The Distribution Pattern Analysis of Housing in Medan Using The Nearest Neighbor Analysis Approach

Fariz Hamzah¹, DwiraNirfalini Aulia² and Amy Marisa²

¹Postgraduate Student, Departement of Architecture, Faculty of Engineering, Universitas Sumatera Utara, Indonesia
²Departement of Architecture, Faculty of Engineering, Universitas Sumatera Utara, Indonesia

Email: farizhamzah@yahoo.co.id

Abstract. The high number of population in a city has affected in an increasing need for housing and settlement. Medan faces the same problem. Population in Medan keeps increasing rapidly, which makes the demands of housing and settlement increase as well. Fulfilling the need of housing can result in the increasing level of transformation. It creates new points which have not been anticipated in a layout by government policy. The objective of this research is to analyze the housing distribution patterns in Medan. This research used the descriptive-quantitative method. The selected subject of this research was formal housing structured by country or developer was bought and sold with minimum large 15.000 m². The identified and validated housings were be analyzed by using the nearest neighbor analysis. The drawing and the measurement of housing distances were taken by using an image map through the Google Earth Application and Geographic Information System. The spread housing pattern in Medan was the clustered-random. It isn’t profitable for infrastructure, and public facility of the city. The recommendation is addressed to the government, expected to be able to direct construction of settlement with cluster pattern and increasing accessibility, public facility, and quality of infrastructure.

1. Introduction

Medan, the third biggest city in Indonesia, is the capital city of North Sumatera province. Since 2010 until 2017 population-growing rate in Medan increased 5.39%, the number of people rose from 2.097.610 to 2.247.425[1]. The city development can be indicated physically by the increasing number of people and populous environment, the closer building distance and constructed area, especially human settlement tending to expand [2]. The higher population-growing rate rises in Medan, the higher number of housing estate and settlement is demanded.

The housing estate is a group of homes as part of the settlement, whether it’s in the urban area or rural area, provided with infrastructure, medium and public utility as the result of attempting to fulfill liveable housing. However, the settlement is a part of urbanized area which consists of groups of the residential area where there are infrastructure, medium, public utility, and any others functional activity supports in the urban area or rural area[3]. It defines that residence is a part of the process of settlement. Settlement and residence are the most important part of the process of a city. Process of built settlement in urban area taking long period urbanizes the right now a form of the city.[4]. The function of housing estate uses a part of land space in city, and it takes biggest part of land space in
The high demand for settlement, residence, and citizen’s living activity in Medan insists more land space for building or construction where can accommodate demands. The high demand for land space for settlement can inflict problem in using land space. It can be caused by the transformation in using land space where new points in layout occur which have not been facilitated and anticipated an urban land or have not been accommodated by city government policy [6]. Moreover, most of the increasing number of housing construction in urban area is not consistent with urban planning. It leads to condition in the city to be disorganized development [5].

The spatial approach is one of means for analyzing a city. It is a method for analyzing a geosphere phenomenon by using a space land as analyzed means [4]. Some professional researchers use the term of horizontal approach for spatial approach, because spacing dimension occurred is more showing spread, pattern, structure, organization, process, tendency, association, geosphere elements interaction in a field overlay on the earth surface [4]. The spread pattern of settlement and residence, which is a part of the spatial approach is one of a method for analyzing the development of the city. Settlement spreading pattern has three types pattern: uniform pattern, random pattern, and clustered pattern. The spreading pattern can be identified by using the nearest neighbor analysis calculating [7].

The difference in settlement spreading pattern can bring on the difference in taking on policy to plan settlement development in the future [8]. Therefore, the existence of spreading housing in a city is fundamental because it affects on developing a city. This research aims to identify spreading of housing in Medan, so that the result is expected to contribute to knowledge literature about housing spreading pattern which is able to reference and information for future research especially relating to housing area development, mainly for Medan government arranging and taking on policy about developing housing area.

2. Method

The descriptive-quantitative method was used by the observation of spread housing pattern in Medan. The research location was focused in every sub-district where there was formal housing structured by country or developer was bought and sold with minimum large 15.000 m². The data processing technique of this research is primary data processing obtained directly in the field. Housing collected data was validated whether the criteria was conformed, then it was processed by splitting the housing dataset into per sub-district data. Next, the data was converted and displayed as a map by using imagery by Google Earth Application and Geographic Information System (GIS). The result of processing data was inserted into the table. After processing data of housing points had done, all of the straight line distance of the housing estate was measured from a housing measurement point to the nearest housing measurement point by using ArcMap 10.2.2 Application, then the result was inserted into the table.

Housing data which had been mapped and inserted into the table was analyzed to make research conclusion. Processing data steps in this research were done by using Nearest Neighbour Analysis [9] determined by computing the value of the parameter of nearest neighbor (R). The calculation is as follow:

a. Calculate the distance of every point of the housing to the nearest housing point ($d_{min}$).

b. Calculate the average of all $d_{min}$

\[
\bar{d}_{min} = \frac{1}{n} \sum_{i=1}^{n} d_{min} (S_i)
\]

Where $d_{min}$ is the distance of each housing point to its nearest neighbor, $S_i$ is the study event, and $n$ is the number of housings.
c. Calculate the nearest R index of housing. The average distance to the nearest neighbor in the random distribution mode, for which expectation is $E(d_{min})$. The nearest R index of housing is defined as:

$$ R = \frac{d_{min}}{E(d_{min})} $$

Where the average distance to the nearest neighbor of housing in the random distribution mode relates to the area of study ($A$) and the number of housing ($n$).

$$ E(d_{min}) = \frac{1}{2 \sqrt{\frac{n}{A}}} $$

d. Categorized the results of the nearest R index of housing. If $R = 0$, the housing distribution are extremely clustered. If $R = 1$, then the housing distribution are random. If $R < 1$, then the large number of housing distribution are clustered. If $R > 1$, then the large number of housing are uniformly distributed.

To calculate the average nearest neighbour distance of housings and ideal random distribution average neighbor distance among housing points at the city level, the nearest R index of housing results will be categorized as follows:

- $R = 0-0.6$ clustered distribution
- $R = 0.6-0.9$ clustered-random distribution
- $R = 0.9-1.2$ random distribution
- $R = 1.2-1.5$ random-discrete distribution
- $R = 1.5-2.149$ uniform distribution

![Uniform distribution to Clustered distribution](image)

Figure 1. Nearest neighbor spread analysis pattern.

3. Results and Discussions

3.1. General Review of Medan

Medan is the capital city of Northern Sumatra province. It lies between 3º.27’ - 3º.47’ Northern Latitude and 98º.35’ - 98º.44’ East Longitude, with 2,5 – 37,5-meter height above sea level. Medan is contiguous with Deli Serdang regency in the North, South, West, and East. It is one of 33 of level II regions in North Sumatera with 265,10 km² area [1].
Most area of Medan is lowland where there is conflux between 2 main rivers, The Babura River and The Deli River. Medan has a tropical climate; it had a temperature at 23.3°C and maximum temperature at 34.3°C in 2017. According to Stasiun Klimatologi Sampali data, Medan temperature is minimum at 23.1°C and maximum temperature at 33.7°C. Average of rainfall in per month is 179mm according to Stasiun Klimatologi Sampali. Medan consists of 21 sub-districts, all of which own large area as the list:

Table 1. Large area of Medan per sub-district.

| No. | Municipality      | Area (Km²) | Percentage |
|-----|-------------------|------------|------------|
| 1.  | Medan Tuntungan   | 20.68      | 7.80       |
| 2.  | Medan Johor       | 14.58      | 5.50       |
| 3.  | Medan Ampla       | 11.19      | 4.22       |
| 4.  | Medan Denai       | 9.05       | 3.41       |
| 5.  | Medan Area        | 5.52       | 2.08       |
| 6.  | Medan Kota        | 5.27       | 1.99       |
| 7.  | Medan Maimum      | 2.98       | 1.13       |
| 8.  | Medan Polonia     | 9.01       | 3.40       |
| 9.  | Medan Baru        | 5.84       | 2.20       |
| 10. | Medan Selayang    | 12.81      | 4.83       |
| 11. | Medan Sunagal     | 15.44      | 5.83       |
| 12. | Medan Helvetia    | 13.16      | 4.97       |
| 13. | Medan Petisah     | 6.82       | 2.57       |
| 14. | Medan Barat       | 5.33       | 2.01       |
| 15. | Medan Timur       | 7.76       | 2.93       |
| 16. | Medan Perjuangan  | 4.09       | 1.54       |
| 17. | Medan Tembung     | 7.99       | 3.01       |
| 18. | Medan Deli        | 20.84      | 7.86       |
| 19. | Medan Labuhan     | 36.67      | 13.83      |
| 20. | Medan Marelan     | 23.82      | 8.99       |
| 21. | Medan Belawan     | 26.25      | 9.90       |

Medan **265.10** 100.00

3.2. Spread housing pattern identification in Medan
ArcMap 10.2.2 application was used for drawing of housing points. The result of survey and validation in field showed that spread housing points in Medan was able to be mapped as follow:

Figure 3. Map of spread housing points in Medan.
Table 2. Distance measurement among nearest housing estates in Medan.

| No | Measurement code | Name of Housing Estate | Measurement point | Straight Line Distance (km) | No | Measurement Code | Name of Housing Estate | Measurement point | Straight Line Distance (km) |
|----|------------------|------------------------|-------------------|----------------------------|----|------------------|------------------------|-------------------|----------------------------|
| A  | B                | C                      | D                  | E                          | A  | B                | C                      | D                  | E                          |
| 1  | A 001            | Taman Riviera          | A 001 - A 002      | 3.3238                     | 31 | C 001            | Perumahan Simalungkar  | C 001 - C 004       | 1.1242                     |
| 2  | A 002            | Villa Mutiar I         | A 002 - A 003      | 0.1723                     | 32 | C 002            | Bekala Asti            | C 002 - C 003       | 0.4597                     |
| 3  | A 003            | Komplek Kelitianan     | A 003 - A 002      | 0.1723                     | 33 | C 003            | Golden Vista 1         | C 003 - C 002       | 0.4597                     |
| 4  | A 004            | Villa Mutiar III       | A 004 - A 005      | 0.3744                     | 34 | C 004            | Royal Samatera         | C 004 - C 002       | 0.9078                     |
| 5  | A 005            | Puri Mediterrania      | A 005 - A 004      | 0.3744                     | 35 | C 005            | Villa Zeqita           | C 005 - C 006       | 1.0325                     |
| 6  | A 006            | Villa Gading Mas       | A 006 - A 007      | 0.4153                     | 36 | C 006            | Milala Ramah Tengah    | C 006 - C 010       | 0.3343                     |
| 7  | A 007            | Villa Gading Mas       | A 007 - A 006      | 0.4153                     | 37 | C 007            | Bunga Ganyong          | C 007 - C 008       | 0.2039                     |
| 8  | A 008            | Cluster De Lavega      | A 008 - B 002      | 0.2415                     | 38 | C 008            | Parasa                 | C 008 - C 007       | 0.2039                     |
| 9  | A 009            | Sixila Residence       | A 009 - B 002      | 0.2089                     | 39 | C 009            | Puri Adam Malik        | C 009 - C 007       | 0.7922                     |
| 10 | A 010            | Villa Harjosari        | A 010 - A 011      | 0.2110                     | 40 | C 010            | Wesley Residence       | C 010 - C 006       | 0.3343                     |
| 11 | A 011            | Villa Harjosari        | A 011 - A 012      | 0.2110                     | 41 | C 011            | The Prime              | C 011 - C 012       | 0.2865                     |
| 12 | B 001            | Green Park             | B 001 - A 007      | 0.5318                     | 42 | C 012            | Grah Putre             | C 012 - C 011       | 0.2865                     |
| 13 | B 002            | Grand Gading Mas       | B 002 - A 009      | 0.2089                     | 43 | C 013            | Puri Zahra II          | C 013 - C 014       | 0.2481                     |
| 14 | B 003            | Deli Gara             | B 003 - A 004      | 0.6651                     | 44 | C 014            | Stella Residence II    | C 014 - C 013       | 0.2481                     |
| 15 | B 004            | Komplek Damai          | B 004 - A 003      | 0.6651                     | 45 | C 015            | Puri Zahra I           | C 015 - C 029       | 0.4745                     |
| 16 | B 005            | Zein Residence         | B 005 - A 004      | 1.1434                     | 46 | C 016            | Griya Kencana          | C 016 - C 015       | 0.7238                     |
| 17 | B 006            | Royal Monsoo           | B 006 - A 019      | 0.9152                     | 47 | C 017            | Royal Galaxy Residence | C 017 - C 019       | 0.6517                     |
| 18 | B 007            | Villa Prima Indah      | B 007 - B 008      | 0.2058                     | 48 | C 018            | Griya Nusa Tiga        | C 018 - C 019       | 0.3992                     |
| 19 | B 008            | Johor Kertel           | B 008 - B 007      | 0.2058                     | 49 | C 019            | Plamboyan Island       | C 019 - C 018       | 0.3992                     |
| 20 | B 009            | Johor Summereville     | B 009 - B 010      | 0.0700                     | 50 | C 020            | Setia Budi Vista       | C 020 - C 003       | 0.4132                     |
| 21 | B 010            | Taman Johor Baru       | B 010 - B 009      | 0.0707                     | 51 | C 021            | Villa Setia Budi       | C 021 - C 012       | 0.5887                     |
| 22 | B 011            | Taman Johor Indah      | B 011 - B 010      | 0.1105                     | 52 | C 022            | Taman Anakgrat Setia Budi | C 022 - C 025 | 0.3666                    |
| 23 | B 012            | Tajur Johor Indah      | B 012 - B 011      | 0.2755                     | 53 | C 023            | Taman Alamanda Indah   | C 023 - C 030       | 0.1453                     |
| 24 | B 013            | Bukit Johor Mas        | B 013 - B 018      | 0.5754                     | 54 | C 024            | Tenggara Asam Kumbang  | C 024 - C 030       | 0.2975                     |
| 25 | B 014            | Cita Wisata            | B 014 - B 015      | 0.3213                     | 55 | C 025            | Waigidi                | C 025 - C 022       | 0.3666                     |
| 26 | B 015            | J City                 | B 015 - B 014      | 0.3213                     | 56 | C 026            | Taman Asoka Asri       | C 026 - C 024       | 0.4881                     |
| 27 | B 016            | Milala Mas             | B 016 - B 012      | 0.3390                     | 57 | C 027            | May Fair               | C 027 - C 001       | 0.1290                     |
| 28 | B 017            | Buena Vista            | B 017 - C 003      | 0.8380                     | 58 | C 028            | Johor Baru City        | C 028 - C 006       | 3.0256                     |
| 29 | B 018            | Johor Permai           | B 018 - B 012      | 0.4747                     | 59 | C 029            | Greatland Setiabudi    | C 029 - C 013       | 0.4370                     |
| 30 | B 019            | Bumi Johor Sentosa     | B 019 - B 018      | 0.6130                     | 60 | C 030            | Taman Sakura Indah     | C 030 - C 023       | 0.1453                     |
| No | Measurement code | Name of Housing Estate | Measurement point | Straight Line Distance (km) | No | Measurement code | Name of Housing Estate | Measurement point | Straight Line Distance (km) |
|----|------------------|------------------------|-------------------|----------------------------|----|------------------|------------------------|-------------------|----------------------------|
| 61 | D 001            | Sejahtera Indah 2      | D 001 - C 027     | 0.1290                     | 91 | E 011            | Graha Sunggal          | E 011 - E 009     | 0.2869                     |
| 62 | D 002            | Grand Pavilion         | D 002 - D 001     | 0.7093                     | 92 | E 012            | Citra Seraya           | E 012 - E 014     | 0.3754                     |
| 63 | D 003            | Debang Taman Sari      | D 003 - C 020     | 0.4132                     | 93 | E 013            | Bumi Seraya Pemai      | E 013 - E 012     | 0.4832                     |
| 64 | D 004            | Villa Malina Indah     | D 004 - D 005     | 0.2777                     | 94 | E 014            | Evergreen              | E 014 - E 012     | 0.3754                     |
| 65 | D 005            | Taman Perkasa Indah    | D 005 - D 004     | 0.2777                     | 95 | E 015            | Palen Mas 2            | E 015 - E 016     | 0.4881                     |
| 66 | D 006            | Setia Budi Estate      | D 006 - D 007     | 0.6399                     | 96 | E 016            | Griya Riahan           | E 016 - E 015     | 0.4881                     |
| 67 | D 007            | Taman Harapan Indah    | D 007 - D 008     | 0.1620                     | 97 | E 017            | Villa Setia Budi Abadi 2 | E 017 - D 020     | 0.8016                     |
| 68 | D 008            | Puri Tanjung Sari      | D 008 - D 007     | 0.1620                     | 98 | E 018            | Taman Rajawali          | E 018 - E 019     | 0.1960                     |
| 69 | D 009            | Villa Asoka            | D 009 - D 008     | 0.4680                     | 99 | E 019            | Taman Kassari Indah II  | E 019 - E 020     | 0.1607                     |
| 70 | D 010            | Taman Setia Budi Indah 2 | D 010 - E 004     | 0.5000                     | 100 | E 020           | Taman Kassari Indah I   | E 020 - E 019     | 0.1607                     |
| 71 | D 011            | Raya Minimalis         | D 011 - D 004     | 0.7519                     | 101 | E 021           | Mutai Raya              | E 021 - E 020     | 0.7598                     |
| 72 | D 012            | Golden Palace          | D 012 - B 016     | 0.3390                     | 102 | F 001           | Addres Cempaka Madani   | G 001 - G 006     | 0.3804                     |
| 73 | D 013            | Graha Tanjung Sari     | D 013 - D 016     | 0.3289                     | 103 | F 002           | The City Residence      | F 002 - F 003     | 0.2755                     |
| 74 | D 014            | Komplek Astoria        | D 014 - D 017     | 0.3581                     | 104 | F 003           | Taman Hako Indah        | F 003 - F 002     | 0.2755                     |
| 75 | D 015            | Villa Setia Budi Garden| D 015 - D 016     | 0.1687                     | 105 | F 004           | Bumi Asri               | F 004 - F 003     | 0.5942                     |
| 76 | D 016            | Ambassador             | D 016 - D 015     | 0.1687                     | 106 | F 005           | Touno Indah             | F 005 - F 001     | 0.4225                     |
| 77 | D 017            | Classic 3              | D 017 - D 018     | 0.1835                     | 107 | F 006           | Greency One             | F 006 - F 001     | 0.3804                     |
| 78 | D 018            | Classic 2              | D 018 - D 019     | 0.1132                     | 108 | F 007           | Tata Alam Asri          | F 007 - F 006     | 0.5496                     |
| 79 | D 019            | Insan Cita Griya       | D 019 - D 018     | 0.1132                     | 109 | F 008           | Taman Impian Indah      | F 008 - F 009     | 0.7496                     |
| 80 | D 020            | Taman Setia Budi Indah 1| D 020 - E 017     | 0.8016                     | 110 | F 009           | The Piazza Residence     | F 009 - F 008     | 0.7496                     |
| 81 | E 001            | Griya Pinang Mas       | E 001 - E 015     | 0.7067                     | 111 | F 010           | Taman Anggrek           | F 010 - F 012     | 0.5355                     |
| 82 | E 002            | Santa Fe Residence     | E 002 - E 003     | 0.6480                     | 112 | F 011           | Penummas Helvetica       | F 011 - F 009     | 1.0656                     |
| 83 | E 003            | Habitat Setia Budi     | E 003 - E 005     | 0.4250                     | 113 | F 012           | Griya Riatur Indah      | F 012 - F 010     | 0.5355                     |
| 84 | E 004            | Permata Setia Budi Residence 2 | E 004 - D 010   | 0.5000                     | 114 | G 001           | Debi Indah              | G 001 - G 001     | 0.8902                     |
| 85 | E 005            | Bumi Sunggal Pemai     | E 005 - E 011     | 0.2920                     | 115 | G 002           | Villa Green Garden       | G 002 - G 003     | 0.3015                     |
| 86 | E 006            | The Sommerset Regency  | E 006 - E 007     | 0.2650                     | 116 | G 003           | Emerald Garden           | G 003 - G 004     | 0.2439                     |
| 87 | E 007            | Green Mediterrania     | E 007 - E 006     | 0.2650                     | 117 | G 004           | Taman Putri Hijau        | G 004 - G 003     | 0.2439                     |
| 88 | E 008            | The Imperium           | E 008 - E 009     | 0.1519                     | 118 | H 001           | Komplek Jemadi Pemai    | H 001 - H 001     | 0.8902                     |
| 89 | E 009            | Sunggal Mas            | E 009 - E 008     | 0.1519                     | 119 | H 002           | Taman Timor Raya         | H 002 - G 002     | 0.4573                     |
| 90 | E 010            | Pinang Baris Pemai     | E 010 - E 008     | 0.1673                     | 120 | H 003           | Jati Residence           | H 003 - H 002     | 0.3359                     |
The table above shows that measurement code was stated in every each housing. Measuring and searching the nearest housing point used ArcMap 10.2.2 application, which could measure exactly the nearest housing point and the distance of each point (column D and E in table 2). The table also
displays the result of a total of straight line distance between nearest neighbor is 87,6386 km with 170 total of housings.

3.3. Spread Housing Pattern in Medan
After mapped housing points and measured distance of nearest neighbour had been done, index of nearest neighbour distribution (R) was computed.

\[ \bar{d}_{\text{min}} = \frac{1}{n} \sum_{i=1}^{n} d_{\text{min}} (S_i) \]

\[ \bar{d}_{\text{min}} = \frac{\text{Total of nearest neighbor distance}}{\text{Total of housing estate}} \]

\[ \bar{d}_{\text{min}} = \frac{87,6386}{170} \]

\[ \bar{d}_{\text{min}} = 0,52 \]

\[ E(d_{\text{min}}) = \frac{1}{2} \left( \frac{n}{A} \right) \]

\[ E(d_{\text{min}}) = \frac{1}{2} \left( \frac{170}{292,05} \right) \]

\[ E(d_{\text{min}}) = 0,65 \]

So the value of the nearest R index in Medan is:

\[ R = \frac{\bar{d}_{\text{min}}}{E(d_{\text{min}})} \]

\[ R = \frac{0,52}{0,65} \]

\[ R = 0,78 \]

According to computing using the formulas above, the result value of the nearest R index housing pattern in Medan found is 0,78. R index in Medan are between 0,6-0,9, which means that the spatial distribution patterns of housing to be clustered-random.
For the results of the analysis of the nearest neighbors of each sub-district in Medan City can be seen in the following table:

**Table 3. Settlement Patterns of Medan City Sub District 2019.**

| No | Sub Districts          | Number of housing \((n)\) | Total of nearest neighbour distance \(d_{min}\) | The area of study \((A)\) | \(\sqrt{\pi / A}\) | \(E(d_{min})\) | \(R\) | Pattern distribution |
|----|------------------------|-----------------------------|-----------------------------------------------|-----------------------------|-----------------|-------------------|-----|---------------------|
| 1  | Medan Tuntungan        | 30                          | 17,25                                         | 0,58                        | 28,69           | 2,04              | 0,48| 1,17                | Random |
| 2  | Medan Johor            | 19                          | 10,32                                         | 0,54                        | 17,00           | 2,11              | 0,47| 1,14                | Random |
| 3  | Medan Amplas           | 11                          | 6,17                                          | 0,56                        | 11,6            | 1,94              | 0,51| 1,09                | Random |
| 4  | Medan Denai            | 2                           | 5,66                                          | 2,83                        | 9,43            | 0,92              | 1,08| 2,60                | Uniform |
| 5  | Medan Polonia          | 8                           | 4,40                                          | 0,55                        | 8,76            | 1,91              | 0,52| 1,05                | Random |
| 6  | Medan Selayang         | 20                          | 11,27                                         | 0,56                        | 16,46           | 2,20              | 0,45| 1,24                | Random |
| 7  | Medan Sunggal          | 21                          | 8,46                                          | 0,40                        | 13,25           | 2,51              | 0,39| 1,01                | Random |
| 8  | Medan Helvetia         | 12                          | 6,51                                          | 0,54                        | 13,14           | 1,91              | 0,52| 1,03                | Random |
| 9  | Medan Barat            | 4                           | 3,72                                          | 0,93                        | 6,30            | 1,59              | 0,62| 1,48                | Random-discrete |
| 10 | Medan Timur            | 4                           | 4,91                                          | 1,23                        | 8,88            | 1,34              | 0,74| 1,64                | Uniform |
| 11 | Medan Perjuangan       | 2                           | 0,24                                          | 0,12                        | 4,52            | 1,32              | 0,75| 0,16                | Cluster |
| 12 | Medan Deli             | 2                           | 8,55                                          | 4,26                        | 20,40           | 0,62              | 1,59| 2,67                | Uniform |
| 13 | Medan Labuhan          | 8                           | 5,94                                          | 0,74                        | 37,22           | 0,92              | 1,07| 0,68                | Cluster-random |
| 14 | Medan Marelan          | 25                          | 11,63                                         | 0,47                        | 33,21           | 1,73              | 0,57| 0,80                | Cluster-random |

The table above shows there is difference of spread housing pattern in every sub-district. It happened because there was different result of computing index spread of nearest neighbor \((R)\). Spread housing pattern formed in sub-district of Medan city is as follow:

1. Cluster distribution pattern, value \(R\) 0 -0.6, is Medan Perjuangan.
2. Cluster-random distribution pattern, value \(R\) 0.6-0.9, is Medan Labuhan, and Medan Marelan.
3. Random distribution pattern, value \(R\) 0.9-1.2, is Medan Tuntungan, Medan Johor, Medan Ampelas, Medan Polonia, Medan Selayang, Medan Sunggal, and Medan Helvetia.
4. Random-discrete distribution pattern, value \(R\) 1.2-1.5, is Medan Barat.
5. Uniform distribution pattern, value \(R\) 1.5-2.149, is Medan Denai, Medan Timur, and Medan Deli.

**4. Conclusions**

The result of research and discussion about Identifying Spread Housing Pattern in Medan, using Nearest Neighbour Analysis method, showed that spread housing pattern in Medan was the clustered-random. The detail results of each sub-district are shown as follow:

1. Medan Tuntungan sub-district with the random pattern
2. Medan Johor sub-district with the random pattern
3. Medan Ampelas sub-district with the random pattern
4. Medan Deli sub-district with the uniform pattern
5. Medan Polonia sub-district with the random pattern
6. Medan Selayang sub-district with the random pattern
7. Medan Sunggal sub-district with the random pattern
8. Medan Helvetia sub-district with the random pattern
9. Medan Barat (West) sub-district with the random-discrete pattern
10. Medan Timur (East) sub-district with the uniform pattern
11. Medan Perjuangan sub-district with the cluster pattern
12. Medan Deli sub-district with the uniform pattern
13. Medan Labuhan sub-district with the cluster-random pattern
14. Medan Marelan sub-district with the cluster-random pattern

Cluster pattern is profitable for infrastructure, medium, and public facility of the city [10]. Medan Perjuangan sub-district is the only sub-district with cluster pattern in Medan city.

Based on the research result, the recommendation is addressed to the government, expected to be able to direct construction of settlement with cluster pattern and increasing accessibility, medium, public facility, and quality of infrastructure.

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