. Therefore, land data collection is very important, starting at the sub-district level. Unfortunately, the information system that supports this does not yet exist, especially in the Sukabumi district. Hence, this study to overview and use a web-based Geographic Information System (GIS) for land mapping, especially in Sukabumi District, Indonesia. The method used in this study was to conduct interviews with land officials at the sub-district level and several communities in the area. Information system problems from potential users are then addressed by designing a web-based information system and integrating it with GIS applications. The developed information system provides menus and sub-menus adapted to the needs of potential users. So far, the information system has been accessible and can help land officials at the sub-district level and several communities in the area. This will provide the level of detailed information that local communities need in responding to information related to their lands to minimize social conflicts.

1. INTRODUCTION

In recent years, with the accelerated urbanization of rural areas, mapping as a land resource is becoming increasingly important in order to promote the sustainable use of the land environment. Appropriate mapping is not only carried out directly on the ground but can also involve the involvement of currently available information systems such as geographic information systems (GIS). Globally, geographic information systems have become increasingly popular in the management and decision-making processes associated with regional emergencies and urgent issues. The construction of modern urban pipeline network digital management systems, which primarily include sewage network, water supply network, land use balance, sediment prediction on a watershed, and so on, has already been carried out in many countries around the world, including the United States, Europe and also Indonesia, which have already applied mature geographic information technology [1-4].

Since its inception in the 1990s, land change research has emerged as a significant component in the study of global environmental change and sustainability. Changes in land use, land cover, and land cover in urban areas, particularly the conversion of farmland and forest land to urban uses, are among the most significant kinds of global environmental change [5, 6]. Monitoring land-use changes in urban areas can aid in the decision-making process for urban planning and

resource management [7-9]. Remote sensing and geospatial information technology have advanced that they now provide a potential foundation for monitoring land changes in metropolitan settings.

However, only a few studies used the Web to map land by GIS for administrative purposes at the sub-district level. Then, this study aimed to overview and utilise a web-based geographic information system (GIS) for land mapping, especially in Sukabumi District, Indonesia. The outcome of this research is that it is expected that land officials at the sub-district level can quickly check documents from the land.

1.1 Related work

1.1.1 Geographic Information System (GIS)

According to Liu and Yang [10], post-classification change detection provides insight into the nature of land change, and the integration of remote sensing and GIS can be particularly effective for defining spatial patterns of urban land change, according to the researchers.

Mazahreh et al. [11] described a GIS-based technique for determining the feasibility of land for various land-use choices in Jordan's semi-arid conditions. This study utilized various data and maps included inside a GIS to ascertain the appropriateness of various land use types (LUTs). Suitability maps were generated for each land use to illustrate the suitability classes and visualize the geographical

representation of agriculturally acceptable soils. Suitability investigations produced information about the sort of land use for which the land was suited and the type of constraints that hampered land usage. Optimal land use options scenarios were developed to increase and maximize agricultural productivity in the research region.

Carver et al. [12] established a GIS model for mapping Scotland's wildness's geographical patterns and distribution. They intend to research a reliable and repeatable approach for mapping wildness in protected landscapes to inform planning, policy, and management choices. They assert that the model is also scalable, capable of being implemented at various geographical scales ranging from local to national, depending on data needs and available computational resources. The work reported here demonstrates that combining local knowledge with the careful application of local-level statistics inside bespoke GIS models may be a strong instrument for assisting in developing specific planning policies and actions for wild land conservation and management.

1.1.2 Web-based GIS

Web-based GIS has long been used for many purposes. A significant advantage of online mapping apps is that they provide efficient distribution of geographical data without extra software [13]. Also, experts can control environmental or contextual (streets, rivers) layers centrally instead of distributing along with software to each end-user [14]. A facilitated soil information system for the United Arab Emirates and its usefulness in agricultural land use planning are among the applications for which Abdelfattah and Kumar [15] employ it. Each component of the system is comprised of multiple parts, including a geographic soil database, a field operating system, and a very intuitive web-based secure application. The UAESIS is described in detail in this document, including its structure, capabilities, functions, advantages, applications, and uses. Two case studies are offered to show the system's applicability to the appraisal of land appropriate for date palm cultivation and the growing of salt-tolerant crops, respectively.

Other research by Rao et al. [16] indicated that the USDA's Conservation Reserve Program is managed and planned to utilize a web-based GIS Decision Support System (CRP). They assert that the integrated web-GIS DSS is built utilizing a web server and Java Servlet technology on top of an ArcIMS platform to enable remote data access and processing. The prototype DSS was used to model the sediment and nutrient dynamics of a small watershed in the Panhandle of Oklahoma.

In Indonesia, Web-based GIS has been widely used for various purposes. As used by Amalia et al. [17] for tropical diseases-prone areas in East Java Province. To encourage halal tourism in Bukittinggi, Afnarius et al. [18] presented information about places of worship. Ginardi et al. [19] for asset management of land and building of Madiun city government. However, to date, no research utilizes Web-based GIS for mapping for administrative purposes at the sub-district level. The main challenge of developing this system is that each region has its characteristics regarding land management.

1.1.3 Evidence of ownership of land rights

Evidence of ownership of land rights or letter C document is official proof of land ownership in Indonesia. Letter C document is evidence of ownership of land rights in Indonesia [20]. The land is the primary requirement for people, as human existence is inextricably linked to the soil. The Indonesian state is undergoing changes in the way land ownership rights are structured, followed by the issuing of land-related legislation. Recognize the early signs of land rights ownership between community members and government agencies in conflict zones [20].

Letter C of land ownership in Indonesia is very important. According to Suryadi et al. [21], three community groups and authorized officials are divided by a letter C letter. Even after the first owner passes away, the inheritance such as right over land, which is according to the inheritance division certificate, must be divided together between some heirs; alternatively, if the inheritance division certificate has not yet been issued, the right transfer is listed to the heirs who deserve the joint rights based on the proof as to the heirs or the inheritance certificate. Therefore, a clear land ownership data collection system at the sub-district level is important to avoid conflict. In addition, the system should also be easily accessible by the community.

1.2 Research positioning

Previous literature has shown various after-effects result from GIS and their functional for mapping. Research trends tend to focus more on the technical part of the problem. However, the application of web-based geographic information systems (GIS) has only been briefly covered in earlier studies. Hence, this research attempts to investigate the application of Web-based GIS for administrative purposes at the sub-district level. It also tries to highlight the menu Web-based GIS has been developed and how to used it. Moreover, the existence of this system will greatly assist land officials at the sub-district level to be able to record the area and designation of the land within the scope of their work so as to minimize conflicts that exist in the community. Disputes over land claims and cultivating land in the community occur if the origin of the land cannot be properly and properly archived. Web-based GIS will assist in clarifying and providing data and archives of the history of the existing land. For this reason, this research attempts to define the function of geographic information systems (GIS) in transformation administration at the sub-district level as well. This paper developed a Web-based GIS in accordance with the needs of land officials at the sub-district level and the use is also the surrounding community of the sub-district.

2. RESEARCH METHODOLOGY

As a case study in Sukabumi District (Cisande Village, Cicantayan District), the data collected consisted of village locations, village maps, coordinate points, village profiles, satellite photos, land data, and Letter C data. The data was obtained from various sources, such as interviews and observations with several expert officers about the village.

In developing a web-based information system with integration into a GIS, the flow is as shown in Figure 1. In summary, the first thing to do is analyze potential users' needs. From this point it will be known the expectations of the users of the Web-based GIS that will be developed. Next, do the design for the information system to be developed. After that, carry out the construction of the developed information system. After the system is formed, testing is carried out for all developed menus and sub-menus. In addition, within a certain period after being disseminated to users, system

maintenance is important to find out if there are bugs in the system.
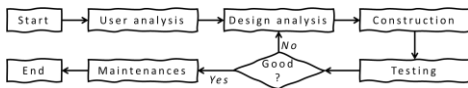

Figure 1. Flowchart of research stages

The system development method used in this study uses the waterfall of software development life cycle (SDLC). SDLC is a process for developing software with the greatest possible quality at the lowest possible cost in the shortest amount of time. SDLC establishes a well-structured flow of stages that enables an organization to rapidly deliver high-quality software that has been thoroughly tested and is suitable for production usage [22]. These are just a few of the reasons why it is critical to create a secure software development life cycle [23]. It appears critical to expand the notion of security and to recognize that security must be a component of every growth.

User analysis is used to investigate problems that occur in the field [24]. It is necessary to identify possible solutions that can be used to address the analytical design.

The design phase allows a researcher to get effective and interactive search media in a certain location. This step requires the programmer to create a design sketch for easy conversion into a specific format. Interactive search media is related to the demand of users who will be involved in using the developed Web-based GIS to be comfortable enough to use this system. In this paper, the Unified Modeling Language (UML) is used in the system design [25], including use case diagrams, class diagrams, and activity diagrams.

Next, construction is the process of writing program code on a computer. The process of coding this design is transforming it into a language that the computer can understand.

A black-box approach conducted system testing [26]. In particular, tests are carried out on the input and output menus of the system to test its functional performance. Therefore, software developers in black box testing can create multiple input condition scenarios to train all the system's functional requirements.

Finally, maintenance focuses on periodic checking of the system, which involves correcting some error menus that have not been found in the previous stage. This is always important to update the system to work properly every time.

3. RESULT AND DISCUSSION

The principle of the program design of the developed web-based GIS is that there are three main users. The first user is a user who can access web-based GIS information from outside without having to log in. These users are people who get general information from Web-based GIS. The second user is a user who must carry out a log-in verification process to view more detailed information on land and add the latest information from certain lands. The third user is the admin, who is in charge of verifying the land proposed by the second user. In addition, the admin will be in charge of maintaining this developed system. Besides that, the website-based land mapping GIS interface design consists of eight main pages. Each main page consists of at least several menus that can be

broken down. The system's appearance was developed using Indonesian language because, in general, the users of this system are local people from Indonesia. This follows the statement of Pan et al. [27], which states that the development of an information system must be appropriate and in accordance with the user community.

3.1 Login page

The login menu is prepared to perform data management. Login menu is also widely used in various information system developments in an effort to improve the security of the information system [28]. This form consists of filling in the username and password to log in. Figure 2 shows a screenshot of the login page of the developed system.
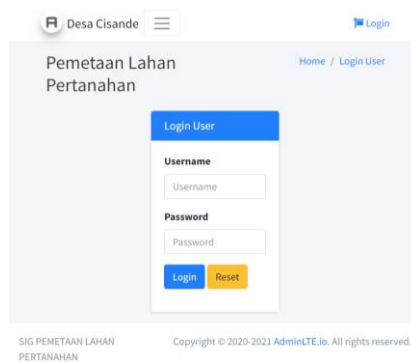

Figure 2. System login page screenshot

3.2 Home page

The dashboard page will appear after the admin has successfully logged in by correctly filling in the username and password. The use of dashboards to display the functionality of a system in real time has been around for quite some time. Dashboard pages are widely used in the development of information systems, especially web-based, to increase the friendliness of the system to the user [29]. On this page, the admin can monitor the history of previous inputs. The input history is in the form of map libraries. Figure 3 displays a dashboard page of the developed system.
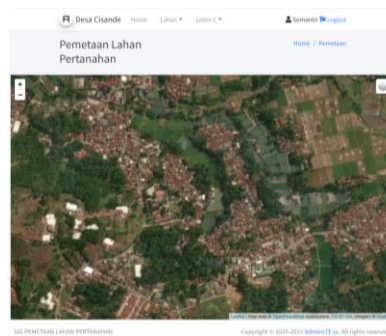
Figure 3. Dashboard page of the system

3.3 Land data input page

This page provides a form to input data related to information from the land. The input data provided consists of several fields according to the information on the existing land categories in the field. A screenshot of the land data input page is presented in Figure 4.
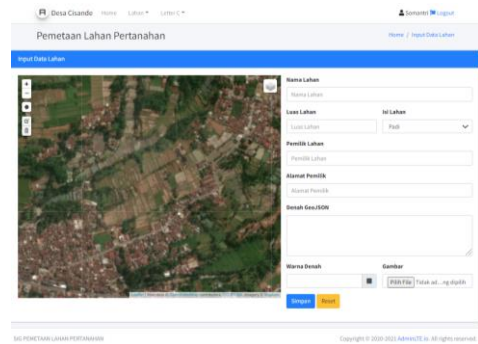

Figure 4. Land data input page

3.4 Photo gallery page

This page provides a photo gallery form consisting of various data that has been inputted from the land data input page. This page also provides a click add photo menu to add supporting data in photos related to the land. The click adds photo menu is also integrated with the add photo gallery page, which provides a form to add photo descriptions and image forms. Screenshots of the photo gallery page and add photo gallery are presented in Figure 5.

Figure 5. Photo gallery page and add photo gallery

3.5 Land data page

The land data page serves to show the input of land data that has been stored. This page consists of land data information, land area, land contents, landowner, and address landowner. Figure 6 shows a screenshot of the land data page of the developed system.

3.6 Land data editing page

Admin can change information related to land data through the land data edit page. This page provides a menu of changing data related to land according to real conditions in the field. For example, if there is a change in land area due to buying and selling activities, this page can change ownership information related to the land. A screenshot of the land data edit page is presented in Figure 7.
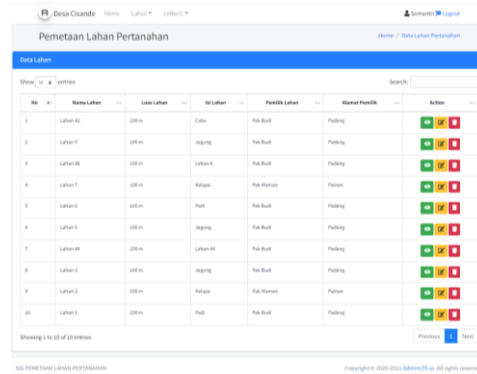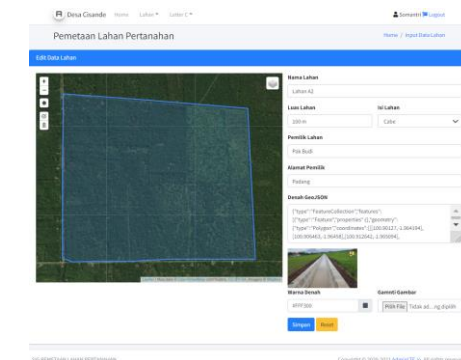

Figure 6. Land data page

Figure 7. Land data edit page

3.7 Land gallery page

This page displays land data that has been inputted and stored in the land gallery. The photos presented in a gallery page are merely thumbnails [30]. Those photographs, which are located in steganogallery, have been linked to their respective full-sized counterparts. The thumbnails are made immediately following the copying and renaming of the full-sized photographs. A screenshot of the land data edit page is shown in Figure 8.

3.8 Letter C of data input page

Land administration, a case study in Cisande Village, Cicantayan District, Sukabumi Regency, Indonesia, has two soil types criteria: dry land (yards, fields, etc.) and wetland (wetland in the form of rice fields). Each of the criteria for the type of land is given a code called a different block number, followed by information related to the date of the change in ownership of the land. Figure 9 shows a screenshot of the developed system's letter C data input page.
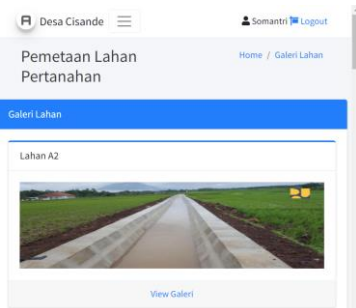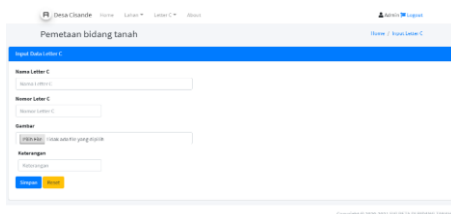
Figure 8. Land gallery page

Figure 9. Screenshot of input data letter C

4. CONCLUSIONS

The study utilized various data and maps included inside a GIS and tandem with web-based to ascertain the appropriateness of various land-use types has been conducted. A case study in Cisande Village, Cicantayan District, Sukabumi Regency, Indonesia, has been used as a pilot project. Appropriate mapping is not only carried out directly on the ground but can also involve the involvement of currently available information systems such as geographic information systems (GIS). Besides, land change science has established itself as a critical component of global environmental change and sustainability. The developed web-based GIS consists of eight main menus (login, homepage, land data input, photo gallery, land data page, land data editing, land gallery, and letter C) that can be accessed online and have provided information related to the land being developed. Monitoring land-use changes in urban areas can aid in the decision-making process for urban planning and resource management. Moreover, the existence of this system will greatly assist land officials at the sub-district level to be able to record the area and designation of the land within the scope of their work so as to minimize conflicts that exist in the community. The future work of this research is to study the impact of using this system on the socio-culture of the area to improve the capabilities of this developed system further.

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Utilization of a Web-based Geographic Information System for Land Mapping and Some Its Overview: A Case Study in Sukabumi District, Indonesia

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ABSTRACT

Land used for residence and agriculture is a source of life, especially in Indonesia. This is because most of the sources of livelihood, especially those living at the sub-district level, are mostly engaged in agricultural activities. Therefore, land data collection is very important, starting at the sub-district level. Unfortunately, the information system that supports this does not yet exist, especially in the Sukabumi district. Hence, this study to overview and use a web-based Geographic Information System (GIS) for land mapping, especially in Sukabumi District, Indonesia. The method used in this study was to conduct interviews with land officials at the sub-district level and several communities in the area. Information system problems from potential users are then addressed by designing a web-based information system and integrating it with GIS applications. The developed information system provides menus and sub-menus adapted to the needs of potential users. So far, the information system has been accessible and can help land officials at the sub-district level and several communities in the area. This will provide the level of detailed information that local communities need in responding to information related to their lands to minimize social conflicts.

1. INTRODUCTION

In recent years, with the accelerated urbanization of rural areas, mapping as a land resource is becoming increasingly important in order to promote the sustainable use of the land environment. Appropriate mapping is not only carried out directly on the ground but can also involve the involvement of currently available information systems such as geographic information systems (GIS). Globally, geographic information systems have become increasingly popular in the management and decision-making processes associated with regional emergencies and urgent issues. The construction of modern urban pipeline network digital management systems, which primarily include sewage network, water supply network, land use balance, sediment prediction on a watershed, and so on, has already been carried out in many countries around the world, including the United States, Europe and also Indonesia, which have already applied mature geographic information technology [1-4].

Since its inception in the 1990s, land change research has emerged as a significant component in the study of global environmental change and sustainability. Changes in land use, land cover, and land cover in urban areas, particularly the conversion of farmland and forest land to urban uses, are among the most significant kinds of global environmental change [5, 6]. Monitoring land-use changes in urban areas can aid in the decision-making process for urban planning and resource management [7-9]. Remote sensing and geospatial information technology have advanced that they now provide a potential foundation for monitoring land changes in metropolitan settings.

However, only a few studies used the Web to map land by GIS for administrative purposes at the sub-district level. Then, this study aimed to overview and utilise a web-based geographic information system (GIS) for land mapping, especially in Sukabumi District, Indonesia. The outcome of this research is that it is expected that land officials at the sub-district level can quickly check documents from the land.

1.1 Related work

1.1.1 Geographic Information System (GIS)

According to Liu and Yang [10], post-classification change detection provides insight into the nature of land change, and the integration of remote sensing and GIS can be particularly effective for defining spatial patterns of urban land change, according to the researchers.

Mazahreh et al. [11] described a GIS-based technique for determining the feasibility of land for various land-use choices in Jordan's semi-arid conditions. This study utilized various data and maps included inside a GIS to ascertain the appropriateness of various land use types (LUTs). Suitability maps were generated for each land use to illustrate the suitability classes and visualize the geographical representation of agriculturally acceptable soils. Suitability investigations produced information about the sort of land use

for which the land was suited and the type of constraints that hampered land usage. Optimal land use options scenarios were developed to increase and maximize agricultural productivity in the research region.

Carver et al. [12] established a GIS model for mapping Scotland's wildness's geographical patterns and distribution. They intend to research a reliable and repeatable approach for mapping wildness in protected landscapes to inform planning, policy, and management choices. They assert that the model is also scalable, capable of being implemented at various geographical scales ranging from local to national, depending on data needs and available computational resources. The work reported here demonstrates that combining local knowledge with the careful application of local-level statistics inside bespoke GIS models may be a strong instrument for assisting in developing specific planning policies and actions for wild land conservation and management.

1.1.2 Web-based GIS

Web-based GIS has long been used for many purposes. A significant advantage of online mapping apps is that they provide efficient distribution of geographical data without extra software [13]. Also, experts can control environmental or contextual (streets, rivers) layers centrally instead of distributing along with software to each end-user [14]. A facilitated soil information system for the United Arab Emirates and its usefulness in agricultural land use planning are among the applications for which Abdelfattah and Kumar [15] employ it. Each component of the system is comprised of multiple parts, including a geographic soil database, a field operating system, and a very intuitive web-based secure application. The UAESIS is described in detail in this document, including its structure, capabilities, functions, advantages, applications, and uses. Two case studies are offered to show the system's applicability to the appraisal of land appropriate for date palm cultivation and the growing of salt-tolerant crops, respectively.

Other research by Rao et al. [16] indicated that the USDA's Conservation Reserve Program is managed and planned to utilize a web-based GIS Decision Support System (CRP). They assert that the integrated web-GIS DSS is built utilizing a web server and Java Servlet technology on top of an ArcIMS platform to enable remote data access and processing. The prototype DSS was used to model the sediment and nutrient dynamics of a small watershed in the Panhandle of Oklahoma.

In Indonesia, Web-based GIS has been widely used for various purposes. As used by Amalia et al. [17] for tropical diseases-prone areas in East Java Province. To encourage halal tourism in Bukittinggi, Afnarius et al. [18] presented information about places of worship. Ginardi et al. [19] for asset management of land and building of Madiun city government. However, to date, no research utilizes Web-based GIS for mapping for administrative purposes at the sub-district level. The main challenge of developing this system is that each region has its characteristics regarding land management.

1.1.3 Evidence of ownership of land rights

Evidence of ownership of land rights or letter C document is official proof of land ownership in Indonesia. Letter C document is evidence of ownership of land rights in Indonesia [20]. The land is the primary requirement for people, as human existence is inextricably linked to the soil. The Indonesian state is undergoing changes in the way land ownership rights are structured, followed by the issuing of land-related legislation. Recognize the early signs of land rights ownership between community members and government agencies in conflict zones [20].

Letter C of land ownership in Indonesia is very important. According to Suryadi et al. [21], three community groups and authorized officials are divided by a letter C letter. Even after the first owner passes away, the inheritance such as right over land, which is according to the inheritance division certificate, must be divided together between some heirs; alternatively, if the inheritance division certificate has not yet been issued, the right transfer is listed to the heirs who deserve the joint rights based on the proof as to the heirs or the inheritance certificate. Therefore, a clear land ownership data collection system at the sub-district level is important to avoid conflict. In addition, the system should also be easily accessible by the community.

1.2 Research positioning

Previous literature has shown various after-effects result from GIS and their functional for mapping. Research trends tend to focus more on the technical part of the problem. However, the application of web-based geographic information systems (GIS) has only been briefly covered in earlier studies. Hence, this research attempts to investigate the application of Web-based GIS for administrative purposes at the sub-district level. It also tries to highlight the menu Web-based GIS has been developed and how to used it. Moreover, the existence of this system will greatly assist land officials at the sub-district level to be able to record the area and designation of the land within the scope of their work so as to minimize conflicts that exist in the community. Disputes over land claims and cultivating land in the community occur if the origin of the land cannot be properly and properly archived. Web-based GIS will assist in clarifying and providing data and archives of the history of the existing land. For this reason, this research attempts to define the function of geographic information systems (GIS) in transformation administration at the sub-district level as well. This paper developed a Web-based GIS in accordance with the needs of land officials at the sub-district level and the use is also the surrounding community of the sub-district.

2. RESEARCH METHODOLOGY

As a case study in Sukabumi District (Cisande Village, Cicantayan District), the data collected consisted of village locations, village maps, coordinate points, village profiles, satellite photos, land data, and Letter C data. The data was obtained from various sources, such as interviews and observations with several expert officers about the village.

In developing a web-based information system with integration into a GIS, the flow is as shown in Figure 1. In summary, the first thing to do is analyze potential users' needs. From this point it will be known the expectations of the users of the Web-based GIS that will be developed. Next, do the design for the information system to be developed. After that, carry out the construction of the developed information system. After the system is formed, testing is carried out for all developed menus and sub-menus. In addition, within a certain period after being disseminated to users, system maintenance is important to find out if there are bugs in the system.
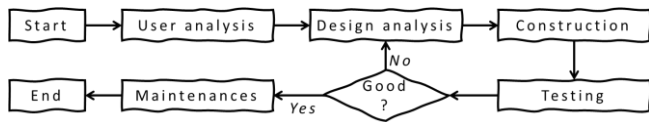
Figure 1. Flowchart of research stages

The system development method used in this study uses the waterfall of software development life cycle (SDLC). SDLC is a process for developing software with the greatest possible quality at the lowest possible cost in the shortest amount of time. SDLC establishes a well-structured flow of stages that enables an organization to rapidly deliver high-quality software that has been thoroughly tested and is suitable for production usage [22]. These are just a few of the reasons why it is critical to create a secure software development life cycle [23]. It appears critical to expand the notion of security and to recognize that security must be a component of every growth.

User analysis is used to investigate problems that occur in the field [24]. It is necessary to identify possible solutions that can be used to address the analytical design.

The design phase allows a researcher to get effective and interactive search media in a certain location. This step requires the programmer to create a design sketch for easy conversion into a specific format. Interactive search media is related to the demand of users who will be involved in using the developed Web-based GIS to be comfortable enough to use this system. In this paper, the Unified Modeling Language (UML) is used in the system design [25], including use case diagrams, class diagrams, and activity diagrams.

Next, construction is the process of writing program code on a computer. The process of coding this design is transforming it into a language that the computer can understand.

A black-box approach conducted system testing [26]. In particular, tests are carried out on the input and output menus of the system to test its functional performance. Therefore, software developers in black box testing can create multiple input condition scenarios to train all the system's functional requirements.

Finally, maintenance focuses on periodic checking of the system, which involves correcting some error menus that have not been found in the previous stage. This is always important to update the system to work properly every time.

3. RESULT AND DISCUSSION

The principle of the program design of the developed web-based GIS is that there are three main users. The first user is a user who can access web-based GIS information from outside without having to log in. These users are people who get general information from Web-based GIS. The second user is a user who must carry out a log-in verification process to view more detailed information on land and add the latest information from certain lands. The third user is the admin, who is in charge of verifying the land proposed by the second user. In addition, the admin will be in charge of maintaining this developed system. Besides that, the website-based land mapping GIS interface design consists of eight main pages. Each main page consists of at least several menus that can be broken down. The system's appearance was developed using Indonesian language because, in general, the users of this system are local people from Indonesia. This follows the

statement of Pan et al. [27], which states that the development of an information system must be appropriate and in accordance with the user community.

3.1 Login page

The login menu is prepared to perform data management. Login menu is also widely used in various information system developments in an effort to improve the security of the information system [28]. This form consists of filling in the username and password to log in. Figure 2 shows a screenshot of the login page of the developed system.
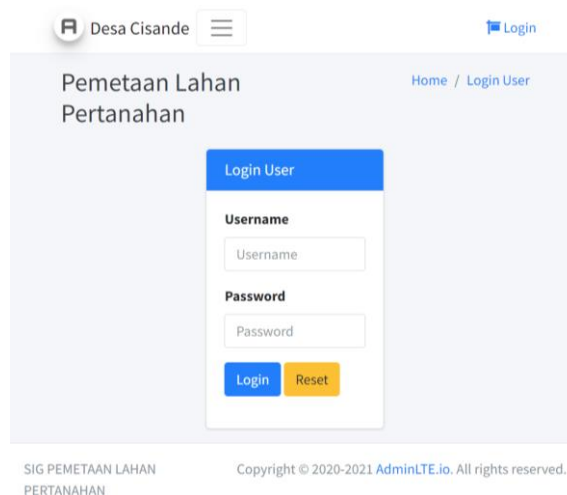

Figure 2. System login page screenshot

3.2 Home page

The dashboard page will appear after the admin has successfully logged in by correctly filling in the username and password. The use of dashboards to display the functionality of a system in real time has been around for quite some time. Dashboard pages are widely used in the development of information systems, especially web-based, to increase the friendliness of the system to the user [29]. On this page, the admin can monitor the history of previous inputs. The input history is in the form of map libraries. Figure 3 displays a dashboard page of the developed system.
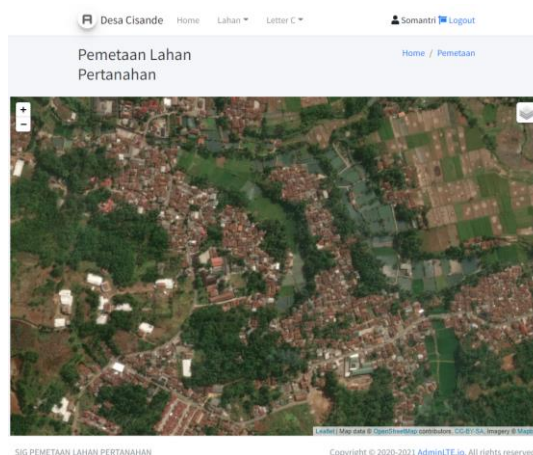

Figure 3. Dashboard page of the system

3.3 Land data input page

This page provides a form to input data related to information from the land. The input data provided consists of several fields according to the information on the existing land categories in the field. A screenshot of the land data input page is presented in Figure 4.
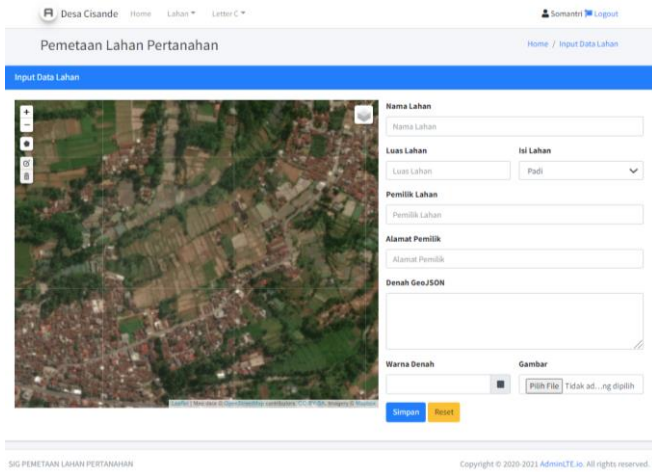

Figure 4. Land data input page

3.4 Photo gallery page

This page provides a photo gallery form consisting of various data that has been inputted from the land data input page. This page also provides a click add photo menu to add supporting data in photos related to the land. The click adds photo menu is also integrated with the add photo gallery page, which provides a form to add photo descriptions and image forms. Screenshots of the photo gallery page and add photo gallery are presented in Figure 5.
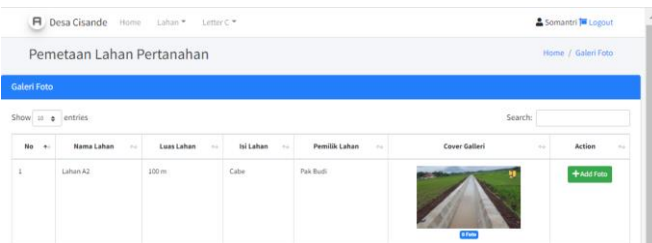

Figure 5. Photo gallery page and add photo gallery

3.5 Land data page

The land data page serves to show the input of land data that has been stored. This page consists of land data information, land area, land contents, landowner, and address landowner. Figure 6 shows a screenshot of the land data page of the developed system.

3.6 Land data editing page

Admin can change information related to land data through the land data edit page. This page provides a menu of changing data related to land according to real conditions in the field. For example, if there is a change in land area due to buying and selling activities, this page can change ownership information related to the land. A screenshot of the land data edit page is presented in Figure 7.
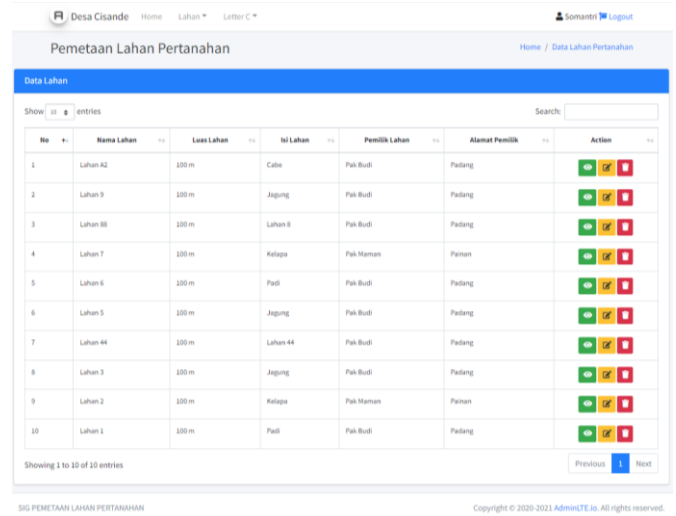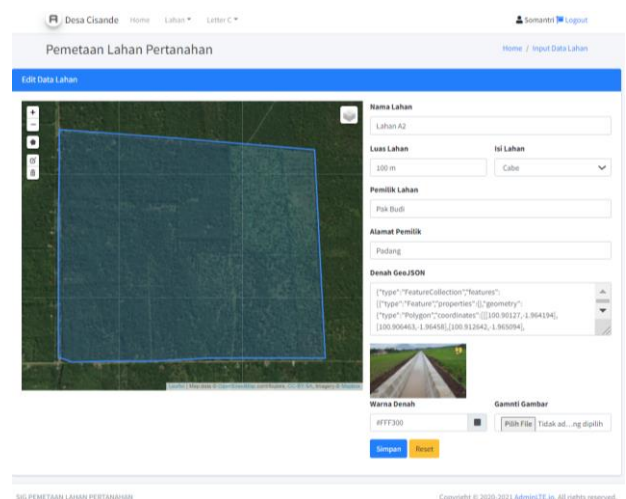

Figure 6. Land data page

Figure 7. Land data edit page

3.7 Land gallery page

This page displays land data that has been inputted and stored in the land gallery. The photos presented in a gallery page are merely thumbnails [30]. Those photographs, which are located in steganogallery, have been linked to their respective full-sized counterparts. The thumbnails are made immediately following the copying and renaming of the full-sized photographs. A screenshot of the land data edit page is shown in Figure 8.

3.8 Letter C of data input page

Land administration, a case study in Cisande Village, Cicantayan District, Sukabumi Regency, Indonesia, has two soil types criteria: dry land (yards, fields, etc.) and wetland (wetland in the form of rice fields). Each of the criteria for the type of land is given a code called a different block number, followed by information related to the date of the change in ownership of the land. Figure 9 shows a screenshot of the developed system's letter C data input page.
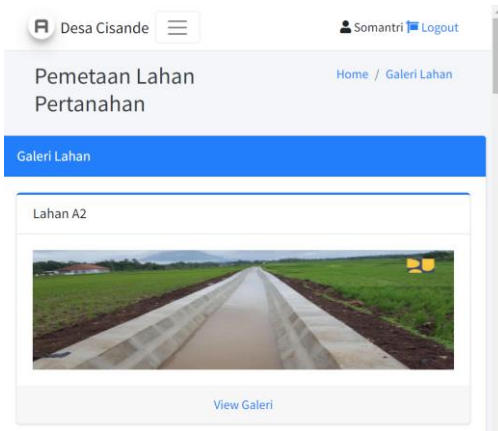
Figure 8. Land gallery page

Figure 9. Screenshot of input data letter C

4. CONCLUSIONS

The study utilized various data and maps included inside a GIS and tandem with web-based to ascertain the appropriateness of various land-use types has been conducted. A case study in Cisande Village, Cicantayan District, Sukabumi Regency, Indonesia, has been used as a pilot project. Appropriate mapping is not only carried out directly on the ground but can also involve the involvement of currently available information systems such as geographic information systems (GIS). Besides, land change science has established itself as a critical component of global environmental change and sustainability. The developed web-based GIS consists of eight main menus (login, homepage, land data input, photo gallery, land data page, land data editing, land gallery, and letter C) that can be accessed online and have provided information related to the land being developed. Monitoring land-use changes in urban areas can aid in the decision-making process for urban planning and resource management. Moreover, the existence of this system will greatly assist land officials at the sub-district level to be able to record the area and designation of the land within the scope of their work so as to minimize conflicts that exist in the community. The future work of this research is to study the impact of using this system on the socio-culture of the area to improve the capabilities of this developed system further.

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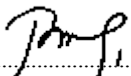
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Utilization of a Web-Based Geographic Information System for Land Mapping and Some Its Overview: A Case Study in Sukabumi District, Indonesia

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ABSTRACT

Land used for residence and agriculture is a source of life, especially in Indonesia. This is because most of the sources of livelihood, especially those living at the sub-district level, are mostly engaged in agricultural activities. Therefore, land data collection is very important, starting at the sub-district level. Unfortunately, the information system that supports this does not yet exist, especially in the Sukabumi district. Hence, this study to overview and use a web-based Geographic Information System (GIS) for land mapping, especially in Sukabumi District, Indonesia. The method used in this study was to conduct interviews with land officials at the sub-district level and several communities in the area. Information system problems from potential users are then addressed by designing a web-based information system and integrating it with GIS applications. The developed information system provides menus and sub-menus adapted to the needs of potential users. So far, the information system has been accessible and can help land officials at the sub-district level and several communities in the area. This will provide the level of detailed information that local communities need in responding to information related to their lands to minimize social conflicts.

1. INTRODUCTION

In recent years, with the accelerated urbanization of rural areas, mapping as a land resource is becoming increasingly important in order to promote the sustainable use of the land environment. Appropriate mapping is not only carried out directly on the ground but can also involve the involvement of currently available information systems such as geographic information systems (GIS). Globally, geographic information systems have become increasingly popular in the management and decision-making processes associated with regional emergencies and urgent issues. The construction of modern urban pipeline network digital management systems, which primarily include sewage network, water supply network, land use balance, sediment prediction on a watershed, and so on, has already been carried out in many countries around the world, including the United States, Europe and also Indonesia, which have already applied mature geographic information technology [1-4].

Since its inception in the 1990s, land change research has emerged as a significant component in the study of global environmental change and sustainability. Changes in land use, land cover, and land cover in urban areas, particularly the conversion of farmland and forest land to urban uses, are among the most significant kinds of global environmental change [5, 6]. Monitoring land-use changes in urban areas can aid in the decision-making process for urban planning and resource management [7-9]. Remote sensing and geospatial information technology have advanced that they now provide a potential foundation for monitoring land changes in metropolitan settings.

However, only a few studies used the Web to map land by GIS for administrative purposes at the sub-district level. Then, this study aimed to overview and utilise a web-based geographic information system (GIS) for land mapping, especially in Sukabumi District, Indonesia. The outcome of this research is that it is expected that land officials at the sub-district level can quickly check documents from the land.

1.1 Related work

1.1.1 Geographic Information System (GIS)

According to Liu and Yang [10], post-classification change detection provides insight into the nature of land change, and the integration of remote sensing and GIS can be particularly effective for defining spatial patterns of urban land change, according to the researchers.

Mazahreh et al. [11] described a GIS-based technique for determining the feasibility of land for various land-use choices in Jordan's semi-arid conditions. This study utilized various data and maps included inside a GIS to ascertain the appropriateness of various land use types (LUTs). Suitability maps were generated for each land use to illustrate the suitability classes and visualize the geographical representation of agriculturally acceptable soils. Suitability investigations produced information about the sort of land use

for which the land was suited and the type of constraints that hampered land usage. Optimal land use options scenarios were developed to increase and maximize agricultural productivity in the research region.

Carver et al. [12] established a GIS model for mapping Scotland's wildness's geographical patterns and distribution. They intend to research a reliable and repeatable approach for mapping wildness in protected landscapes to inform planning, policy, and management choices. They assert that the model is also scalable, capable of being implemented at various geographical scales ranging from local to national, depending on data needs and available computational resources. The work reported here demonstrates that combining local knowledge with the careful application of local-level statistics inside bespoke GIS models may be a strong instrument for assisting in developing specific planning policies and actions for wild land conservation and management.

1.1.2 Web-based GIS

Web-based GIS has long been used for many purposes. A significant advantage of online mapping apps is that they provide efficient distribution of geographical data without extra software [13]. Also, experts can control environmental or contextual (streets, rivers) layers centrally instead of distributing along with software to each end-user [14]. A facilitated soil information system for the United Arab Emirates and its usefulness in agricultural land use planning are among the applications for which Abdelfattah and Kumar [15] employ it. Each component of the system is comprised of multiple parts, including a geographic soil database, a field operating system, and a very intuitive web-based secure application. The UAESIS is described in detail in this document, including its structure, capabilities, functions, advantages, applications, and uses. Two case studies are offered to show the system's applicability to the appraisal of land appropriate for date palm cultivation and the growing of salt-tolerant crops, respectively.

Other research by Rao et al. [16] indicated that the USDA's Conservation Reserve Program is managed and planned to utilize a web-based GIS Decision Support System (CRP). They assert that the integrated web-GIS DSS is built utilizing a web server and Java Servlet technology on top of an ArcIMS platform to enable remote data access and processing. The prototype DSS was used to model the sediment and nutrient dynamics of a small watershed in the Panhandle of Oklahoma.

In Indonesia, Web-based GIS has been widely used for various purposes. As used by Amalia et al. [17] for tropical diseases-prone areas in East Java Province. To encourage halal tourism in Bukittinggi, Afnarius et al. [18] presented information about places of worship. Ginardi et al. [19] for asset management of land and building of Madiun city government. However, to date, no research utilizes Web-based GIS for mapping for administrative purposes at the sub-district level. The main challenge of developing this system is that each region has its characteristics regarding land management.

1.1.3 Evidence of ownership of land rights

Evidence of ownership of land rights or letter C document is official proof of land ownership in Indonesia. Letter C document is evidence of ownership of land rights in Indonesia [20]. The land is the primary requirement for people, as human existence is inextricably linked to the soil. The Indonesian state is undergoing changes in the way land ownership rights are structured, followed by the issuing of land-related legislation. Recognize the early signs of land rights ownership between community members and government agencies in conflict zones [20].

Letter C of land ownership in Indonesia is very important. According to Suryadi et al. [21], three community groups and authorized officials are divided by a letter C letter. Even after the first owner passes away, the inheritance such as right over land, which is according to the inheritance division certificate, must be divided together between some heirs; alternatively, if the inheritance division certificate has not yet been issued, the right transfer is listed to the heirs who deserve the joint rights based on the proof as to the heirs or the inheritance certificate. Therefore, a clear land ownership data collection system at the sub-district level is important to avoid conflict. In addition, the system should also be easily accessible by the community.

1.2 Research positioning

Previous literature has shown various after-effects result from GIS and their functional for mapping. Research trends tend to focus more on the technical part of the problem. However, the application of web-based geographic information systems (GIS) has only been briefly covered in earlier studies. Hence, this research attempts to investigate the application of Web-based GIS for administrative purposes at the sub-district level. It also tries to highlight the menu Web-based GIS has been developed and how to used it. Moreover, the existence of this system will greatly assist land officials at the sub-district level to be able to record the area and designation of the land within the scope of their work so as to minimize conflicts that exist in the community. Disputes over land claims and cultivating land in the community occur if the origin of the land cannot be properly and properly archived. Web-based GIS will assist in clarifying and providing data and archives of the history of the existing land. For this reason, this research attempts to define the function of geographic information systems (GIS) in transformation administration at the sub-district level as well. This paper developed a Web-based GIS in accordance with the needs of land officials at the sub-district level and the use is also the surrounding community of the sub-district.

2. RESEARCH METHODOLOGY

As a case study in Sukabumi District (Cisande Village, Cicantayan District), the data collected consisted of village locations, village maps, coordinate points, village profiles, satellite photos, land data, and Letter C data. The data was obtained from various sources, such as interviews and observations with several expert officers about the village.

In developing a web-based information system with integration into a GIS, the flow is as shown in Figure 1. In summary, the first thing to do is analyze potential users' needs. From this point it will be known the expectations of the users of the Web-based GIS that will be developed. Next, do the design for the information system to be developed. After that, carry out the construction of the developed information system. After the system is formed, testing is carried out for all developed menus and sub-menus. In addition, within a certain period after being disseminated to users, system maintenance is important to find out if there are bugs in the system.
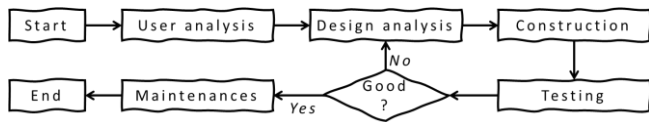
Figure 1. Flowchart of research stages

The system development method used in this study uses the waterfall of software development life cycle (SDLC). SDLC is a process for developing software with the greatest possible quality at the lowest possible cost in the shortest amount of time. SDLC establishes a well-structured flow of stages that enables an organization to rapidly deliver high-quality software that has been thoroughly tested and is suitable for production usage [22]. These are just a few of the reasons why it is critical to create a secure software development life cycle [23]. It appears critical to expand the notion of security and to recognize that security must be a component of every growth.

User analysis is used to investigate problems that occur in the field [24]. It is necessary to identify possible solutions that can be used to address the analytical design.

The design phase allows a researcher to get effective and interactive search media in a certain location. This step requires the programmer to create a design sketch for easy conversion into a specific format. Interactive search media is related to the demand of users who will be involved in using the developed Web-based GIS to be comfortable enough to use this system. In this paper, the Unified Modeling Language (UML) is used in the system design [25], including use case diagrams, class diagrams, and activity diagrams.

Next, construction is the process of writing program code on a computer. The process of coding this design is transforming it into a language that the computer can understand.

A black-box approach conducted system testing [26]. In particular, tests are carried out on the input and output menus of the system to test its functional performance. Therefore, software developers in black box testing can create multiple input condition scenarios to train all the system's functional requirements.

Finally, maintenance focuses on periodic checking of the system, which involves correcting some error menus that have not been found in the previous stage. This is always important to update the system to work properly every time.

3. RESULT AND DISCUSSION

The principle of the program design of the developed web-based GIS is that there are three main users. The first user is a user who can access web-based GIS information from outside without having to log in. These users are people who get general information from Web-based GIS. The second user is a user who must carry out a log-in verification process to view more detailed information on land and add the latest information from certain lands. The third user is the admin, who is in charge of verifying the land proposed by the second user. In addition, the admin will be in charge of maintaining this developed system. Besides that, the website-based land mapping GIS interface design consists of eight main pages. Each main page consists of at least several menus that can be broken down. The system's appearance was developed using Indonesian language because, in general, the users of this system are local people from Indonesia. This follows the

statement of Pan et al. [27], which states that the development of an information system must be appropriate and in accordance with the user community.

3.1 Login page

The login menu is prepared to perform data management. Login menu is also widely used in various information system developments in an effort to improve the security of the information system [28]. This form consists of filling in the username and password to log in. Figure 2 shows a screenshot of the login page of the developed system.
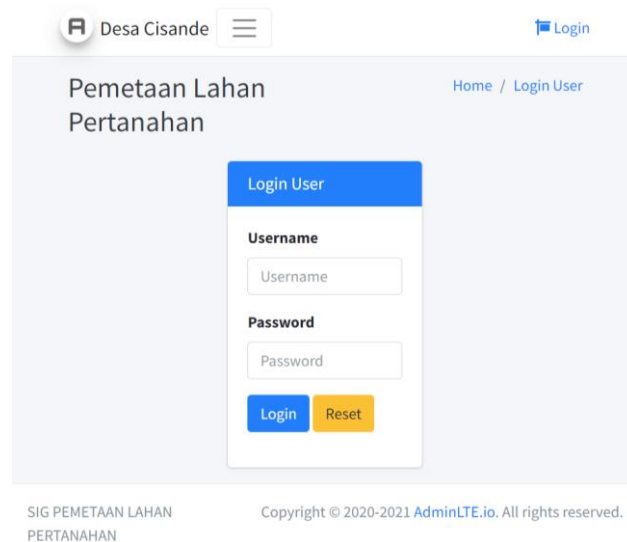

Figure 2. System login page screenshot

3.2 Home page

The dashboard page will appear after the admin has successfully logged in by correctly filling in the username and password. The use of dashboards to display the functionality of a system in real time has been around for quite some time. Dashboard pages are widely used in the development of information systems, especially web-based, to increase the friendliness of the system to the user [29]. On this page, the admin can monitor the history of previous inputs. The input history is in the form of map libraries. Figure 3 displays a dashboard page of the developed system.
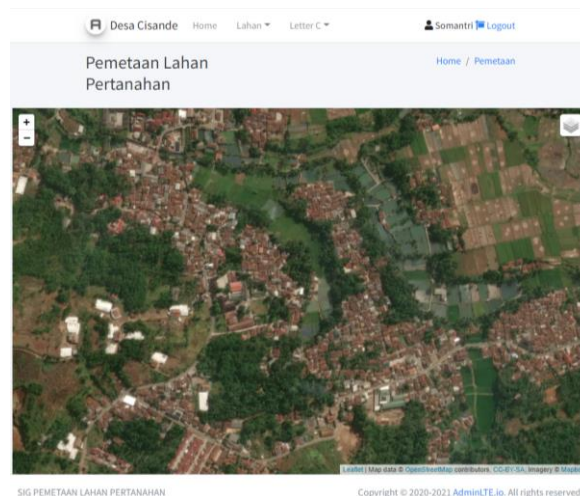

Figure 3. Dashboard page of the system

3.3 Land data input page

This page provides a form to input data related to information from the land. The input data provided consists of several fields according to the information on the existing land categories in the field. A screenshot of the land data input page is presented in Figure 4.
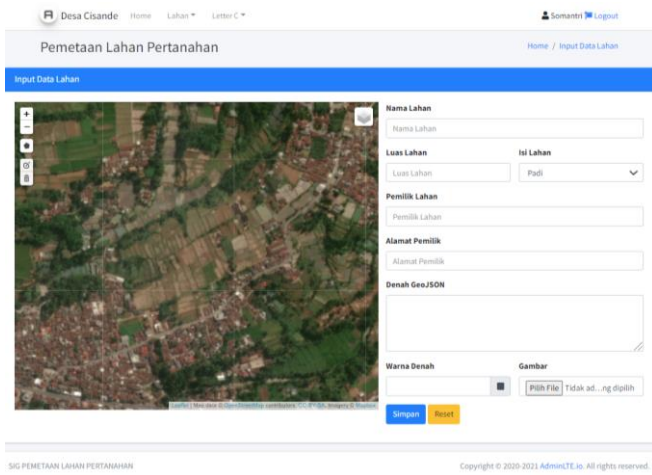

Figure 4. Land data input page

3.4 Photo gallery page

This page provides a photo gallery form consisting of various data that has been inputted from the land data input page. This page also provides a click add photo menu to add supporting data in photos related to the land. The click adds photo menu is also integrated with the add photo gallery page, which provides a form to add photo descriptions and image forms. Screenshots of the photo gallery page and add photo gallery are presented in Figure 5.
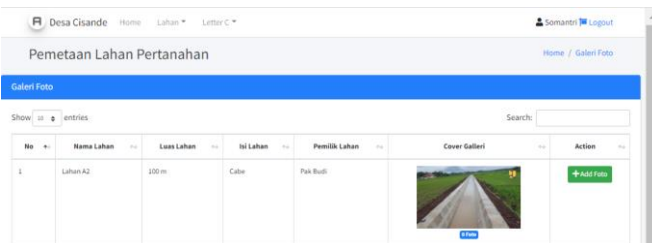

Figure 5. Photo gallery page and add photo gallery

3.5 Land data page

The land data page serves to show the input of land data that has been stored. This page consists of land data information, land area, land contents, landowner, and address landowner. Figure 6 shows a screenshot of the land data page of the developed system.

3.6 Land data editing page

Admin can change information related to land data through the land data edit page. This page provides a menu of changing data related to land according to real conditions in the field. For example, if there is a change in land area due to buying and selling activities, this page can change ownership

information related to the land. A screenshot of the land data edit page is presented in Figure 7.
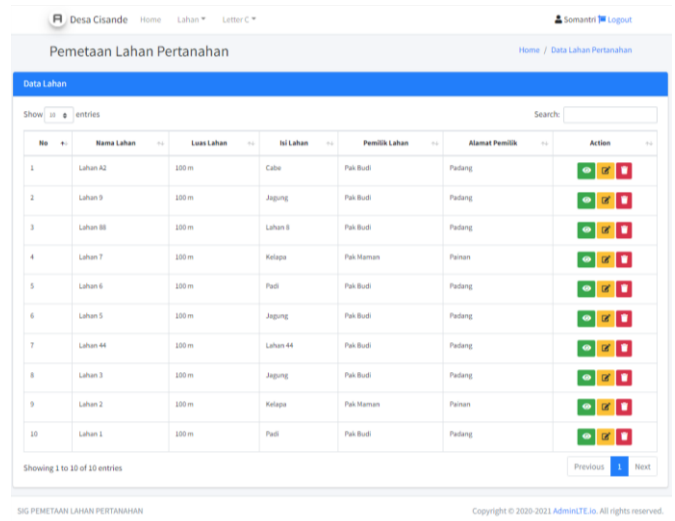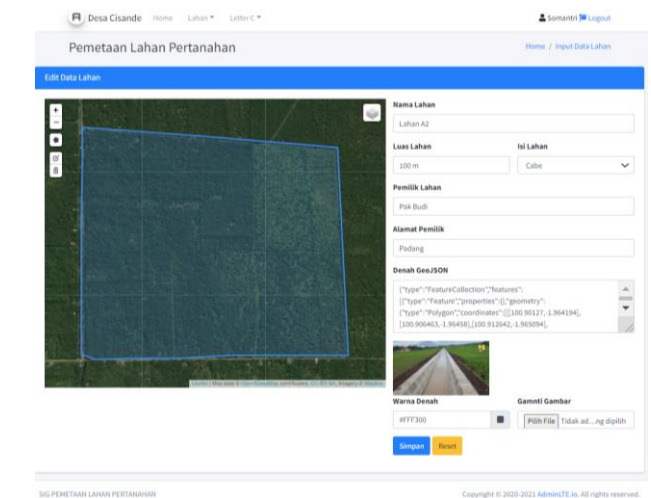

Figure 6. Land data page

Figure 7. Land data edit page

3.7 Land gallery page

This page displays land data that has been inputted and stored in the land gallery. The photos presented in a gallery page are merely thumbnails [30]. Those photographs, which are located in steganogallery, have been linked to their respective full-sized counterparts. The thumbnails are made immediately following the copying and renaming of the full-sized photographs. A screenshot of the land data edit page is shown in Figure 8.

3.8 Letter C of data input page

Land administration, a case study in Cisande Village, Cicantayan District, Sukabumi Regency, Indonesia, has two soil types criteria: dry land (yards, fields, etc.) and wetland (wetland in the form of rice fields). Each of the criteria for the type of land is given a code called a different block number, followed by information related to the date of the change in ownership of the land. Figure 9 shows a screenshot of the developed system's letter C data input page.
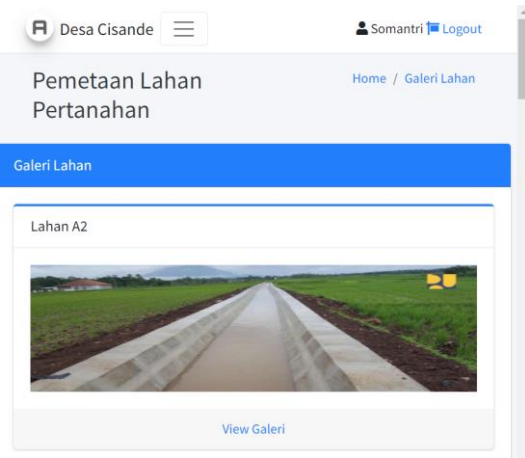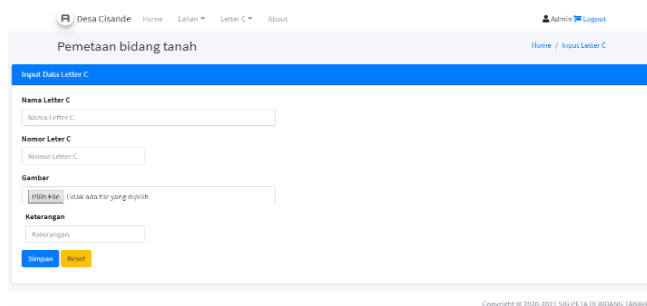
Figure 8. Land gallery page

Figure 9. Screenshot of input data letter C

4. CONCLUSIONS

The study utilized various data and maps included inside a GIS and tandem with web-based to ascertain the appropriateness of various land-use types has been conducted. A case study in Cisande Village, Cicantayan District, Sukabumi Regency, Indonesia, has been used as a pilot project. Appropriate mapping is not only carried out directly on the ground but can also involve the involvement of currently available information systems such as geographic information systems (GIS). Besides, land change science has established itself as a critical component of global environmental change and sustainability. The developed web-based GIS consists of eight main menus (login, homepage, land data input, photo gallery, land data page, land data editing, land gallery, and letter C) that can be accessed online and have provided information related to the land being developed. Monitoring land-use changes in urban areas can aid in the decision-making process for urban planning and resource management. Moreover, the existence of this system will greatly assist land officials at the sub-district level to be able to record the area and designation of the land within the scope of their work so as to minimize conflicts that exist in the community. The future work of this research is to study the impact of using this system on the socio-culture of the area to improve the capabilities of this developed system further.

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