Studies of the Status of Transportation Condition (TC) in Yangon, Myanmar

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Abstract—To become a modern developed city or a better environment, all items of city are very important. The development of a town is characterized by the development of the economical condition of this town. The development of economical condition mainly depends on the conditions of transportation and accessibility with surrounding areas. Mandalay is one of the cities with highest vehicle density of in Myanmar.

The development of commercial activities and areas in Mandalay mainly depends on these main highway roads. Therefore, highway oriented commercial uses are also important. Therefore, highway oriented commercial uses should be more developed and systematic.

To be clear relationship, the content of research firstly discussed about overview of exciting economic growth and lifestyle changes in Yangon. Moreover, along highway safety, road side beauty, general amenities of the adjoining users, location and access conditions mainly discussed to become a systematic and effective functioning highway oriented commercial areas. Above facts are very important not only to avoid disturbance and annoyance but also to enable service facilities to be designed so that highway users can efficiently use. The result of research will be a way leading to a systematic and effective functioning highway oriented commercial areas with more pleasant and healthy environment.

Keywords—environment, Transportation, commercial activities, highway, Traffic Congestion, highway safety, healthy environment, systematic.

I. INTRODUCTION

In every country, transportation is important. So Bus terminal is needed for transportation. Highway road mainly become the main fact for the economic growth of Yangon. Yangon City has grown rapidly in recent years and new bus terminal has been developing to trade and transportation.

Yangon is one of highest vehicle densities of any major city in Myanmar. Yangon Division is one of the most important in Myanmar economy. The development of commercial conditions of city mainly depends on the condition of transportation and the condition of accessibility with surrounding areas.

The development of commercial activities and areas in Yangon mainly depends on these main highway roads. Therefore, highway oriented commercial uses should be more developed and systematic. Increasing urban population and development of town has resulted in a rapid increase in public transport on the highway roads and bus terminal for highway users. Therefore, highway oriented commercial uses are also important to become a Modern develop city.

II. APPROACH TO TRANSPORTATION CONDITION (IN YANGON)

There is a need to understand the terms traffic, transport and transportation before understanding their importance in our society. Traffic means movement of people an vehicles. Transport means movement of people and goods from one place to another place. Transportation means the entire activity involving traffic and transport. Modern cities need better highways to link the cities and improved traffic regulation. The parking problem is also acute which needs immediate attention. With the changing life styles in cities, faster modes of transport are preferred by people. The economic prosperity increased the car ownership in the recent days and it has become a business necessity to reach destinations. The large variety of vehicles on the roads are creating traffic jams and parking problems, which are difficult to manage.

III. LITERATURE REVIEW

A. Important factors for transportation condition

The following important factors are taken into consideration in the transportation condition.

1. Importance of Transportation
2. Important Transport Components
3. Carrier or Vehicle
4. Driver
5. Right-of-way
1. Importance of Transportation

To solve the traffic and transportation problems, a comprehensive package of measures is needed. Increasing concentration of economic activities in few cities should be discouraged. Employment generation and economic activity should be encouraged in small and medium towns to discourage people migrating to large cities. However, this does not solve the existing problems in the cities. Transportation system within and between the cities should be improved by providing improved road conditions, traffic regulation, better parking facilities and good highways. Inadequate traffic facilities means not only loss of time and energy but also of economic development. There is a need for smooth flow of traffic by using or widening the existing roads and construction of new roads and other traffic regulation measures.

2. Important Transport Components

The following are the important components of any transport.
1. Carrier or vehicle
2. Driver or crew
3. Right-of-way or channel of movement

The performances of all the above three determine the efficiency of the mode of transportation. The terminals and servicing points are also important.

3. Carrier or Vehicle

Vehicle characteristics which need to be taken into consideration are length, width, weight, maneuverability, turning radius and horse power. Most of the vehicles are not more than ten feet high. The length between the front and rear wheels is known as axial length and the actual body length is known as total length. When the vehicle is fully loaded, it is known as ‘laden weight’ which includes its own weight. ‘Un-laden weight’ is the weight of the vehicle without any load. If the un-laden weight is deducted from laden weight, then it is known as ‘pay load’ of the vehicle. The number of axles depends upon the type of work carried out by the vehicle. A car has two axles and the trailer has four or six axles.

Maneuverability shows how best the vehicle can be maneuver or operated with ease. Here the ingenuity of the manufacturer is revealed. Easy maneuverability makes it an attractive vehicle for purchase and it helps easy movement on the roads. The turning radius of a vehicle depends on the weight, length and maneuverability. Turning radius is easy for light vehicles and difficult for heavy vehicles.

4. Driver

Normally fear of accident creates a behavior in a driver. There are also other means of controlling a driver behavior by legal rules and regulations like punishment and fine. The perception and reaction time of the driver is very important. After a person’s eye registers a given happening, a period of time lapses before muscular reaction occurs. This period is called ‘reaction-time’ and it differs between two persons. Another interval of time called ‘perception time’ is required before reaction can begin. Under alert conditions perception time appears to be between 0.2 and 0.3 seconds. An alert increasing speed more alertness is required, so speed controls are essential to avoid accidents. There is specialized training for driver to get acquainted to the traffic rules and road conditions. There are severe punishments in case of grave violations. All these measures should be able control the behavior of the driver for safe driving.

5. Right-of-way

In the past, the land acquired for right-of-way used to be narrow. Thus when it was felt necessary to widen a road or a street, then developed property along one or both sides of the road or street has to be purchased at different times at different higher rates. To avoid such situations, it is felt necessary to acquire right-of-way of roads, which are wide enough for future expansion. It is recommended that the width of land acquisition should include all necessary elements like ramps, walls and border areas. The channel of path should be wide enough with hierarchy of roads for easy plying of vehicles. The segregation of vehicular and pedestrian traffic is preferred.

B. Car circulation and access

Traffic circulation should be around a residential development, not through it. Major traffic arterials, existing or assured, should provide for fast and convenient access to the development. When the project has been reached, however, safety, convenience, and pleasant living for the residents take precedence over traffic speed and shortcuts through the project.

Arterial streets should not be used for car access to the home sites. The backing of cars off the on-lot parking spaces into fast-moving traffic is too hazardous.

Collector streets of ample width and flowing alignment should feed traffic between the arterial streets and to a network of minor access streets on which most of the home sites are located. Location of collector streets near the perimeter of a development is often advantageous.
Short loop streets and cul-de-sacs are best for the minor streets because they provide the safest access to and from home sites in small housing groups. The width of minor streets may be limited to two traffic lanes if car parking for owners and guests is adequately and conveniently provided elsewhere. Through careful design, this can produce savings in grading, drainage, and street construction.

The overall street system will provide maximum accessibility to all parts of the community and ensure proper coordination with proposed circulation changes. Direct to a major arterial highway is essential. Such intersections must be adequately controlled with lights or other means. The practical minimum distance between intersections on the major arterial highway should be 800 to 1000 ft. No through streets should be provided. All circulation should be around the periphery of the development to the major arterial highway. Each lane of traffic will carry from 600 to 800 cars per hour. Horizontal alignment of all collection, minor, loop, and access streets should provide for a minimum of 200 ft clear sight distance. The vertical alignment should not exceed 6 to 8 percent grade differentials. Side walks, when used, should be a minimum of 4 ft wide. When trees are planted between the curb and sidewalk, the sidewalk should be set back approximately 8 ft. If no trees are used, the set back should be 4 ft [95McG].

C. Studies on Parking Space Requirements

Parking is an essential role in providing mobility and accessibility to a great variety of places. Vehicles’ parking has become a major problem in the cities. Using various vehicles like buses, cars, motor cycles, and bicycles has become common for movement of people and goods.

The availability of vehicles has made people commute to long distances for various purposes. General vehicle parking habits of the people can be broadly classified into three categories:
1. Parking within premises
2. Short-time parking
3. Long-time parking

Parking within premises

Vehicles parked within the premises normally include independent houses, residential and commercial complexes. Vehicles parking in all types of buildings are guided by local building bye-laws. Construction of residential and commercial complexes is permitted, only if they meet the required parking norms. Whenever the parking is inadequate, vehicles are parked on the roadside. Visitors parking are also neglected in the rules compelling them to parks on the roadside. Such roadside parking often obstructs flow of traffic creating traffic jams. Parking norms should be periodically revised depending upon the vehicle ownership of the people. Violation of parking norms should be dealt severely [01MPR].

Short-time parking

Normally, short-time parking takes place on the roadside. The parking time varies from few minutes to one hour. Adequate parking lots should be provided at proper places for such parking on the roadsides and in the lanes without obstructing free flow of traffic. Short-time parking is not a major problem, but it requires proper planning and traffic regulation.

On-street parking shows motor vehicle speeds by narrowing the travel lanes. The narrowing is particularly effective because of the height of the parked cars and the articulation (irregular appearance) of the enclosure that the parked cars provide. Beyond its immediate traffic calming effect, on-street parking greatly improves the pedestrian qualities of the street, by putting a barrier of parked cars between the sidewalk and moving vehicles [01MPR].

Long-time parking

Long-time parking varies from few hours to one or two days. Long-time parking is going to be a big problem in the coming years with the rapid increase of vehicle ownership, particularly with the raise of car-ownership of the people. To solve the vehicle parking problems, good mass transportation system should be developed in the cities. People should be discouraged to use personal transport to commute to their work-place. Efficient bus transport can mitigate many of the acute parking problems [01MPR].
C. Scope

1. General planning guidelines for bus terminal areas in Mandalay
2. Lead to passenger only bus terminal in Mandalay
3. General planning guidelines for along highway safety, road side beauty, general amenities of the adjoining areas of bus terminal area and within bus terminal area.
4. Lead to provide mainly road classification, road widths, minimum spacing of intersection, design speed, parking spaces requirements, zoning relationship and public facilities for highway users.

IV. STUDIES ON CURRENT CONDITION IN YANGON

A. Urban Structure Overview

As the future urban area of the Yangon, total 39 townships, which are consisted of 33 townships under YCDC’s jurisdiction and parts of six (6) periphery townships, are set as the study area which has an area of approximately 1,500 km² as shown in figure-1. In 2002, Yangon has an urbanized area which expands with an area of approximately 505 km².

- Nga Moeyeik Creek flows into the center of Yangon City. Eastern part of Delta Region.
- Including Yangon City (784 km²) and part of six neighboring townships, which has a total area of approximatel 1500 km².

Fig.1 Extension of Yangon City

B. Topographic Features of Greater Yangon

- Bounded on the south, southeast & southwest by the Yangon, Bago & Hlaing Rivers.
D. Population trend of Yangon City

The average growth rate is 2.76% annual. YCDC has a population of 5.1 million in 2011. The average growth rate of population in YCDC between 1998 and 2011 is 2.58% annual.

Public Transportation System

- Administration
  - Secure and Smooth Transport Supervisory Committee (SSTSC)
  - Yangon Division Bus Control Committee (YDBCC) other organizations, Such as Shwe Ae’ The, Bandoola Transport, Than Myan Thu, Adi Padi
  - (Approximately 20 Org.)

- Bus Lines
  - 400 Bus Lines in Total
  - 8,000 Buses in Total (Approximately)
  - 5,800 Buses Daily Run (Approximately 73% of total)
  - 20,000 Trips per day (Approximately)
  - YDBCC – operated 134 Bus lines with 2530 different type of buses/4,453 Drivers and 6,371 Conductors employed.

V. STUDIES ON EXISTING CONDITION OF YANGON (TRANSPORTATION)

1) Location and Area of CBD

The area of Yangon City is nearly 3 square mile and which has seven townships.

They are Lanmadaw, Lathar, Pabedan, Kyauktadar, Botahaung, Pazundaung and Seikkan. According to studies about commercial facilities within CBD areas are divided by four sectors. They are - Service Sector
- Modern Retail Shop
- Traditional Market
- Short House or Street Stores.

In service sector, there are many companies and business offices, banks, hotels and motels, restaurants, parks, cinema, hospital and medical clinic and other services. In modern retail shops, they have many shopping malls, shopping complex, convenience stores and supermarket. In traditional market, it has many public markets. In short house or street stores, they have electronic stores, book stores, mobile shops, furniture stores, other stores.

Commercial floor area of Lanmadaw Township is 46.2 acres. There are many numbers of commercial buildings in this township. In this area, it has 45 numbers of service sector, 1320 numbers of shop houses or street stores, 2 numbers of retail shops and 2 numbers of traditional markets.

In Latha Township which has 22.2 acres of commercial floor area. In this area which has 2133 numbers of shop houses or street stores such as electronic stores, jewellery stores and many others stores. This area also has 40 numbers of service sector such as banks, cinema, restaurant, beauty salon, etc., and 4 numbers of modern retail shops such as Orange Supermarket, Sein Gay Har Shopping Center and others, 4 numbers of traditional market such as Theihgyi Market, Than Market and Central City Plaza.

In Pabedan Township which has 52 acres of commercial floor area. In this area has 4583 numbers of shop houses or street stores such as book stores, electronic stores and others, 74 numbers of services sector such as medical center, bank, cinema, business office and others. And then, 5 numbers of retail shops such as FMI Shopping Center, Super One Sales Center and convenience stores, 4 numbers of traditional market such as Bogoke Aung San Market and New Bogoke Market.

In Kyauktada Township which has 12.8 acres of commercial floor area. In this area which has 469 numbers of shop house or street stores such as Confectioneries, furniture stores, jewellery art galleries, mobile shops, electronic stores and others. And then, 144 numbers of services sector such as bank, cinema, hotel, photos and video studio, business office and 9 numbers of modern retail shops.
In Botahtaung Township which has 28.6 acres of commercial area. In this area which has 544 numbers of shop house or street stores such as book shops, aluminum shop and 54 numbers of service sector such as business office, bank, and cinema. And then, 2 numbers of modern retail shop such as City Mart and Royal Mart Supermarket, 2 numbers of traditional market such as Bogalay Market and New May Yu Market.

In Pazaundaung Township which has 23 acres of commercial area. In this area has 305 numbers of shop house or street stores such as electronic stores and mobile shops, 22 numbers of service sectors such as restaurant, bank, cinema and other services, 2 traditional markets such as Pazundaung Market and Ye Gyaw Market.

2) Traffic Condition

The road networks in CBD area are connected by this way. The main roads, Pyay road, Insein road, Kaga-Aye Pagoda Road, Waizanyantar Road, etc. are connected between Northern and Southern Area. Parami Road is used for connection between Eastern and Western Area. The roads in the CBD were laid out by the British Colonial administration in the 1850 on a grid pattern with the heart of the System.

The major east-west links;
- Bogyoke Aung San Street Northern side of the central area runs to the east;
- Anawrahta Street to the west;
- Mahabandoola Street to the east;
- Merchant Road to the west;
- Strand Road allows for two ways traffic flow.

The major north-south links;
- Shwe Dagon and Sule Pagoda Road, Pansotan and Bo Aung Kyaw Street and Thein Phu Road are provided for two-way traffic movement.

3) Traffic Volume in Central Area

Traffic was divided into three categories, Public transport vehicles, private cars and freight transport vehicles. In CBD, especially some of the entry points to the CBD are high. The traffic volume on the junction of Bogyoke Road and Shwedagon Pagoda Road was 2600 Vph. The intersection of Sule Pagoda Road and Bogyoke Road was nearly 3000 Vph. On Anawyahtar road at Sherdagon Pogada Road was 3600 Vph and on Anawyahtar road at Sule Pogada road was 3200 Vph and on Mahar Bandoola road at Sule Pagoda was 2400 Vph.

4) Bus Routing in CBD Area

Route from all directions must use Anawrahtar and Merchant Road for east to west and Mahabandoola Road for west to east travel and some bus route use Bogyoke Aung San Road.

![Fig.5 Bus Routing in Yangon CBD Area](image-url)

VI. CONCLUSION

To improve the quality of highway oriented commercial areas planning and get better and better satisfaction for highway users, field survey of existing conditions of intercity highway roads in Yangon is firstly carried out. Secondly, standards, others transportation guidelines and case studies were deeply studied for this topic. From this study, the proposed comments will provide a structure approach to analyze and to support guidelines for the capability of existing intercity highway oriented commercial areas to meet current and future needs. Thirdly, data collections from intercity highway roads and their related bus terminals were studied in details. And then, field survey, case studies and literature studies have been comparatively analyzed with each other.

In this comparative analyses, it can be found that existing conditions of highway network performance along intercity highway roads, road types, functional classification road type, spacing of intersection, design speed and road side beautiful along intercity highway roads and general amenities of adjoining areas in Yangon. Moreover, parking area and area requirements within bus terminal area, distance commercial usage locations, bus terminal types, and general amenities of the adjoining users are mainly analyzed by activities and facilities inter-relationship.
Finally, general planning guidelines will lead to a systematic and effective functioning highway oriented commercial areas with more pleasant and healthy environment.

Congestion is increasingly occurring at every road and highway roads at the traditional morning and evening peaks. Hence, more attention needs to be given to road network. Therefore, it is firmly believed that these guidelines can be served as a good reference for development activities in order to generate a systematic and effective functioning highway oriented commercial areas with more pleasant and healthy environment in Yangon.

REFERENCES

[11] Survey Data from Urban Planning Department, Yangon City Development Committee (YCDC).