IRSAJ
International Remote Sensing Applied Journal
e-ISSN = 2775-3409
p_ISSN = ___-
Vol 4 No 2 I Desember 2023

THE ROLE OF REMOTE SENSING AND SIG DATA FOR MAPPING LAND PRICE ESTIMATION IN PAYAKUMBUH CITY

*Risa Ramanda[1], Fitriana Syahar[2], Yudi Antomi[3], dan Risky Ramadhan[4]
Student[1] of Remote Sensing Technology Study Program, Padang State University
Lecture[2 3 4]of Remote Sensing Technology Study Program, Padang State University
Email: rsaramanda@gmail.com

ABSTRACT: Land is a field that has a strategic role in the development of an urban area, land located in a strategic location of economic activity, easy accessibility, and complete infrastructure can be said that the land has a high land price. Factors that influence land prices in urban areas are increasing population, land change, and regional development. Payakumbuh City is a city that is strategically located and close to the city center, has complete public facilities, adequate road access, proximity of land to economic areas, and urban development and buildings affect land prices in Payakumbuh City. The research objectives (1) identify factors that affect land prices in Payakumbuh City (2) analyze the spatial distribution of land price estimates in Payakumbuh City. The research method to determine land price estimation is the overlay and weighting method. The parameters used in this study are land use using Pleiades imagery, land accessibility, and completeness of public facilities. Based on the results of the research, the factors that affect land prices in Payakumbuh City are land use that is closer to the city center will be more expensive, land accessibility that facilitates road access, and completeness of public facilities. Based on the results of data processing, it is found that there are 4 classes of land price estimation in Payakumbuh City, namely the very high class has a price of Rp. 5,000,000.00 - Rp. 10,000,000.00, the high class has a land price of Rp. 2,000,000.00 - Rp. 5,000,000.00, the medium class has a land price of Rp. 1,000,000.00 - Rp. 2,000,000.00, and the low class has a land price of Rp. 200,000.00 - Rp. 500,000.00.

Keywords: *Remote Sensing, GIS, Land Price, Estimation, Factors affecting land price*.

1. INTRODUCTION

Land is a field that has a strategic role in the development of an urban area, land located in a strategic location of economic activity, easy accessibility, and complete infrastructure can be said that the land has a high land price (Suryatmojo, 2017). Land price is a land valuation based on the economic usefulness of land related to productivity and economic strategies (Putra, 2013).

Land prices in an area can be influenced by land accessibility, public and social facilities, and regional development. Land accessibility is the distance of the location of an area to be reached from other areas with various types of transportation available public facilities and social facilities. According to Thunen (1826) the proximity of land to marketing areas such as in urban areas that have a relatively large population will cause land sales profits to be higher than other locations far from marketing areas, such as rural areas.

Land prices are also determined by social factors, namely population development and population density. Population density in an area is not the same, land that has a dense population has a high price compared to land that is not densely populated (Erwanto, 2013). The increasing number of people each year in an area results in having complete facilities such as educational facilities, government or private institutions, easy accessibility, and supported by the development of trade and services, this makes the area experience rapid land use changes. Land use changes that occur will increase land prices if the function, value or benefits of the land increase. Areas with dynamic land change are areas where land value increases rapidly, which will directly affect land prices (Gifari, 2019).

Payakumbuh City is one of the cities that is experiencing rapid regional development. The factor that affects land prices in Payakumbuh City is land accessibility which consists of the distance of the location to the city center, where the closer the land is to the city center, the higher the land price will be. In addition to the city center area, areas that have good infrastructure can also increase land prices in Payakumbuh, such as commercial economic areas, service areas, school areas, cross roads and good land topography, thus making land in Payakumbuh City increase even though the land is not in the city center. Road access also affects land prices in Payakumbuh City, the smoother and better road access and transportation access, the higher the land price. Payakumbuh City has access to the connecting road between Riau Province and West Sumatra Province. This connecting road plays an important role in the development of economic development. The development of the area in Payakumbuh City has increased, resulting in an increase in demand and supply for land so that

land needs increase. With this connecting road, the surrounding land will experience an increase in land prices.

Based on the problems that occur in Payakumbuh City, researchers want to conduct research on land price estimation and find out the factors that affect land prices in Payakumbuh City using remote sensing data and processing with Geographic Information Systems (GIS).

2. RESEARCH METHODS

This research uses a quantitative method with a spatial approach that uses data in the form of numbers that can be measured, weighted, marked on an object studied to determine land prices. The methods used in this research are on-screen digitizing, buffering, weighting, and overlaying to determine land price estimates in Payakumbuh City. To determine the accuracy test of land use using Google Earth to determine the accuracy of the image. Data processing techniques are carried out in Arcgis software.

The remote sensing data used in this study is the Pleiades 2020 image, for data analysis techniques in this study consists of several stages, namely the first step of cutting the Pleiades image in accordance with the administrative boundaries of Payakumbuh City, then digitizing on screen for land use using the SNI 7645-1: 2014 classification, after that doing the sampling process for land use classification. Then do the buffering of the parameters that determine land prices, namely land accessibility data in the form of road networks, river networks, government institutions, educational institutions, factories, and cemeteries. The next stage is scoring each parameter, following the classification and score table:

a. Land Use Classification

Table 1. Land use classification and score

No	Land Use	Class	Score
1	Trade and Services	I	4
2	Cemetery and industry	II	3
3	Vacant land	III	2
4	Rice fields and gardens	IV	1

(Source : Meyliana, 1996)

b. Classification Accessibility of positive land

Table 2. Classification and score of positive land accessibility

No	Positive Land Accessibility	Criteria(m)	Class	Score
1	Distance to Arterial Road	<50	I	4
		50-150	II	3
		150-500	III	2
		>500	IV	1
2	Distance to collector road	<50	I	4
		50-150	II	3
		150-500	III	2
		>500	IV	1
3	Distance to local roads Rice	<50	I	4
		50-150	II	3
		150-500	III	2
		>500	IV	1
4	Distance to government institutions	<200	I	4
		200-500	II	3
		>500	III	2

IRSAJ
International Remote Sensing Applied Journal
e-ISSN = 2775-3409
p_ISSN = ___-
Vol 4 No 2 I Desember 2023

No	Positive Land Accessibility	Criteria(m)	Class	Score
5	Distance to educational institutions	<200	I	4
		200-500	II	3
		>500	III	2

(Source : Meyliana, 1996)

c. Classification Negative land accessibility

Table 3. Classification and score of negative land accessibility

No	Negative land accessibility	Criteria(m)	Class	Score
1	Distance to river	<200	I	2
		>200	II	1
2	Distance to industry	<200	I	2
		>200	II	1
3	Distance to cemetery	<200	I	2
		>200	II	1

(Source : Meyliana, 1996)

d. Classification of public facilities

Table 4. Classification and score of Amount of Facility completeness

No	Number of complete facilities	Class	Score
1	3 pieces	I	4
2	2 pieces	II	3
3	1 pieces	III	2
4	None	IV	1

(Source : Meyliana, 1996)

The next step is to overlay, combining all parameters that determine land prices. Land price class mapping is calculated from the total score of land price parameters obtained from multiplication and summation using the following formula:

Land Price Class = 3*PL + 2*Positive land accessibility + Public facilities - Negative land accessibility
(Source : Hidayat, 2013)

The following table shows the weighted value of land price determination factors

Table 5. Weight value of land price determination factors

No	Land pricing factors	Value weight
1	Land use	3
2	Positive land accessibility	2
3	Negative land Completeness of	-1
4	public facilities	1

(Source : Hidayat, 2013)

IRSAJ
International Remote Sensing Applied Journal
e-ISSN = 2775-3409
p_ISSN = ___-
Vol 4 No 2 I Desember 2023

3. RESULTS AND DISCUSSION

3.1 Research Results

A research on land price estimation in Payakumbuh City using Remote Sensing and Geographic Information System (GIS) data was conducted. In the process of mapping land price estimation using overlay and scoring methods, there are three stages of data processing, namely as follows:

3.1.1 Results of land use mapping in Payakumbuh City with a scale of 1: 5,000

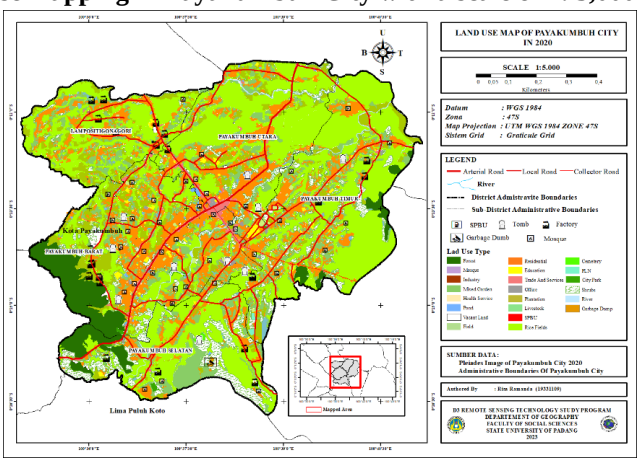

Figure 1.Map of Land Use in Payakumbuh City

3.1.2 Buffer Processing Results

1) Map of Road Network Buffers

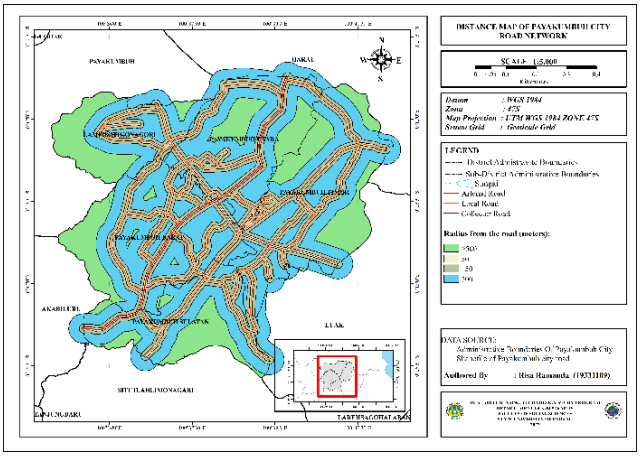

Figure 2. Road Network Buffer Map of Payakumbuh City

2) Education Institution Buffer Map

IRSAJ
International Remote Sensing Applied Journal
e-ISSN = 2775-3409
p_ISSN = ___-
Vol 4 No 2 I Desember 2023

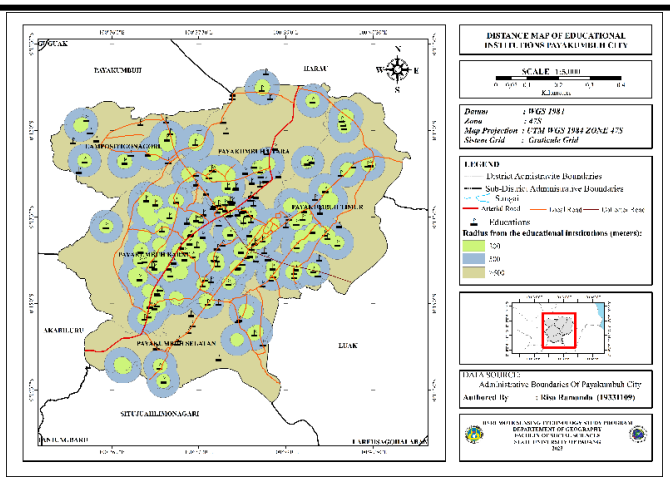

Figure 1. Buffer Map of Educational Institutions in Payakumbuh City

3) Buffer Map of Government Institutions

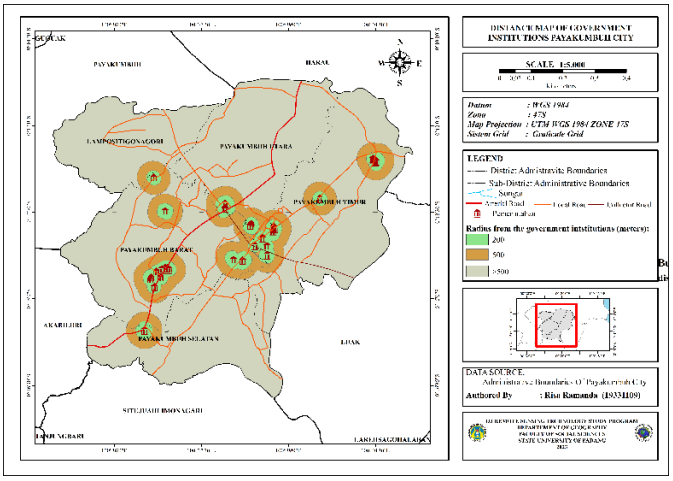

Figure 2. Buffer Map of Payakumbuh City Government Institutions

4) Map of River Network Buffers

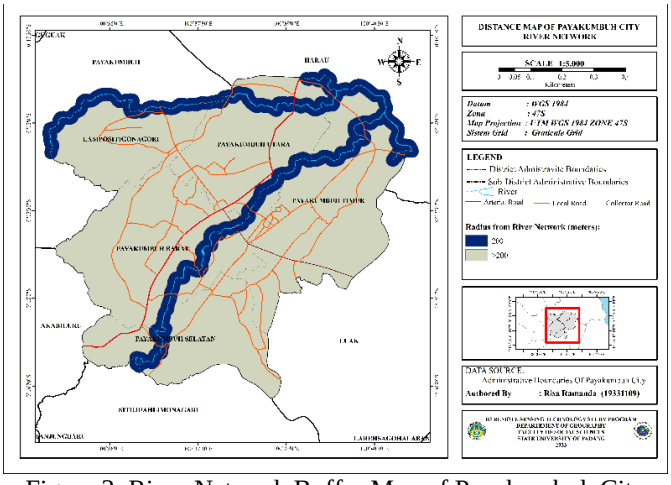

Figure 3. River Network Buffer Map of Payakumbuh City

5) Tomb Buffer Map

IRSAJ
International Remote Sensing Applied Journal
e-ISSN = 2775-3409
p_ISSN = ___-
Vol 4 No 2 I Desember 2023

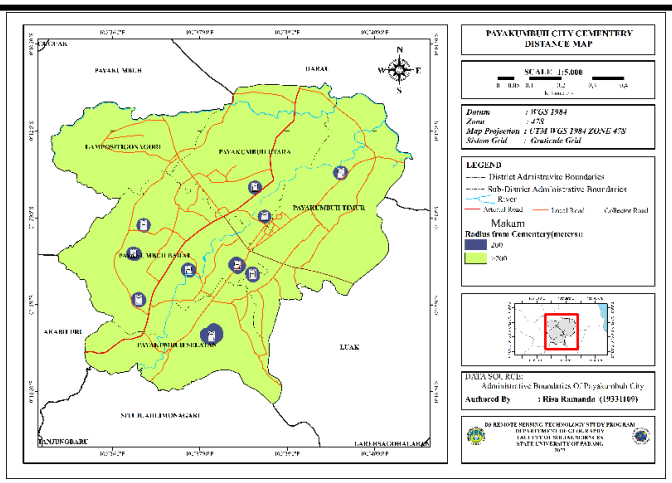

Figure 4. Tomb Buffer Map of Payakumbuh City

6) Industry Buffer Map

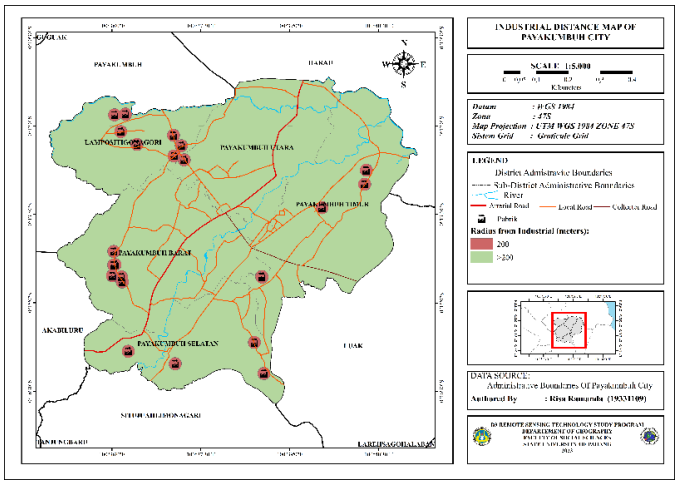

Figure 5. Payakumbuh City Industry Buffer Map

3.1.3 Overlay Processing Results

1) Positive Land Accessibility

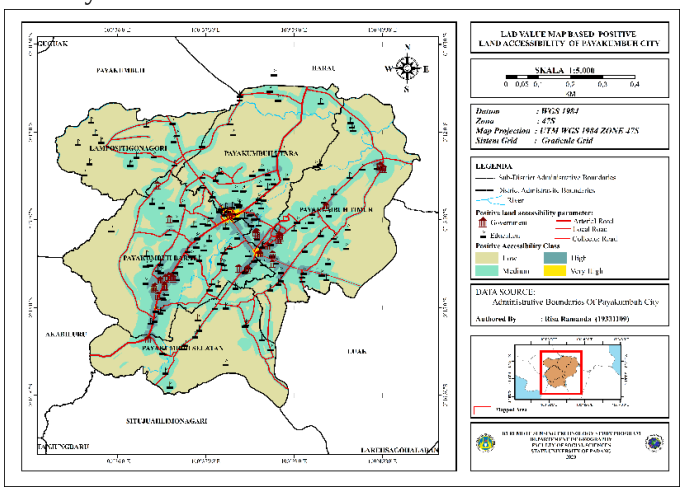

Figure 6. Positive Land Accessibility Map of Payakumbuh City

2) Negative Land Accessibility

IRSAJ
International Remote Sensing Applied Journal
e-ISSN = 2775-3409
p_ISSN = ___-
Vol 4 No 2 I Desember 2023

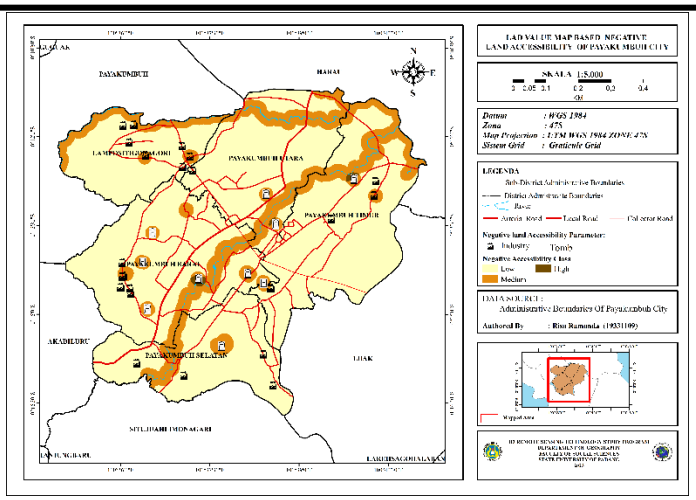

Figure 7. Negative Land Accessibility Map of Payakumbuh City

3) Land Price Estimation Map

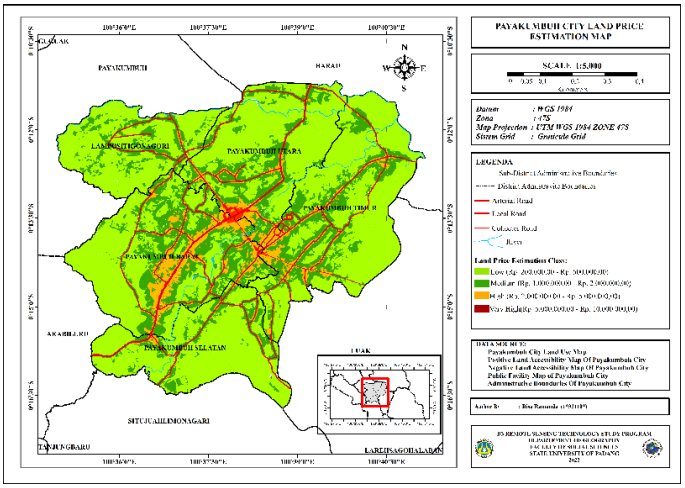

Figure 8. Payakumbuh City Land Price Estimation Map

3.2 Discussion

A. Factors affecting land prices

Based on the results of research that has been conducted, there are 4 factors that affect land prices in Payakumbuh City, namely land use, positive land accessibility, negative land accessibility, and public facilities. Land use is a factor that has a considerable influence on land prices, the closer the land is to the center of human activity, the more expensive the land price will be (Gifari, 2019). In the research results, land prices that occur in Payakumbuh City have land uses that are close to the center of human activity, where land use is built-up land for the economy such as large markets, government offices, and several educational institutions in the vicinity. Non-building land uses such as rice fields, plantations, shrubs, and mixed gardens have low land prices on average, the areas that include the most agricultural land uses are in the Districts of Payakumbuh Timur, Payakumbuh Utara and Lamposi tigo nagari Districts. Residential land use, trade and services, and complete public facilities in Payakumbuh City make the area have a high land price. West Payakumbuh Sub-district is the city center in Payakumbuh City and makes the sub-district have adequate public facilities such as close health services, trade and service land use along the main road, and there are government institutions.

The results of the researcher's analysis of good land accessibility areas have land values above the average. Parameters determining positive land accessibility include distance to roads, distance to government institutions, and distance to educational institutions, these parameters are obtained from the results of

e-ISSN = 2775-3409
p_ISSN = ___-
Vol 4 No 2 I Desember 2023

image interpretation and buffer analysis. There are three classes of positive land accessibility in Payakumbuh City, namely low, medium and high. High-class positive land accessibility has a high land price, because areas that have high economic potential make many people interested in getting the area. The main road in Payakumbuh City is in the labuah basilang road intersection area, along the main road of the West Payakumbuh District, the intersection of the fort intersection, and the napar road intersection. High land accessibility in Payakumuh City is generally located at road intersections with three or four road intersections. The intersection road is the main road that is often traveled and used by the surrounding community because of its strategic location.

Negative land accessibility is a parameter that can reduce land prices in an area. There are several parameters in negative land accessibility in this study, namely distance to food, distance to industry, and distance to rivers. Land close to tombs causes land prices to be low, tombs in Payakumbuh that can be interpreted by imagery are found in national tombs in West Payakumbuh District and Chinese tombs in South Payakumbuh, which causes eating land to have low prices due to psychological factors so that people prefer land far from tombs. Land near industries such as in Labuah Baru, North Payakumbuh sub-district, there is a tofu factory that will cause environmental pollution and noise that makes the surrounding comfort disturbed, so the price of land near the industry is low. The Batang Gam riverbank area in western Payakumbuh City has a low land price, because land located close to negative land accessibility is land that is not profitable or even detrimental, this is because land close to the river is likely to flood during the rainy season.

Completeness of public facilities also affects land prices, Completeness of public facilities is assessed based on supporting facilities for environmental feasibility which conditions of several facilities needed by the community and affect the development of the surrounding area, the more complete and better the facilities that support various activities and community needs will increase land prices in the area and influence people to choose the land as a means of residence or others. Areas that have very high completeness of facilities will have a relationship with positive land accessibility, because public facilities are usually located in strategic areas and can be reached easily, located near collector roads or arterial roads. Public facilities in Payakumbuh City are government and private banks, public markets such as Payakumbuh market and ibuah market, places of worship, electricity networks, supermarkets or minimarkets, health services such as ibu sina hospital in Payakumbuh Barat sub-district and Andnaan WD house in Payakumbuh timur.

City development can also affect land prices, Payakumbuh City which is experiencing rapid growth and diverse population activities will require suitable land such as housing development on land that is still vacant, for example the land is far from the city center. This is because there is no more land available to build a residential or other building, so that the unavailability of land which is getting less and less than the development encourages the community, especially developers or developers, to look for development activities on land that is some distance from the city center.

B. Analysis of Spatial Distribution of Land Price Determinants

Spatial distribution analysis of land price determinants is obtained from land use classes, positive land accessibility, negative land accessibility, and public facilities. From these parameters, an overlay process is carried out to obtain a land price estimation map. The land price estimation map in Payakumbuh City obtained four land price classes, namely very high, high, medium and low classes. The very high land price class in Payakumbuh City is located at road intersections, road intersections, close to economic centers such as Payakumbuh market and Ibuah market. The very high land price class has an area of 48.5 ha around the intersection of Sudirman Labuah Baru road and Labuah Basilang road intersection, because the area has high positive land accessibility, trade and service land use, as well as government offices, sufficient public facilities make the land has a high land price.

The high land price class in Payakumbuh City has quite high positive land accessibility such as the existence of arterial roads, collector roads, and also local roads, and quite a lot of educational institutions. High class land prices are mostly found in Payakumbuh Barat and Payakumbuh Timur sub-districts, this is because the two sub-districts have quite complete public facilities, low negative land accessibility, quite a lot of available trade and services, and also close to government institutions such as PUPR Payakumbuh

City, BAPEDA Payakumbuh City, and ADNAAN WD hospital.

The medium land price class includes areas with non-building land use types such as agricultural land, has rather minimal land accessibility, is located in villages, the area is found in Lampasi Tigo Nagari District which generally has a medium land price class. Public facilities in this land price class are not as complete as in the high land price class, existing facilities are roads with small widths, far from government institutions, and health services.

The low land price class is the dominant class in Payakumbuh City, this is because it has a dominant land use of rice fields found in every sub-district in Payakumbuh City. Positive land accessibility is far from the city center, high negative land accessibility such as close to rivers, close to eating or close to industry and livestock.

Land price data obtained through the Bhumi Atrbpn website shows that land prices in Payakumbuh City vary. The following table shows land prices in Payakumbuh City:

Table 6. Land Price Interval for Payakumbuh City

No	Classification	Land Price Interval (m²)
1	Very High	Rp. 5.000.000.,00 - Rp. 10.000.000,00
2	High	Rp. 2.000.000.,00 - Rp. 5.000.000,00
3	Medium	Rp. 1.000.000.,00 - Rp. 2.000.000,00
4	Low	Rp. 200.000.,00 - Rp. 500.000,00

(Source : Bhumi Atrbpn, 2023)

4. CONCLUSIONS

A. Factors affecting land prices in Payakumbuh City are land use, positive land accessibility, negative land accessibility, and completeness of public facilities. The factors that most influence land prices in Payakumbuh City are positive land accessibility and land use, for positive land accessibility the most influential distance to the city center, while the most influential land use is the type of trade and service land use.

B. From the results of the study, four classes of land price estimation were obtained, namely low, medium, high and very high land price classes. The low land price class has a large area of the four classes, the area for this class is far from the city center as in the southern Payakumbuh sub-district, the very high land price class only has the smallest area, the area for the very high class is in the city center between the bordering western, eastern and northern Payakumbuh sub-districts.

5. REFERENCES

[1] Astrini, D. (2009). Analysis of Environmental Factors Affecting Residential Land Prices (Case Study of North Bogor and South Bogor Sub-districts, Bogor City).[Thesis]. Department of Resource and Environmental Economics. Faculty of Economics and Management. Bogor Agricultural University.
[2] Arsyad, S. (2006). Soil and Water Conservation. Bogor Agricultural University.
[3] Arorof, S. (1989). geographic information: A Management Prespective. WDL Publication
[4] Central Bureau of Statistics (BPS) Payakumbuh City. 2021. Payakumbuh in numbers. BPS catalog: 1102001. 1376.
[5] Budiharji, Eko, Prof. Ir. M.Sc. (2005). Architecture and Cities in Indonesia. Bandung: PT Alumni
[6] Djollong, A. F. (2014). Tehnik Pelaksanaan Penelitian Kuantitaif. Istiqra: Journal of Education and Islamic Thought, 2(1).
[7] Eckert, K.K., et.al. (1990). Property Appraisal and Assemment Administration. The International Association Of Assessing Officers. Chicago.
[8] Erwanto. Zulkifly Alamsyah and Emilia. (2013). Analysis of Land Selling Value for Housing in Tebo Regency. Journal. Master of Economics Program. Faculty of Economics. Jambi University.

[9] Fahira, F. (2010). Identification of Factors that Affect the Selling Value of Land and Buildings in Simple Tipes Housing. SMARTEK, 8(4).
[10] Fitriyanto, B. R. (2018). The Influence of Urban Land Dynamics on the Distribution of Criticality of Infiltration Areas in Watersheds that Enters Jakart Bay. Diponegoro University.
[11] Febriati, F. (2017). Land Value Mapping in Aur Birugo Tigo Baleh District, Bukittinggi City. Buana Journal, 1(1), 43-43.
[12] Ghana, A. K., & Navastara, A. M. (2012). The Effect of Residential Development on Land Prices in West Surabaya. Pomits Engineering Journal, 1-8.
[13] Grimes, Arthur and Yun Liang. (2008). Spatial Determinants of Land Prices: does Auckland's Metropoilitan Urban Limit Have an Effect. Journal of Springer: Appl. Spatial Analysis (2009) 2:23-45I.
[14] Gifari, R. M., & Sigit, A. A. (2019). Analysis of Land Price in Sintang City by Utilizing Pleiades Imagery (Doctoral dissertation. Universitas Muhammadiyah Surakarta).
[15] Hidayati, I. N. (2013). Land Price Analysis Based on High Resolution Remote Sensing Imagery. Journal of Geography Gea, 13(1).
[16] Hermit, Herman. (2009). Urban Land Price Appraisal Techniques. Bandung: CV. Mandar Maju
[17] Kivel, Philip (2014). Land and the city. Proceedings of the 2014 Land Policy Conference.
[18] Irwansyah, E. (2013). Geographic information systems: basic principles and application development. DigiBook Yogyakarta.
[19] Nelson, J. P. (1977). Accessibility ant The Value of Time in Commuting Southern Economic Journal 43 (3): 1321-3129.
[20] M, F.B. S., Sasmito, B, and Haniah. (2015). Study of Segmentation Method for Identification of Land Cover and Land Area Using Google Earth Image (Case Study: Tembalang Sub-district, Semarang). Undip Geodesy Journal. 4
[21] Meyliana (1996). Application of Remote Sensing and Geographic Information System to Assess Land Price in Laweyan District, Surakarta Municipality. Faculty of Geography, Gadjah Mada University. Yogyakarta.
[22] Orford, S. (1999). Valuing the Built Enviroment: GIS and House Price nalysis. Aldershot: Ashgate.
[23] Putri, M. B., & Kurnianingsih, N. A. (2021). Correlation of Space Utilization Intensity, Accessibility, and Land Price in Urban Areas. Journal of Science, Technology, and Visual Culture, 1(1), 1-8.
[24] Putra, I Nyoman Dita P., (2013). Land Valuation, Textbook, Faculty of Civil Engineering and Planning, National Development University "Veteran" of East Java, Surabaya.
[25] Prahasta, Eddy. (2009). Geographic Information Systems Basic Concepts. Bandung: Infromatika Bandung.
[26] Prasetyo, E. (2014). Data Mining: Processing Data into Information Using Matlab. Yogyakarta, CV. Andi Offset
[27] Ridwan, B. W., Saraswati, E., & Widartono, B. S. (2013). Utilization of Ikonos Image and Geographic Information System for Land Price Zoning in Godean District, Sleman Regency, Special Region of Yogyakarta. Journal of Earth Indonesia, 2(2), 78272.
[28] Sutanto. (2013). Remote Sensing Research Methodology. Yogyakarta: Ombak Publisher.
[29] Santoso, S. (2010).Parametric Statistics Concepts and Applications with SPSS (p. 79). PT Elex Media Komputindo.
[30] Suryatmojo, H. (2017). Land Use Arrangement. Jurnal Kebencaan Indonesia.
[31] Sudarsono, B. (2011). Inventory of Changes in Coastal Areas with Remote Sensing Methods (Semarang City Case Study). Engineering, 32(2): 162-169
[32] Suwargara, N. (2013). Spatial, Temporal and Spectral Resolution of Landsat, Spot and Ikonos Satellite Images. Scientific Journal of WIDYA, Vol.1, No.2, July-August 2013.
[33] Seelye, Marhin, see marhn,. (2004). Remote sensing. Cambridge An Introduc hon to ocean University Press.
[34] Simamora, F. B., Sasmmito, B., Hanifah, H. (2015). Study of segmentation methods for identification of land cover and land area using google earth images (case study: Tembalang Sub-district, Semarang). Journal of Geodesy UNDIP.

e-ISSN = 2775-3409
p_ISSN = ___-
Vol 4 No 2 I Desember 2023

[35] Sutanto. (1994). Remote Sensing Volume 1. Yogyakarta. Gajah Mada. University Press
[36] S.Bagas. Naldius, B. S, F. S. Hana. (2020). Analysis of the Relationship between Accessibility, Public Facilities, Social Facilities, and Physical Variables of Land to the Price of Land Parcels in Harjosari I Village, Medan Amplas District, Medan City. Undip Journal of Geodesy, 10(1), 207-215.
[37] Suparmoko. (1989). Economics of Natural Resources and the Environment: A Theoretical Approach. PAU-UGM. Yogyakarta.
[38] Somatri, L. (2020). Land Price Mapping in the Northern Suburbs of Bandung City West Java Province Indonesia. In Forum Geography
[39] Utomowati, R. (2012). Utilization of Landsat 7 Enhanced Thematic Mapper Imagery to Determine Flood Management Priority Areas Based on Geographic Information System (GIS). In: National Seminar on Remote Sensing and Geographic Information Systems 2012.
[40] Wibowo, D. A., Sriyono, S., & Putro, S. (2014). Estimation of Land Price Class Based on Geographic Information System (Sig) in Ambarawa District, Semarang Regency. Geo-Image, 3(1).
[41] Wijayanti, P., & Widjonarko, W. (2015). Land Price Module of Magelang City (case study: Magelang City). PWK Engineering (Urban Regional Planning).
[42] Yuniarto, Nuas. (2013). The Impact of Semarang State University on Land Prices in Sekaran Village, Gunung pati Subdistrict, Semarang City. Semarang: State University of Semarang
[43] Yuliawati, V., Setiawan, I., & Somantri, L. (2020). Analysis of Land Price Estimates Using Geographic Information Systems in Rumpin District, Bogor Regency. Journal of Geocelebes, 4(2), 118-128.