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HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
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Judul Jurnal Ilmiah (Artikel)	:	Combination of Terrestrial Laser Scanner and Unmanned Aerial Vehicle Technology in The Manufacture of Building Information Model
Jumlah Penulis	:	4 orang (Sawitri Subiyanto, **Nurhadi Bashit**, Naftalie Dinda Rianty, Aulia Darmaputri Savitri)
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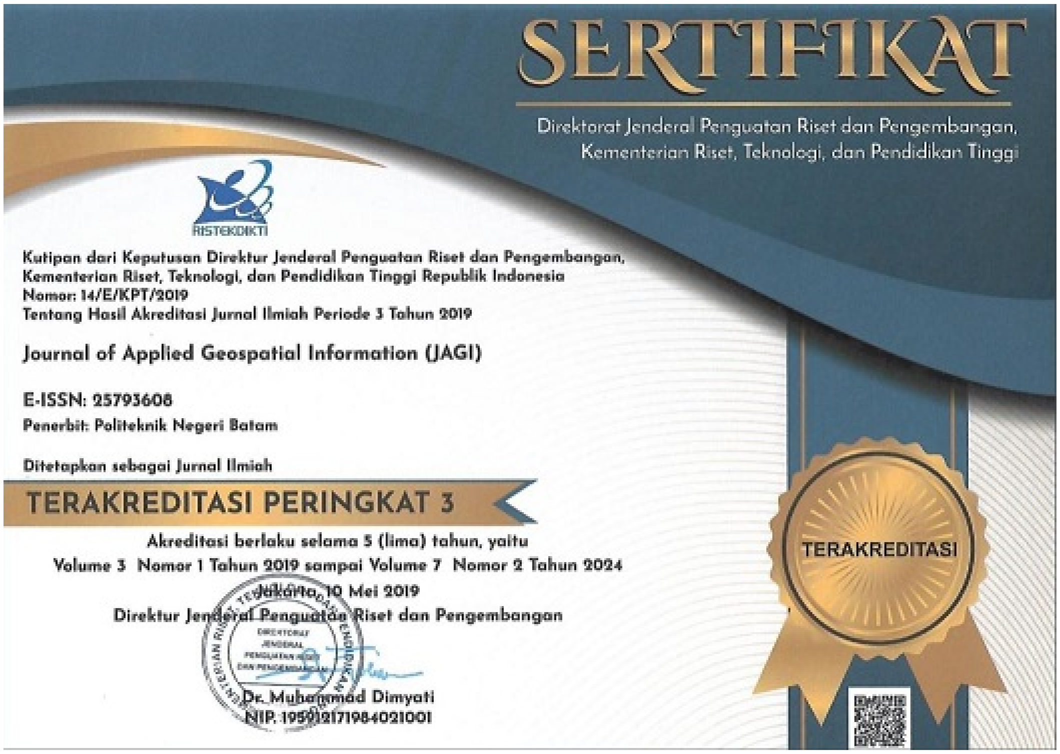
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Combination of Terrestrial Laser Scanner and Unmanned Aerial Vehicle Technology in The Manufacture of Building Information Model

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Abstract

The rapid development of the construction world in Indonesia has led to an increase in supporting technology that is more effective and efficient. The Building Information Model (BIM) technology that begins with the creation of an as-built 3D model, this model describes the existing condition of the building. The Terrestrial Laser Scanner (TLS) method can provide a point cloud with a decent point density, but there are still areas of the building that aren't covered, such as the roof. To be more complete and detailed, additional data is needed using an Unmanned Aerial Vehicle (UAV). The results of the combination of TLS and UAV complement each other so that the results of the point cloud can form more detailed buildings. BIM may be built by combining these two data sets, allowing for three-dimensional depiction of assets in buildings. The registration results for TLS point cloud data have a fairly good value where the overlap value is 44.9% (minimum 30%), balance is 41.2% (minimum 20%), points < 6mm is 98.9% (minimum 90%). The measurement results using the UAV have an RMSE GCP value of 0.266m and an RMSE ICP of 0.455m. Merging the results of TLS and UAV measurements is done using 3DReshaper software with four align points. The final result of making the BIM model is obtained level of detail (LOD) 3 where room models such as columns, floors, stairs, and walls are well depicted, while asset models such as furniture are also depicted although they are still simple objects.

Keywords: TLS, UAV, Point Cloud, BIM.

1. Introduction

Buildings are physical forms of construction work that are integrated with their domicile, partially or entirely positioned aboveand/or inlandand/or water, and that serve as a space for humans to carry out their activities, according to Law Number 28 of 2002 governing buildings. Whether for residence or residence, business activities, religious activities, social activities, special activities, or culture. The word building is closely related to construction activities because its implementation requires good construction. The word construction comes from English construction which means putting elements together systematically. Construction activities aim to maintain the integrity of the form so that it is strong and or does not change its shape (Hartiningsih, 2016).

Various kinds of technology are produced to ease the implementation of construction work, be it offices, shopping centers, road construction, or even other public facilities. One of the technologies currently being developed in Indonesia is Building Information Modeling technology or abbreviated as BIM. BIM itself is a digital system that integrates building design with other information about the building itself. Generally, modeling architectural elements that are not included in BIM libraries takes a considerable amount of time (Andriasyan, 2020). This BIM concept allows the stages carried out in development to be carried out more quickly, accurately, effectively, and efficiently starting from the planning, design, construction to operational stages according to needs. Material selection and use of equipment can also be more optimal with this technology so that

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Spatiotemporal Analysis of Potential Impact of Soil Erosion on Maize and Groundnuts Yield in Northern Ghana

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Abstract

Soil erosion is a threat to the viability of arable land, which has a relationship with crop productivity. This study was carried out in the Northern, North-East and Savannah Regions of Ghana, which have a high agricultural potential. The study examined erosion-yield relationship by comparing estimated erosion rates with maize and groundnut yields in a GIS environment. The study also projected soil erosion and determined its potential effect on the yield of maize and groundnuts. The soil erosion rates were found to be 4.2 t ha-1y-1, 5.1 t ha-1y-1 and 7.1 t ha-1y-1 for the Northern, North-East and Savannah Regions respectively.
Projections for the next 10 years showed that, soil erosion will averagely increase by about 12 %, which could reduce the yield of maize and groundnut by 21 % and 16 % respectively by the year 2031, should the current trend continue. The study also found out that crop (maize and groundnut) yield per land area is relatively lower in areas severely affected by soil erosion. Farmers in the study area and areas of similar ecology must be encouraged to adopt Soil and Water Conservation (SWC) strategies to enhance and sustain productivity.

Keywords: RUSLE, Northern Region, North-East Region, Savannah Region.

1. INTRODUCTION

One of the most important natural resources for humans is the soil. It is a limited, strategic resource of huge social, economic and environmental significance (Telles *et al.,* 2013). However, soil erosion continues to disrupts the natural balance which can lead to decrease in the productive potential of agricultural land (Pimentel *et al.,* 1995). Erosion results in the loss of topsoil layers and soil fertility, thereby leading to declining yield per unit of applied inputs (Telles *et al.,* 2011). Soil erosion is widely considered a serious threat to the long-term viability of agriculture in many parts of the world (El-Swaify and Moldenhauer, 1985).

Erosion results in the degradation of a soil's productivity in a number of ways; it reduces the efficiency of plant nutrient use, damages seedlings, decreases plants' rooting depth, reduces the soil's water-holding capacity, decreases its permeability, increases runoff, and reduces its infiltration rate (O'Geen *et al.,* 2001). Soil erosion greatly influences incomes and output from the agricultural sector as yields decline and input costs rise. The decreasing water holding capacity of the soil and loss of soil nutrients as well as changes that takes place in various soil properties (Oguz *et al.,* 2006) causes the destructive effect of the soil erosion. The erosion impact on agricultural land has negative effects on the productivity of the soil and eventually, on crop yield. The effect of erosion on crop yield, resulting in the decline in crop production, is complex and influenced by changes in soil quality variables (Obando and Stocking, 2001).

In Ghana, majority of the rural folks are farmers and are dependent on agriculture with about 70 % involved in the sector. Already, the contribution of the agricultural sector to Ghana's national output has dwindled compared to other sectors of the economy, meanwhile soil erosion continues to cause productivity decline and stagnated crop yield (Fredua 2014). Given that rapid rates of soil erosion are occurring on farms in the study area, a logical place to begin to look at the issue from an economic perspective is its effect on crop yield. This paper examines erosion-yield relationship by analyzing erosion and yield data of maize and groundnuts in three northern regions of Ghana.

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WorldView-2 Satellite Image Classification using U-Net Deep Learning Model

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Abstract
Land cover maps are important documents for local governments to perform urban planning and management. A field survey using measuring instruments can produce an accurate land cover map. However, this method is time-consuming, expensive, and labor-intensive. A number of researchers have proposed using remote sensing, which generates land cover maps using an optical satellite image with various statistical classification procedures. Recently, artificial intelligence (AI) technology, such as deep learning, has been used in multiple fields, including satellite image classification, with satisfactory results. In this study, a WorldView-2 image of Terangun in Aceh Province, which was acquired on Aug 2, 2016, was classified using a commonly used deep-learning-based classification, namely, U-net. There were eight classes used in the experiment: building, road, open land (such as green open space, bare land, grass, or low vegetation), river, farm, field, aquaculture pond, and garden. For comparison, three classification methods: maximum-likelihood, random forest, and support vector machine, were performed compared to U-Net. A land cover map provided by the government was used as a reference to evaluate the accuracy of land cover maps generated using two classification methods. The results with 100 randomly selected pixels revealed that U-Net was able to obtain a 72% and 0.585 for overall and kappa accuracy, respectively; whereas, overall accuracy and kappa accuracy for the maximum likelihood, random forest and support vector machine methods were 49% and 0.148; 59% and 0.392; and 67% and 0. 511; respectively. Therefore, U-Net outperformed those three of classification methods in classifying the image.

Keywords: artificial intelligence, deep learning, landcover, sustainability, U-net, WorldView-2

1. INTRODUCTION

An accurate land cover map is a critical asset for land management, environmental development, natural resource estimation, and other applications on different geographical scales ranging from local to regional (Belward and Skøien, 2015; Gómez et al., 2016; Xing et al., 2017). A land cover map is considered accurate if it is spatially corrected relative to the actual condition of land cover conditions. Field surveys can provide satisfactory results; however, they require a large number of human resources and are time-consuming, thus rendering them impractical. Recently, optical satellite images have been used to alleviate the burden of field surveys using a statistical classification technique. (Mohajane et al., 2018) used the Landsat image series from the multispectral scanner, enhanced thematic mapper plus, thematic mapper, and operational land imager (OLI) sensors to generate time-series land cover maps in the Middle Atlas, Morocco, between 1987 and 2017. In another study, (Nguyen et al., 2020) used Sentinel-2 images for land classification over Dak Nong Province, Vietnam. However, the spatial resolution of the optical images was medium (30–10 m), whereas, for spatially accurate mapping, higher-resolution images are necessary, such as those from Quickbird (2.4 m) and IKONOS (3.2 m). Classification techniques rely on the variation of radiance or reflectance values at different wavelengths of a pixel, known as pixel-based classification, or a group of pixels, known as object-based classification(Memarian et al., 2013). The maximum likelihood classifier is extensively used and considered the most accurate method in pixel-based classification in which certain pixels are classified into a corresponding class in which their spectral shapes or signatures have similar patterns (Sun et al., 2013). A limitation of the maximum likelihood classifier, however, is that the "salt-and-pepper problem" may arise because the spectral shape of an individual pixel does not represent the characteristics of the surface object (Stoian et al., 2019). To address this problem, the information of neighboring pixels should be