SPATIAL-TEMPORAL LAND USE CHANGE IN DEPATI AMIR AIRPORT BASED ON GOOGLE EARTH IMAGERY

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Abstract

The new Depati Amir Airport in the northeast of the Bangka Tengah Regency was built in 2013, which can destroy the natural vegetation due to the airport's development and extensive buildings. The research aims to identify and analyze the spatial temporal of land use change characteristics in the new Depati Amir Airport. The land use change detections are in the new Depati Amir Airport by spatial-temporal analysis with three land use maps (2004, 2014, and 2022) on Google Earth Imagery. Google Earth Imagery is analyzed with QGIS to assess spatiotemporal land use changes in the new Depati Amir Airport between 2004, 2014, and 2022. Depati Amir Airport, as the new airport in Bangka Tengah Regency, has influenced land use change in Bangka Tengah Regency. The new Depati Amir Airport land types are buildings, including roads, natural vegetation, tin mining, and open space. The three new Depati Amir Airport Imagery in 2004, 2014, and 2022 on Google Earth Data can examine land use changes that depict red, orange, purple, and green rectangles. The natural vegetation (-25.30) and tin mining (-8.62) decreased due to the development of a new airport, such as roads (+5.40), open spaces (+5.78), and extensive buildings (+22.74) with a significant transformation. Hence, understanding the land use changes for local governments, regional planners, and scientific communities requires close attention to spatial to reach crucial knowledge.

Keywords: *spatial-temporal, land use change, airport area, Google Earth imagery*

Introduction

The world is becoming increasingly complex, uncertain, and changing quickly (Kasim et al., 2022). Environmental changes are affected by human activities (Putri et al., 2021). The main drivers of land use change are demographics and human population dynamics, social and economic growth, and urbanization (Zhao et al., 2021). Due to urban development, there is a great demand for urban land, primarily for commercial, industrial, and residential uses (Koroso et al., 2021). Finding the mechanisms based on spatial-temporal dynamics of land use change will provide a scientific foundation for environmentally responsible usage (Zhang et al., 2018).

The land use types are building, natural vegetation, agriculture, arable land, built-up land, water, vegetation, and unused land (Shih et al., 2016) (Ge et al., 2019). The accessibilities, such as roads, significantly change land use (Zhang et al., 2018). Land use changes become more complicated over time, impacting ecological land, forest land, and wetland losses (Zhang et al., 2018). The new Depati Amir Airport has a new airport area built in 2013 in Bangka Tengah Regency. The land use of the new Depati Amir airport, such as buildings,

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open space, roads, natural vegetation, and tin mining, assists airport development.

An area with various spatial-temporal identifies typical land use (Ge et al., 2019). Monitoring land use change with spatial-temporal analysis is essential to determine the significance of land use change (Wibowo et al., 2016). The spatial-temporal land use change patterns provide data that support environmental development (Ge et al., 2019). Hence, the new Depati Amir airport area is needed to determine how extensive land use changes from 2004 until 2022.

The research aims to identify and analyze the spatial temporal of land use change characteristics in the new Depati Amir Airport area based on Google Earth Imagery in Bangka Tengah Regency in 2004, 2014, and 2022. This research focuses on observing, examining, collecting, and understanding spatial-temporal land use change data based on Google Earth Imagery. The study can provide land use change information to Bangka Belitung province's local governments, regional planners, and other scientific communities. It contributes to encouraging practical decision-making for governments.

Research Methodology

Research Stages

The research informs the land use change based on Google Earth Imagery that supports identifying land use change (Li et al., 2017). It has a high-spatial-resolution satellite image as a geography information system application (Shih et al., 2016). However, Google Earth Imagery has a limited dataset on a national scale (Li et al., 2017). Three land use maps from 2004, 2014, and 2022 are used on Google Earth Imagery to access the new Depati Amir Airport areas on different dates to analyze the variation of land use change in 2004, 2014, and 2022. Google Earth imageries were analyzed with QGIS to analyze land use change in 2004, 2014, and 2022. The diagram of the research methodology is shown in Figure 1.

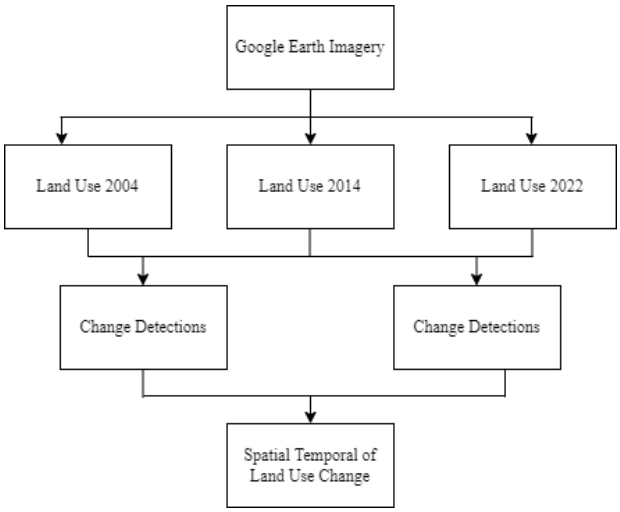

Figure 1. Diagram of Research Methodology

Research Location

The research location is the new Depati Amir Airport northeast of the Bangka Tengah Regency, Bangka Belitung Island Province. The coordinates are 2°09'60" South Latitude and 106°08'45" East Longitude (Google Earth Imagery, 2022). Depati Amir Airport, the new airport in Bangka Tengah Regency, is a new airfield that allows people to travel by airplane. The research area is 108.18 hectares.

Result and Discussion

Google Earth Imagery

Google Earth Imagery is a visual interpretation of high-resolution (Li et al., 2017). Using Google Earth Imagery provides a fast and efficient way to detect land use change for different periods of satellite imagery (Abdelaty, 2016). Land use change in the new Depati Amir Airport can be examined in 2004, 2014, and 2022 using Google Earth Imagery. The new Depati Amir Airport image from 2004 to 2014 has ten years to identify different land use types on Google Earth Data. From 2014 to 2022, which has been eight years, Google Earth Data has the recent image of this research. The three new Depati Amir Airport images in 2004, 2014,

and 2022 based on Google Earth Data are shown in Figure 2.

Figure 2. Depati Amir Airport in 2004, 2014, and 2022 Based on Google Earth Data

The land use changes of the new Depati Amir Airport land in 2004, 2014, and 2022 are identified by Google Earth Data. The new Depati Amir Airport imagery date was 2 July 2004, 1 September 2014, and 1 April 2022. Based on Figure 2, the new Depati Amir Airport land types are buildings, including roads, natural vegetation, tin mining, and open space. The land use change of the new Depati Amir Airport on Google Earth Data is valuable for finding information on spatial-temporal land use changes.

Land Use Changes Based on Google Earth Imagery

Satellite imagery provides information on land use change (Malarvizhi et al., 2016). Google Earth Imagery can examine land use changes in specific areas and times (Wibowo et al., 2016). The land use change in Depati Amir Airport can be identified, which will find the land use types in 2004, 2014, and 2022. The three new Depati Amir Airport images in 2004, 2014, and 2022 based on Google Earth Data are shown in Figure 3.

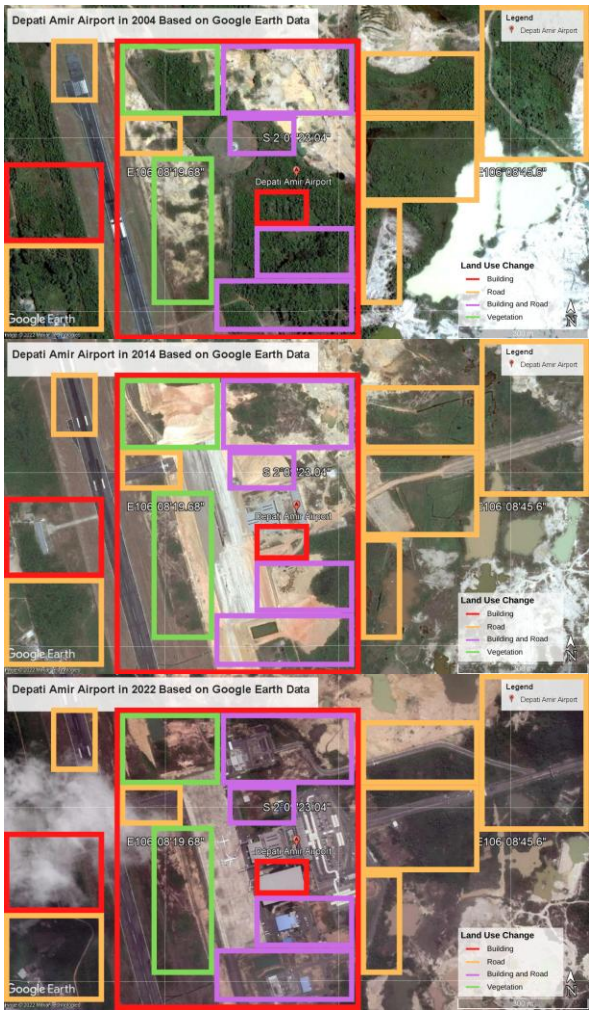

Figure 3. Change Detections in Depati Amir Airport in 2004, 2014, and 2022 by Google Earth Data

The new Depati Amir Airport has different information on land use types and extensive land use for three years in 2004, 2014, and 2022 using Google Earth Data. Figure 3 shows that the red, orange, purple, and green rectangles provide information on the land use change in the new Depati Amir Airport. The three rectangular with red colors detect the land use change from natural vegetation in 2004 to buildings in 2014 and 2022 based on Google Earth Imagery. The seven rectangles with orange color were the land use change from natural vegetation in 2004 to roads in 2014 and 2022 using Google Earth Imagery. The four purple rectangles depict land use changes from natural vegetation in 2004 to buildings and roads in 2014 and 2022 using Google Earth Imagery. The two green rectangles illustrate that land use changed from natural vegetation in 2004 to open spaces in 2014 and 2022.

Land Use Changes Analysis

The new airport in Bangka Belitung, the new Depati Amir Airport, was built in 2013 as the recent airport land use change. The extent of land use change in the new Depati Amir Area was recorded from 2004 to 2022. The spatial-temporal land use change in Depati Amir Airport can be explained and analyzed based on Google Earth Imagery, which will discover the analysis of land use type in 2004, 2014, and 2022. The land use changes in 2004 and 2022 in the new Depati Amir Airport are shown in Table 1.

Table 1. Land Use Changes in 2004 and 2022 in the new Depati Amir Airport

Land use type	2004 (hectare)	2022 (hectare)	Changes (hectare)
Building	1.13	23.87	+22.74
Road	2.22	7.62	+5.40
Open Space	10.88	16.66	+5.78
Tin mining	29.36	20.74	-8.62
Natural vegetation	64.59	39.29	-25.30

The new Depati Amir Airport has also undergone significant changes. The most land use type in the new Depati Amir Airport images in 2022 using Google Earth Imagery is building. The second land use type is natural vegetation, and the third land use type is tin mining. The fourth land use type is open spaces, and the fifth land use type is the road.

The results of land use changes in 2004 and 2022 in the new Depati Amir Airport demonstrate that the natural vegetation and the tin mining decreased for eighteen years while the building, the road, and the open space expanded. The structure provided information on land use change at the value of +22.74 from 2004 to 2022 using Google Earth Imagery. The road information shows that the land use change of the road is +5.40 by Google Earth Imagery for eighteen years. The open space provides information on land use changes at +5.78 from 2004 to 2022 using Google Earth Imagery. Tin mining is given information on land use changes of -8.62 from 2004 to 2022. The value of natural vegetation of land use change is -25.30 for ten years using Google Earth Imagery. Hence, land use change in the new airport area from 2004 until 2022 has remained relatively stable.

The new Depati Amir Airport has significant underground land use changes from 2004 to 2022. The results of land use change with spatial-temporal analysis can evaluate the effects of land use change due to the building development of the new airport, such as building, road, and open space. The positive impact of land use changes is that land use change in the new airport areas becomes an economic development zone. The negative effect of land use change is that new airports decrease vegetation and building expansion as the pace of urban growth.

Conclusions

The research provides information on land use change in the new Depati Amir Airport. Using

Google Earth imagery in land use change detection was also explored by utilizing the images of 2004, 2014, and 2022. The new Depati Amir Airport land types on Google Earth Imagery from 2004 to 2022 could be identified as the changes in buildings, including roads, natural vegetation, tin mining, and open space. The three new Depati Amir Airport imagery on Google Earth Data in 2004, 2014, and 2022 can detect land use changes that depict red, orange, purple, and green rectangles.

The spatial-temporal land use change characteristics in the new Depati Amir Airport area can be analyzed based on Google Earth Imagery in Bangka Tengah Regency in 2004, 2014, and 2022. The Depati Amir, the new airport in Bangka Tengah Regency, is the most influencing area of land use change. The land use change in the new Depati Amir Airport shows that from 2004 until 2022, land use has changed rapidly. The natural vegetation (-25.30) and tin mining (-8.62) decreased due to the development of a new airport, such as roads (+5.40), open spaces (+5.78), and extensive buildings (+22.74) with a significant transformation. Human activities cause land use change with spatial-temporal on urban growth. Hence, understanding the land use changes for local governments, regional planners, and scientific communities requires close attention to spatial to reach crucial knowledge.

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