Spatial Analysis Of Roads Transportation Networks In Mayangone Township, Yangon City

Cherry
University of Banmaw
cherryhadyzin@gmail.com

Myint Myint Kyi
University of Banmaw
myintkyilay102@gmail.com

Myo Tun
University of Banmaw
drmyotungeog@gmail.com

Abstract

Network Analysis aims at finding solutions to routing problems related to transferability, rate of flow, and network connectivity. It helps in identifying optimumlocations for services to be provided. Transportation Network Analysis use to determine the flow of vehicles through a transport network the investigation of structural analysis in transport line of MayangoneTownship has been fully emphasizes on the distribution pattern of vertices or node and edges. The required data was collected from YCBCC and field work. The Arc GIS 10.1 is used to perform the extraction of region of interest from primary data. Total road length and total area iscalculated using the Arc Map software. It is used to calculate the Network Connectivity Indices.

Keywords*: GIS / RS, Network Indices, Road Density, Transportation Network Analysis.*

1.Introduction

The Transportation System is a critical component of urban infrastructure growth of that region. It also displays region's economic condition as well as planners' dedication for their region. An efficient route planning and accessibility facilitate sustainable development.

With geographic information system (GIS) software can also analyze a transportation network to support planning goals.

1.1. Study Area

The co-ordinates for Mayangone Township are 16°51’ 51.494”N, 96°8’ 33.483”E. The study area is bounded on the East by the Dagon Myothit (North), South Oakkalarpa and On the West by HlaingTharyar, Insein,Hlaing and Mingalardone,

NorthOakkalarpa lie on the north while on the South there are Bahan, Kamaryutand Yankin. The total of study area is (0.007343 Sq. miles). Traffic jams occurred especially at 8 miles junction. (Figure-1)

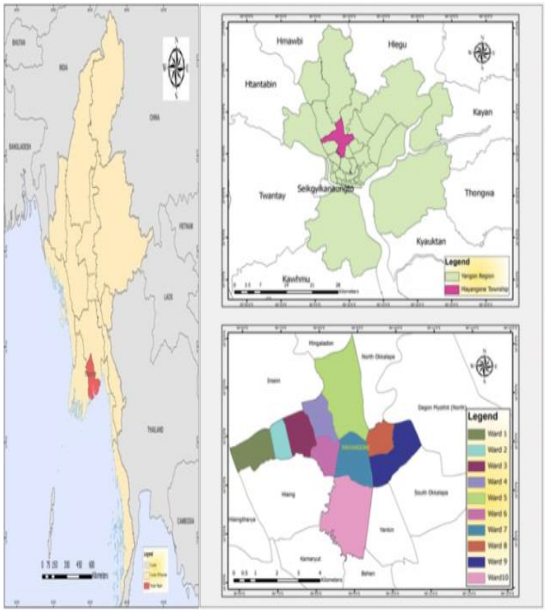

Figure1. Location of Yangon Region in Myanmar
Source: Based on UTM Map, GCI Co, Lt

1.2 Aim and Objectives

To find out the relative degree of connectedness within a Transportation Network in Mayangone Township by means of measure of accessibility without regard to distance.

The main objectives of research work areto understand the current pattern of transportation routes in the study area,to analyses the road network of the study area and to examine the access the connectivity of Network Analysis.

2.Research Problem

Is Transportation Network insufficiency especially during peak hours?

2.1 Sources of Data and Methodology

The data used in this paper can be broadly divided into four categories: Remotely Sensed Data: Geoeye (Satellite Imageries), Field Collected Data (FCD), Official Data by YCDC and Fire Brigade Myanmar.

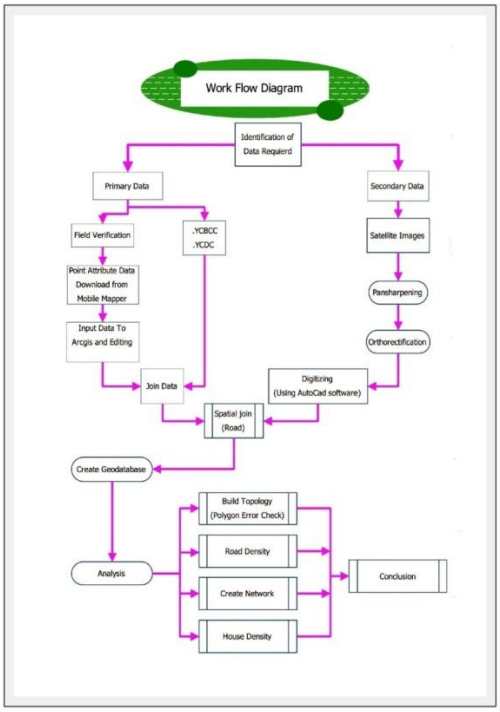

Figure 2. Work Flow Diagram

3.The Structural Analysis of Road Network

A digital transport network with complex mathematical model is the basis for transport analysis and urban growth. The network is a representation of major routes within the routes within the area. This digital network is the input to the transport analysis and to identify urban growth, which contains vertex and Edge. This is use to identify the start and end point of any routes.Transportation planning consists of a various individual modules. These modules can be road type (width of road), pavement management, traffic management and accident related data. As per the population with that area the transport network structure should be redesigned. This may be to increase road width, make one way and identify the parking area. The use of GIS technology in development of Urbanization, the transportation information system and management can provide a very strong solution.Information Designing, Construction, Maintainance and Management of the transport system in Mayangone Township transportation network consistof the major road, Main Road and other road shown in figure (3).

Figure 3. Road Types inMayangoneTownship Source: GCI Co,Ltd.Nodes and linkages

Transportation networks can be represented by a series of nodes (Vertices) and linkages (a set of edges). Nodes may be the origins as destinations of flows and they are points as which flows in the network can change their volume, direction of movement and mode of transport. They range in size and complexity from a road junction to a major international port. Links or edges are any behind of connections between these nodes.

To analyze the road network of Mayangone Township, every start points or end points of any routes is defined as nodes(vertices) and the roads these connect these vertices are termed as edges (linkages). According to this identification these are 2,802 vertices and 2,792 edges in road network of MayangoneTownship. (Figure 4.)

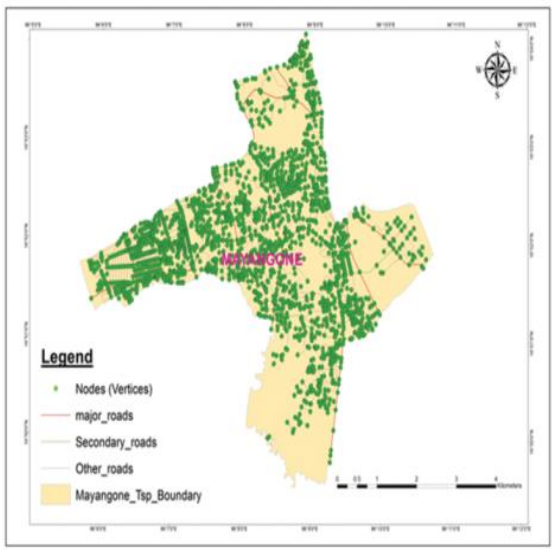

Figure 4. Nodes& Linkages inMayangoneSource: GCI Co,Ltd.Network Analysis.

A network is a system of interconnected elements such as lines (Edge) and connecting junction (better or

points) which represent ever possible route from one junction to another junction form a feature class a network dataset is create but it is restricted that form only one feature class can create only one Network Dataset. The Arc GIS network analyst extension allows building a network dataset and performing analysis on a network dataset.

3.1. The Problems of Traffic Jam

Traffic jams occurred especially at 8 miles junction, Thamine Junction, Parami Junction, Chaw twingone Junction and Bayintnaung Junction.

The critical problem which the resident a Mayangone Township has to face is traffic jamming at Bayintnaung Road, BahoRoad, Yangon-Insein Road and Pyay Road during rush hours. Previously, the number on line assigned for the township was small. November 2013 has opened the new bus line Big Ranger Cars, Trailer and Container, etc. Routes coming from HlaingTharYar, Nyaung Tone and Ayeyarwaddy Division area.

All this line has to take Bayintnaung Bridge as a compulsory route making the bridge busy all the time. The main roads of Thamine Junction and 8 mile Junction are always busy. (Figure 5.)

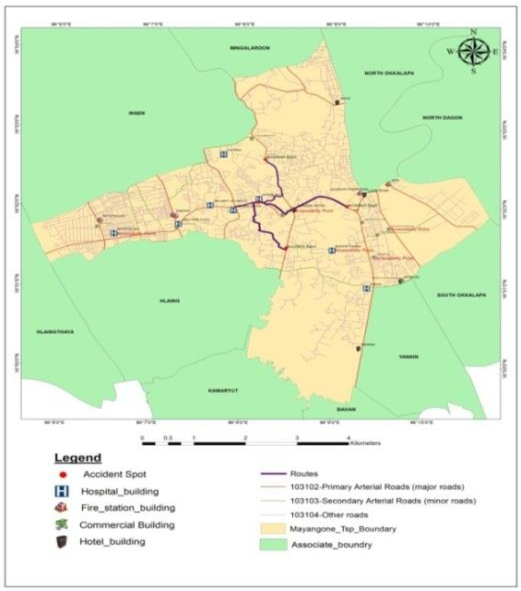

Figure 5. Closest Hospital Facility from an Accident Spot Source: GCI Co,Ltd.

3.2. Determination of the Road Density of the Study Area

The road density of the study area is calculated by relating the total density to the total area. This is represented mathematically as Eq (RD = L / A), 269.9099 Km / 25.52305 Sq. Km =10.5752 km .This analysis is showed that the road density was high comparing it with the standard as highlighted in Mayangone township.

3.3. Connectivity

Connectivity is based on topologic distance. The relative degree of connection between all vertices is defined as the connectivity of the network.

The Beta Index = E/V,

Where; E = Edges, V = Vertices

E / V = 2792/ 2802

= - 0.9964

= 99.64%

The Alpha Index= E – (V + 1)/ 2V – 5 --- (1)

= 0.4481

= 44.81 %

The Gamma Index = E/3(V-2) ---(2).

=2792/8400

=0.3324

=33.24%

Due to above calculation the gamma index foe this network is 33.24%. Therefore it can be said that 33.24 % of vertices are connect. (a) The connectivity is the relative degree of connectedness within the transportation network.(b) A connectivity Index can be used to quantity how well as roadway connects destination.

4. Findings and Suggestions

The Mayangone Township very high connectivity and high connectivity are: 8-miles Junction, 7miles junction, Thamine Junction and Chawtwingone Junction,Main roads and Junctions in wards Main road with far away from wards are not connectivity for commuters.

4.1. Suggestions

To reduce the problems of over congestion of commuters and traffic jams in rush hours.

- To eliminate slow vehicle parking and without discipline on daily commuting car routes.
- To remove vehicle with without discipline.
- To maintain the roads condition.
- To prevent the road from over flooding.
- To extend insufficient of parking at schools,hospitals and supermarket.
- To remove temporary festival,emporia,block of the road within the limit of road boundaries.
- To prepare and extend the limit of road boundaries.
- To remove the big ranger cars,trailers and container on running of daily routes during office hours and traffic jams.
- To promote the traffic point for insufficient.
- To reduce venders and temporary market,shop within the limit of road boundaries.
- To be distant junctions and bus-stop from nearest.

4.2. Land Used in Mayangone Township

Mayangone Township which lieson the north district still has vast stretches of Land Use.TheMayangone Area has vast 25.522998 Sq/ Km .Commercial Area is 1.45260 Sq/Km. Government Office Area is 2.9851Sq/Km .Industries Area is 0.229595 Sq/Km. Lake and pond Area is 3.260165 Sq/Km. Public Facilities Area is 6.081613 Sq/Km. Railway Area is 0.041972 Sq/Km. Residential Area is 8.158217. River Area is 0.342025 Sq/Km. Utilities Area is 0.793428 Sq/Km. vegetation Area is 2.17791 Sq/Km.

Table1 . Land Use in Mayangone Township

No	Area	Sq/Km
1	Commercial Area	1.452608
2	Government Office Area	2.9851
3	Industries Area	0.229595
4	Lake and pond Area	3.260165
5	Public Facilities Area	6.081613
6	Railway Area	0.041972
7	Residential Area	8.158217
8	River Area	0.342025
9	Utilities Area	0.793428
10	vegetation Area	2.17791

Source : GCI Co.,Lt

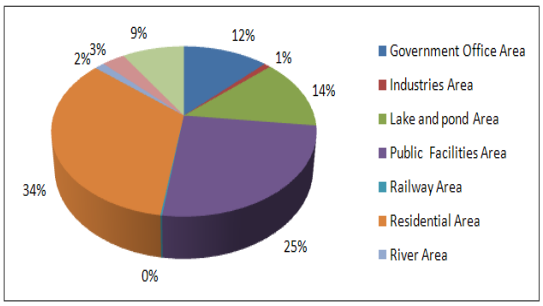

Figure 6. Land Use in Mayangone Township

5. Conclusion

In Mayangone Township, there are total 10 wards and these are named as Ward 1 to 10. Among these, wards 5 have the largest area, Ward 10 is second largest area, Ward 9 is third largest area. Wards 7 are four largest area and Ward 1,3,6,4,8 and 2 are medium and smallest areas. The road density of all Ward is shown in **Table (1).**

The relative degree of the connection between all vertices is defined as the connectivity of the network. A network node is vulnerable if loss or degradation of a small number of links diminishes the accessibility of the node. In the study area, 8 – miles Junction, Thamine Junction, Bayintanung Junction are very high connectivity and Chawtwingone- Parami Junction are high connectivity. Ward 5 is very high connectivity and Ward 8 has low connectivity .So,Ward 5 finding nearest to main routes and bus-stop is high connectivity.Most of the area in ward 8 are military and MRT but important center and bus-stop with far away from ward 8 is low connectivity for commuters.The study reversals that the Mayangone Township are good transportation facilities .If there are inter connection between the vertices, the stage of network will change into high connectivity, low isolation high accessibility in the future.

This paper also proves that the use of remote sensing, GIS and Network Analysis techniques can readily yield the oft-repeated(but as yet, unsatisfied) demands of professionals associated with transportation planning and development, of effective planning tools and funding for a more effective network dataset which can provide enormous benefits for urban planning.

Acknowledgements

We would like to express my deep appreciation to University journal of Creativity and Innovative Research (UJCJR 2020)committee members of computer university (Banmaw)for their kind permission to submit our research paper. We are greatly indebted to Rector Dr. May Phyo Oo, Computer University (Banmaw),for her permission to participate of this journal. We would like to express my gratitude to Professor Dr. Khin Khin Han, Head of Geography Department, West Yangon University for her review on the manuscript. We would like to thank Professor Dr. Nwe Nwe Hlaing, Natural Science, Computer University (Banmaw).

References

[1].Ajay D. Nagne (2013):*TransportationNetwork Analysis by using Remote Sensing and GIS* A Review, International journal of Engineering research and applications (IJERA) ISSN:2248- 9622,Vol.3, Issue 3.

[2].Amol D. Vibhule (2013):Transportation Network Analysis and modeling ofAgricultural Land use using RemoteSensing and Geographic In-formation System: Internationa Journal of Engineering, Research anApplications (IJERA) ISSN : 2248 – 9622 Vol – 3, Issue 3.

[3].MezyaedAlterkawi (2001):*Application of GIS in Transportation Planning* ,The case of Riyadh , the Kingdom of SuadiArabia ,Alterkawi MGBER Vol-1 No.2 pp 38-46

[4].Yan Aung Linn (2010) *: Network Analysis on Passenger Buslines of DagonMyothit(East)Township,* Unpublished Master Thesis, Department of Geography, Dagon University.

[5].InternetInsert*http://help.arcgis.com/en/arcgisdestop/10.0/help/index*.html#/Feature_class_basics/003n0000005000000

[6].InternetInsert:*http://blogs.esri.com/ersi/arcgis*/2013/02/07/export-topology-error/

[7].InternetInsert*http://webhelp.esri.com/arcgisdestop/9.3/index.cfm?*TopicName=What_i_s_a_network_dataset%3F

[8].InternetInsert:*http://www.veethi.com/places/maharashtra-aurangabad-district-374htm*

[9].InternetInsert:*http://aurangabad.nic.in/newsite/history.htm*

[10].InternetInsert:*http://help.arcgis.com*/en/arcgisdestop/10.0/help/index.html#//003n0000007n000000