GEOGRAPHICAL STUDY ON RELATIONSHIP BETWEEN ROAD NETWORK ACCESSIBILITY AND RESIDENTIAL LAND VALUE IN SITTWAY CITY

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Abstract

One of the important measurements of transportation network is accessibility and geographers think about accessibility as a location feature (Saxena,2005:67). In urban economic models, urban structure is explained as a function of employment. Residential land value, there are many factors that contribute to the value of a location: the characteristic of housing, environment, employment and other social economic opportunities. In today's world economy, real estate determines the value of urban land in both urban planning and real estate industry. Although Sittway City is composed of 34 wards, 33 wards are used for analysis because Kissapa Ward, which established in 2021, the last extended ward was uninhabited. Connectivity Matrix, Shimbel Accessibility Matrix, (D-Matrix) and Total Accessibility (Matrix-T) have been used for understanding the magnitude of network accessibility in Sittwe City. In order to know land values, three hundred fourth two semi-structured interviews were conducted with estate agents and local residents and were collected according to randomized stratified sampling method. Pearson Correlation analysis are preformed to find the relationship between network accessibility, population density and land value. The road network accessibility higher, the higher the land value rather than population density. Therefore, in the study area, road network accessibility has a greater effect on land value than the settlement. This study refers to the future study is city planning, urban design and real estate.

Keywords: *network accessibility, land value, urban planning, real estate industry*

Introduction

A city is place that is built with more efficient infrastructures that connect residential, workplaces, and commercial buildings. These factors not only the main attractions but pull factors of migration. Nowadays, people are considering housing land not accommodation but also marking investments. Investment of highest road network accessibility of city is has become a more reliable for long-term business. Accessibility is the measure of the capacity of a location to be reached from, or to be reached by, different locations. Therefore, the capacity and the arrangement of transport infrastructure are key elements in the determination of accessibility (Rodrigue, 2020:376). Geographer study uneven development between place from a geographical perspective. According to the accessibility of the place, the uneven development is stronger in the city. In addition, different capacity of place, the land value of the place is also diverse.

Smart (1917) described Sittway was founded in 1826 and started six wards in 1844.Today, Sittway comprises 34 wards, 18 wards of which were created due to transportation. Zaw latt Tun and Zin Nwe Myint (2007) presented six wards due to Baluma Bridge in 1858, nine wards due to Satyogya Jetty and three wards to Mayyu Road in 1948. So, Sittway has total area of 21.96 sq kilometre (8.48 sq mile), in which 6.2 sq kilometre (2.40 sq mile) was appeared due to transport. According to Sittway history intra- urban transportation has been a strong impact on

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large-scale urban expansion. This study emphasized on relationship between of intra-urban road network accessibility, land value and population density, which becoming a distinct and an important urban transport and urban planning in urban area like Sittway.

The objectives of this research work are as follows;

- To examine residential land value of wards in Sittway City
- To evaluate the accessibility of intra-urban road network in the Sittway City
- To determine the level of accessibility in the city
- To find out relationship between of intra-urban road network accessibility, land value and population density.

Methodology

This study is based on primary and secondary data sources. Primary data are obtained by asking questions to real estate agents, House-agents, Land-agents through interviews, open talk and discussion and field observation. The questionnaire, open talk interviews with some local inhabitants were conducted for selection ward to living perception data and information collection. Secondary data have been collected from General Administrative Department, Development Committee of Sittway Township, Agricultural Land Management and Statistics Department of Sittway Township. Shortest path matrix, Shimbel accessibility matrix, (D-Matrix) and Total accessibility (Matrix-T) have been used to analysis the connectivity and accessibility of Intra-urban road network. For analysis, the junctions that high communicate with other wards have been taken into consideration as a vertex. The value of shortest path matrix, Shimbel accessibility matrix (D-Matrix) and Total accessibility (Matrix-T) for each ward is combined and these results are considering as accessibility grade. Spatial Interpolation maps are prepared using Inverse Distance Weighted (IDW)method and Zonal Statistics method of GIS (Geographical Information Systems) technology to create choropleth map. In order to know land values, semi-structured interviews were arranged with 12 real estate agents and local residents 330 (10 persons in each ward) who have lived at least 5 years. The necessary data for this research work were collected according to randomized stratified sampling method. In order to achieve the aim of this paper, accessibility grade of each ward obtain from intra-urban road network analysis, land value and population density of each ward are set as three variables. Pearson Correlation analysis are preformed to find the relationship between these variables.

Description of Study Area

Sittway 's geographical features play a crucial role in understanding its current situation. Sittway City lies between North latitudes 20° 6′53″ and 20° 12′ 4″ and between East longitudes 92°50′12″ and 92°54′30″. Now it comprises 34 Wards but North Aungmingalar Ward is not continuous with other wards, located in the northwestern part of the Sittway, joining with Mayu Road. The length of the town is 6.8 kilometres (4 miles) from east to west and 6.2 kilometres (3.8 miles) from north to south. It has an area of 21.96 sq kilometres (8.48 sq miles) (Figure 1). According to the 2022-2023 data, Intra urban roads in study area has 154 km (93 miles) of all kinds of roads. These roads may again group into five categories by the type of their surfacing materials as asphalted, concreted, bituminous, crushed rock, earth roads. A total of 17km

(11miles) or 11.04 percent are asphalted road,73km (46miles) or 47.4 percent concreted road,12km (7 miles) are bituminous road,13km(8miles) or 11.68 percent crushed rock road and 34 km (21 miles) or 22.08 percent are earth road.

Results and Discussions

Population Density

In 2023 the population of the city was 121967 persons and with the area of 21.96 square kilometres. The average density was 15554 persons per square kilometre. Table 1 shows the population density of Sittway in 2023. Among 34 wards of the City, Kondan Ward was highest in population density with 24358 persons per square kilometre. The wards with a density of over 20000 persons were South Lanmadaw, Aungmingalar and Katheyar Ward. High population concentration in these wards was due to their location near the city centre being adjacent with Main Road and high concentration of commercial activities. The ward with least population density was Yenwesu Ward with 1093 persons per square kilometre and Pyitawthar Ward with 1388 persons, followed by North Aungmingalar Ward with 2218 persons (Figure 2), (Table 1).

Land Value

Land value refers to the to the monetary worth of a piece of the land based on factors such as its location, size and potential for development. It is influenced by market demand, environmental factors and the availability of amenities or infrastructure such as road, utilities and public services**.** Wards with high land value are clustered in the urban centre of Sittway City. Wards with low land value are found in the northeast of Sittway City. The lowest land value ward is North Aungmingalar Ward. It is located 4.6km (2.8mls) in the northwestern of Sittway City and in Maungnipyin Village Tract area. The highest Land value ward is Kyaypingyi Ward, where Myoma market is located. Most landuse types of this ward is commercial landuse (Figure 3), (Table 1).

Table 1. Population Density and Land Value of Residential Wards in Sittway City (2023)

Ward No	Vertex	Wards	Area (Sq.km)	Total Population	Population Density (Per Sq-km)	Land Value (Per Sq-Ft)
1	V_1	Kyaypingyi	0.52	1539	2960	200000
2	V_2	Mawleik	0.19	1990	10474	100000
3	V_3	Ohdan	0.05	956	19120	200000
4	V_4	Mizan	0.14	1272	9086	200000
5	V_5	SouthYupa	0.05	987	19740	180000
6	V_6	North Yupa	0.07	1274	18200	160000
7	V_7	Myothugyi	0.24	2004	8350	100000
8	V_8	Tayarthesu	0.23	1188	5165	43000
9	V_9	South Lanmadaw	0.17	3430	20176	40000

Ward No	Vertex	Wards	Area (Sq.km)	Total Population	Population Density (Per Sq-km)	Land Value (Per Sq-Ft)
10	V_{10}	North Lanmadaw	0.41	2512	6127	40000
11	V_{11}	Shwepyar	0.19	1396	7347	40000
12	V_{12}	Sinkulan	0.3	5030	16767	40000
13	V_{13}	Ohtapin	0.12	1675	13958	37000
14	V_{14}	Lanthit	0.04	315	7875	100000
15	V_{15}	South Ywagyi	0.19	1827	9616	40000
16	V_{16}	North Ywagyi	0.39	5809	14895	37000
17	V_{17}	Baungdyutharsu	0.09	986	10956	45000
18	V_{18}	Bauktheesu	0.12	1935	16125	180000
19	V_{19}	Kyaukgtatlan	0.16	2333	14581	250000
20	V_{20}	Pyitawthar	3.77	5231	1388	80000
21	V_{21}	West Sanpya	2.65	6894	2602	30000
22	V_{22}	Yenwesu	1.79	1956	1093	40000
23	V_{23}	Magyimyaing	0.89	7657	8603	30000
24	V_{24}	Katheywa	0.14	3370	24071	60000
25	V_{25}	Setyonesu	3.4	13171	3874	70000
26	V_{26}	Kondan	0.24	5846	24358	80000
27	V_{27}	Bawlonekwin	0.18	2008	11156	50000
28	V_{28}	Kyaunggyinlan	0.21	2701	12862	160000
29	V_{29}	Aungmingalar	0.19	4151	21847	100000
30	V_{30}	Setyogya	1.85	13857	7490	60000
31	V_{31}	Dannyawadi	0.29	3781	13038	40000
32	V_{32}	Mingan	2.04	12154	5958	100000
33	V_{33}	North Aungmingalar	0.33	732	2218	20000
34	V_{34}	Kissapa	0.36	0	0	Nil
Total /Average			21.96	121967	15554	Nil

Source: General Administrative Department, Agricultural Land Management and Statistics Department of Sittway Township and Field Observation (May 2023-September 2023)

Figure 1: Location of Sittway City and Intra-Urban Roads in Sittway City

Source: Development Committee and Agricultural Land Management and Statistics Department of Sittway Township

Index: Table 1

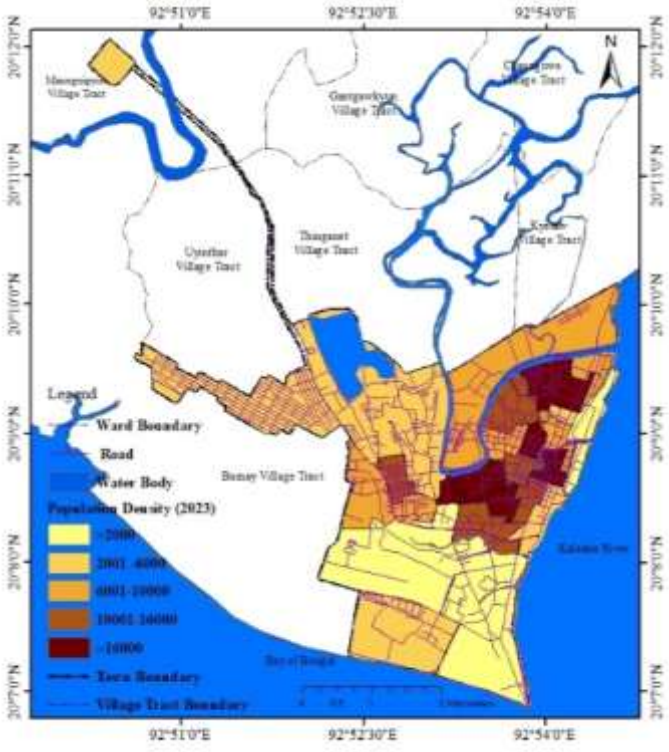

Figure 2: Population Density of Sittway City (2023)

Source: Based on Table 1

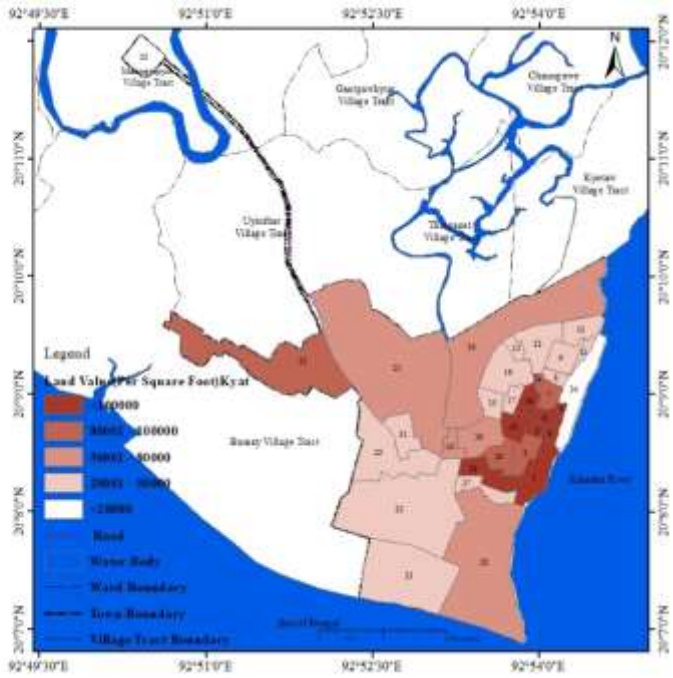

Figure 3: Land Value of Residential Wards in Sittway City (2023)
Source: Based on Table 1

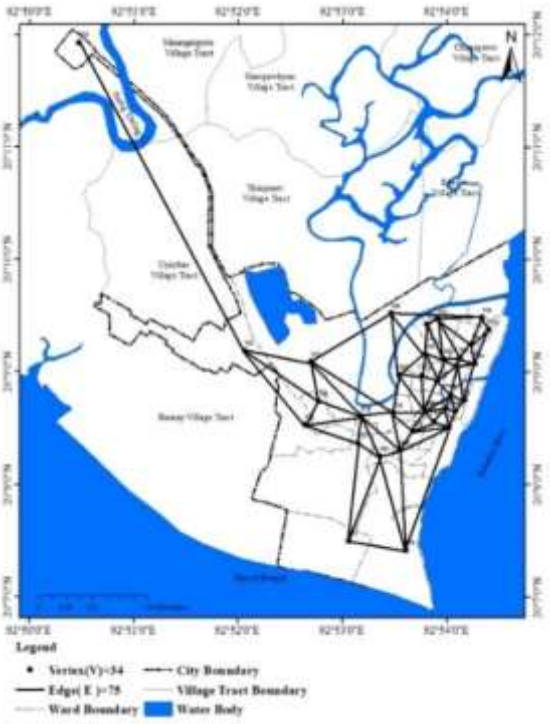

Figure 4: A Simulated Planner Graph for Intra Urban-Roads Network in Sittway City(2023)
Source: Development Committee of Sittway Township

Centrality (Shortest path matrix)

Land value is fundamentally shaped by its location, with centrality and accessibility. In a transport network, the Shimbel number represents the shortest path between nodes, determining the network's centrality by evaluating these paths between all node's pairs. A node with a lower Shimbel number is considered more central. This method does not consider factors like population density, distance, link quality or traffic flow. (Rodrigue,2020) For analysis, the junctions that best accessible with other wards have been taken into consideration as a vertex (Figure 4). The process involves using shortest path algorithms to generate the first-order shortest-path matrix(D)and first- order connectivity matrix (C_1) (Table 2). The final step involves the shortest-path matrix (C_n) and determining the matrix's solution time, which also established the network's diameter. Saxena (2005)· prepared topological intra-urban road network is represented as matrix. Number of rows and columns of the matrix equal to the total number of nodes in the prepared graph network of Sittway City. Since the prepared topological network has 34 nodes, the matrix that represents the road network is thirty-four rows by thirty-four columns grid. The horizontal rows of the matrix are defined as a set of origin and vertical columns are regarded as destination nodes. In this matrix, a value of '1' is filled in the cells that have a direct linkage between nodes and a value of '0' is filled in the cell that has no direct linkage. This matrix is commonly referred to as 'C' matrix /original matrix/ direct connectivity (Table 2). In the 'C' matrix table, the total value of Kyaukgtatlan Ward (V_{19}) and Katheywa Ward (V_{24}) have the maximum number of direct linkages with 7 links (Table 2). Therefore, this network, the Shimbel number (shortest-path matrix) analysis shows that Sittway has 34 nodes, with 7 connections between the most distant nodes, leading to a network diameter of '7' and a short-path matrix of D_7 (Table 3). The results reveal that in the intra-urban road network (2023), Kyaukgtatlan Ward (V_{19}) and Kondan Ward (V_{26}) have the lowest Shimbel numbers, designating them as the accessibility centre of wards in Sittway City (Figure 4), (Table 3).

Accessibility (Total accessibility)

This is known as Total accessibility (Matrix-T) by Rodrigue (2013). In a network, each vertex (node) includes the direct and indirect path that shows the total number of paths. In order to measure the accessibility of the network, *firstly*, be constructed the connectivity matrix(C_1) (Table 2). *Secondly*, constructed the second order (two-linkages path) connectivity matrix (C_2). This matrix derived from (C_1 x C_1) and it represents the node vertices with two-linkage paths. *Thirdly*, repeat the construction of N^{th}order connectivity matrices. N^{th}linkage paths are diameter (path between most distant nodes) of this network. *Finally*, the total accessibility matrix is constructed. It is the row summation result of the matrices constructed until N^{th}order (Table 4). This row sum of matrix T represents the accessibility of nodes in the network. The higher the row sum value, the greater the accessibility of that node. The highest accessibility of the intra-urban road in Sittway is Ohdan Ward (V_3) and the least accessible is North Aungmingalar Ward(V_{33}) (Table 4).

Finally, the highest accessible vertex is expressed by the sum of the ranks sum of three matrices (Direct Connectivity Matrix C_1, Shortest-Path Matrix(D), Total Matrix (T)) (Table 5).

The highest accessibility node in this analysis is Kyaukgtatlan Ward (V_{19}), and which is located in eastern part of Satyogya Creek, in the centre part of Sittway City. The lowest accessibility node is North Aungmingalar Ward (V_{33}) which is not clustered with urban wards, and West Sanpya Ward (V_{21}) located at the southern part of Sittway City (Figure 5), (Table 5).

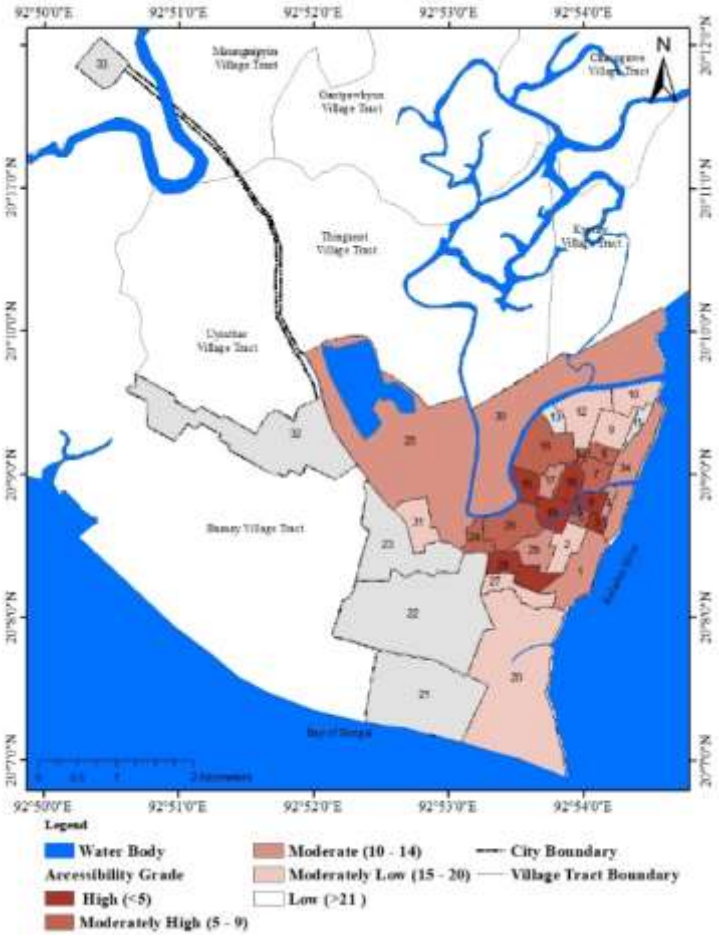

Figure 5: Accessibility Grade for Intra-Urban Roads Network in Sittway City (2023)
Source : Table 5

Table 2. The Connectivity Matrix (C_1) for Inter Urban Roads Network in Sittway City (2023)

V	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26	V27	V28	V29	V30	V31	V32	V33	V34	∑
V1	0	1	1		1															1								1							5
V2	1	0			1														1									1							4
V3	1		0	1	1	1																													4
V4			1	0		1	1																											1	4
V5	1	1	1		0	1													1																5
V6			1	1	1	0	1											1	1																6
V7				1		1	0	1						1				1																1	6
V8							1	0	1			1		1																				1	5
V9								1	0	1	1	1																						1	5
V10									1	0	1	1																		1					4
V11									1	1	0																							1	3
V12								1	1	1		0	1	1																					5
V13												1	0	1																					2
V14							1	1				1	1	0		1		1																	6
V15															0	1	1		1						1					1					5
V16														1	1	0	1	1												1					5
V17															1	1	0	1	1																4
V18						1	1							1		1	1	0	1																6
V19		1			1	1									1		1	1	0										1						*7
V20	1																			0	1						1	1							4
V21																				1	0	1					1								3
V22																					1	0	1	1			1								4
V23																						1	0	1							1	1			4
V24																						1	1	0	1	1	1	1			1				*7
V25																								1	0	1				1	1	1			5
V26															1									1	1	0		1	1						5
V27																				1	1	1		1			0	1							5
V28	1																			1				1		1	1	0	1						6
V29		1																	1						1		1	0							4
V30										1					1	1									1				0						4
V31																							1	1	1					0	1				4
V32																							1		1					1	0	1			4
V33																															1	0			1
V34				1			1	1	1		1																							0	5
	5	4	4	4	5	6	6	5	5	4	3	5	2	6	5	5	4	6	7	4	3	4	4	7	5	5	5	6	4	4	4	4	1	5	

Note ***** = The highest connected nodes

Source: Calculation Based on Data Obtained from Development Committee of Sittway Township (2023)

Reference: Figure 2

Table 3.The Shortest Path Matrix (D_7) for Intra Urban Roads Network in Sittway City (2023)

V	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26	V27	V28	V29	V30	V31	V32	V33	V34	∑
V1	0	1	1	2	1	2	3	4	4	5	4	5	5	4	3	4	3	3	2	1	2	3	3	3	3	2	2	1	2	4	3	4	5	3	97
V2	1	0	2	3	1	2	3	4	5	6	6	5	4	3	2	3	2	2	1	2	3	4	4	3	3	2	3	2	1	3	4	4	5	4	102
V3	1	2	0	1	1	1	2	3	3	4	3	4	4	3	3	3	3	2	2	2	3	4	5	4	4	3	3	2	2	4	4	5	6	2	98
V4	2	3	1	0	2	1	1	2	2	3	2	3	3	2	4	3	3	2	2	3	4	5	5	4	5	4	4	3	3	4	5	5	6	1	102
V5	1	1	1	2	0	1	2	3	4	5	4	4	4	3	2	3	2	2	1	2	3	4	5	4	3	3	3	2	2	3	4	4	5	3	95
V6	2	2	1	1	1	0	1	2	3	4	3	3	3	2	3	2	2	1	1	3	4	4	4	3	3	2	4	3	3	3	4	4	5	2	88
V7	3	3	2	1	2	1	0	1	2	3	2	2	2	1	3	2	2	1	2	4	5	5	5	4	4	3	5	4	4	3	5	5	6	1	98
V8	4	4	3	2	3	2	1	0	1	2	2	1	2	1	3	2	3	2	3	5	6	6	6	5	5	4	6	5	4	3	5	5	6	1	113
V9	4	5	3	2	4	3	2	1	0	1	1	1	2	2	4	3	4	3	4	5	6	7	7	5	5	5	6	5	5	4	6	6	7	1	129
V10	5	6	4	3	5	4	3	2	1	0	1	1	2	3	2	2	3	4	4	5	6	5	4	4	2	3	5	4	4	1	3	3	4	2	110
V11	4	6	3	2	4	3	2	2	1	1	0	2	3	3	5	4	5	3	5	5	6	6	5	4	3	4	6	5	5	2	4	4	5	1	123
V12	5	5	4	3	4	3	2	1	1	1	2	0	1	1	3	2	3	3	4	6	7	6	6	5	4	4	6	5	4	3	5	5	6	2	122
V13	5	4	4	3	4	3	2	2	2	2	3	1	0	1	2	2	3	2	3	6	6	5	5	4	4	4	6	5	4	2	4	4	5	4	116
V14	4	3	3	2	3	2	1	1	2	3	3	1	1	0	2	1	2	1	2	5	6	5	5	4	3	4	5	4	3	2	4	4	5	2	98
V15	3	2	3	4	2	3	3	3	4	2	5	3	2	2	0	1	1	2	1	3	4	3	3	2	2	1	3	2	2	1	3	3	4	4	86
V16	4	3	3	3	3	2	2	2	3	2	4	2	2	1	1	0	1	1	2	4	5	4	4	3	3	2	4	3	3	1	4	4	5	3	93
V17	3	2	3	3	2	2	2	3	4	3	5	3	3	2	1	1	0	1	1	4	5	4	4	3	3	2	4	3	2	2	4	4	5	3	96
V18	3	2	2	2	2	1	1	2	3	4	3	3	2	1	2	1	1	0	1	4	5	4	4	3	3	2	4	3	2	2	4	4	5	2	87
V19	2	1	2	2	1	1	2	3	4	4	5	4	3	2	1	2	1	1	0	3	4	4	4	2	2	2	3	2	1	3	3	3	4	3	**84**
V20	1	2	2	3	2	3	4	5	5	5	5	6	6	5	3	4	4	4	3	0	1	2	3	2	3	2	1	1	2	4	3	4	5	4	109
V21	2	3	3	4	3	4	5	6	6	6	6	7	6	6	4	5	5	5	4	1	0	1	2	2	3	3	1	2	3	5	3	3	4	5	128
V22	3	4	4	5	4	4	5	6	7	5	6	6	5	5	3	4	4	4	4	2	1	0	1	1	2	2	1	2	3	4	2	2	2	3	116
V23	3	4	5	5	5	4	5	6	7	4	5	6	5	5	3	4	4	4	4	3	2	1	0	1	2	2	2	2	3	3	1	1	2	6	119
V24	3	3	4	4	4	3	4	5	5	4	4	5	4	4	2	3	3	3	2	2	2	1	1	0	1	1	1	1	2	2	1	2	3	5	94
V25	3	3	4	5	3	3	4	5	5	2	3	4	4	3	2	3	3	3	2	3	3	2	2	1	0	1	2	2	2	1	1	1	2	5	92
V26	2	2	3	4	3	2	3	4	5	3	4	4	4	4	1	2	2	2	2	2	3	2	2	1	1	0	2	1	1	2	2	2	3	4	**84**
V27	2	3	3	4	3	4	5	6	6	5	6	6	6	5	3	4	4	4	3	1	1	1	2	1	2	2	0	1	2	4	2	3	4	5	113
V28	1	2	2	3	2	3	4	5	5	4	5	5	5	4	2	3	3	3	2	1	2	2	2	1	2	1	1	0	1	3	2	3	4	4	92
V29	2	1	2	3	2	3	4	4	5	4	5	4	4	3	2	3	2	2	1	2	3	3	3	2	2	1	2	1	0	3	3	3	4	4	92
V30	4	3	4	4	3	3	3	3	4	1	2	3	2	2	1	1	2	2	3	4	5	4	3	2	1	2	4	3	3	0	2	2	3	3	91
V31	3	4	4	5	4	4	5	5	6	3	4	5	4	4	3	4	4	4	3	3	3	2	1	1	1	2	2	2	3	2	0	1	2	6	109
V32	4	4	5	5	4	4	5	5	6	3	4	5	4	4	3	4	4	4	3	4	3	2	1	2	1	2	3	3	3	2	1	0	1	5	113
V33	5	5	6	6	5	5	6	6	**7**	4	5	6	5	5	4	5	5	5	4	5	4	2	2	3	2	3	4	4	4	3	2	1	0	6	144
V34	3	4	2	1	3	2	1	1	1	2	1	2	4	2	4	3	3	2	3	4	5	3	6	5	5	4	5	4	4	3	6	5	6	0	109

Note ***** = The lowest Shimbel Numbers
Source: Calculation Based on Data Obtained from Development Committee of Sittway Township (2023) Reference: Figure 2

Table 4. The Accessibility Matrix T_7 for Intra Urban Roads Network in Sittway City (2023)

Vertex	C_1	C_2	C_3	C_4	C_5	C_6	C_7	∑
Kyaypingyi (V_1)	5	21	111	543	2711	13608	1070	18069
Mawleik (V_2)	4	21	97	499	2554	12742	1550	17467
Ohdan (V_3)	4	20	99	498	2520	12767	21441	***37349**
Mizan (V_4)	4	21	105	530	2676	13255	3282	19873
SouthYupa (V_5)	5	25	124	636	3184	16218	2169	22361
North Yupa (V_6)	6	30	159	820	4028	21933	3901	30877
Myothugyi (V_7)	6	31	160	789	3997	19902	5140	30025
Tayarthesu (V_8)	5	27	128	625	3058	15250	4714	23807
South Lanmadaw (V_9)	5	21	98	461	2258	11099	3737	17679
North Lanmadaw (V_{10})	4	17	73	340	1606	7869	2372	12281
Shwepyar (V_{11})	3	14	59	280	1274	6227	2266	10123
Sinkulan (V_{12})	5	19	104	503	2371	11804	3644	18450
Ohtapin (V_{13})	2	11	51	257	1284	5830	3492	10927
Lanthit (V_{14})	6	29	151	737	3651	17999	4485	27058
South Ywagyi (V_{15})	5	25	123	640	3207	16112	1758	21870
North Ywagyi (V_{16})	5	23	121	605	3148	15772	2836	22510
Baungdyutharsu (V_{17})	4	22	123	605	3132	15595	2236	21717
Bauktheesu (V_{18})	6	34	162	894	4320	22544	4358	32318
Kyaukgtatlan (V_{19})	7	34	180	897	4615	23158	3353	32244
Pyitawthar (V_{20})	4	18	85	438	2067	10271	287	13170
West Sanpya (V_{21})	3	13	62	285	1377	6489	69	8298
Yenwesu (V_{22})	4	20	90	426	2011	9638	89	12278
Magyimyaing (V_{23})	4	20	90	419	1962	9305	76	11876
Katheywa (V_{24})	7	35	165	774	3632	17575	296	22484
Setyonesu (V_{25})	5	21	107	519	2499	12320	426	15897
Kondan (V_{26})	5	27	135	654	3190	15567	821	20399
Bawlonekwin (V_{27})	5	23	115	544	2637	12551	111	15986
Kyaunggyinlan (V_{28})	6	30	145	720	3451	18221	578	23151
Aungmingalar (V_{29})	4	23	107	555	2684	13673	869	17915
Setyogya (V_{30})	4	17	82	428	2101	10442	1527	14601
Dannyawadi (V_{31})	4	20	90	423	2041	9524	134	12236
Mingan (V_{32})	4	14	65	301	1428	7262	97	9171
North Aungmingalar (V_{33})	1	4	14	61	301	1425	9	1815
Kissapa (V_{34})	5	18	103	495	2662	13252	4053	20588

Source: Calculation Based on Data Obtained from Development Committee of Sittway Township (2023)

Note * = The highest Accessibility node

Reference: Table 2

Table 5. Three Types of Matrix Analysis on Intra Urban Roads Network in Sittway City (2023)

Vertex	Connectivity	Shortest-Path	Accessibility	Total	Grade
Kyaukgtatlan (V_{19})	7	23	32	62	1
Bauktheesu (V_{18})	6	21	33	60	2
North Yupa (V_6)	6	20	31	57	3
Kyaunggyinlan (V_{28})	6	18	27	51	4
Ohdan (V_3)	4	12	34	50	5
South Ywagyi (V_{15})	5	22	23	50	5
Myothugyi (V_7)	6	12	30	48	6
North Ywagyi (V_{16})	5	17	26	48	6
Katheywa (V_{24})	7	16	25	48	6
Kondan (V_{26})	5	23	20	48	6
Lanthit (V_{14})	6	12	29	47	7
SouthYupa (V_5)	5	15	24	44	8
Tayarthesu (V_8)	5	8	28	41	9
Baungdyutharsu (V_{17})	4	14	22	40	10
Aungmingalar (V_{29})	4	18	16	38	11
Kissapa (V_{34})	5	10	21	36	12
Kyaypingyi (V_1)	5	13	17	35	13
Setyonesu (V_{25})	5	18	12	35	13
Mizan (V_4)	4	11	19	34	14
Setyogya (V_{30})	4	19	11	34	14
Mawleik (V_2)	4	11	14	29	15
Sinkulan (V_{12})	5	5	18	28	16
Bawlonekwin (V_{27})	5	8	13	26	17
Pyitawthar (V_{20})	4	10	10	24	18
South Lanmadaw (V_9)	5	2	15	22	19
North Lanmadaw (V_{10})	4	9	9	22	19
Dannyawadi (V_{31})	4	10	7	21	20
Yenwesu (V_{22})	4	7	8	19	21
Magyimyaing (V_{23})	4	6	6	16	22
Mingan (V_{32})	4	8	3	15	23
Ohtapin (V_{13})	2	7	5	14	24
Shwepyar (V_{11})	3	4	4	11	25
West Sanpya (V_{21})	3	3	2	8	26
North Aungmingalar (V_{33})	1	1	1	3	27

Source: Based on Table 2,3 and 4

Relationship Between Road Network Accessibility, Land Value and Population Density

The Pearson product-moment correlation analysis shows that network accessibility has a stronger positive relationship with land value ***r(33) = .589,p <.001***, compared to population density ***r(33) = .529,p=.001***(Table 6). Both correlations are moderate and positive, meaning that as network accessibility increases, both land value and population density tend to increase as well. However, the correlation with land value is slightly higher, indicating that higher in network accessibility have a more effect on land value than population density.

Table 6. **Pearson Product Moment Correlation Table**

		Population Density	**Land Value**	**Network Accessibility**
Population Density	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	33		
Land Value	Pearson Correlation	*.241*	1	
	Sig. (2-tailed)	*.176*		
	N	33	33	
Network Accessibility	Pearson Correlation	**.529****	**.589****	1
	Sig. (2-tailed)	.001	.000	
	N	33	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Findings and Conclusion

In Sittway City, which is composed of 34 wards, Kyaypingyi ward is 13th in terms of network accessibility grade, and the population density is 2960 per square kilometer, so the population density is lower than other centre wards of city but the land value is the highest given on Figure 6. This is because Myo Ma Market is located in that ward, and it is a ward with many commercial landuse types. High landuse efficiency leading to more land value. Therefore, the land value and directly related to economic opportunity in the study area. The wards with the highest population density, network accessibility, and land value are Ohdan, North Yupa Ward illustrated by Figure 6. These wards are located in the centre of Sittway City and are most commercial landuse type. High land value, especially in urban centre, can promote business investment**.** Vice versa, land is valuable, it signals strong economic potential in this area.

Kyaukgtatlan Ward, which has both high network accessibility and land value, has a population density of only 2333 per square kilometre displayed on Figure 6. South Lanmadaw, North Lanmadaw, and Shwepyar Wards, which have high population density, but have a moderately low level of network accessibility and the land value is lower than other wards on the outskirts of the city due to the scarcity of water in the summer. Therefore, urban infrastructure requirement is one of the factors to determine land value.

Although Setyogya Ward is located in the northern part of Sittway City but accessibility grade is moderate level due to two Setyogya Creek bridges. Before these bridges were built, the land value of this ward was 5000Ks per square feet. After the bridges were opened, land value increased to 62500Ks per square feet in 2020. The population density is also 7490 per square kilometre, it is lower density other wards. It is found that road network accessibility has a greater effect on land value than population density. Infrastructure improvements in Setyogya Ward led to a significant increase in land value, underscoring the role of network accessibility in driving economic growth.

North Aungmingalar Ward, which is not contiguous with the city's wards, is found to be weak in terms of population density, network accessibility and land value shown on Figure 6. This showing that distance from the economic core diminishes accessibility and in turn land value. This spatial pattern emphasizes that peripheral wards with low network accessibility face reduced economic potential as demonstrated by lower population density and landuse intensity.

Interviews with residents further underscore the importance of network accessibility, while also highlighting the socio-spatial factors that influence residential choice. Besides accessibility, people prioritize places with familial ties, balanced land value, neighborhood characteristics and social economic status, safety, availability of urban infrastructure and public services, access to school, economic opportunities. Locations expected to benefit from upcoming infrastructure projects of economic developments tend to rising land value. Therefore, Sittway Port, which is included as a transit port of the Kaladan Multi-Modal Transit Transport Project, is located in Kyaypingyi Ward, so that the neighboring of this ward can have more economic potential in the future.

Land value in urban area is determined by a complex interplay of geographical factors such as location, accessibility, infrastructure, economic potential. These factors combine to create a dynamic pattern of land value that reflect the economic, social and spatial structure of the urban environment.

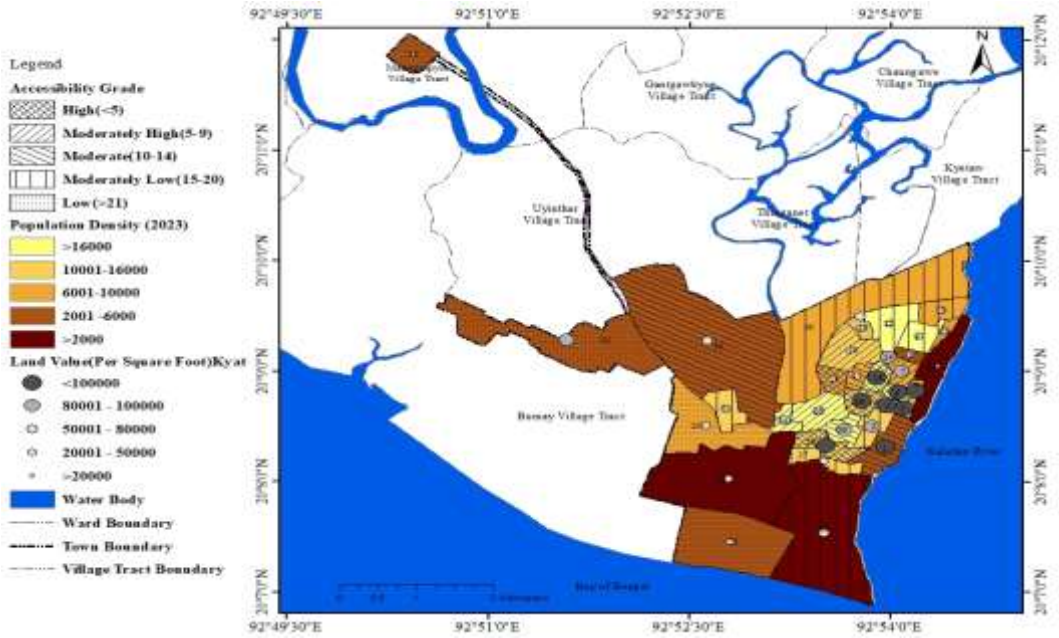

Figure 6: Road Network Accessibility, Land Value and Population Density in Sittway City(2023)
Source: Based on Table 1,5

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