

**PROJECT FOR COMPREHENSIVE
URBAN TRANSPORT PLAN OF THE
GREATER YANGON (YUTRA)**

**FINAL REPORT
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Image of Inner Ring Road and BRT



Image of Elevated Railway and Yangon Station Development

TABLE OF CONTENTS

| | | |
|----------|---|------------|
| 1 | INTRODUCTION..... | 1-1 |
| 1.1 | STUDY BACKGROUND AND OBJECTIVES..... | 1-1 |
| 1.2 | STUDY OBJECTIVES..... | 1-1 |
| 1.3 | STUDY AREA..... | 1-2 |
| 1.4 | STUDY SCHEDULE & FRAMEWORK..... | 1-4 |
| 1.5 | COMPOSITION OF YUTRA REPORTS..... | 1-4 |
| 1.6 | PROJECT ORGANIZATION..... | 1-5 |
| 2 | CURRENT TRANSPORT SITUATION, PROBLEMS, AND ISSUES..... | 2-1 |
| 2.1 | GENERAL..... | 2-1 |
| 2.1.1 | SOCIOECONOMIC AND URBAN DEVELOPMENT CHARACTERISTICS..... | 2-1 |
| 2.1.2 | MOTORIZATION AND TRANSPORT DEMAND..... | 2-8 |
| 2.2 | MAIN TRANSPORT COMPONENTS..... | 2-12 |
| 2.2.1 | ROAD..... | 2-12 |
| 2.2.2 | RAILWAY..... | 2-22 |
| 2.2.3 | TRAFFIC MANAGEMENT AND SAFETY..... | 2-44 |
| 2.2.4 | PUBLIC TRANSPORT SERVICES..... | 2-66 |
| 2.2.5 | WATER TRANSPORT..... | 2-74 |
| 2.2.6 | GOODS TRANSPORT (LAND)..... | 2-89 |
| 2.2.7 | IMPLICATIONS WITH NATIONAL TRANSPORT..... | 2-110 |
| 2.3 | TRANSPORT DEMAND CHARACTERISTICS..... | 2-115 |
| 2.3.1 | ROAD TRAFFIC VOLUME..... | 2-115 |
| 2.3.2 | EXTERNAL TRAFFIC VOLUME..... | 2-121 |
| 2.3.3 | PERSON TRIPS..... | 2-126 |
| 2.3.4 | MODAL SHARE..... | 2-129 |
| 2.3.5 | TRIP GENERATION AND ATTRACTION..... | 2-133 |
| 2.3.6 | HOURLY DISTRIBUTION OF TRIPS..... | 2-134 |
| 2.3.7 | TRAVEL TIME AND SPEED..... | 2-136 |
| 2.3.8 | TRIP LENGTH AND DISTRIBUTION BY MODE..... | 2-139 |
| 2.3.9 | TRIP MAKER'S OPINION..... | 2-143 |
| 2.4 | ENVIRONMENTAL CONDITIONS AND ISSUES..... | 2-145 |
| 2.4.1 | POLICY, LEGISLATIVE AND INSTITUTIONAL FRAMEWORK..... | 2-145 |
| 2.4.2 | EXISTING CONDITIONS: SOCIAL ENVIRONMENT..... | 2-150 |
| 2.4.3 | EXISTING CONDITIONS: NATURAL ENVIRONMENT..... | 2-152 |
| 2.4.4 | EXISTING CONDITIONS: ENVIRONMENTAL POLLUTION..... | 2-154 |
| 2.4.5 | STRATEGIC ENVIRONMENTAL ASSESSMENT IN COMPREHENSIVE URBAN TRANSPORT PLAN OF THE GREATER YANGON..... | 2-154 |
| 2.5 | PUBLIC SECTOR PLANNING AND BUDGETING SYSTEMS..... | 2-157 |
| 2.5.1 | RECENT DEVELOPMENTS..... | 2-157 |

| | | |
|----------|---|------------|
| 2.5.2 | KEY MYANMAR INSTITUTIONS FOR NATIONAL PLANNING AND BUDGETING | 2-158 |
| 2.5.3 | UNION BUDGETING PROCESS | 2-162 |
| 2.5.4 | PERFORMANCE REVIEW OF PUBLIC FINANCIAL MANAGEMENT | 2-163 |
| 2.5.5 | FINANCING OF TRANSPORT PROJECTS | 2-167 |
| 2.6 | TRANSPORT SECTOR INSTITUTIONS AND ADMINISTRATION | 2-186 |
| 2.6.1 | OVERALL | 2-186 |
| 2.6.2 | MINISTRY OF RAIL TRANSPORTATION (MORT) | 2-189 |
| 2.6.3 | MINISTRY OF TRANSPORT (MOT) | 2-192 |
| 2.6.4 | MINISTRY OF CONSTRUCTION (MOC) | 2-197 |
| 2.6.5 | MINISTRY OF HOME AFFAIRS (MOHA) | 2-199 |
| 2.6.6 | COMMITTEES UNDER YANGON REGION GOVERNMENT | 2-200 |
| 2.7 | CURRENT TRANSPORT PROBLEMS AND ISSUES | 2-208 |
| 2.7.1 | ROAD NETWORK AND TRAFFIC | 2-208 |
| 2.7.2 | RAILWAY NETWORK AND SERVICES | 2-212 |
| 2.7.3 | BUS TRANSPORT AND SERVICES | 2-215 |
| 2.7.4 | WATER TRANSPORT AND SERVICES | 2-217 |
| 2.7.5 | GOODS TRANSPORT | 2-217 |
| 2.7.6 | IMPLICATION WITH NATIONAL TRANSPORT | 2-219 |
| 2.7.7 | INSTITUTIONAL SETUP | 2-221 |
| 3 | TRANSPORT DEMAND CONTEXT | 3-1 |
| 3.1 | URBAN DEVELOPMENT SCENARIO | 3-1 |
| 3.1.1 | DEVELOPMENT VISION OF GREATER YANGON | 3-1 |
| 3.1.2 | URBAN STRUCTURE OF GREATER YANGON | 3-3 |
| 3.1.3 | FUTURE LAND USE | 3-5 |
| 3.2 | SOCIO-ECONOMIC FRAMEWORK | 3-7 |
| 3.2.1 | POPULATION | 3-7 |
| 3.2.2 | EMPLOYMENT | 3-13 |
| 3.2.3 | NUMBER OF STUDENTS | 3-20 |
| 3.2.4 | HOUSEHOLD INCOME AND CAR OWNERSHIP | 3-24 |
| 3.2.5 | SUMMARY OF SOCIO-ECONOMIC FRAMEWORK FOR GREATER YANGON | 3-29 |
| 3.3 | FUTURE TRANSPORT DEMAND | 3-30 |
| 3.3.1 | DEMAND FORECAST METHODOLOGY | 3-30 |
| 3.3.2 | TRAVEL DEMAND FORECAST | 3-30 |
| 3.3.3 | IMPACT OF FORECAST TRAVEL DEMAND ON TRANSPORT INFRA STRUCTURE | 3-35 |
| 3.4 | ASSESSMENT OF FUTURE DEMAND-SUPPLY GAPS | 3-40 |
| 3.4.1 | SETTING MINI SCREEN LINES | 3-40 |
| 3.4.2 | DEMAND/SUPPLY GAPS | 3-40 |
| 4 | TRANSPORT DEVELOPMENT STRATEGY | 4-1 |
| 4.1 | OVERALL TRANSPORT POLICY | 4-1 |
| 4.1.1 | CURRENT URBAN DEVELOPMENT POLICY | 4-1 |

| | | |
|----------|--|------------|
| 4.1.2 | YUTRA OVERALL TRANSPORT DEVELOPMENT STRATEGY | 4-4 |
| 4.2 | BUDGET ENVELOP | 4-9 |
| 4.2.1 | ECONOMIC GROWTH SCENARIOS | 4-9 |
| 4.2.2 | GREATER YANGON BUDGET ESTIMATES | 4-18 |
| 4.3 | LAND USE AND TRANSPORT INTEGRATION | 4-23 |
| 4.3.1 | PLANNING APPROACH | 4-23 |
| 4.3.2 | STRATEGIC URBAN DEVELOPMENT PLAN | 4-25 |
| 4.3.3 | NETWORKING CONCEPT | 4-26 |
| 4.3.4 | EVALUATION OF THE EXISTING NETWORK | 4-27 |
| 4.3.5 | INDICATIVE TRANSPORT NETWORK WITH THE SUB-CENTRE SYSTEM | 4-40 |
| 4.4 | PUBLIC TRANSPORT | 4-44 |
| 4.4.1 | GENERAL | 4-44 |
| 4.4.2 | URBAN RAILWAY DEVELOPMENT | 4-50 |
| 4.4.3 | BRT AND CONVENTIONAL BUS SERVICES | 4-64 |
| 4.5 | ROAD NETWORK DEVELOPMENT | 4-75 |
| 4.5.1 | ROAD TRAFFIC DEMAND | 4-75 |
| 4.5.2 | ROAD DEVELOPMENT STRATEGY | 4-79 |
| 4.5.3 | ROAD NETWORK HIERARCHY | 4-85 |
| 4.5.4 | ROAD NETWORK PLANNING | 4-88 |
| 4.6 | TRAFFIC MANAGEMENT AND SAFETY | 4-98 |
| 4.6.1 | TRAFFIC MANAGEMENT DEVELOPMENT STRATEGIES | 4-98 |
| 4.6.2 | PARKING DEVELOPMENT STRATEGIES | 4-100 |
| 4.6.3 | TRAFFIC SAFETY IMPROVEMENT STRATEGIES | 4-103 |
| 4.7 | GOODS MOVEMENT AND CORRESPONDING PLANS | 4-104 |
| 4.7.1 | MAJOR FREIGHT TRAFFIC GENERATORS | 4-104 |
| 4.7.2 | PASSENGER TRANSPORT BY INLAND WATER TRANSPORT SERVICES | 4-106 |
| 4.7.3 | CURRENT GOODS MOVEMENT MANAGEMENT AND DEVELOPMENT POTENTIAL | 4-106 |
| 4.7.4 | FUTURE GOODS MOVEMENT MANAGEMENT | 4-109 |
| 4.8 | INSTITUTIONAL REFORM AND STRENGTHENING | 4-112 |
| 4.8.1 | ESTABLISHMENT OF “YANGON URBAN TRANSPORT AUTHORITY (YUTA)” | 4-112 |
| 4.8.2 | DEVELOPMENT OF BRT MANAGEMENT AGENCY | 4-124 |
| 4.8.3 | OPERATOR LICENSING AND CONTRACTS | 4-126 |
| 4.8.4 | POSSIBLE TECHNICAL ASSISTANCE FOR THE DEVELOPMENT OF YUTA AND BRT MANAGEMENT AGENCY | 4-130 |
| 5 | ONGOING AND PROPOSED PROJECTS | 5-1 |
| 5.1 | ON-GOING PROJECTS | 5-1 |
| 5.1.1 | ROAD TRANSPORT SECTOR | 5-1 |
| 5.1.2 | RAILWAY TRANSPORT SECTOR | 5-6 |
| 5.1.3 | WATER TRANSPORT SECTOR | 5-7 |
| 5.1.4 | AIR TRANSPORT SECTOR | 5-11 |

| | | |
|----------|--|------------|
| 5.2 | PROJECTS PROPOSED/PLANNED BY VARIOUS AGENCIES | 5-11 |
| 5.2.1 | ROAD TRANSPORT SECTOR | 5-11 |
| 5.2.2 | RAILWAY TRANSPORT SECTOR..... | 5-14 |
| 5.2.3 | WATER TRANSPORT SECTOR | 5-16 |
| 5.2.4 | AIR TRANSPORT SECTOR..... | 5-18 |
| 6 | MASTER PLAN 2035..... | 6-1 |
| 6.1 | TRANSPORT NETWORK PLANNING | 6-1 |
| 6.1.1 | TRANSPORT NETWORK FORMATION..... | 6-1 |
| 6.1.2 | TRANSPORT NETWORK ASSESSMENT | 6-10 |
| 6.2 | MAJOR MASTER PLAN PROJECTS..... | 6-13 |
| 6.2.1 | PUBLIC TRANSPORT PROJECTS | 6-13 |
| 6.2.2 | ROAD DEVELOPMENT PROJECTS | 6-58 |
| 6.2.3 | TRAFFIC MANAGEMENT PROJECTS | 6-80 |
| 6.2.4 | FREIGHT TRAFFIC MANAGEMENT PROJECTS | 6-101 |
| 6.2.5 | PROJECTS SUMMARY..... | 6-105 |
| 6.3 | EVALUATION OF MAJOR MASTER PLAN PROJECTS | 6-125 |
| 6.3.1 | ECONOMIC EVALUATION OF PROJECTS | 6-125 |
| 6.3.2 | FINANCIAL EVALUATION OF PROJECTS | 6-130 |
| 6.3.3 | ENVIRONMENTAL EVALUATION OF PROJECTS | 6-131 |
| 6.3.4 | NECESSARY ENVIRONMENTAL AND SOCIAL CONSIDERATIONS IN PLANNING AND IMPLEMENTATION OF PRIORITIZED PROJECTS..... | 6-137 |
| 6.3.5 | OVERALL MCA OF MAJOR MASTER PLAN PROJECTS | 6-150 |
| 7 | Implementation Program | 7-1 |
| 7.1 | IMPLEMENTATION SCHEDULE AND RESPONSIBLE AGENCY | 7-1 |
| 7.2 | INVESTMENT PLAN..... | 7-5 |
| 7.3 | POTENTIAL FUNDING SOURCE FOR TOD PROJECT..... | 7-6 |
| 7.3.2 | VALUE CAPTURE..... | 7-6 |
| 7.3.3 | UNUSED GOVERNMENT LANDS | 7-9 |
| 7.4 | INSTITUTIONAL REFORMS..... | 7-12 |
| 8 | CONCLUSION AND RECOMMENDATIONS..... | 8-1 |
| 8.1 | CONCLUSION..... | 8-1 |
| 8.2 | RECOMMENDATIONS | 8-3 |

LIST OF FIGURES

| | | |
|-----------------|--|------|
| Figure 1.3.1 | YUTRA Study Area | 1-3 |
| Figure 1.4.1 | Project Framework..... | 1-4 |
| Figure 1.6.1 | Project Organization of YUTRA | 1-5 |
| Figure 2.1.1.1 | Economic Sector in Myanmar and Yangon Region..... | 2-3 |
| Figure 2.1.1.2 | Growth of Yangon City Before 1988..... | 2-4 |
| Figure 2.1.1.3 | Growth of Yangon City After 1988..... | 2-4 |
| Figure 2.1.1.4 | New Towns, Satellite Towns, and Industrial Zones in Yangon Region | 2-5 |
| Figure 2.1.1.5 | Location of Housing Projects in Yangon Region | 2-6 |
| Figure 2.1.1.6 | Location Map of Industrial Zones in Yangon Region..... | 2-7 |
| Figure 2.1.2.1 | Registered Motor Vehicles by Type in Yangon Region | 2-8 |
| Figure 2.1.2.2 | Household Income Distribution | 2-9 |
| Figure 2.1.2.3 | Vehicle Ownership by Income Level | 2-10 |
| Figure 2.2.1.1 | Asian Highway and GMS Network in and around Myanmar | 2-12 |
| Figure 2.2.1.2 | Road Network in Myanmar | 2-13 |
| Figure 2.2.1.3 | Gateways to Nationwide Road Network | 2-14 |
| Figure 2.2.1.4 | Surface Condition of Roads under MOC and YCDC | 2-17 |
| Figure 2.2.1.5 | Connectivity with Ports, Logistic Facilities and Industrial Areas | 2-20 |
| Figure 2.2.1.6 | Existing and Proposed Bus Terminals..... | 2-21 |
| Figure 2.2.2.1 | Trans-Asian Railway Network | 2-22 |
| Figure 2.2.2.2 | Railway Transportation Network in Myanmar..... | 2-23 |
| Figure 2.2.2.3 | Current Railway Network in the Study Area | 2-25 |
| Figure 2.2.2.4 | Construction Gauge and Car Gauge | 2-27 |
| Figure 2.2.2.5 | Typical Track Cross Section in Yangon Circular Railway and the Suburban Lines | 2-28 |
| Figure 2.2.2.6 | Current Automatic Block Color light Signal and Paper Token System | 2-31 |
| Figure 2.2.2.7 | Signaling System in Yangon Circular Railway and the Suburban Lines..... | 2-31 |
| Figure 2.2.2.8 | Telecommunication Equipments installed in Yangon Circular Railway and the Suburban Lines | 2-32 |
| Figure 2.2.2.9 | Current Low Height Platform..... | 2-33 |
| Figure 2.2.2.10 | Current Two Separate Platforms | 2-33 |
| Figure 2.2.2.11 | Organizational Chart of Myanma Railways..... | 2-34 |
| Figure 2.2.2.12 | Organizational Chart of Division 7 | 2-35 |
| Figure 2.2.2.13 | Change in the Number of Passengers and Train Operations of Yangon Circular Railway and the Suburban Lines..... | 2-41 |
| Figure 2.2.2.14 | Train Operation Number at Each Section | 2-42 |
| Figure 2.2.2.15 | Hourly Number of Passengers by Boarding and Alighting | 2-43 |
| Figure 2.2.2.16 | Trip Purpose and Access/Egress Mode..... | 2-43 |
| Figure 2.2.3.1 | Congested intersections and road sections in the CBD..... | 2-45 |
| Figure 2.2.3.2 | Congested Intersections and Road Sections | 2-47 |
| Figure 2.2.3.3 | Examples of Congested Intersections (1/2) | 2-48 |
| Figure 2.2.3.4 | Examples of Congested Intersections (2/2) | 2-49 |
| Figure 2.2.3.5 | Case 1 | 2-50 |
| Figure 2.2.3.6 | Case 2 | 2-50 |
| Figure 2.2.3.7 | Case 3 | 2-50 |
| Figure 2.2.3.8 | The actual condition of street parking in and south of Inya Lake in Yangon city | 2-51 |
| Figure 2.2.3.9 | The actual condition of street parking in the CBD..... | 2-52 |
| Figure 2.2.3.10 | The actual condition of street parking in the CBD with vehicle type | 2-52 |
| Figure 2.2.3.11 | Actual condition of street parking at shopping centers | 2-54 |
| Figure 2.2.3.12 | Actual condition of street parking at Shwe Dagon Pagoda | 2-54 |
| Figure 2.2.3.13 | Actual condition of street parking in front of Apartment houses..... | 2-55 |
| Figure 2.2.3.14 | Number of Accidents per 10,000 Vehicles | 2-58 |
| Figure 2.2.3.15 | Number of Accidents by Vehicle type and by Causes..... | 2-58 |
| Figure 2.2.3.16 | Locations of Existing Signalized Intersections..... | 2-59 |
| Figure 2.2.3.17 | Designated Truck Routes | 2-63 |

| | |
|---|-------|
| Figure 2.2.3.18 Existing ITS Facilities in Yangon..... | 2-64 |
| Figure 2.2.4.1 Small Booth | 2-67 |
| Figure 2.2.4.2 Bus Transport Industry Structure and Institutional Arrangement..... | 2-69 |
| Figure 2.2.4.3 Type of Bus Fleets in Yangon Region | 2-71 |
| Figure 2.2.4.4 Bus Routes Distribution | 2-72 |
| Figure 2.2.4.5 Distribution of Bus Vehicles by Types | 2-73 |
| Figure 2.2.4.6 Existing Bus Routes Distribution..... | 2-73 |
| Figure 2.2.4.7 Bus Stops in Yangon Region | 2-74 |
| Figure 2.2.5.1 Main Inland Waterway in Myanmar..... | 2-75 |
| Figure 2.2.5.2 Freight Modal Share of Myanmar in 2010..... | 2-75 |
| Figure 2.2.5.3 Trend of Passenger and Freight Volume (2004-2010)..... | 2-76 |
| Figure 2.2.5.4 Inland Waterway Route in the Study Area | 2-78 |
| Figure 2.2.5.5 Route Map of Main Passenger Ferry to/from CBD in Yangon..... | 2-82 |
| Figure 2.2.5.6 Major Ports and Jetties in Yangon | 2-84 |
| Figure 2.2.5.7 Destination-Wise Passenger Number by Township | 2-85 |
| Figure 2.2.5.8 Wharf Location of Yangon Main Port | 2-86 |
| Figure 2.2.5.9 Plots in Thilawa Area Port..... | 2-87 |
| Figure 2.2.6.1 Major Freight Traffic Generators in the Study Area | 2-91 |
| Figure 2.2.6.2 Industrial Zones in Yangon and Surrounding Area..... | 2-93 |
| Figure 2.2.6.3 Shopping Centers in Yangon | 2-96 |
| Figure 2.2.6.4 Traditional Markets in Yangon..... | 2-100 |
| Figure 2.2.6.5 Freight Rail Stations in Yangon..... | 2-106 |
| Figure 2.2.6.6 Dagon Bridge Figure 2.2.6.71 Thanlyin Bridge | 2-109 |
| Figure 2.2.6.8 Aung Zaya Bridge Figure 2.2.6.9 Shwepyitha Bridge..... | 2-109 |
| Figure 2.2.7.1 National Level Transport Systems..... | 2-111 |
| Figure 2.2.7.2 Inter-city Bus Routes in Myanmar..... | 2-114 |
| Figure 2.3.1.1 Screen-line Survey Location, 2013 | 2-115 |
| Figure 2.3.1.2 Hourly Variation of Traffic Volume on East Screen-line (Inbound), 2013..... | 2-117 |
| Figure 2.3.1.3 Hourly Variation of Traffic Volume on East Screen-line (Outbound), 2013..... | 2-117 |
| Figure 2.3.1.4 Hourly Variation of Traffic Volume on West Screen-line (Inbound), 2013..... | 2-118 |
| Figure 2.3.1.5 Hourly Variation of Traffic Volume on West Screen-line (Outbound), 2013..... | 2-118 |
| Figure 2.3.1.6 Fluctuation of Average Occupancy by Vehicle Type, 2013 | 2-119 |
| Figure 2.3.1.7 Assumption to Estimate Bus Occupancy, 2013 | 2-120 |
| Figure 2.3.2.1 Locations of Cordon-line Survey, 2013 | 2-121 |
| Figure 2.3.2.2 Hourly Variation of Traffic Volume at Cordon (Inbound), 2013 | 2-123 |
| Figure 2.3.2.3 Hourly Variation of Traffic Volume at Cordon (Outbound), 2013 | 2-123 |
| Figure 2.3.2.4 Hourly Variation of Airport Access Traffic Volume, 2013 | 2-125 |
| Figure 2.3.2.5 Hourly Variation of Airport Egress Traffic Volume, 2013..... | 2-125 |
| Figure 2.3.3.1 Distribution of Trip Makers by Number of Daily Trips, 2013 | 2-127 |
| Figure 2.3.3.2 Trip Rate by Age & Gender, 2013 | 2-127 |
| Figure 2.3.3.3 Trip Rate by Personal Income & Car Availability, 2013 | 2-127 |
| Figure 2.3.3.4 Trip Rate by Personal Income and Working Condition, 2013..... | 2-128 |
| Figure 2.3.3.5 Trip Rate by Occupation, 2013 | 2-128 |
| Figure 2.3.3.6 Trip Rate by Employment Sector, 2013 | 2-129 |
| Figure 2.3.4.1 Modal Share, 2013 | 2-129 |
| Figure 2.3.4.2 Modal Share by Gender and Age Group, 2013..... | 2-130 |
| Figure 2.3.4.3 Modal Share by Vehicle Ownership and Household Income Level, 2013..... | 2-131 |
| Figure 2.3.4.4 Modal Share by Trip Purpose, 2013 | 2-132 |
| Figure 2.3.5.1 Trip Generation/ Attraction by Urban Planning Zone, 2013..... | 2-134 |
| Figure 2.3.6.1 Hourly Distribution of Generated Trips by Travel Mode, 2013..... | 2-135 |
| Figure 2.3.6.2 Hourly Distribution of Generated Trips by Trip Purpose, 2013..... | 2-135 |
| Figure 2.3.6.3 Pattern of Generated Trips by Trip Purpose (Excluding walk), 2013..... | 2-136 |
| Figure 2.3.7.1 Average Travel Time by Trip Purpose & Personal Income Level, 2013 | 2-137 |
| Figure 2.3.7.2 Survey Routes for Travel Speed Survey, 2013 | 2-138 |

| | |
|--|-------|
| Figure 2.3.7.3 Average Travel Speed on Selected Roads (South-North), 2013..... | 2-138 |
| Figure 2.3.7.4 Average Travel Speed on Selected Roads (East-West), 2013 | 2-138 |
| Figure 2.3.8.1 Trip Length and Distribution of All Motorized Vehicles | 2-139 |
| Figure 2.3.8.2 Trip Length and Distribution of Motorcycle..... | 2-140 |
| Figure 2.3.8.3 Trip Length and Distribution of Passenger Car | 2-140 |
| Figure 2.3.8.4 Trip Length and Distribution of Public Mode including Bus | 2-141 |
| Figure 2.3.8.5 Trip Length and Distribution of Taxi..... | 2-141 |
| Figure 2.3.8.6 Trip Length and Distribution of Truck | 2-142 |
| Figure 2.3.9.1 Opinion on Used Car Import, 2013 | 2-143 |
| Figure 2.3.9.2 Opinion on Used Car Import by Gender & Age Group, 2013 | 2-143 |
| Figure 2.3.9.3 Opinion on Used Car Import by Personal Income Level (Kyat/month) , 2013..... | 2-143 |
| Figure 2.3.9.4 Opinion on Used Car Import by Car Availability, 2013 | 2-143 |
| Figure 2.3.9.5 Opinion of Motorcycle Limitation, 2013..... | 2-144 |
| Figure 2.3.9.6 Opinion of Motorcycle Limitation by Car Availability, 2013 | 2-144 |
| Figure 2.3.9.7 Opinion of Motorcycle Limitation by House Location, 2013 | 2-144 |
| Figure 2.4.1.1 Schematic Processes of Environmental Approval..... | 2-148 |
| Figure 2.5.1.1 Myanmar National Planning Framework..... | 2-158 |
| Figure 2.5.3.1 Union Budget Preparation Agencies | 2-162 |
| Figure 2.5.3.2 Union Budget Bill Process | 2-162 |
| Figure 2.5.3.3 Institutional Arrangements for Management of Public Finances | 2-163 |
| Figure 2.5.4.1 Myanmar Fiscal Indicators to GDP, FY1988/89 to FY2012/13..... | 2-167 |
| Figure 2.5.5.1 OECD Inland Transport Investment, 2011 | 2-169 |
| Figure 2.5.5.2 ODA Processing Procedures | 2-171 |
| Figure 2.5.5.3 Joint Venture Arrangement Procedures | 2-174 |
| Figure 2.5.5.4 Approval Procedure for Privatization of State Economic Enterprises | 2-175 |
| Figure 2.5.5.5 Public and Private Delivery Systems | 2-176 |
| Figure 2.5.5.6 JICA Assistance Scheme for PPP Projects..... | 2-177 |
| Figure 2.5.5.7 Example of Private Sector Investment Finance Scheme (Vietnam)..... | 2-178 |
| Figure 2.5.5.8 Example of Project Implementation Structure (Vietnam) | 2-179 |
| Figure 2.5.5.9 Average Monthly Rental Rates for Grade A Office Space, as of Q1 2013 | 2-180 |
| Figure 2.5.5.10 Average Daily Rates for Hotel Rooms in Yangon | 2-180 |
| Figure 2.5.5.11 Average Lease Rates for Industrial Land in Yangon..... | 2-180 |
| Figure 2.5.5.12 Government Lands in Yangon Region..... | 2-185 |
| Figure 2.6.1.1 Organizations involved in Transport Sector of Yangon Region (As of June, 2013) | 2-188 |
| Figure 2.6.3.1 Department of Transport's Organization Chart | 2-193 |
| Figure 2.6.3.2 Inland Water Transport's Organization Chart..... | 2-194 |
| Figure 2.6.3.3 Myanma Port Authority's Organization Chart..... | 2-195 |
| Figure 2.6.3.4 DWIR's Organization Chart..... | 2-197 |
| Figure 2.6.4.1 Public Work's Organization Chart | 2-198 |
| Figure 2.6.5.1 Organizations/Departments Involved in Road-Traffic related Activities..... | 2-199 |
| Figure 2.6.6.1 YCDC's Organization Chart..... | 2-201 |
| Figure 2.6.6.2 Engineering Department (Roads & Bridges) Organization Chart..... | 2-203 |
| Figure 2.6.6.3 Yangon Region Development Committee's Organization Chart | 2-204 |
| Figure 2.6.6.4 Organization Structure of Ma-hta-tha-Central (As of September 2012) | 2-207 |
| Figure 2.7.1.1 Road Area of Metropolitan Cities | 2-208 |
| Figure 2.7.1.2 Composition of Number of Lanes | 2-209 |
| Figure 2.7.1.3 Proposed Typical Cross Section for Elevated Inner Road | 2-210 |
| Figure 2.7.1.4 Proposed Typical Cross Section for BRT | 2-210 |
| Figure 2.7.1.5 Current Bottleneck Sections | 2-211 |
| Figure 2.7.3.1 Problems related to Service Level of Bus Operation | 2-216 |
| Figure 2.7.6.1 Preliminary Ideas (expansion of the expressway, etc)..... | 2-221 |
| Figure 3.1.1.1 The Development Vision of Greater Yangon for 2040..... | 3-1 |
| Figure 3.1.1.2 Relationship of Development Vision and Sector Visions..... | 3-2 |

| | |
|---|------|
| Figure 3.1.2.1 Proposed Urban Structure of Greater Yangon, “Sub-center with Green Isle System” | 3-4 |
| Figure 3.1.3.1 Future Land Use Maps | 3-6 |
| Figure 3.1.3.2 Land Use in 2012, 2025 and 2040 | 3-6 |
| Figure 3.2.1.1 Night-time Population Projection by Urban Planning Zone | 3-8 |
| Figure 3.2.1.2 Projected Population Density by Traffic Zone (Night-time) | 3-10 |
| Figure 3.2.1.3 Projected Population Density by Traffic Zone (Day-time) | 3-12 |
| Figure 3.2.2.1 Projected Number of Workers by Township and Sector (Night-time) | 3-15 |
| Figure 3.2.2.2 Projected Number of Workers by Township and Sector (Day-time) | 3-18 |
| Figure 3.2.2.3 Future Industrial Zones, Planned by SUDP | 3-19 |
| Figure 3.2.3.1 Projected Number of Students by Township (Night-time / Day-time) | 3-23 |
| Figure 3.2.4.1 Projected Household Income by Township | 3-27 |
| Figure 3.2.4.2 Projected Household Car Ownership Ratio by Township | 3-28 |
| Figure 3.3.2.1 Current and Forecast Trip Distribution Patters in YUTRA Areas | 3-33 |
| Figure 3.3.3.1 2013 Assigned Traffic Volume on Current Transport Network | 3-37 |
| Figure 3.3.3.2 2018 Assigned Traffic Volume on Current Transport Network | 3-37 |
| Figure 3.3.3.3 2025 Assigned Traffic Volume on Current Transport Network | 3-38 |
| Figure 3.3.3.4 2035 Assigned Traffic Volume on Current Transport Network | 3-39 |
| Figure 3.4.1.1 Mini Screen Lines for Demand/Supply Gap Analysis | 3-40 |
| Figure 3.4.2.1 Demand/Supply Gaps by Mini Screen Line, 2013 and 2035 | 3-42 |
| Figure 4.1.2.1 Indicative Target for Modal Share for 2035 | 4-5 |
| Figure 4.1.2.2 Main Features and Strategies of YUTRA Master Plan | 4-8 |
| Figure 4.2.1.1 Relationship between National Strategies and Plans | 4-10 |
| Figure 4.2.1.2 Growth Sectors for Myanmar High Economic Growth Path | 4-15 |
| Figure 4.2.1.3 Selected ASEAN Countries’ GDP Growth | 4-17 |
| Figure 4.2.1.4 Myanmar GDP Forecasts by Growth Scenarios | 4-18 |
| Figure 4.2.2.1 Economic Take-Off and Investment in Selected Asian Countries | 4-19 |
| Figure 4.2.2.2 Economic Centers of Thailand, Myanmar and Vietnam | 4-21 |
| Figure 4.3.1.1 Planning Approach | 4-24 |
| Figure 4.3.2.1 Sub-Centres with Green Isle System by SUDP | 4-26 |
| Figure 4.3.3.1 Hierarchical Centre System and Links | 4-27 |
| Figure 4.3.4.1 SUDP Hierarchical Centre System and Corresponding Links | 4-28 |
| Figure 4.3.4.2 Thanlyin Rail and Road for Link A4 | 4-29 |
| Figure 4.3.4.3 Ferry and Sampans Crossing at Link A5 | 4-30 |
| Figure 4.3.4.4 Hlaing River Bridge (left) and Aung Zaya Bridge (right) for Link B1 | 4-31 |
| Figure 4.3.4.5 Desire Line between centres, 2013 and 2035 | 4-34 |
| Figure 4.3.4.6 Person Trips on Link between centres, 2013 and 2035 | 4-34 |
| Figure 4.3.5.1 Area needs high-order transit service in 2013 | 4-41 |
| Figure 4.3.5.2 Area needs high-order transit service in 2035 | 4-41 |
| Figure 4.3.5.3 Suggested direct link by mass transit, 2035 | 4-42 |
| Figure 4.3.5.4 Possible mass transit routes, 2035 | 4-43 |
| Figure 4.3.5.5 Suggested road capacity increase between the centres | 4-43 |
| Figure 4.4.1.1 Comparison of Transport Capacity and Speed among Each Transit Mode | 4-44 |
| Figure 4.4.1.2 Cost vs. Capacity Comparisons between Modes | 4-46 |
| Figure 4.4.1.3 Comparison of Risk of Fatal Accident among Transportation Mode | 4-48 |
| Figure 4.4.1.4 Comparison of Energy Consumption Rate among Transportation Mode | 4-48 |
| Figure 4.4.1.5 Comparison of CO2 Emission Rate among Transportation Mode | 4-48 |
| Figure 4.4.2.1 Future Railway Network planed by SUDP | 4-50 |
| Figure 4.4.2.2 Virtuous and Vicious Cycle by with/without Integration among Transport Mode | 4-52 |
| Figure 4.4.2.3 Schematic Image among Railway Improvement/Modernization, Railway Land Development and Integrated Multi-Modal Transport | 4-53 |
| Figure 4.4.2.4 Schematic Image of Station Improvement for Multi-Modal Facility Integration | 4-54 |
| Figure 4.4.2.5 Schematic Figure of Relocation of Existing Depots and Workshops to New Integrated Depot/Workshop | 4-55 |
| Figure 4.4.2.6 Future Railway Freight Transport Plan prepared by MYT-Plan | 4-57 |

| | |
|---|-------|
| Figure 4.4.2.7 Yangon's Position in 2025 on Relation Figure UMRT Opening Year and GRDP in Asian Major Cities..... | 4-60 |
| Figure 4.4.2.8 Example of Railway Development Scenario in combination with the Related Projects..... | 4-61 |
| Figure 4.4.2.9 Cycle of Railway Infrastructure Development by using Yard Development Benefit..... | 4-62 |
| Figure 4.4.2.10 Comparison of Development Method and Sequence for Existing Railway Modernization | 4-63 |
| Figure 4.4.3.1 Components of BRT | 4-64 |
| Figure 4.4.3.2 Before and after (proposed) road layout on a 2 lane directional roadway..... | 4-65 |
| Figure 4.4.3.3 Before and After – Jakarta | 4-66 |
| Figure 4.4.3.4 City Bus with a Carrying Capacity of 70 passengers | 4-70 |
| Figure 4.4.3.5 Bi-articulated bus with a Carrying Capacity of 160-210 passengers..... | 4-70 |
| Figure 4.4.3.6 Seating Layout for Articulated and Bi-articulated Buses | 4-70 |
| Figure 4.4.3.7 Closed system of ticketing turnstiles..... | 4-71 |
| Figure 4.4.3.8 Contactless card reader..... | 4-71 |
| Figure 4.4.3.9 Automated Ticket Vending machine Brisbane..... | 4-71 |
| Figure 4.4.3.10 Roles and Responsibilities under the Shared-Risk Management Model | 4-73 |
| Figure 4.5.1.1 Demand / Supply Gaps on Current Road Network | 4-75 |
| Figure 4.5.1.2 Demand Increase between 2013 and 2035 showing by “pcu*km” on Current Road Network | 4-76 |
| Figure 4.5.1.3 Under Developing Area and Flooding Area..... | 4-77 |
| Figure 4.5.2.1 Urban Development Concept of CBD Area..... | 4-79 |
| Figure 4.5.2.2 Major arterial roads in Yangon | 4-81 |
| Figure 4.5.2.3 Image of Double Deck Road (Waiza Yan Tar Road) | 4-82 |
| Figure 4.5.2.4 Possible spaces even along the union highways..... | 4-83 |
| Figure 4.5.3.1 Hierarchy of Road Functional Classification | 4-87 |
| Figure 4.5.3.2 Relationship of Functionally Classified Road System | 4-88 |
| Figure 4.5.4.1 Procedure for Road Network Planning | 4-88 |
| Figure 4.5.4.2 Do-nothing Scenario (2035)..... | 4-90 |
| Figure 4.5.4.3 Do-minimum Scenario (2035)..... | 4-90 |
| Figure 4.5.4.4 Demand Increase of North-South Corridors..... | 4-91 |
| Figure 4.5.4.5 Demand Increase of East-West Corridors | 4-91 |
| Figure 4.5.4.6 Introduction of 3.0m Lane Width in Urban Area | 4-92 |
| Figure 4.5.4.7 Introduction of 3.0m Lane Width in Urban Area with Elevated Road | 4-92 |
| Figure 4.5.4.8 Comparison of Possible “East-West Corridors” (1/2)..... | 4-93 |
| Figure 4.5.4.9 Comparison of Possible “East-West Corridors” (2/2)..... | 4-94 |
| Figure 4.5.4.10 Demand/Supply Gaps of River Crossings | 4-95 |
| Figure 4.5.4.11 Traffic Volume Composition of Kyee Min Daing Road | 4-97 |
| Figure 4.5.4.12 Existing Road Network and Logistic Traffic Flow | 4-97 |
| Figure 4.6.1.1 Concept of Traffic Demand Management (TDM) | 4-99 |
| Figure 4.6.1.2 Image of the Proposed Comprehensive Traffic Management Policy | 4-99 |
| Figure 4.6.2.1 Proposed Organizational Setup for Public Parking Development and Operation..... | 4-102 |
| Figure 4.7.1.1 Location of Waterfront Development Plan | 4-105 |
| Figure 4.7.2.1 Water Buses | 4-106 |
| Figure 4.7.3.1 Self - Navigation Barge (Mekong River)..... | 4-108 |
| Figure 4.7.4.1 New Truck Route | 4-110 |
| Figure 4.7.4.2 Extension of the Expressway and New Truck Terminal & MR ICD | 4-111 |
| Figure 4.8.1.1 Possible Organizational Structure of YUTA | 4-117 |
| Figure 4.8.2.1 Possible Organizational Structure of BRT Management Agency | 4-126 |
| Figure 5.1.1.1 Location of Bayint Naung Bridge | 5-3 |
| Figure 5.1.1.2 Presentation of BRT Expert from YUTRA Project Team at BRT Technical Support Committee Meeting on 5 December, 2013..... | 5-4 |
| Figure 5.1.1.3 Tow Truck in Yangon..... | 5-4 |
| Figure 5.1.3.1 Plan View of New Botahtaung Jetty | 5-10 |
| Figure 5.1.3.2 Section View of New Botahtaung Jetty | 5-10 |
| Figure 5.2.3.1 Location Map for Future Port Development at Yangon Inner Harbor Area | 5-17 |

| | |
|--|------|
| Figure 6.1.1.1 Do-maximum Road Network..... | 6-1 |
| Figure 6.1.1.2 Recommended Road Network for 2035..... | 6-3 |
| Figure 6.1.1.3 Recommended Road Network for Short-, Middle- and Long-term | 6-4 |
| Figure 6.1.1.4 Recommended BRT Routes | 6-9 |
| Figure 6.1.2.1 Assigned Traffic Volume, 2013 | 6-10 |
| Figure 6.1.2.2 Assigned Traffic Volume, 2035 | 6-11 |
| Figure 6.2.1.1 Chronological Correlation Diagram among Railway Projects and TOD/Land Redevelopment Project (1/2) | 6-14 |
| Figure 6.2.1.2 Chronological Correlation Diagram among Railway Projects and TOD/Land Redevelopment Project (2/2) | 6-15 |
| Figure 6.2.1.3 Proposed Project Location Map for Short-term | 6-16 |
| Figure 6.2.1.4 Proposed Project Location Map for Middle-term | 6-17 |
| Figure 6.2.1.5 Proposed Project Location Map for Long-term | 6-18 |
| Figure 6.2.1.6 Step-Development for Yangon Circular Railway Western Half..... | 6-24 |
| Figure 6.2.1.7 Location Map for Yangon Circular Railway Western Half..... | 6-25 |
| Figure 6.2.1.8 Current Condition and Image of After Improvement..... | 6-26 |
| Figure 6.2.1.9 Image of After Electrified/Elevated (Example of Tokyo) | 6-27 |
| Figure 6.2.1.10 Step-Development for Yangon Circular Railway Eastern Half | 6-28 |
| Figure 6.2.1.11 Location Map for Yangon Circular Railway Eastern Half | 6-29 |
| Figure 6.2.1.12 Image of After Electrification (Example of Tokyo) | 6-29 |
| Figure 6.2.1.13 Location Map for Electrification Section for Yangon-Mandalay Suburban Line | 6-31 |
| Figure 6.2.1.14 Location Map for Yangon-Pyay Suburban Line | 6-32 |
| Figure 6.2.1.15 Location Map for Thilawa Access Line Improvement and Double-tracking..... | 6-33 |
| Figure 6.2.1.16 Image of After Installation of UMRT (Example of Japan and Bangkok) | 6-34 |
| Figure 6.2.1.17 Location Map for UMRT Line1..... | 6-35 |
| Figure 6.2.1.18 Location Map for UMRT Line1 Extension | 6-36 |
| Figure 6.2.1.19 Location Map for UMRT Line2..... | 6-37 |
| Figure 6.2.1.20 Location Map of MR's Yard for Redevelopment/TOD | 6-40 |
| Figure 6.2.1.21 Example of Station Plaza | 6-41 |
| Figure 6.2.1.22 Draft Conceptual Image of Yangon Central Station Redevelopment..... | 6-42 |
| Figure 6.2.1.23 Draft Conceptual Plan and Perspective Image for Insein Workshop Redevelopment | 6-44 |
| Figure 6.2.1.24 BRT Corridors for Construction | 6-49 |
| Figure 6.2.1.25 BRT Implementation Schedule by Phase | 6-50 |
| Figure 6.2.1.26 Typical Cross-section of BRT (example)..... | 6-52 |
| Figure 6.2.2.1 Typical Cross Section for Inter Urban Expressway | 6-59 |
| Figure 6.2.2.2 Typical Cross Section for Intra Urban Expressway (at Grade)..... | 6-60 |
| Figure 6.2.2.3 Typical Cross Section for Intra Urban Expressway (Bridge) | 6-60 |
| Figure 6.2.2.4 Typical Cross Section for Major Arterial Roads..... | 6-61 |
| Figure 6.2.2.5 Typical Cross Section for Secondly Arterial Roads | 6-61 |
| Figure 6.2.2.6 Typical Cross Section for Collector and Local Streets | 6-62 |
| Figure 6.2.2.7 Arterial Road Network Plan (Ultimate) | 6-64 |
| Figure 6.2.2.8 Typical Cross Section and Image of Inner Ring Expressway..... | 6-66 |
| Figure 6.2.2.9 Typical Cross Section of Outer Ring Expressway (Reference)..... | 6-67 |
| Figure 6.2.2.10 Expressway Network Plan (Ultimate) | 6-68 |
| Figure 6.2.2.11 Short Term Projects (2018)..... | 6-70 |
| Figure 6.2.2.12 Middle Term Projects (2025)..... | 6-71 |
| Figure 6.2.2.13 Long Term Projects (2035) | 6-72 |
| Figure 6.2.2.14 Road Development Projects (after 2035) <Reference> | 6-73 |
| Figure 6.2.2.15 Screwed Pile Foundation and Steel Girder (Example) | 6-75 |
| Figure 6.2.2.16 Japanese Technology for River Crossing (Example)..... | 6-76 |
| Figure 6.2.3.1 Areas Bundled on Congestion Points in a Specific Group | 6-86 |
| Figure 6.2.3.2 Proposed Improvement for Bottleneck Intersections | 6-93 |
| Figure 6.2.3.3 Image of Minor Modification of intersection..... | 6-94 |
| Figure 6.2.3.4 Organizational Structure for the Traffic Planning and Management Unit | 6-95 |

| | |
|--|-------|
| Figure 6.2.3.5 Example of the parking restricted area in the CBD and proposed location of off-road parking | 6-98 |
| Figure 6.2.3.6 No. of lanes and parking prohibited section in the CBD..... | 6-99 |
| Figure 6.2.3.7 Parallel parking on narrow roads in the CBD | 6-99 |
| Figure 6.2.3.8 Back-in style parking on the high-standard trunk road in the CBD..... | 6-99 |
| Figure 6.2.4.1 Lat Krabang ICD, Thailand | 6-102 |
| Figure 6.2.4.2 Lat Krabang ICD, Thailand | 6-102 |
| Figure 6.2.4.3 Freight Management related projects | 6-103 |
| Figure 6.3.1.1 VOC by Vehicle Type | 6-128 |
| Figure 6.3.4.1 Schematic Features of Transport Projects and Expected Environmental Impacts | 6-137 |
| Figure 7.3.2.1 Land Prices in Yangon and Proposed Center Location..... | 7-8 |
| Figure 7.3.3.1 Government Owned Lands | 7-10 |

LIST OF TABLES

| | |
|--|------|
| Table 1.3.1 YUTRA Study Area | 1-2 |
| Table 1.6.1 Steering Committee Members | 1-5 |
| Table 1.6.2 Working Group Members..... | 1-6 |
| Table 1.6.3 Counterpart Staff | 1-6 |
| Table 1.6.4 JICA Project Team Members | 1-7 |
| Table 2.1.1.1 Population Size & Growth Rate by Township..... | 2-1 |
| Table 2.1.1.2 Labor Force by Township..... | 2-2 |
| Table 2.1.1.3 Contribution Ratio of Yangon Region by Economic Sector | 2-3 |
| Table 2.1.1.4 Industrial Zones | 2-7 |
| Table 2.1.2.1 Number of Vehicle per Population (2010)..... | 2-9 |
| Table 2.1.2.2 Estimation of Current Transport Demand..... | 2-11 |
| Table 2.1.2.3 Vehicle Ownership by Per-capita Income | 2-11 |
| Table 2.2.1.1 International Highways in Myanmar..... | 2-12 |
| Table 2.2.1.2 Road Classification of MOC (DHSHD)..... | 2-15 |
| Table 2.2.1.3 Road Classification of MOC (PW)..... | 2-15 |
| Table 2.2.1.4 Road Length and Responsible Authorities in Myanmar (km) | 2-16 |
| Table 2.2.1.5 Volume/Capacity Ratio of Major Roads | 2-18 |
| Table 2.2.2.1 Railway Length and Number of Stations in Each Region | 2-24 |
| Table 2.2.2.2 The Major Track Lines and Their Lengths..... | 2-24 |
| Table 2.2.2.3 Current Railway Routes in the Study Area..... | 2-26 |
| Table 2.2.2.4 Geometric Condition of Yangon Circular Railway and the Suburban Lines | 2-27 |
| Table 2.2.2.5 Issues and the Expected Causes of the Current Track in Yangon Circular Railway and the Suburban Lines..... | 2-29 |
| Table 2.2.2.6 Number of Bridge and Crossing Structures | 2-30 |
| Table 2.2.2.7 Number of Rolling Stock for Yangon Circular Railway and the Suburban Lines | 2-34 |
| Table 2.2.2.8 Number of Staff of Myanmar Railways..... | 2-34 |
| Table 2.2.2.9 Financial Statement of MR..... | 2-36 |
| Table 2.2.2.10 Financial Statement of Yangon Circular Railway and the Suburban Lines (Estimation) | 2-36 |
| Table 2.2.2.11 Fare Table of Yangon Circular Railway and the Suburban Lines | 2-37 |
| Table 2.2.2.12 Fare Table of Express train of Yangon - Mandalay Line..... | 2-38 |
| Table 2.2.2.13 Fare Table of Freight Transportation of Yangon - Mandalay Line..... | 2-38 |
| Table 2.2.2.14 Railway Transport Volume | 2-39 |
| Table 2.2.2.15 Freight Transport Volume for Main Commodities..... | 2-40 |
| Table 2.2.2.16 Future Railway Transport Demand from 2011/2012 to 2015/2016..... | 2-41 |
| Table 2.2.3.1 Past Trend of Road Traffic Accidents | 2-56 |
| Table 2.2.3.2 Number of Accidents per 10,000 Vehicles | 2-56 |
| Table 2.2.3.3 Number of Accidents by Township (2011) | 2-57 |
| Table 2.2.3.4 Yangon City Development Committee's Laws and Regulations | 2-61 |

| | | |
|----------------|---|-------|
| Table 2.2.4.1 | Regulation of Urban Bus Transportation in Yangon Region | 2-70 |
| Table 2.2.4.2 | Capacity of Bus by Type | 2-71 |
| Table 2.2.4.3 | Total Bus Routes & Type of Bus Fleets | 2-72 |
| Table 2.2.5.1 | Restrain of Calling Vessels of Yangon Main Port | 2-76 |
| Table 2.2.5.2 | Registered Vessels by IWT | 2-79 |
| Table 2.2.5.3 | Charge of Passenger and Hand-Carry Good | 2-79 |
| Table 2.2.5.4 | Transport Charge of Commodity | 2-80 |
| Table 2.2.5.5 | Summary of Maritime Law and Regulation | 2-81 |
| Table 2.2.5.6 | Outline of Main Passenger Ferry to/from CBD in Yangon | 2-82 |
| Table 2.2.5.7 | Outline of MPA-Owned Jetty in Yangon | 2-83 |
| Table 2.2.5.8 | OD Matrix by the Survey | 2-85 |
| Table 2.2.5.9 | International/Coastal Cargo Throughput of Yangon Port | 2-88 |
| Table 2.2.5.10 | Inland Waterway Transport Cargo Throughput of Yangon Port (by IWT) | 2-88 |
| Table 2.2.5.11 | Container Throughput of Yangon Port | 2-89 |
| Table 2.2.6.1 | Industrial Zones in the City of Yangon | 2-92 |
| Table 2.2.6.2 | Major Shopping Centers suggested by Myanmar Travel Information 2012 | 2-94 |
| Table 2.2.6.3 | Major Shopping Centers | 2-95 |
| Table 2.2.6.4 | Traditional Markets (1/3) | 2-97 |
| Table 2.2.6.5 | Traditional Markets (2/3) | 2-98 |
| Table 2.2.6.6 | Traditional Markets (3/3) | 2-99 |
| Table 2.2.6.7 | Ports in Yangon | 2-102 |
| Table 2.2.6.8 | Container traffic at ports in Yangon | 2-102 |
| Table 2.2.6.9 | Yangon Station Rail Passenger cum Cargo (May 2013) | 2-103 |
| Table 2.2.6.10 | Average Daily Truck Traffic Volume Passing HFTSA checkpoints in the week of 16 - 22 February 2013 | 2-107 |
| Table 2.2.6.11 | Containers handled by Container Trucks Association | 2-108 |
| Table 2.2.7.1 | Outline of HIA Facility Requirements | 2-112 |
| Table 2.2.7.2 | Expressway from Yangon to Mandalay | 2-113 |
| Table 2.2.7.3 | Daily Service Frequency of Inter-city Bus by Terminal | 2-114 |
| Table 2.3.1.1 | Total Traffic Volume across Screen-lines by Vehicle Type and Direction, 2013 | 2-116 |
| Table 2.3.1.2 | Average Occupancy on Screen Line, 2013 | 2-119 |
| Table 2.3.2.1 | Traffic Volume Across Study Area Boundary, 2013 | 2-122 |
| Table 2.3.2.2 | Airport Access/Egress Trips (Vehicle and Person) by Vehicle Types, 2013 | 2-124 |
| Table 2.3.3.1 | Number of Person Trips in the Study Area by Mode, 2013 | 2-126 |
| Table 2.3.3.2 | Average Trip Rate per Person per Day, 2013 | 2-126 |
| Table 2.3.4.1 | Modal Share by Gender and Age Group, 2013 | 2-130 |
| Table 2.3.4.2 | Modal Share by Vehicle Ownership and Household Income Level, 2013 | 2-131 |
| Table 2.3.4.3 | Modal Share by Trip Purpose, 2013 | 2-132 |
| Table 2.3.5.1 | Trip Generation and Attraction by Township & Purpose, 2013 | 2-133 |
| Table 2.3.7.1 | Number of Trips by Travel Time and Trip Purpose, 2013 | 2-137 |
| Table 2.4.1.1 | List of IEE/EIA required project of infrastructure development | 2-147 |
| Table 2.4.1.2 | Responsible Agencies for Land Acquisition | 2-149 |
| Table 2.4.5.1 | Development Plan and SEA/EIA | 2-155 |
| Table 2.5.2.1 | Laws on National Plans and Union Budgets | 2-159 |
| Table 2.5.2.2 | Composition of the Financial Commission | 2-160 |
| Table 2.5.4.1 | Consolidated Government Fiscal Outcomes ¹ | 2-164 |
| Table 2.5.4.2 | Actual Government Budget Outlays by Sector | 2-165 |
| Table 2.5.4.3 | Union Budget Law Allocation by Sector | 2-165 |
| Table 2.5.5.1 | ASEAN Countries' Global Competitiveness Ranking, 2013 | 2-168 |
| Table 2.5.5.2 | Proportion of GFCF in the Transport Sector to Total | 2-168 |
| Table 2.5.5.3 | Union Government Revenues | 2-169 |
| Table 2.5.5.4 | Current ODA Loan Terms for Myanmar Projects | 2-171 |
| Table 2.5.5.5 | Selected Transport BOT Projects | 2-172 |
| Table 2.5.5.6 | Transport Projects in SEZs under Joint Venture Arrangement | 2-173 |

| | | |
|---------------|--|-------|
| Table 2.5.5.7 | Assessed Land Values, as of October 2013 | 2-181 |
| Table 2.6.1.1 | Responsibilities of each Government Agency..... | 2-186 |
| Table 2.6.3.1 | Navigable Waterway Route Managed by DWIR | 2-196 |
| Table 2.6.5.1 | Equipment of Traffic Police (Sub-Office Yangon)..... | 2-200 |
| Table 2.6.6.1 | No. of Staff in Engineering Department (Road & Bridge)..... | 2-202 |
| Table 2.7.5.1 | Preliminary Traffic Assessment..... | 2-218 |
| Table 2.7.6.1 | Preliminary Planning Thoughts | 2-220 |
| Table 3.1.3.1 | Definition of Land Use Category | 3-5 |
| Table 3.2.1.1 | Past Population Trends of Yangon City and YUTRA Study Area | 3-7 |
| Table 3.2.1.2 | Future Population Growth Rate | 3-8 |
| Table 3.2.1.3 | Night-time Population Projection by Township | 3-9 |
| Table 3.2.1.4 | Day-time Population Projection by Township | 3-11 |
| Table 3.2.2.1 | Number of Workers by Sector for YUTRA Study Area, 2013 (Night-time, '000)..... | 3-13 |
| Table 3.2.2.2 | Projected Number of Workers by Sector (Night-time, '000) | 3-14 |
| Table 3.2.2.3 | Land Use Category and Workers' Density | 3-16 |
| Table 3.2.2.4 | Projected Number of Workers (Day-time, '000) | 3-17 |
| Table 3.2.3.1 | Ratio of Students vs. Population in YUTRA Study Area, 2013..... | 3-20 |
| Table 3.2.3.2 | Projected Number of Students at Residence (Night-time, '000)..... | 3-21 |
| Table 3.2.3.3 | The Projected Number of Students (Day-time, '000) | 3-22 |
| Table 3.2.4.1 | Household Car Ownership Ratio and Average Income, 2013..... | 3-24 |
| Table 3.2.4.2 | Projected Household Car Ownership Ratio and Average Income..... | 3-26 |
| Table 3.2.5.1 | Summary Socio-economic Framework for Greater Yangon..... | 3-29 |
| Table 3.3.2.1 | Growth in Total Travel by All Modes, Person Trips ('000)..... | 3-30 |
| Table 3.3.2.2 | Forecast Person Trips by Purpose and Vehicle Availability..... | 3-31 |
| Table 3.3.2.3 | Growth in YUTRA Area GRDP and GRDP per Capita | 3-32 |
| Table 3.3.2.4 | Total Travel Demand in YUTRA Study Area..... | 3-34 |
| Table 3.3.3.1 | Vehicle Occupancy and PCU Factors | 3-35 |
| Table 3.3.3.2 | Total Travel Demand in PCU in YUTRA Study Area | 3-36 |
| Table 3.4.2.1 | Demand/Supply Gaps by Mini Screen Line, 2013 and 2035 | 3-41 |
| Table 4.2.1.1 | GDP per Capita and HDI in ASEAN..... | 4-9 |
| Table 4.2.1.2 | Official GDP Statistics | 4-11 |
| Table 4.2.1.3 | Real GDP Growth, in percentage | 4-14 |
| Table 4.2.1.4 | Nominal Myanmar GDP Estimates, in US\$ Billion | 4-17 |
| Table 4.2.1.5 | Myanmar GDP Forecasts, in US\$ Billion at 2013 prices..... | 4-17 |
| Table 4.2.2.1 | Total Public Investment and Transport Sector Allocation (US\$ Billion at 2013 Prices)..... | 4-20 |
| Table 4.2.2.2 | Greater Yangon Transport Sector Budget Envelopes (US\$ Billion at 2013 Prices) | 4-22 |
| Table 4.3.4.1 | CBD – Sub-centre Links, 2013 | 4-29 |
| Table 4.3.4.2 | Link between Sub-centres, 2013 | 4-30 |
| Table 4.3.4.3 | Link between Sub-centre and Town Centre, 2013 | 4-32 |
| Table 4.3.4.4 | Link between Town Centres, 2013..... | 4-32 |
| Table 4.3.4.5 | Link Volume Analysis (public transport) | 4-39 |
| Table 4.3.4.6 | Link Volume Analysis (private mode of transport)..... | 4-40 |
| Table 4.4.1.1 | General Comparison of Public Transport System | 4-45 |
| Table 4.4.2.1 | SUDP's Development Goals and Effect Indicators for Railway..... | 4-50 |
| Table 4.4.2.2 | Comparison of Project Cost per Km | 4-59 |
| Table 4.5.2.1 | Traffic Volume of Port related Traffic..... | 4-80 |
| Table 4.5.2.2 | Road Development Strategy for CBD Area..... | 4-80 |
| Table 4.5.2.3 | Development Strategy for Urban Developed Area | 4-82 |
| Table 4.5.2.4 | Development Strategy for Urban Developing Area | 4-84 |
| Table 4.5.2.5 | Development Strategy for Suburban Area | 4-85 |
| Table 4.5.3.1 | Differences of Road Classification | 4-86 |
| Table 4.5.3.2 | Proposed Road Classification..... | 4-86 |
| Table 4.5.4.1 | Target Number of Lanes for Proposed Road Network | 4-92 |
| Table 4.5.4.2 | Existing, Under-construction and Under-planning Bridges | 4-94 |

| | | |
|----------------|--|-------|
| Table 4.5.4.3 | Target Number of Lanes for Rivers/Creek/Canal Crossings | 4-96 |
| Table 4.6.1.1 | TDM Measures | 4-99 |
| Table 4.6.3.1 | Development Goals and Effect Indicators | 4-103 |
| Table 4.8.1.1 | YUTA Staffing (tentative)..... | 4-121 |
| Table 4.8.1.2 | Possible Functions of YUTA | 4-122 |
| Table 4.8.4.1 | Scope of Capacity Development Project for YUTA | 4-131 |
| Table 4.8.4.2 | Scope of Capacity Development Project for BRT Management Agency | 4-132 |
| Table 5.1.1.1 | Upgrading Road Infrastructure by YCDC..... | 5-1 |
| Table 5.1.1.2 | Flyover Projects | 5-1 |
| Table 5.1.1.3 | Tow-Away Zone | 5-5 |
| Table 5.1.3.1 | On-going Inland Water Transport Project..... | 5-7 |
| Table 5.1.3.2 | Current Participation of Private Sector for Port Industry | 5-8 |
| Table 5.1.3.3 | On-going Project by Myanmar Port Authority..... | 5-9 |
| Table 5.2.1.1 | Upgrading Road Infrastructure Projects Planned by Public Works, MOC..... | 5-11 |
| Table 5.2.1.2 | New Bridges Construction Projects Proposed by Public Works, MOC | 5-12 |
| Table 5.2.1.3 | Public Transport Services Project Proposed by Road Transport, MORT | 5-14 |
| Table 5.2.2.1 | Yangon-Mandalay Railway Modernization & Rehabilitation Project..... | 5-14 |
| Table 5.2.3.1 | Proposed/Planned Projects by Inland Water Transport, MOT | 5-16 |
| Table 5.2.3.2 | Proposed/Planned Projects by Myanmar Port Authority, MOT..... | 5-18 |
| Table 6.1.1.1 | Comparison of Alternative Railway Networks | 6-6 |
| Table 6.1.1.2 | Recommended Railway Network Plan for Short-term, Middle-term, and Long-term..... | 6-8 |
| Table 6.1.2.1 | Transport Network Performance | 6-12 |
| Table 6.2.1.1 | Overall Project List (1/3) | 6-19 |
| Table 6.2.1.2 | Overall Project List (2/3) | 6-20 |
| Table 6.2.1.3 | Overall Project List (3/3) | 6-21 |
| Table 6.2.1.4 | Proposed Projects for Urban Sections of Existing Myanmar Railway | 6-22 |
| Table 6.2.1.5 | Proposed Projects for UMRT | 6-34 |
| Table 6.2.1.6 | Proposed Projects for TOD..... | 6-38 |
| Table 6.2.1.7 | Required Public Functions for Yangon Central Station Redevelopment | 6-42 |
| Table 6.2.1.8 | Required Public Functions for Yangon Central Station Redevelopment | 6-43 |
| Table 6.2.1.9 | Required Public Functions for Yangon Central Station Redevelopment | 6-45 |
| Table 6.2.1.10 | Rough Construction and Procurement Cost Estimate (MR, UMRT and TOD)..... | 6-48 |
| Table 6.2.1.11 | BRT Route and Construction Length (per phase) and Cost..... | 6-50 |
| Table 6.2.1.12 | Operating Results for Five Tested Scenarios..... | 6-56 |
| Table 6.2.1.13 | 20 Year Result for All Scenarios..... | 6-57 |
| Table 6.2.2.1 | Design Speed Specifications | 6-58 |
| Table 6.2.2.2 | Median Specification (AASHTO)..... | 6-59 |
| Table 6.2.2.3 | List of Road Development Projects..... | 6-74 |
| Table 6.2.2.4 | Rough Cost Estimates of Road Development Projects..... | 6-76 |
| Table 6.2.2.5 | Implementation Schedule of Road Development Projects (1/3)..... | 6-77 |
| Table 6.2.2.6 | Implementation Schedule of Road Development Projects (2/3)..... | 6-78 |
| Table 6.2.2.7 | Implementation Schedule of Road Development Projects (3/3)..... | 6-79 |
| Table 6.2.3.1 | Short-Term Traffic Congestion Mitigation Measure in Yangon CBD (Proposed) | 6-81 |
| Table 6.2.3.2 | Basic Implementation Strategy | 6-85 |
| Table 6.2.3.3 | Possible Short Term Traffic Congestion Mitigation Measures | 6-87 |
| Table 6.2.3.4 | Issues and Measures to be taken for Improving Intersections..... | 6-93 |
| Table 6.2.3.5 | Study of parking demand and in the CBD and required off-road parking space | 6-98 |
| Table 6.2.3.6 | Estimation of the on-road parking capacity in the CBD..... | 6-100 |
| Table 6.2.5.1 | Summary of Master Plan Projects | 6-105 |
| Table 6.3.1.1 | VOC by Vehicle Type (Economic Price) | 6-127 |
| Table 6.3.1.2 | TTC by Travel Modes (kyat/ min)..... | 6-128 |
| Table 6.3.1.3 | Economic Evaluation Results for BRT Projects | 6-129 |
| Table 6.3.1.4 | Economic Evaluation Results for Urban Railway Projects | 6-129 |
| Table 6.3.1.5 | Economic Evaluation Results for Road Development Projects..... | 6-130 |

| | | |
|---------------|---|-------|
| Table 6.3.2.1 | Financial Evaluation Results for the Selected Projects | 6-131 |
| Table 6.3.3.1 | Environmental Criteria | 6-132 |
| Table 6.3.3.2 | Rating and Weighting the Criteria | 6-132 |
| Table 6.3.3.3 | Results of Environmental Evaluation | 6-132 |
| Table 6.3.4.1 | Activities due to Candidate Projects | 6-139 |
| Table 6.3.4.2 | Results of Preliminary Scoping | 6-140 |
| Table 6.3.4.3 | Possible Mitigation Measures | 6-144 |
| Table 6.3.4.4 | List of IEE/EIA required project related to transport development | 6-147 |
| Table 6.3.5.1 | Ranking Threshold by Evaluation Criteria | 6-151 |
| Table 6.3.5.2 | Summary of Multi-criteria Analysis Results | 6-152 |
| Table 7.1.1 | Implementation Schedule of Public Transport Projects | 7-1 |
| Table 7.1.2 | Implementation Schedule of Road Development Projects | 7-2 |
| Table 7.1.3 | Implementation Schedule of Traffic Management Projects | 7-4 |
| Table 7.1.4 | Implementation Schedule of Freight Transport | 7-4 |
| Table 7.2.1 | Investment Requirement for Major Master Plan Projects | 7-5 |
| Table 7.2.2 | Investment Requirement vs. Fund Availability | 7-6 |
| Table 7.4.1 | Implementation Schedule of Institutional Reform and Strengthening | 7-12 |
| Table 8.1.1 | Proposed Master Plan Projects | 8-2 |

ABBREVIATION

| | |
|---------|--|
| AASHTO | American Association of State Highway and Transportation Officials |
| ACMECS | Ayeyawady-Chao Phraya-Mekong Economic Cooperation Strategy |
| ADB | Asia Development Bank |
| AFC | Automatic Fare Collection system |
| AH | Asian Highways |
| ASEAN | Association of Southeast Asian Nations |
| ATCS | Area Traffic Control System |
| AWPT | Asia World Port Terminal |
| BIMSTEC | Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation |
| BLC | Bus line committees |
| BOT | Build-Operate-Transfer |
| BRT | Bus rapid transit |
| BSC | Bus supervisory committees |
| BSW | Bo Aung Kyaw Wharf |
| C/P | Counterpart |
| CBD | Central business district |
| CBTA | Cross-Border Transportation Agreement |
| CFS | Container Freight Station |
| CNG | Compressed natural gas |
| DCA | Department of Civil Aviation |
| DDA | Department of Development Affair |
| DHSHD | Department of Human Settlement and Housing Development |
| DMH | Department of Meteorology and Hydrology, Ministry of Transport |
| DOT | Department of Transport |
| DVD | Didital Video Disk |
| DWIR | Department of Water Resources and Improvement of River System |
| DWT | Dead weight tonnage |
| EDCF | Economic Development Cooperation Fund |
| EIA | Environmental impact assessment |
| EIRR | Equity internal rate of return |
| EVD | Enhanced Video Disk |
| F/R | Final Report |
| F/S, FS | Feasible Study |
| FIRR | Financial Internal Rate of Return |
| FOB | Overpass for pedestrian |
| FOC | Free of Charge |
| GDP | Gross Domestic Product |
| GFCF | Gross Fixed Capital Formation |
| GIS | Geographic Information System |
| GMS | Greater Mekong Subregion |
| HCM | Highway Capacity Manual |
| HH | Household |
| HHWL | The highest high water level |
| HIA | Hanthawaddy International Airport |
| HIS | Household Interview Survey |
| HPH | Hutchison Port Holding |
| IAPH | International Association of Ports & Habours |

| | |
|-----------|--|
| IC/R | Inception report |
| ICD | Inland Container Depots |
| ID, MOAI | Irrigation Department, Ministry of Agriculture and Irrigation |
| IEE | Initial environmental examination |
| IFCL | Irrawaddy Flotilla Company Limited |
| INGO | International Non-Governmental Organization |
| IT/R | Interim Report |
| ITS | Intelligent Transport Systems |
| IWT | Inland Water Transport |
| IZ | Industrial zone |
| JETRO | Japan External Trade Organization |
| JICA | Japan International Cooperation Agency |
| JICA-SUDP | Project for Strategic Urban Development Plan of the Greater Yangon |
| JPT | JICA Project Team |
| JPY | Japanese Yen |
| KLIA | Kuala Lumpur International Airport |
| KPMG | Proper noun. Global network of professional firms providing Audit, Advisory and Tax services |
| LCD | Liquid Clystal Display |
| LCL | Less than Container Load |
| LED | Light-emitting diode |
| LIBOR | London Inter-Bank Offered Rate |
| LOA | Length Overall |
| LRT | Light Rail Transit |
| MEB | Myanmar Economic Bank |
| MEC | Myanmar Economic Corporation |
| MES | Myanmar Engineering Society |
| METI | Ministry of Economy, Trade and Industry of Japan |
| MFSL | Myanmar Five Star Line |
| MFTB | Myanma Foreign Trade Bank |
| MIC | Myanmar Investment Commition |
| MIP | Myanmar Industrial Port |
| MIPL | Myanmar Integrated Port Limited |
| MITT | Myanmar International Terminal Thilawa |
| MMK | Myanmar Kyats |
| MNPED | Ministry of National Planning and Economic Development |
| MOC | Ministry of Construction |
| MOECF | Ministry of Environment Conservation and Forestry |
| MOHA | Ministry of Home Affairs |
| MORT | Ministry of Rail Transportation |
| MOT | Ministry of Transport |
| MPA | Myanmar Port Authority |
| MPPA | Million passengers per annum |
| MR | Myanma Railways |
| MRT | Mass Rapid Transit |
| MRTV | Myanmar Radio and Television |
| MWL | MeanWaterLevel |
| MYT-Plan | The Survey Program for the National Transporation Development Plan in the Republic of the Union of Myanmar |

| | |
|-----------|---|
| NGO | Non-Governmental Organization |
| NTU | Unit of Turbidity |
| OD | Origin-Destination |
| ODA | Official Development Assistance |
| OECD | Organized for Economic Cooperation and Development |
| OJT | On the Job Training |
| OPEC | Organization of Petroleum Exporting Countries |
| PCC | Programme Coordinating Committee |
| PCU | Passenger Car Unit |
| PHPDT | Peak Hour Peak Direction Trips |
| PM | Particulate matter |
| PPP | Public private partnership |
| PW | Public Works |
| RT | Road Transport |
| RTAD | Road Transport Administration Department |
| S/C | Steering Committee |
| SEA | Strategic Environmental Assessment |
| SEZ | Special Economic Zone |
| SPW | Sule Pagoda Wharves Terminal, Sule Pagoda Wharf |
| STRASYA | Standard Urban Railway System for Asia |
| SUDP | The Strategic Urban Development Plan of the Greater Yangon, JICA (2013) |
| TEU | Twenty-foot equivalent units |
| TOD | Transit Oriented Development |
| TOR | Terms of Reference |
| TPD | Transport Planning Department |
| TRESC | Yangon Region Traffic Rules Enforcement Supervisory Committee |
| TSPM | Total suspended particulate matter |
| UHF | Ultra High Frequency |
| UMRT | Urban Mass Rapid Transit |
| UN | United Nations |
| UNDP | United Nations Development Programme |
| UNHABITAT | United Nations Human Settlements Programme |
| UNHCR | United Nations High Commissioner for Refugees |
| USD | US Dollar |
| VCD | Video Compact Disk |
| VHF | Very High Frequency |
| VIP | Very Important Person |
| VOC | Vehicle Operation Cost |
| WG | Working Group |
| WHO | World Health Organization |
| WS | Workshop |
| YCDC | Yangon City Development Committee |
| YCR | Yangon Circular Railways |
| YIA | Yangon International Airport |
| YRDC | Yangon Region Development Committee |
| YRG | Yangon Region Government |

1 INTRODUCTION

1.1 Study Background and Objectives

Yangon City, with a population of about 5.1 million as of 2011, is the largest economic center of the nation, and experiences rapid urbanization and motorization as the nation's economic growth. The current rapid urbanization and motorization put more and more pressure on the existing transport infrastructure in Yangon City and its surrounding areas. The deteriorating urban transport situation has become a serious concern socially, politically and environmentally.

Under these circumstances, JICA conducted a fact-finding survey in March 2012 and reviewed present conditions of Yangon city and its surrounding areas. This survey suggested the need of a comprehensive urban development plan of the Greater Yangon, which covers not only Yangon City but also adjoining townships affected by the current urbanization. Based on this finding, Yangon Region Government and JICA agreed to launch a project named "The Greater Yangon Urban Development Programme" in May 2012. Under the framework of this Programme, "The project for Strategic Urban Development Plan of the Greater Yangon (SUDP)" started in August 2012 focusing mainly on the urban development and land use aspects of the Yangon City. As the next step following this project, Yangon Region Government and JICA agreed in September 2012 to start this project named "The Project for Comprehensive Urban Transport Plan of the Greater Yangon (YUTRA)" to prepare a comprehensive urban transport plan in line with the above-mentioned strategic urban development plan, so as to provide efficient, safe, comfortable and environmentally friendly transport services to the people in the Greater Yangon, in order to contribute to its balanced, inclusive and sustainable growth.

This Project (YUTRA) accords with the Japanese government's cooperation policy towards the Government of the Republic of the Union of Myanmar, emphasizing the promotion of economic and regional development. It also accords with JICA's cooperation program, which focuses on development of economic infrastructure and industry in the Republic of the Union of Myanmar since the Project will contribute to better quality of life as well as economic activities and logistics in the Greater Yangon.

1.2 Study Objectives

The objective of this project is to ensure mobility and accessibility to urban services for the Greater Yangon's people and society by an efficient and sustainable public transport system and road network. For this objective, this project aims to formulate an urban transport master plan for Greater Yangon up to the year 2035 (the long-term target year of "The Project for the Strategic Urban Development plan of the Greater Yangon" was 2040, but its project identification was up to 2035) as well as to conduct pre-feasibility studies for identified priority projects. Capacity development for Myanmar counterpart staff was done during the course of the project.

The outputs of the Project are:

- (1) A comprehensive urban transport plan of the Greater Yangon, which includes a long term plan until 2035, a mid-term plan until 2025, and a short-term action plan until 2018;
- (2) Pre-Feasibility Study for the prioritized project;
- (3) Lessons from implementation of the pilot project;
- (4) Technology transfer to Myanmar counterparts through the Project;

In this Project, the prioritized project mentioned above was “The Feasibility Study for the Project for Construction of New Thaketa Bridge”. This was selected from the short-term projects identified by SUDP due to its urgent needs for reconstruction of the obsolete bridge. The pilot project was identified as traffic signal improvement at the “8-mile Intersection”. This location was selected from a number of congested intersections after traffic surveys and analyses.

1.3 Study Area

The target site of the Project is the Greater Yangon including Yangon City and a part of adjacent six townships (Thalyin, Hmawbi, Helgu, Htantabin, Twantay and Kyauktan). The total area is about 1,500 km² and the total population is about 5.7 million as of 2013. The definition of Study Area is summarized in Table 1.3.1 and Figure 1.3.1.

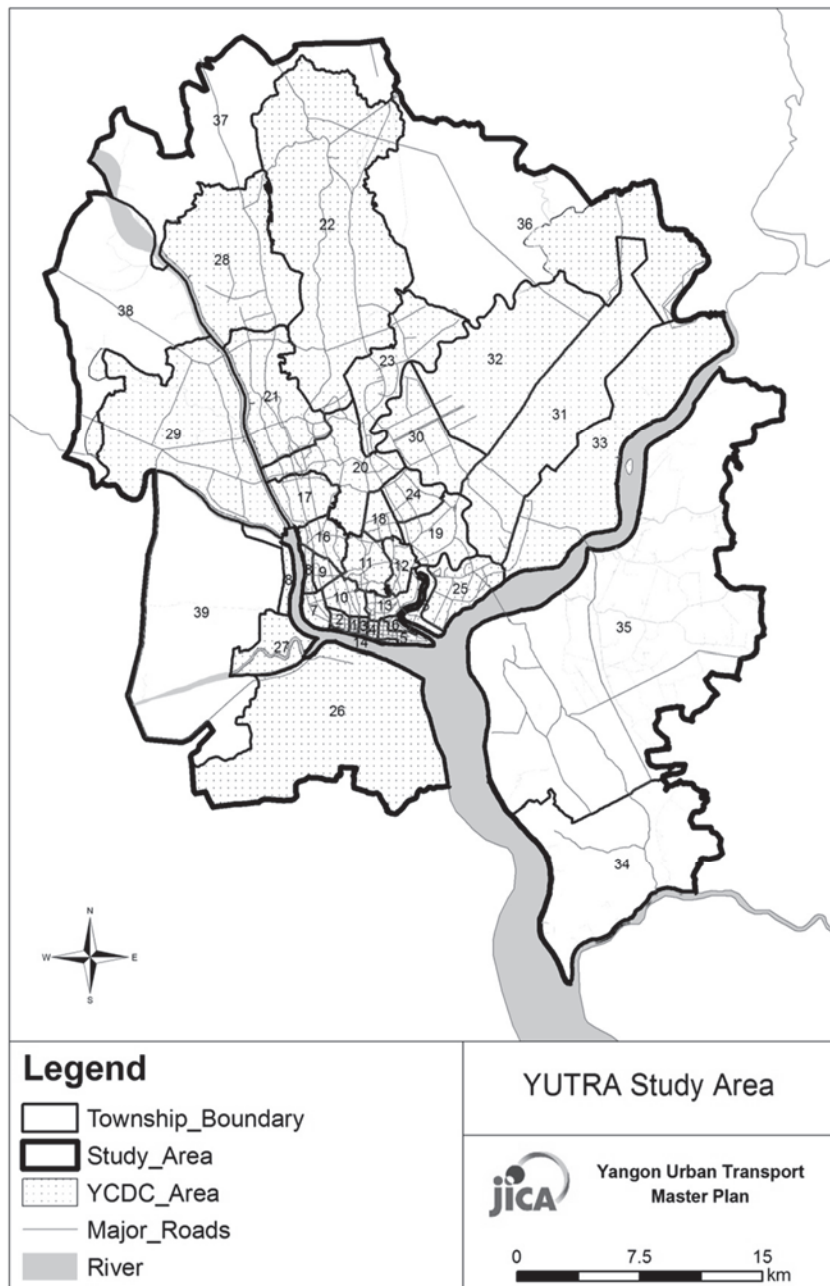
Table 1.3.1 YUTRA Study Area

| Urban Planning Zone | | Township | Area (km ²) | Population(2013) |
|---------------------|----|-------------------------|-------------------------|------------------|
| CBD | 1 | Latha | 0.6 | 34,125 |
| | 2 | Lanmadaw | 1.3 | 43,137 |
| | 3 | Pabedan | 0.6 | 37,551 |
| | 4 | Kyauktada | 0.7 | 34,797 |
| | 5 | Bothtaung | 2.6 | 49,134 |
| | 6 | Pazundaung | 1.1 | 53,791 |
| Inner Urban Ring | 7 | Ahlone | 3.4 | 65,653 |
| | 8 | Kyee Myin Daing | 4.5 | 117,414 |
| | 9 | Sanchaung | 2.4 | 105,351 |
| | 10 | Dagon | 4.9 | 25,636 |
| | 11 | Bahan | 8.5 | 101,124 |
| | 12 | Tarmwe | 5.0 | 191,400 |
| | 13 | Mingalar Taung Nyunt | 4.9 | 156,196 |
| | 14 | Seikkan | 1.2 | 2,241 |
| Outer Ring | 15 | Dawbon | 3.1 | 87,427 |
| | 16 | Kamaryut | 6.5 | 88,596 |
| | 17 | Hlaing | 9.8 | 151,586 |
| | 18 | Yankin | 4.8 | 125,909 |
| Northern Suburbs | 19 | Thingangyun | 13.1 | 232,193 |
| | 20 | Mayangone | 25.8 | 208,405 |
| | 21 | Insein | 31.4 | 314,345 |
| Older Suburbs | 22 | Mingalardon | 128.0 | 318,310 |
| | 23 | North Okkalapa | 27.8 | 337,773 |
| | 24 | South Okkalapa | 8.2 | 191,674 |
| South of CBD | 25 | Thaketa | 13.5 | 254,571 |
| | 26 | Some parts of Dala | 98.4* | 132,835 |
| | 27 | Seikgyikhanaungto | 12.1 | 40,141 |
| New Suburbs | 28 | Shwe Pyi Thar | 52.7 | 306,430 |
| | 29 | Hlaing Tharyar | 77.6 | 500,635 |
| | 30 | North Dagon | 24.2 | 224,345 |
| | 31 | South Dagon | 37.5 | 378,981 |
| | 32 | East Dagon | 170.9 | 194,974 |
| | 33 | Dagon Seikkan | 42.0 | 133,457 |
| Periphery Area | 34 | Some parts of Kyauktan | 76.1* | 60,096 |
| | 35 | Some parts of Thanlyin | 254.9* | 232,571 |
| | 36 | Some parts of Hlegu | 101.0* | 23,889 |
| | 37 | Some parts of Hmawbi | 84.2* | 75,329 |
| | 38 | Some parts of Htantabin | 81.8* | 46,252 |
| | 39 | Some parts of Twantay | 107.9* | 37,823 |

| Urban Planning Zone | Township | | Area (km ²) | Population(2013) |
|---------------------|----------|--------------------------|-------------------------|------------------|
| Sub Total | 1-6 | CBD | 6.9 | 252,535 |
| | 7-15 | Inner Urban Ring | 37.8 | 852,441 |
| | 16-19 | Outer Ring | 34.2 | 598,284 |
| | 20-22 | Northern Suburbs | 185.2 | 841,061 |
| | 23-25 | Older Suburbs | 49.4 | 784,018 |
| | 26-27 | South of CBD | 110.5 | 172,976 |
| | 28-33 | New Suburbs | 404.9 | 1,738,823 |
| | 34-39 | Periphery Area | 705.8 | 475,961 |
| Total | 1-33 | Yangon City Total | 828.9 | 5,240,137 |
| | 1-39 | Study Area Total | 1,534.8 | 5,716,098 |

Note: Dala and Periphery Area are included in the Study Area only partially. Its population was estimated considering the area inside and outside the Study Area.

Source: YUTRA Project Team



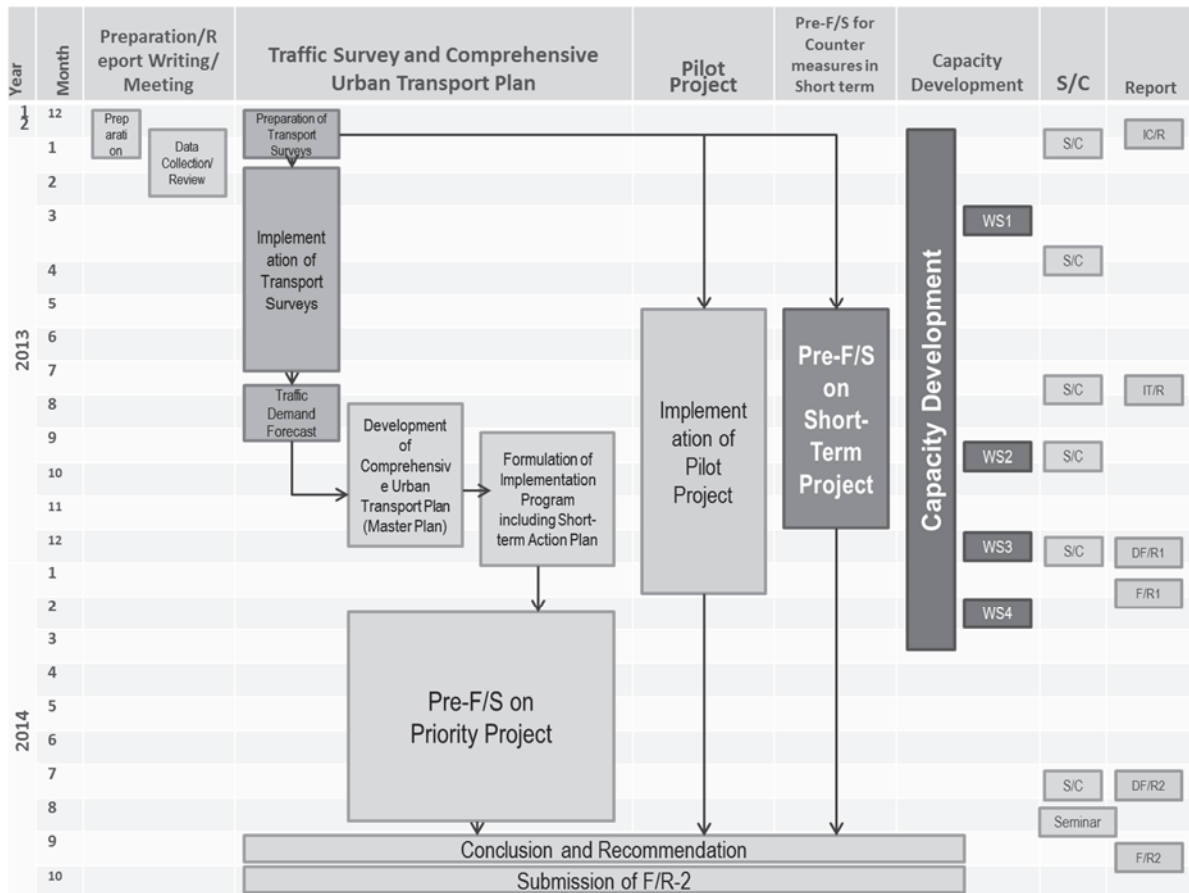
Source: YUTRA Project Team

Figure 1.3.1

YUTRA Study Area

1.4 Study Schedule & Framework

The overall project framework is shown in Figure 1.4.1.



Note: S/C: Steering Committee. IC/R: Inception Report. IT/R: Interim Report. DF/R: Draft Final Report. F/R: Final Report. WS: Workshop. F/S: Feasibility Study.
 Source: YUTRA Project Team

Figure 1.4.1 Project Framework

This is the final report of YUTRA covering the urban transport master plan for the Greater Yangon. YUTRA will further continue up to October 2014 for the pre-feasibility study for “the Improvement of the Western Half of the Yangon Circular Railway” identified as the priority project.

1.5 Composition of YUTRA Reports

The entire YUTRA Final Report I is composed of the following.

- (i) Summary;
- (ii) Volume I: main text of Urban Transport Master plan for Greater Yangon
- (iii) Volume II: covering traffic surveys, transport demand forecast, environmental and social considerations, capacity development, pilot project, and transport database.

Note that for “The Feasibility Study for the Project for Construction of New Thaketa Bridge”, a separate report will be prepared.

1.6 Project Organization

Figure 1.6.1 presents the project organization of YUTRA. The Joint Project Team is a combination of Myanmar Working Group (counterpart staff) and JICA Project Team.

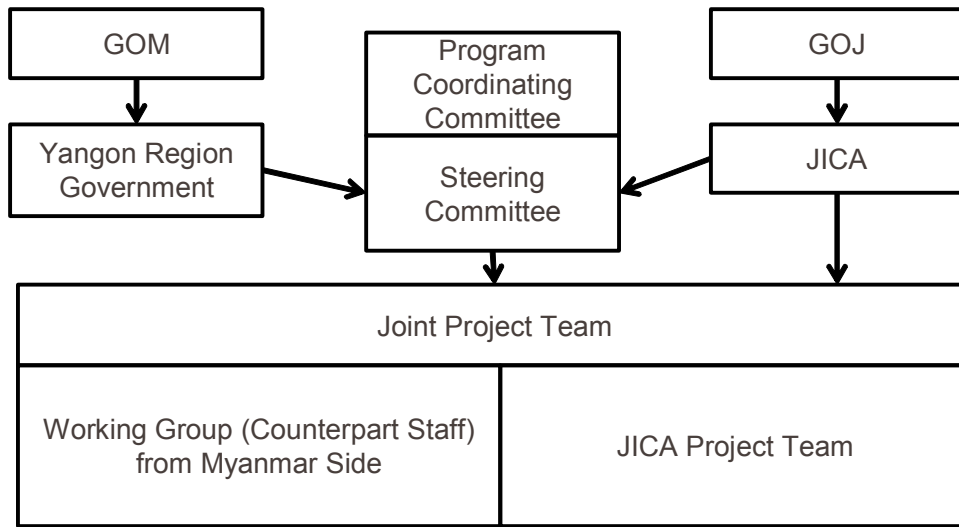


Figure 1.6.1 Project Organization of YUTRA

The members of Steering Committee and a Working Group as shown in Table 1.6.1 and 1.6.2, respectively. Table 1.6.3 lists the counterpart staff of the Project nominated to work with the JICA Project Team as listed in Table 1.6.4.

Table 1.6.1 Steering Committee Members

| No. | Name | Position | Responsibility in Steering Committee |
|-----|---------------------|---|--------------------------------------|
| 1 | H.E U Aung Khin | Region Minister for Transport and Communication, Ministry of Transport, Yangon Region | Chairman |
| 2 | Mr. Kyaw Myint | Managing Director, Myanmar Port Authority, Yangon Region | Member |
| 3 | Mr. Win Phay | Managing Director, Inland Water Transport, Yangon Region | Member |
| 4 | Mr. Kyaw Soe | Secretary, YCDC | Member |
| 5 | Mr. Kyi Tin | Director, Yangon Region Development Committee | Member |
| 6 | Mr. Kyaw Aye Lwin | Director, Road Transport Administration Department, Yangon Region Government | Member |
| 7 | Mr. Lin Htut | Police Lieutenant Colonel, Traffic Police, Yangon Region | Member |
| 8 | Mr. Kyaw Myint | Chief Engineer, Public Works, Yangon Region, | Member |
| 9 | Mr. Tun Aung Thin | General Manager, Myanma Railways, Yangon Region | Secretary |
| 10 | Mr. Aye Thant | Director, Transport Planning Department, Yangon Region | Joint-Secretary |
| 11 | Mr. Masahiko Tanaka | Representative, JICA Myanmar | Member |

Table 1.6.2 Working Group Members

| No. | Name | Position | Responsibility in Working Group Committee |
|-----|-----------------------|--|---|
| 1 | Mr. Tun Aung Thin | General Manager, Myanmar Railways | Chairman |
| 2 | Mr. Lin Htut | Police Lieutenant Colonel, Yangon Region | Member |
| 3 | Mr. Bo Soe | Assistant General Manager, Myanmar Port Authority | Member |
| 4 | Mr. Maung Maung Aung | Assistant General Manager, Inland Water Transport (Delta Region) | Member |
| 5 | Mr. Nyan Thar | Executive Engineer, Engineering Department (Road and Bridges) | Member |
| 6 | Mr. Tin Mg Myint | Deputy Superintendent Engineer, Yangon Region Development Affairs Department | Member |
| 7 | Mrs. Myint Myint Sein | Executive Engineer, Public Works, Yangon Region | Member |
| 8 | Mr. Toe Myint | Deputy Director, Department of Marine Administration | Member |
| 9 | Mr. Thein Han Oo | Executive Engineer, Road Transport Administration Department | Member |
| 10 | Mr. Hla Aung | Chairman, Yangon Region Central Supervisory Committee for Motor Vehicles and Vessels | Member |
| 11 | Mr. Aye Thant | Director, Transport Planning Department | Secretary |
| 12 | Mr. Kyaw Kyaw Myo | Divisional Traffic Manager, Myanmar Railways | Joint-Secretary |

Table 1.6.3 Counterpart Staff

| No. | Name | Position | Agency |
|-----|-----------------------|----------------------------------|---|
| 1 | Mr. Lian Sian Mung | Assistant Manager (Traffic) | Myanmar Port Authority, Yangon Region |
| 2 | Mr. Zaw Thet Aung | Assistant Manager (Delta Region) | Inland Water Transport |
| 3 | Mr. Khine Myint | Sub Assistant Engineer (2) | Yangon Region Development Affairs Department |
| 4 | Mr. Moe Thiha Kyaw | Police Lieutenant | Traffic Police Office , Yangon |
| 5 | Mr. Htet Ye' Paing | Senior Clerk | Transport Planning Department, Yangon Region |
| 6 | Mr. Thein Han Oo | Executive Engineer | Road Transport Administration Department |
| 7 | Mr. Moe Kyaw | Assistant Manager | Myanmar Railways |
| 8 | Mrs. Myint Myint Sein | Executive Engineer | Public Works, Yangon Region |
| 9 | Mr. Nyan Thar | Executive Engineer | Engineering Department (Road and Bridges), YCDC |

Table 1.6.4 JICA Project Team Members

| No. | Name | Job title |
|-----|-------------------------|--|
| 1 | Mr. Takashi SHOYAMA | Team Leader/ Comprehensive Urban Transport Plan |
| 2 | Mr. Tetsuji MASUJIMA | Deputy Team Leader/ Institution and Capacity Development Planning |
| 3 | Ms. Momoko ITO | Project Coordinator/ Institution and Capacity Development Planning |
| 4 | Mr. Hideo ARIKAWA | Traffic Survey/ Analysis (1) |
| 5 | Ms. Yuko SAKAI | Traffic Survey/ Analysis (2) |
| 6 | Mr. Masaru KOMORI | Traffic Survey/ Analysis (3) |
| 7 | Mr. Mazhar IQBAL | Traffic Demand Forecast |
| 8 | Mr. Makoto OKAMURA | Traffic Database/ Specific Demand Analysis |
| 9 | Mr. Seiya MATSUOKA | Pilot Project (1) |
| 10 | Ms. Phyo Thet Thet Htun | Pilot Project (2) |
| 11 | Mr. Junji SHIBATA | Terminal Planning (Passenger Flow/ Freight Flow) (1) |
| 12 | Mr. Masaaki GOTO | Terminal Planning (Passenger Flow/ Freight Flow) (2) |
| 13 | Mr. Takaaki TANAKA | Road Facility Planning |
| 14 | Mr. Eiji Yonezawa | Road Network Planning |
| 15 | Mr. Frits Olyslagers | Road-based Public Transport Planning |
| 16 | Mr. Hirotoishi SUZUKI | Rail-based Public Transport Planning |
| 17 | Mr. Shinya NAKAMURA | Railway Facility Planning (1) |
| 18 | Mr. Naoto KUDO | Inland Waterway Planning |
| 19 | Mr. Michimasa TAKAGI | Traffic Management Planning/ Traffic Safety |
| 20 | Mr. Nobuyoshi KAWAI | Design and Facility Planning (1), Institution/Operation and Maintenance Management for Railway |
| 21 | Mr. Takashi SHIMIZU | Railway Planning |
| 22 | Mr. Akira HONDA | Construction Planning/ Cost Estimation/ Procurement (1) |
| 23 | Mr. Tomokuni HAYAKAWA | Construction Planning/ Cost Estimation/ Procurement (2) |
| 24 | Mr. Masaru FURUTA | Operation/ Management Planning |
| 25 | Mr. George Esguerra | Transport Development Funding |
| 26 | Mr. Koji Otsuka | Economic and Financial Analysis (1) |
| 27 | Mr. Shinjiro OKUZAWA | Environmental & Social Consideration |
| 28 | Mr. Hiroaki UEYAMA | Construction Planning/ Cost Estimation/ Procurement (3) |
| 29 | Mr. Akira MAGARIO | Design and Facility Planning (3) |
| 30 | Mr. Hironobu KUROE | Hydrologic Characteristics Analysis |
| 31 | Mr. Tomoyuki TATSUMI | Geographical Conditions Survey (Topography/ Soil/ Hydrology) |
| 32 | Mr. Eiichi YOKOTA | Road Planning/ Design |
| 33 | Mr. Toshio ICHIKAWA | Bridge Planning/ Design (1) |
| 34 | Mr. Tomoyuki KONISHI | Bridge Design (2), Road Structure Planning (1) |
| 35 | Mr. Ryo TANAHASHI | Construction Planning/ Cost Estimation/ Project Coordinator |
| 36 | Mr. Takeshi MAEDA | Geographical Conditions Survey |
| 37 | Ms. Rie TAJIMA | Economic and Financial Analysis(2) |
| 38 | Mr. Tetsujiro TANAKA | Environmental & Social Consideration(2) |
| 39 | Mr. Isao FUKUNAGA | Railway Facility Planning (2) |
| 40 | Mr. Yoshiyuki TAJIMA | Railway Planning Assistant (1) |
| 41 | Mr. Takayoshi FUTOSE | Railway Planning Assistant (2) |
| 42 | Mr. Shoichiro TOKUMARU | Road Structure Planning (2) |
| 43 | Mr. Denichiro YAMADA | Road Maintenance Management |

| No. | Name | Job title |
|-----|----------------------|-------------------------------------|
| 44 | Mr. Katsuya KUSUNOKI | Railway Wiring Plan/ Alignment Plan |
| 45 | Mr. Takeshi YOSHIDA | Road Bridge Planning |
| 46 | Ms. Sawako TOMIOKA | Bridge Design (3) |
| 47 | Mr. Ippei IWAMOTO | Road Planning/ Design (2) |

2 CURRENT TRANSPORT SITUATION, PROBLEMS, AND ISSUES

2.1 General

2.1.1 Socioeconomic and Urban Development Characteristics

1) Socio-economic Characteristics

Population

Yangon Region has 6,944,000 people or approximately 12% of the national population at the end of 2010-2011. The average annual population growth rate of Yangon city is 2.58% from 1998 to 2011. The population size and average annual growth rate by each township is presented in Table 2.1.1.1.

Table 2.1.1.1 Population Size & Growth Rate by Township

| | Township | Population | | Ave. Annual Growth (%) 1998-2011 | Area (km ²) |
|-------------------|----------------------|------------|-----------|-------------------------------------|-------------------------|
| | | 1998 | 2011 | | |
| 1 | Latha | 32,535 | 34,125 | 0.37% | 0.60 |
| 2 | Lanmadaw | 40,597 | 43,137 | 0.47% | 1.31 |
| 3 | Pabedan | 47,461 | 37,551 | -1.79% | 0.62 |
| 4 | Kyauktada | 44,076 | 34,797 | -1.80% | 0.70 |
| 5 | Botahtaung | 52,653 | 49,134 | -0.53% | 2.60 |
| 6 | Pazundaung | 38,363 | 53,648 | 2.61% | 1.07 |
| CBD | | 255,685 | 252,391 | -0.10% | 6.91 |
| 7 | Ahlone | 43,569 | 65,510 | 3.19% | 3.38 |
| 8 | Kyee Myin Daing | 87,491 | 115,841 | 2.18% | 4.46 |
| 9 | Sanchaung | 78,788 | 105,208 | 2.25% | 2.40 |
| 10 | Dagon | 39,967 | 24,492 | -3.70% | 4.89 |
| 11 | Bahan | 95,114 | 100,695 | 0.44% | 8.47 |
| 12 | Tarmwe | 128,455 | 191,114 | 3.10% | 4.99 |
| 13 | Mingalar Taung Nyunt | 109,796 | 155,767 | 2.73% | 4.94 |
| 14 | Seikkan | 1,379 | 2,241 | 3.81% | 1.17 |
| 15 | Dawbon | 79,582 | 87,284 | 0.71% | 3.11 |
| Inner City | | 689,081 | 778,156 | 0.94% | 49.42 |
| 16 | Kamaryut | 82,943 | 87,881 | 0.45% | 6.47 |
| 17 | Hlaing | 167,881 | 151,014 | -0.81% | 9.82 |
| 18 | Yankin | 107,195 | 125,909 | 1.25% | 4.79 |
| 19 | Thingangyun | 240,417 | 231,621 | -0.29% | 13.12 |
| Outer City | | 598,436 | 596,426 | -0.03% | 34.20 |
| 20 | Mayangone | 183,024 | 205,403 | 0.89% | 25.83 |
| 21 | Insein | 240,704 | 311,200 | 2.00% | 31.40 |
| 22 | Mingalardon | 170,950 | 288,858 | 4.12% | 127.96 |
| 23 | North Okkalapa | 189,068 | 333,484 | 4.46% | 27.76 |
| 24 | South Okkalapa | 220,214 | 191,388 | -1.07% | 8.22 |
| 25 | Thaketa | 279,799 | 253,284 | -0.76% | 13.45 |
| 26 | Dala | 77,236 | 181,087 | 6.77% | 98.41 |
| 27 | Seikgyikhanaungto | 25,586 | 38,425 | 3.18% | 12.10 |
| Old Suburbs | | 1,386,581 | 1,803,129 | 2.31% | 345.13 |
| 28 | Shwe PyiThar | 172,377 | 295,993 | 4.25% | 52.69 |
| 29 | Hlaing Tharyar | 199,190 | 488,768 | 7.15% | 77.61 |
| 30 | North Dagon | 101,673 | 221,200 | 6.16% | 24.18 |
| 31 | South Dagon | 140,387 | 370,403 | 7.75% | 37.51 |
| 32 | East Dagon | 55,192 | 145,505 | 7.74% | 170.87 |
| 33 | Dagon Seikkan | 18,279 | 120,161 | 15.59% | 42.04 |
| New Suburbs | | 687,098 | 1,642,030 | 6.93% | 404.90 |
| Yangon City Total | | 3,691,941 | 5,142,128 | 2.58% | 828.96 |
| 34 | Part of Kyauktan | - | 48,473 | - | 76.12 |
| 35 | Part of Thanlyin | - | 181,959 | - | 254.85 |
| 36 | Part of Hlegu | - | 50,793 | - | 101.00 |
| 37 | Part of Hmawbi | - | 83,719 | - | 84.23 |
| 38 | Part of Htantabin | - | 40,234 | - | 81.77 |
| 39 | Part of Twantay | - | 24,936 | - | 107.86 |
| Periphery Area | | - | 430,114 | - | 706.83 |
| Study Area Total | | - | 5,572,242 | - | 1,534.89 |

Source: SUDP, JICA (2013)

Population growth of the township varies. The growth of inner city area has been low at less than 1% per annum. On the other hand, the townships located at the fringes towards north-west and eastern parts of Yangon City have experienced a rapid increase in population with a growth rate of more than 4%.

Labor Force

Labor markets in Yangon Region are categorized into 4 sectors such as primary industry, secondary industry, tertiary industry, and extempore. The primary industry consists of agriculture, forestry, livestock and fishery, energy, and mining. Secondary sector includes manufacturing and construction, and tertiary (or service) sector includes the areas of electricity, gas, water, transport, communication and other services. The labor force data by each township is shown in Table 2.1.1.2.

The key employment sector is tertiary sector which share more than 60% of the total employment. About 7% of the total is employed in secondary sector and about 2% in primary sector, particularly agriculture.

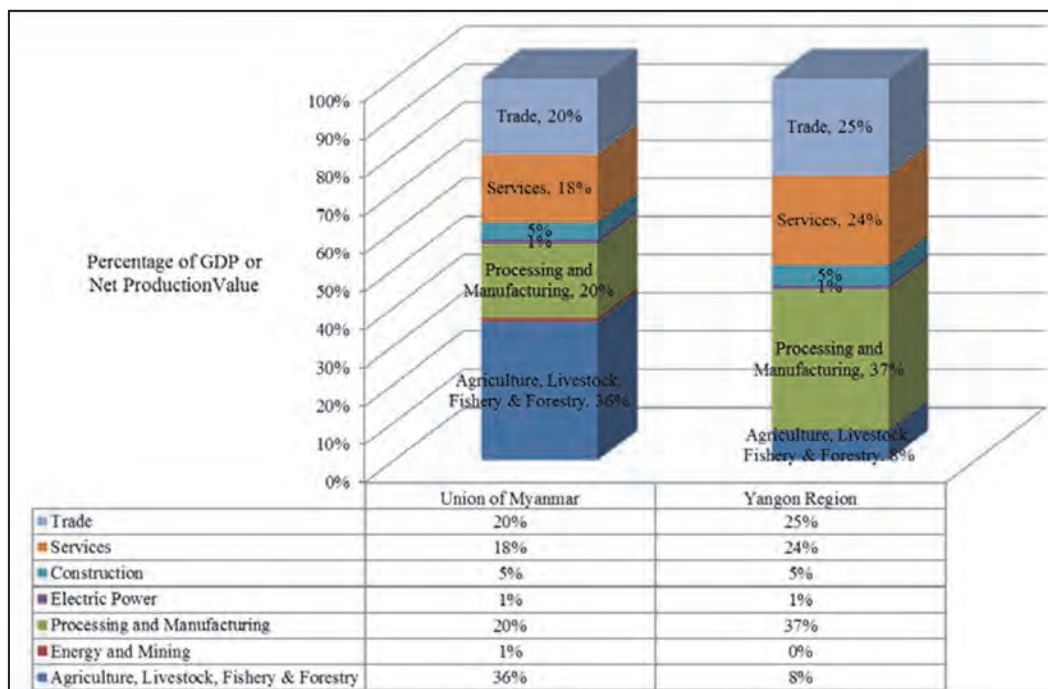
Table 2.1.1.2 Labor Force by Township

| Township | Population | Primary Industry | Secondary Industry | Tertiary Industry | Extempore | Total Workers | Working ratio | Non-worker |
|-------------------------|------------|------------------|--------------------|-------------------|-----------|---------------|---------------|------------|
| 1 Latha | 34,125 | 0 | 293 | 8,449 | 533 | 9,275 | 27.2% | 24,850 |
| 2 Lanmadaw | 43,137 | 0 | 3,737 | 29,300 | 1,495 | 34,532 | 80.1% | 8,605 |
| 3 Pabedan | 37,551 | 0 | 256 | 2,119 | 1,714 | 4,089 | 10.9% | 33,462 |
| 4 Kyauktada | 34,797 | 0 | 1,281 | 15,555 | 3,046 | 19,882 | 57.1% | 14,915 |
| 5 Botahtaung | 49,134 | 0 | 569 | 21,504 | 2,918 | 24,992 | 50.9% | 24,142 |
| 6 Pazundaung | 53,648 | 0 | 2,264 | 21,749 | 2,789 | 26,803 | 50.0% | 26,845 |
| CBD | 252,391 | 0 | 8,042 | 97,637 | 12,618 | 118,297 | 46.9% | 134,094 |
| 7 Ahlone | 65,510 | 0 | 2,065 | 37,440 | 2,065 | 41,569 | 63.5% | 23,941 |
| 8 Kye Myin Daing | 115,841 | 520 | 1,516 | 66,613 | 19,090 | 87,739 | 75.7% | 28,102 |
| 9 Sanchaung | 105,208 | 0 | 1,003 | 95,169 | 1,245 | 97,417 | 92.6% | 7,791 |
| 10 Dagon | 24,492 | 102 | 518 | 15,308 | 381 | 16,308 | 66.6% | 8,184 |
| 11 Bahan | 100,695 | 0 | 3,687 | 35,030 | 22,493 | 61,210 | 60.8% | 39,485 |
| 12 Tarmwe | 191,114 | 0 | 4,508 | 112,711 | 54,209 | 171,428 | 89.7% | 19,686 |
| 13 Mingalar Taung Nyunt | 155,767 | 0 | 2,158 | 87,997 | 23,892 | 114,047 | 73.2% | 41,720 |
| 14 Seikkan | 2,241 | 41 | 10 | 1,755 | 248 | 2,055 | 91.7% | 186 |
| 15 Dawbon | 87,284 | 126 | 1,894 | 32,302 | 27,469 | 61,792 | 70.8% | 25,492 |
| Inner City | 778,156 | 388 | 52,996 | 373,188 | 133,229 | 559,800 | 71.9% | 218,356 |
| 16 Kamaryut | 87,881 | 0 | 85 | 68,387 | 2,832 | 71,304 | 81.1% | 16,577 |
| 17 Hlaing | 151,014 | 39 | 380 | 18,681 | 2,090 | 21,190 | 14.0% | 129,824 |
| 18 Yankin | 125,909 | 0 | 0 | 48,278 | 4,943 | 53,221 | 42.3% | 72,688 |
| 19 Thingangyun | 231,621 | 5,674 | 1,213 | 103,600 | 14,270 | 124,757 | 53.9% | 106,864 |
| Outer City | 596,426 | 6,369 | 1,853 | 232,902 | 24,340 | 265,464 | 44.5% | 330,962 |
| 20 Mayangone | 205,403 | 213 | 146 | 51,146 | 51,196 | 102,702 | 50.0% | 102,702 |
| 21 Insein | 311,200 | 117 | 1,876 | 156,816 | 11,165 | 169,974 | 54.6% | 141,226 |
| 22 Mingalardon | 288,858 | 680 | 16,020 | 40,867 | 45,122 | 102,690 | 35.6% | 186,168 |
| 23 North Okkalapa | 333,484 | 482 | 418 | 250,926 | 48,795 | 300,621 | 90.1% | 32,863 |
| 24 South Okkalapa | 191,388 | 0 | 436 | 73,303 | 5,329 | 79,067 | 41.3% | 112,321 |
| 25 Thaketa | 253,284 | 56 | 40,916 | 92,423 | 74,159 | 207,553 | 81.9% | 45,731 |
| 26 Dala | 181,087 | 238 | 1,858 | 21,085 | 43,759 | 66,941 | 37.0% | 114,146 |
| 27 Seikgyikhanaungto | 38,425 | 148 | 697 | 3,969 | 14,177 | 18,991 | 49.4% | 19,434 |
| Old Suburbs | 1,803,129 | 1,934 | 62,367 | 690,535 | 293,702 | 1,048,539 | 58.2% | 754,591 |
| 28 Shwe PyiThar | 295,993 | 5,382 | 944 | 68,066 | 50,189 | 124,582 | 42.1% | 171,411 |
| 29 Hlaing Tharyar | 488,768 | 10,451 | 66,406 | 19,510 | 4,414 | 100,781 | 20.6% | 387,987 |
| 30 North Dagon | 221,200 | 61 | 2,826 | 61,211 | 5,633 | 69,731 | 31.5% | 151,469 |
| 31 South Dagon | 370,403 | 11,335 | 20,111 | 88,570 | 65,129 | 185,145 | 50.0% | 185,258 |
| 32 East Dagon | 145,505 | 3,549 | 3,317 | 46,675 | 9,264 | 62,805 | 43.2% | 82,700 |
| 33 Dagon Seikkan | 120,161 | 5,659 | 0 | 31,416 | 16,905 | 53,980 | 44.9% | 66,181 |
| New Suburbs Zone | 1,642,030 | 33,999 | 95,165 | 306,467 | 140,105 | 575,735 | 35.1% | 1,066,295 |
| Total | 5,142,128 | 42,674 | 190,062 | 1,778,298 | 600,944 | 2,611,977 | 50.8% | 2,530,152 |

Source: SUDP, JICA (2013)

Economic Sector

The economic sector in Myanmar comprises agriculture, fishery & forestry sector, energy & mining sector, processing & manufacturing sector, electric power & construction sector, service sector which includes transportation, communications, financial institution, social and administrative services, rental and other services, and trade sector. Figure 2.1.1.1 describes economic sector of the whole country and Yangon Region on the basis of GDP in 2010-2011.



Source: SUDP, JICA (2013)

Figure 2.1.1.1 Economic Sector in Myanmar and Yangon Region

Table 2.1.1.3 shows the contribution ratio of Yangon Region to the national net production values of each economic sector based on the data in 2010-2011.

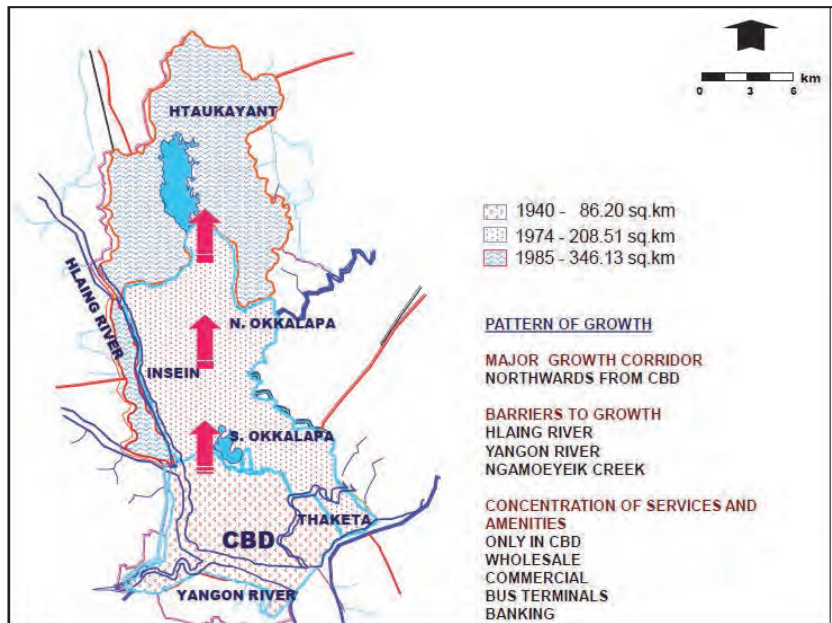
Table 2.1.1.3 Contribution Ratio of Yangon Region by Economic Sector

| Economic Sector | Contribution Ratios | |
|--|---------------------|--------------|
| | (In kyat million) | (percentage) |
| Agriculture, Fishery and Forestry Sector | | |
| (i) Agriculture | 367,616 | 3% |
| (ii) Livestock and Fishery | 314,059 | 9% |
| (iii) Forestry | 1,888 | 1% |
| Energy and Mining Sector | 18,937 | 5% |
| Processing and Manufacturing Sector | 3,246,235 | 41% |
| Electric Power and Construction Sector | | |
| (i) Electric Power | 92,661 | 22% |
| (ii) Construction | 457,051 | 25% |
| Service Sector | | |
| (i) Transportation | 1,504,852 | 29% |
| (ii) Communications | 137,563 | 41% |
| (iii) Financial institutions | 18,560 | 59% |
| (iv) Social and administrative services | 327,019 | 38% |
| (v) Rental and other services | 109,479 | 15% |
| Trade Sector | 2,230,423 | 28% |

Source: YUTRA Project Team based on data from SUDP, JICA (2013)

2) Urban Development Characteristics

Yangon City was founded in 1752 by Myanmar King Alaungphaya and re-planned as the capital city of lower Myanmar in 1852 by the British colonial for 50,000 inhabitants. After independence in 1948, the population of Yangon reached up to 600,000 and many people migrated to Yangon, living in slums and squatter areas which is very close to CBD.

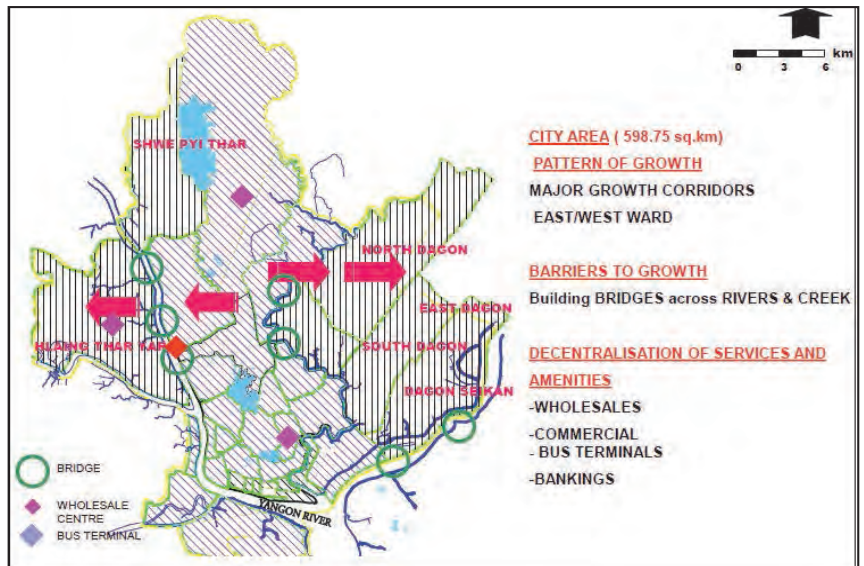


Source: DHSHD

Figure 2.1.1.2 Growth of Yangon City Before 1988

Yangon City is bordered by the rivers, Yangon River and Hlaing River in the west, Bago River in the south, and Nga Moe Yeik Creek in the east. Therefore, the city has historically grown northwards from the central area, forming an elongated shape until 1988 as shown in Figure 2.1.1.2. Three new satellite towns such as South Okkalapa, North Okkalapa, and Thaketa, were built as part of a slum clearance programme and to alleviate the housing shortage in Yangon.

In 1989, the Government constructed Dagon (North), and Dagon (South) in the east side of the city and enlarged Hlaingtharyar on the west side of Hlaing River. Since then Yangon has become a cross pattern, having Dagon (North), Dagon (South), and Hlaingtharyar as east-west axis, CBD and htaukkyant as north-south axis. (Figure 2.1.1.3)

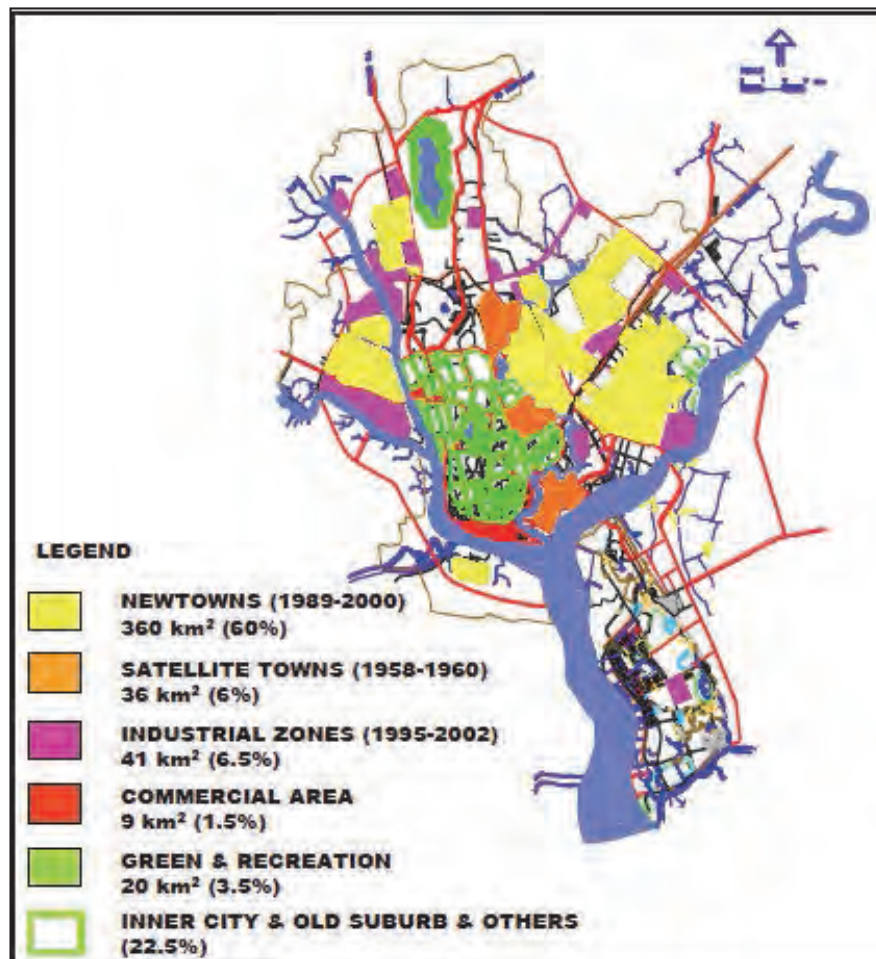


Source: DHSHD

Figure 2.1.1.3 Growth of Yangon City After 1988

Before 1988, most of the industrial zones are existed in residential area, especially located in Inner Urban Ring (mostly in Hlaingtowship). In 1988, these area were moved to urban

fringes such as Hlaingtharyar, western part of Yangon city across the Hlaing River, Shwepyithar, northern part, and Dagon (East) and Dagon (South), eastern part of the city. Wholesale and large commercial areas still exist in CBD. The location of new towns, satellite towns, and industrial zones in Yangon Region are shown in Figure 2.1.1.4.



Source: DHSHD

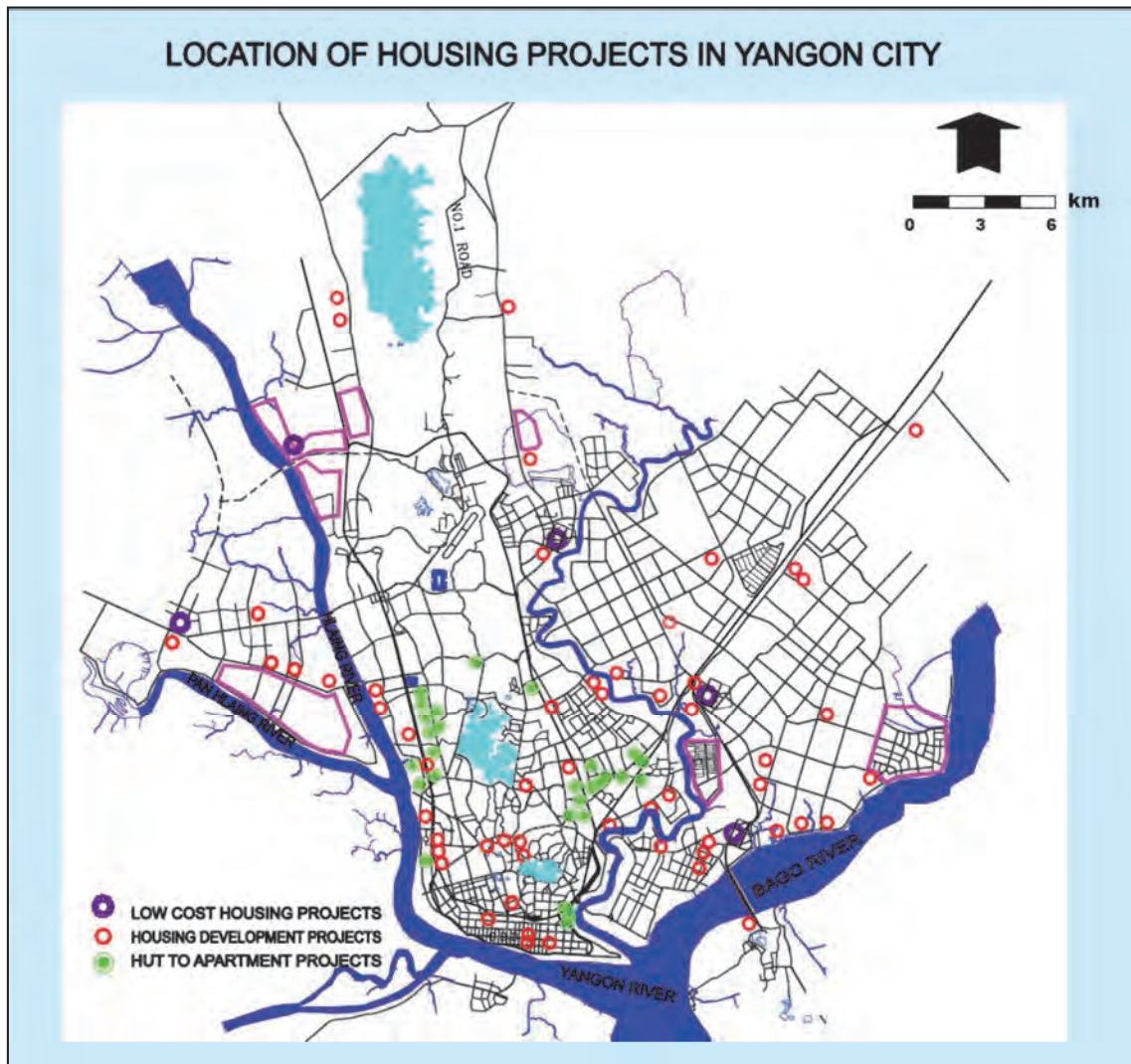
Figure 2.1.1.4 New Towns, Satellite Towns, and Industrial Zones in Yangon Region

The city has grown rapidly and new suburban satellite townships have been developed to accommodate the increasing population and resettle inhabitants from the congested inner area. Two main bodies, YCDC and DHSHD manage urban land (Figure 2.1.1.5). YCDC is responsible for administering private land whereas DHSHD caters to the need of government land.

Initially, a policy and program response of the government to the deficiency of urban shelter was focused on the public housing schemes and slum clearance. The main housing delivery systems undertaken by the governments are:

- (i) Public and Rental Housing
- (ii) Government's Joint Housing
- (iii) Programs for individual housing
- (iv) Sites and services schemes
- (v) Slum and squatter upgrading (Hut to apartment scheme)

- (vi) Urban redevelopment projects
- (vii) Area development projects
- (viii) Low cost housing
- (ix) Industrial zone development
- (x) Provision of social infrastructure



Source: DHSHD

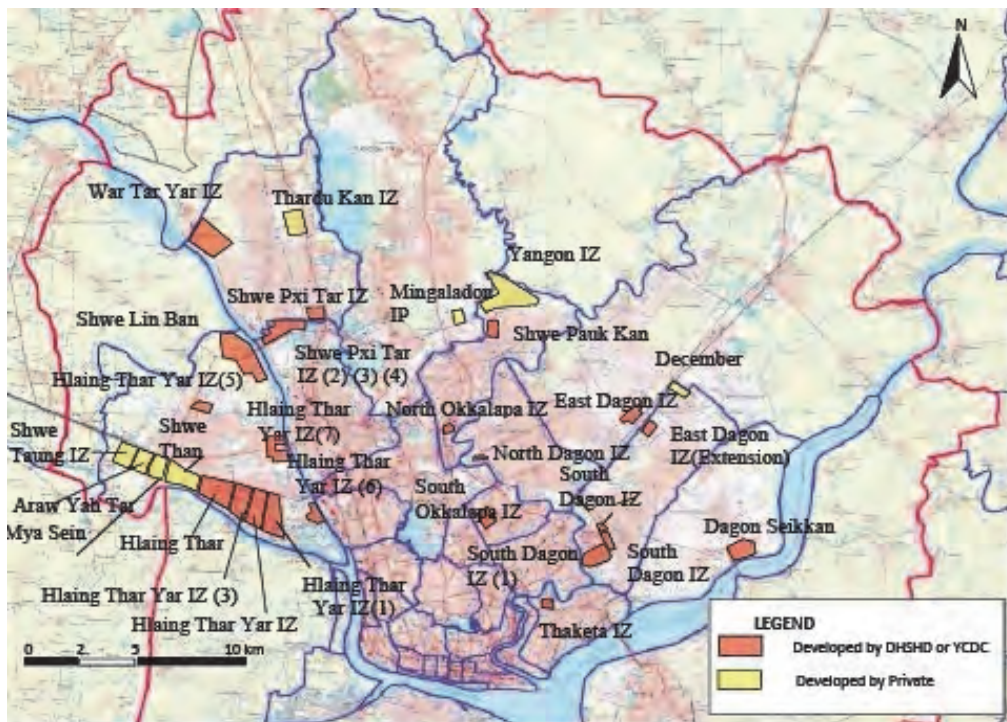
Figure 2.1.1.5 Location of Housing Projects in Yangon Region

Industrial zone development is considered one of the most important driving forces in the overall economic growth in the country. Since the market-oriented economic policies adopted in 1988/89, Myanmar Government has been trying to stimulate industrial investment and production by encouraging private-sector participation and granting foreign direct investment in industry. The Private Industrial Enterprise Law promulgated in November 1990 has allowed the promotion of private sector development and the direct foreign investment. This led to a significant increase in industrial investment and production. Table 2.1.1.4 shows the industrial zones at various status of development with a total land area of about 6,700 ha. Figure 2.1.1.6 shows the location of industrial zones in Yangon Region.

Table 2.1.1.4 Industrial Zones

| Name of Industrial Zone | | Developer | Status of Development | Land Area(ha) |
|-------------------------|-----------------------------------|---------------------------------|------------------------|---------------|
| 1 | Hlaing Tharyar IZ(1-7) | DHSHD | Completed in 1994-1997 | 780 |
| 2 | Shwe Thann Lwin IZ | Shwe Thann Lwin Co. | Under Development | 168 |
| 3 | Mya Sein Young IZ | War War Win Co. | Under Development | 118 |
| 4 | Anaw Yah Tar IZ and Shwe Taung IZ | Mahar Shwe Taung Co. | Under Development | 315 |
| 5 | Shwe Lin Ban IZ | DHSHD | Completed in 2002 | 445 |
| 6 | Shwe Pyi Thar IZ(1) | DHSHD | Completed in 1989 | 136 |
| 7 | Shwe Pyi Thar IZ(2,3,4) | DHSHD | Completed in 1998-2000 | 400 |
| 8 | War Ta Yar IZ | DHSHD | Completed in 2004 | 445 |
| 9 | Thardu Kan IZ | TOSTA High Rise | Completed in 2002 | 195 |
| 10 | Mingalardon IP | Mingalardon Industrial Park Co. | Completed in 1998 | 89 |
| 11 | Yangon IP | Zaykabar Co. | Completed in 2000 | 400 |
| 12 | Shwe Paukkan IZ | DHSHD | Completed in 1992-1993 | 38 |
| 13 | North Okkalapa IZ | DHSHD | Completed in 1998 | 45 |
| 14 | South Okkalapa IZ | DHSHD | Completed in 2001 | 15 |
| 15 | North Dagon | YCDC | Completed | 10 |
| 16 | East Dagon IZ | DHSHD | Completed in 2000 | 202 |
| 17 | East Dagon IZ(extension) | DHSHD | Completed | 115 |
| 18 | South Dagon IZ(1) | DHSHD | Completed in 1992 | 192 |
| 19 | South Dagon IZ(2) | DHSHD | Completed in 1992 | 87 |
| 20 | South Dagon IZ(3) | DHSHD | Completed in 1992 | 22 |
| 21 | December IZ | December Co. | Under Development | 142 |
| 22 | Dagon Seikkan IZ | DHSHD | Completed in 1998-1999 | 490 |
| 23 | Tharketa IZ | DHSHD | Completed in 1999 | 81 |
| 24 | Thilawa IZ | DHSHD | Completed | 175 |
| 25 | Thilawa SEZ | Japanese Co.(expected) | Under Planning | 1,560 |
| Total | | | | 6,665 |

Source: SUDP, JICA (2013)



Source: SUDP, JICA (2013)

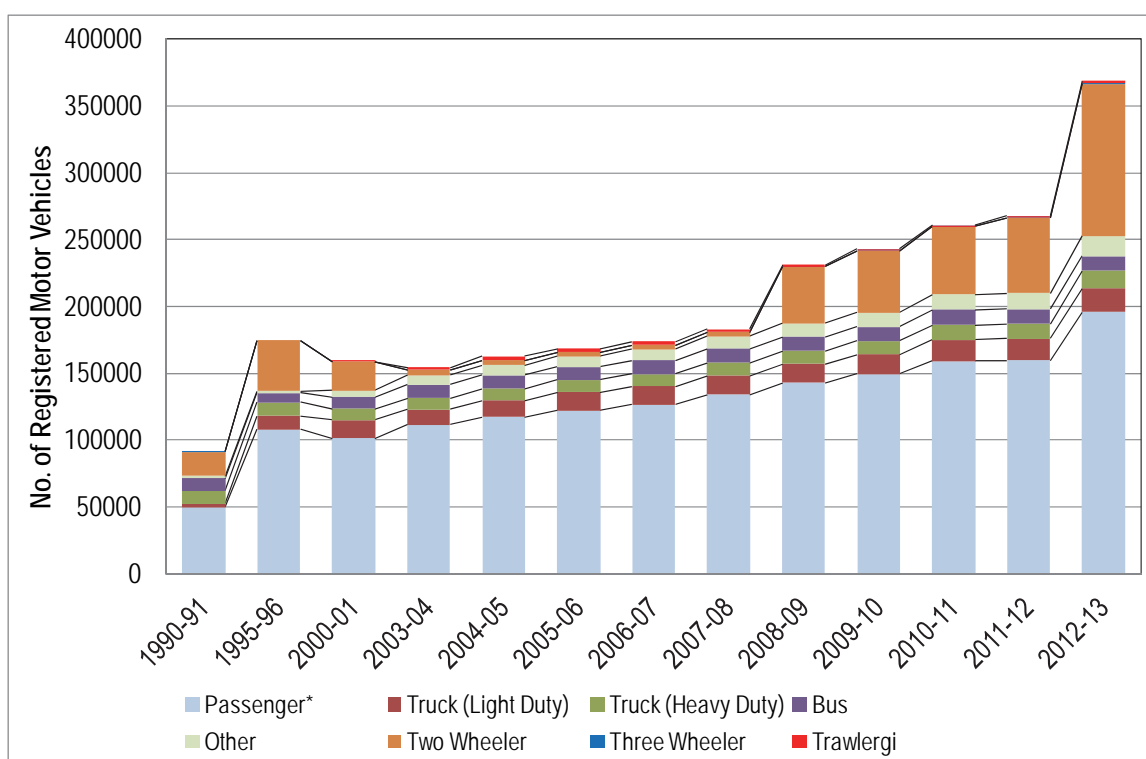
Figure 2.1.1.6 Location Map of Industrial Zones in Yangon Region

2.1.2 Motorization and Transport Demand

1) Motorization Development

Historically, vehicles ownership in Myanmar is low due to low per capita GDP as well as government's restrictive policies on importing foreign automobiles. However, the government has begun to relax such policies since September 2011 in order to promote replacement of the old motor vehicles. Over 20 years old manufactured motor vehicles are allowed to register only for outside of YCDC area.

Figure 2.1.2.1 shows the number of registered motor vehicles by type in Yangon Region. Due to the recent government deregulation policy on the importation of motor vehicles in parallel with economic development has encouraged rapid expansion of motorization resulting to worsening traffic congestion in the urban areas as compared to the past years. It is expected that the number will continue to increase along with high level of economic growth.



| Classification | 1990-91 | 1995-96 | 2000-01 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | 2012-13 |
|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Passenger* | 49927 | 107886 | 101396 | 111377 | 117129 | 122159 | 126433 | 134088 | 142869 | 149415 | 159025 | 159461 | 195969 |
| Truck (Light Duty) | 2386 | 10196 | 13845 | 11775 | 12464 | 13630 | 13717 | 13943 | 14012 | 14561 | 15813 | 16411 | 17206 |
| Truck (Heavy Duty) | 10032 | 10039 | 8112 | 8401 | 8843 | 9102 | 9244 | 9703 | 9624 | 10252 | 11261 | 10914 | 13234 |
| Bus | 9062 | 7344 | 9041 | 9775 | 9997 | 9882 | 10415 | 10674 | 10780 | 10592 | 11379 | 11384 | 11434 |
| Other | 1964 | 1218 | 4835 | 7310 | 7746 | 7694 | 8052 | 9151 | 9900 | 10401 | 11461 | 11897 | 14791 |
| Two Wheeler | 17815 | 37696 | 21442 | 3692 | 3466 | 3310 | 3162 | 3013 | 42416 | 46539 | 50619 | 56094 | 113651 |
| Three Wheeler | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52 | 48 | 145 | 244 | 618 |
| Trawlergi | 0 | 0 | 132 | 2177 | 2867 | 2756 | 2515 | 2243 | 1280 | 1036 | 658 | 1189 | 1548 |

Source: Road Transport Administration Department, As of July 4, 2013

Note: "Trawlergi" is a kind of tractor for farm use and carries passengers sometimes, which is not allowed to drive on the road. "Other" includes any vehicles which are utilized for special purpose of works.

Figure 2.1.2.1 Registered Motor Vehicles by Type in Yangon Region

Since motorcycle usage is prohibited in YCDC area (i.e. 31 townships out of 33 townships), the number of motorcycle shares less than 20% in Yangon Region. In fact, the motorcycle ban contributes to easy traffic flow and traffic safety in YCDC area. Non-motorized vehicles such as bicycles and trishaws are also limited inside CBD while it can be used in the suburban area of Yangon Region and other major cities.

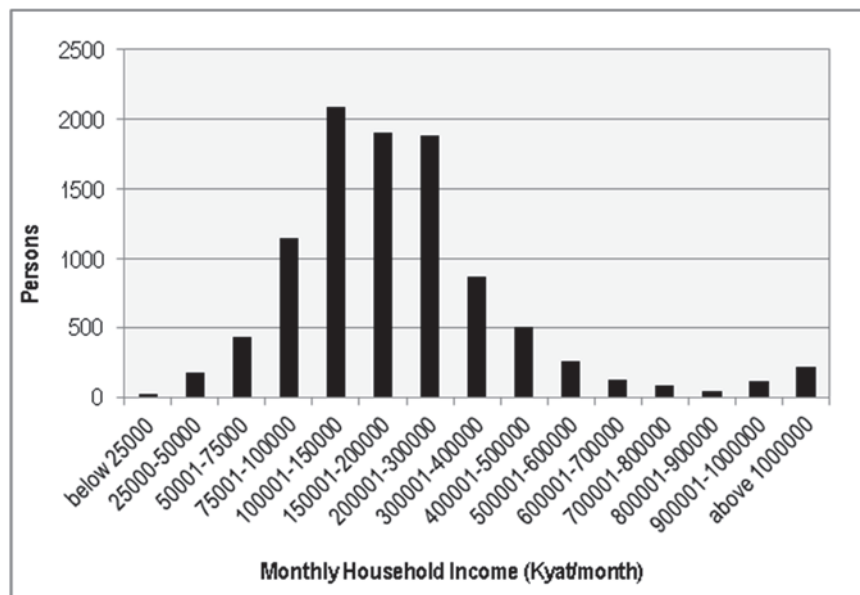
Table 2.1.2.1 shows vehicles population in major states and regions in Myanmar. As of 2010, motorization rate per 1000 population in Yangon Region was comparatively lower than other major states/regions because of the small number of motorcycles. Share of motorcycle in Yangon Region is quite small at only 20% as compared with around 90% share in other states and regions.

Table 2.1.2.1 Number of Vehicle per Population (2010)

| No. | State/Region | Total Vehicle Registered | Motorcycle Registered | Motorcycle Portion | Vehicle/1000 population |
|---------------|-------------------|--------------------------|-----------------------|--------------------|-------------------------|
| 1 | Mandalay Region | 626,202 | 549,338 | 87.73% | 75.0 |
| 2 | Shan State | 346,073 | 305,894 | 88.40% | 61.2 |
| 3 | Kachin State | 80,953 | 70,016 | 86.50% | 51.8 |
| 4 | Kayah State | 16,711 | 14,752 | 88.30% | 48.0 |
| 5 | Taninthayi Region | 70,323 | 64,787 | 92.10% | 41.6 |
| 6 | Sagaing Region | 252,986 | 237,225 | 93.80% | 38.9 |
| 7 | Yangon Region | 253,904 | 50,401 | 19.80% | 36.5 |
| 8 | Mon State | 103,119 | 92,586 | 89.80% | 33.2 |
| Myanmar Total | | 2,291,675 | 1,877,596 | 81.9% | 38.49 |

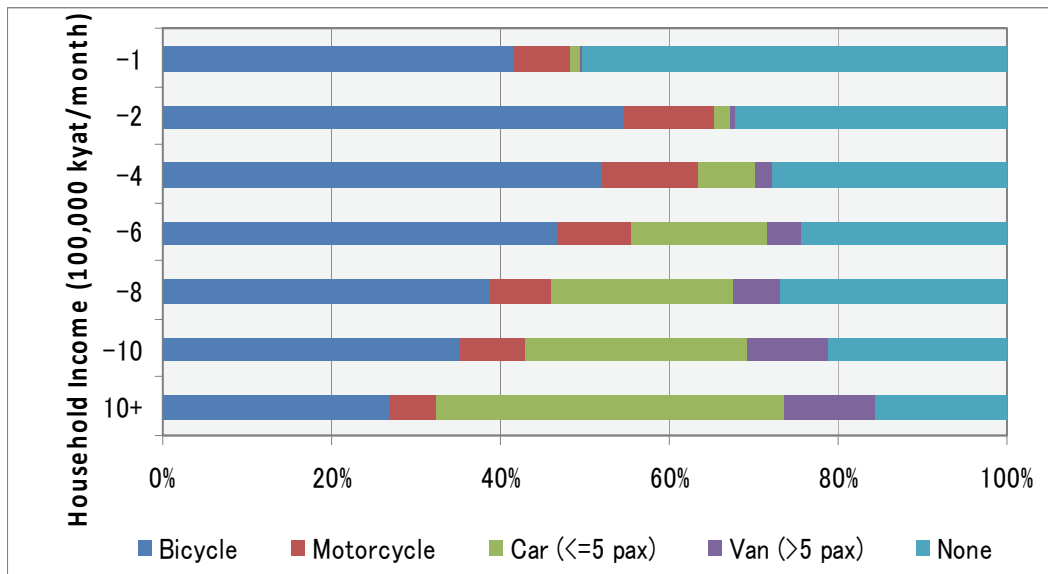
Source: Myanmar Statistical Yearbook, 2010

Figure 2.1.2.2 and Figure 2.1.2.3 show the household income distribution and vehicle ownership by income level. This data was extracted from the results of Household Interview Survey (HIS) which was conducted in 2012 over 10,000 randomly-sampled households in Yangon.



Source: HIS Results, 2012

Figure 2.1.2.2 Household Income Distribution



Source: HIS Results, 2012

Figure 2.1.2.3 Vehicle Ownership by Income Level

Monthly household income of more than 90% of the respondents is less than MMK 400,000 per month (approximately US\$ 360). And 40-50% of the families have bicycle and 5-10% of them own motorcycle, but 30-40% of them do not have any private mode of transport. Moreover, they can use bicycle or motorcycle in the rural area, but they can not use these for commuting to the urban center due to the prohibition of the two-wheel vehicles in the urban center. Therefore, most of the respondents living in the suburban areas have no choice but to use bus or the circular railway when they want to go to the urban center.

Car ownership rate of high income families, i.e. with income level of more than MMK 1,000,000 per month (US\$ 900), comprise 40% or almost half of the private car owners. At present, the number of families which belong to this level is quite limited. However, this will be alarming once economic situation is improved and motorization expanded rapidly. How to manage the rate of motorization will be a significant issue for the future transport system development in Yangon Region.

2) Current Transport Demand

Current transport demand is concentrated mainly in two corridors radiating from the existing urban center (CBD): the north-south corridor and the corridor between CBD and eastern districts (South Okkalapa, Dagon).

Bus serves as the prime mode of transport for people's mobility in Yangon, in particular, to and from places of work. The modal share of bus was reportedly to be 84% carrying 4.4 million per day in 2008. The modal share of circular railway was about 3% carrying 130,000 passengers per day. The modal share of private cars, including taxi was 11%. There were 233,000 vehicles registered in 2009 (37.5 vehicles per 1,000 population), which included 143,000 passenger cars (25 passenger cars per 1,000 population).

Based on the above information, current transport demand and modal share are estimated as shown in Table 2.1.2.2.

Table 2.1.2.2 Estimation of Current Transport Demand

| Year | Population (thousand) | Use Traffic Mode (trip/person) | Total Trip (1,000) | Vehicle Use and Modal Share | | | | | | | |
|------|-----------------------|--------------------------------|--------------------|---------------------------------|----------------|----------|-----------------------|-----------|---------------------------|-------------------------------------|------------------------|
| | | | | Ownership (veh/1000 population) | Vehicle (veh.) | Use Rate | Trip Average (trip/d) | Occupancy | Total Vehicle Trip (1000) | Vehicle Use Person Trips (thousand) | Modal Share of Vehicle |
| 2008 | 5,500 | 0.96 | 5,280 | 25 | 137,500 | 0.7 | 3.0 | 2.0 | 289 | 578 | 11% |
| 2009 | 5,740 | 1.00 | 5,740 | 25 | 142,869 | 0.7 | 3.0 | 2.0 | 300 | 600 | 10% |
| 2011 | 6,214 | 1.00 | 6,214 | 25 | 157,156 | 0.7 | 3.0 | 2.0 | 300 | 660 | 11% |

| Year | Total No. of Trips ('000) | Modal Share (%) | | | | | Person Trip ('000) | | | | |
|------|---------------------------|-----------------|-------|-----|--------|-------|--------------------|-------|-----|--------|-------|
| | | Rail | Bus | Car | Others | Total | Rail | Bus | Car | Others | Total |
| 2008 | 5,280 | 2.5% | 84.0% | 11% | 2.5% | 100% | 132 | 4,435 | 581 | 132 | 5,280 |
| 2011 | 6,214 | 2.1% | 84.0% | 11% | 2.9% | 100% | 130 | 5,220 | 684 | 180 | 6,214 |

Source: SUDP, JICA (2013)

Current trip rate (person trips per day per person) in Yangon Region is not more than 1.0. In comparison, the current trip rate (excluding "Walk" trip) in Yangon Region is lower than those in other cities in Asia mainly due to (1) lower car ownership ratio, (2) prohibition of motorcycle and bicycle in the urban area, and (3) less urban economic activities.

Table 2.1.2.3 shows the vehicle ownership in other Asian countries. As compared with the vehicle ownership of 67 vehicles per 1,000 population in Thailand and 325 in Malaysia, 25 of the same unit in Yangon (only passenger cars) is still very low.

Table 2.1.2.3 Vehicle Ownership by Per-capita Income

| Country | Year | GDP Per-capita (constant 2005 USD) | Passenger Cars per 1000 population |
|-----------|------|------------------------------------|------------------------------------|
| Thailand | 2010 | 3,164 | 67 |
| Malaysia | 2010 | 6,303 | 325 |
| Indonesia | 2010 | 1,570 | 37 |
| Korea | 2010 | 20,625 | 276 |
| Japan | 2010 | 36,473 | 453 |

Source: World Bank

Recently, the foreign investments in Myanmar are growing rapidly as a result of the relaxation of economic sanctions. The current population of 6 million is projected to increase up to 11.7 million by 2040. In addition, with the projected increase in the average annual income level of Yangon in the future, vehicle ownership and usage of the motor vehicles is expected to reach a high level which may lead to serious traffic congestions such as those being experienced in Bangkok, Jakarta, and Manila.

2.2 Main Transport Components

2.2.1 Road

1) Road Network

The Greater Yangon is connected with the neighboring countries of GMS (The Greater Mekong Subregion) and BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation) through the Asian Highways (AH) as shown in Figure 2.2.1.1.

The four (4) union highways in Myanmar crossing the national border are designated as parts of Asian Highway in Myanmar. These four routes are also partly overlapped with the three Economic Corridors in GMS, namely, Western Economic Corridor (AH-1) to Kun Ming in China, East-West Economic Corridor to Da Nang in Vietnam, and Southern Economic Corridor to Bangkok in Thailand and Ho Chi Minh City in Vietnam.

The present condition of the international highways in Myanmar (5,138 km in total length) is summarized in Table 2.2.1.1. Figure 2.2.1.2 shows the road network of the whole country.



Source: YUTRA Project Team

Figure 2.2.1.1 Asian Highway and GMS Network in and around Myanmar

Table 2.2.1.1 International Highways in Myanmar

| International Highway | | Union Highway | Length (km) | | | Remarks |
|-----------------------|---------------|--|-------------|-----|-------|------------------------|
| Asian Highway | ASEAN Highway | | BOT | PW | Total | |
| AH-1 | A-1 | Myawady-Kawkareik-Baann-Tathone-Payargyi-Taungoo | 923 | 560 | 1,484 | |
| AH-2 | A-2 | Pynmanar-Meikhtila-Mandalay-Monywa-Gantgaw-Tamu Road | - | - | - | (A-1,A-2) overlap part |
| AH-2 | A-2 | Tachileik-Kyaingtone-Taunggyi-Meikhtila-Monywa | 718 | 802 | 1,521 | |

| International Highway | | Union Highway | Length (km) | | | Remarks |
|-----------------------|---------------|---|-------------|-------|-------|------------------------|
| Asian Highway | ASEAN Highway | | BOT | PW | Total | |
| AH-1 | A-1 | Gantgaw-Kalay-Tamu Road | | | | (A-1,A-2) overlap part |
| AH-3 | A-3 | Kyaingtone-Monglr Road | - | 90 | 90 | |
| AH-14 | A-14 | Mandalay-Lasio-Theinni-Koutkhing-Muse Road | 464 | - | 477 | |
| AH-111 | R-7 | Loilen-Laecha-Panktu-Thipaw Road | - | 240 | 240 | |
| AH-112 | - | Thehtone-Mawlamyine-Yae-Dawai-Meik-Kawtoug Road | 353 | 768 | 1,122 | |
| AH-112 | - | Laynyar-Thailand border (KaloneLawi) | - | 60 | 60 | |
| AH-123 | - | Htawal-Thailand border (Princess valley) | - | 142 | 142 | |
| Total | | | 2,460 | 2,665 | 5,138 | |

Source: 30 Years Long-term Plan, MOC



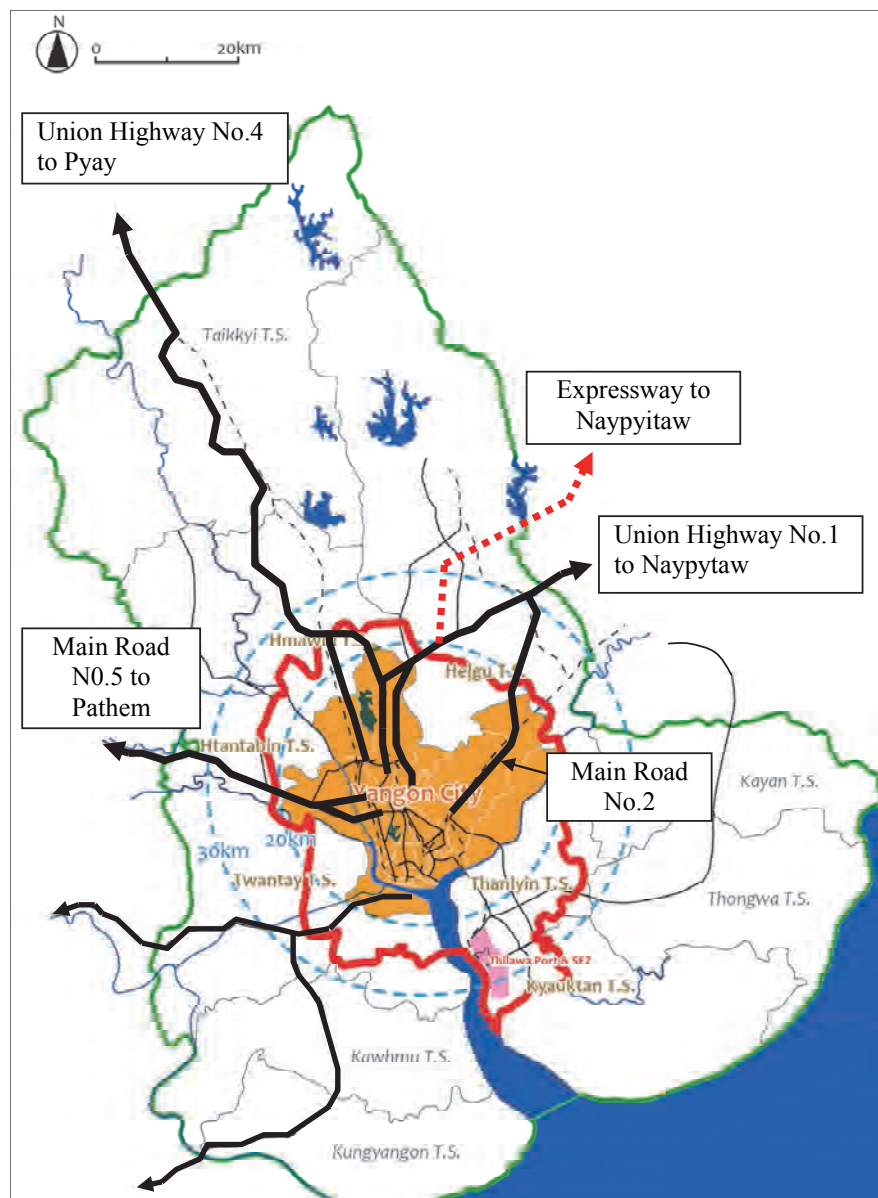
Source: YUTRA Project Team

Figure 2.2.1.2 Road Network in Myanmar

The Yangon-Naypyitaw-Mandalay Expressway (586.2 km) became open in 2009, with 2 lanes per direction (total four (4) lanes) and the speed limit is at 100 km/hour. At present, no heavy trucks are allowed to use the expressway.

The gateways to the nationwide road network from Greater Yangon are shown in Figure 2.2.1.3. Main roads located at the gateways are listed below:

- Yangon-Mandalay Expressway (to Naypyitaw and Mandalay)
- Union Highway No.1 & No.2 (to Naypyitaw and Mandalay)
- Main Road No.3 (to Naypyitaw and Mandalay via. Union Highway No.1)
- Union Highway No.4 (to Main Road No.5 (to Pathem in Ayeyarwaddy Region) Pyay)



Source: YUTRA Project Team

Figure 2.2.1.3 Gateways to Nationwide Road Network

Of these gateway roads, the Union Highway No.1 is one of most important backbone roads

to connect Naypyitaw and Mandalay with the Greater Yangon which is a part of Asian Highways and ASEAN Highways (AH-1).

2) Road Development and Maintenance

According to the regulation of MOC (Department of Human Settlement and Housing Development), roads are classified into the following six (6) types. (Table 2.2.1.2)

Table 2.2.1.2 Road Classification of MOC (DHSHD)

| Road Classification | Functions and Design Features | ROW (m) | Cross Section Elements | Speed (km/h) |
|---------------------|---|----------------------------|--|--------------|
| Expressways | Provide metropolitan and city continuity and unity. Limited access: Some channelized grade crossing and signal at major intersection. Parking prohibited. | 45-90 | 3.6m per lane, 2.4-3.0m shoulders, 2.4-7.2m median strip | 80 |
| Major Roads | Provide unity through contiguous urban areas. Usually from boundaries for neighborhoods. Minor access control; parking generally prohibited. | 30-45 | Minimum 4 lanes; 1.8-4.2m median strip | 56-72 |
| Secondary Roads | Main feeder streets. Signals where needed; Stop signs on side streets. Occasionally from boundaries from neighborhoods. | 24-30 | 2@3.6m or 4@3.6m traffic lanes; 2@3.0m parking lanes | 56-64 |
| Collector Streets | Main interior streets. Stop sign on side streets | 18-24 | 2@3.6m traffic lanes; 2@3.0m parking lanes | 48 |
| Local Streets | Local service streets. Non conductive to through traffic | 12-18 | 2@2.7-3.3m traffic lanes | 40 |
| Cul-de-sac | Street open at only one end, with provision for a practical turnaround at the other | 9 (27m dia. turnaround) | | |

Source: Regulation of DHSHD, MOC, Sep. 2010: converted to metric by YUTRA Project Team

Additionally, MOC is still using the “Design Standard for Highways Geometric Road Standard” published in 1969. This old standard specifies the road design classification as summarized in Table 2.2.1.3 covering only from single lane to 4 (2+2) lanes roads.

Table 2.2.1.3 Road Classification of MOC (PW)

| Design Class | | | D-VI | D-V | D-IV | D-III | D-II | D-I |
|------------------------------|-------------|----|-------------|--------|---------------------------------|---------------------------------|-------------------------------|-----------|
| | | | Single Lane | | 2 lanes | | 4 lanes | |
| Annual Average Daily Traffic | | | Under 50 | 50-200 | 200-500 | 500-2,500 | Over 2,500 | |
| Design Speed (km/h) | Flat | 80 | 80 | 60 | 60 | 113 | 113 | |
| | Rolling | 64 | 64 | 80 | 80 | 97 | 97 | |
| | Mountainous | 48 | 48 | 64 | 64 | 80 | 80 | |
| Number of Lanes | | | 1 | 1 | 2 | 2 | 4 | 4 divided |
| Width of Lanes (m) | | | 3.7 | 4.9 | 2.7 | 3.4 (min.) 3.7 (desirable) | 3.4 (min.) 3.7 (desirable) | 3.7 |
| Right of Way (m) | | | 30.5 | 30.5 | 30.5 (min.) 45.7 (desirable) | 30.5 (min.) 45.7 (desirable) | 45.7 | 91.4 |

Source: Geometric Road Standard, 1969, MOC: converted to metric by YUTRA Project Team

Furthermore, YCDC classifies the type of roads as shown below.

- Main Road: Connects major cities and towns with paved type links (incl. Union Highways inside YCDC area)
- Collector Road: Secondary paved roads connecting cities/towns with Main Roads
- Minor Road: Other roads connecting towns

3) Road Length and Surface Conditions

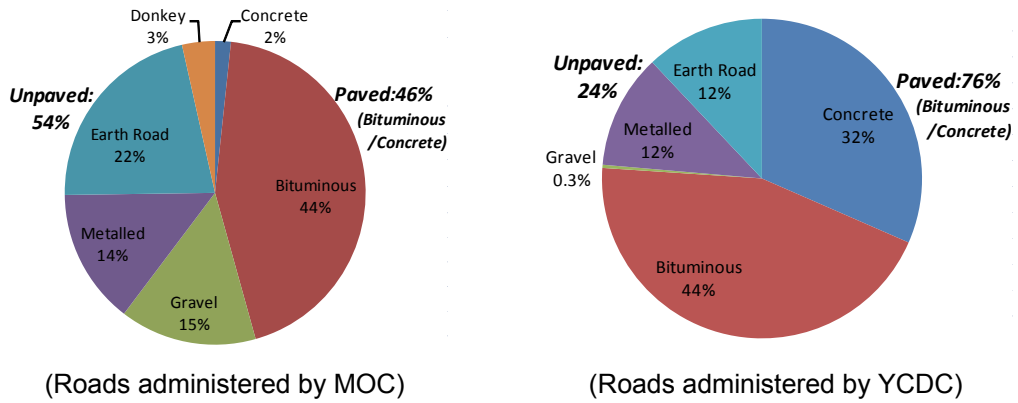
Table 2.2.1.4 and Figure 2.2.1.4 show the road length in Myanmar by responsible authority and by type of road surface.

Table 2.2.1.4 Road Length and Responsible Authorities in Myanmar (km)

| Responsible Authorities | Type of Road Surface | | | | | | Total |
|---|----------------------|---------------|---------------|---------------|---------------|--------------|----------------|
| | Concrete | Bituminous | Gravel | Metalled | Earth Road | Donkey | |
| MINISTRY OF CONSTRUCTION, DEPARTMENT OF PUBLIC WORKS | | | | | | | |
| Highways | 612 | 11,733 | 2,441 | 2,700 | 1,974 | 44 | 19,503 |
| Regional & State Roads | 50 | 5,452 | 3,300 | 2,941 | 6,497 | 1,340 | 19,580 |
| Sub-total | 661 | 17,185 | 5,740 | 5,642 | 8,471 | 1,384 | 39,083 |
| Yangon Region (under MOC) | 61 | 648 | 127 | 73 | 71 | - | 980 |
| MINISTRY OF PROGRESS OF BORDER AREA AND NATIONAL RACES | | | | | | | |
| Urban Road | 7 | 4,881 | 2,216 | 661 | 3,509 | - | 11,273 |
| Village & Border Road | 120 | 4,073 | 17,042 | 4,977 | 55,889 | - | 82,100 |
| Sub-total | 127 | 8,954 | 19,257 | 5,638 | 59,398 | - | 93,373 |
| YANGON CITY DEVELOPMENT COMMITTEE (YCDC) | | | | | | | |
| Sub-total | 1,240 | 1,748 | 13 | 455 | 473 | - | 3,928 |
| MANDALAY CITY DEVELOPMENT COMMITTEE | | | | | | | |
| Sub-total | 11 | 573 | 120 | - | 310 | - | 1,014 |
| NAYPYITAW CITY DEVELOPMENT COMMITTEE | | | | | | | |
| Sub-total | 246 | 129 | 43 | 735 | 1,131 | - | 2,284 |
| ARMY CORPS OF ENGINEER | | | | | | | |
| Sub-total | 393 | 62 | 605 | 166 | 6,823 | - | 8,050 |
| MINISTRY OF ELECTRIC POWER 1 (MOEP-1) | | | | | | | |
| Sub-total | 48 | 89 | 542 | - | 280 | - | 959 |
| TOTAL | 2,726 | 28,739 | 26,320 | 12,635 | 76,885 | 1,384 | 148,690 |

Source: Department of Public Works, MOC, reported in 2012

54% of roads under control of MOC are still unpaved. On the other hand, 76% of roads under control of YCDC is paved.



Source: YUTRA Project Team, Department of Public Works, MOC, reported in 2012

Figure 2.2.1.4 Surface Condition of Roads under MOC and YCDC

4) Service Level of Roads

Table 2.2.1.5 presents the “Volume/Capacity Ratio”(V/C>0.9 means “saturated”) estimated by the Study Team based on the traffic counting survey conducted in 2013 and other relevant information. It is revealed that most of 2 (1+1) lanes roads are already saturated in the peak hours and immediate measures shall be taken to enlarge the road network.

Table 2.2.1.5 Volume/Capacity Ratio of Major Roads

| Name of Roads | Time | Direction | Hourly Traffic Volume per Direction (pcu) | Capacity per lane (pcu/lane/hr) | Current Number of Lanes per direction | Volume/ Capacity Ratio (V/C) | Source of Traffic Volume |
|-------------------------|--------------|------------|---|---------------------------------|---------------------------------------|------------------------------|--------------------------|
| Insein Rd | Morning | - | 957 | 1,200 | 3 | 0.27 | See Note 1) |
| | Evening Peak | - | 1,028 | 1,200 | 3 | 0.29 | See Note 1) |
| Pyay Rd | Morning | - | 3,524 | 1,200 | 3 | 0.98 | See Note 1) |
| | Evening Peak | - | 2,847 | 1,200 | 3 | 0.79 | See Note 1) |
| Kabar Aye Pagoda Rd | Morning | - | 2,656 | 1,200 | 3 | 0.74 | See Note 1) |
| | Evening Peak | - | 2,880 | 1,200 | 3 | 0.80 | See Note 1) |
| Mahabandula Rd | Morning Peak | Inbound | 1,782 | 1,200 | 3 | 0.50 | See Note 2) |
| | | Outbound | 1,009 | 1,200 | 3 | 0.28 | See Note 2) |
| | Evening Peak | Inbound | 1,325 | 1,200 | 3 | 0.37 | See Note 2) |
| | | Outbound | 2,102 | 1,200 | 3 | 0.58 | See Note 2) |
| Lower Pazundaung Rd | Morning | - | 2,105 | 1,000 | 2 | 1.05 | See Note 1) |
| | Evening Peak | - | 2,144 | 1,000 | 2 | 1.07 | See Note 1) |
| Swe Dagon Pagoda Rd | Morning | - | 2,569 | 1,000 | 2 | 1.28 | See Note 1) |
| | Evening Peak | - | 2,645 | 1,000 | 2 | 1.32 | See Note 1) |
| No.2 Main Rd | Morning Peak | Inbound | 1,310 | 1,200 | 2 | 0.55 | See Note 2) |
| | | Outbound | 1,202 | 1,200 | 2 | 0.50 | See Note 2) |
| | Evening Peak | Inbound | 1,654 | 1,200 | 2 | 0.69 | See Note 2) |
| | | Outbound | 885 | 1,200 | 2 | 0.37 | See Note 2) |
| Lower Kyee Min Daing Rd | Morning Peak | Northbound | 1,219 | 1,000 | 2 | 0.61 | See Note 2) |
| | | Southbound | 1,293 | 1,000 | 2 | 0.65 | See Note 2) |
| | Evening Peak | Northbound | 1,455 | 1,000 | 2 | 0.73 | See Note 2) |
| | | Southbound | 1,307 | 1,000 | 2 | 0.65 | See Note 2) |
| Kyee Min Daing Rd | Evening Peak | Northbound | 943 | 1,000 | 2 | 0.47 | See Note 2) |
| | | Southbound | 1,369 | 1,000 | 2 | 0.68 | See Note 2) |
| | Morning Peak | Northbound | 1,004 | 1,000 | 2 | 0.50 | See Note 2) |
| | | Southbound | 1,178 | 1,000 | 2 | 0.59 | See Note 2) |
| Hlaing River Rd | Evening Peak | Inbound | 990 | 1,200 | 2 | 0.41 | See Note 2) |
| | | Outbound | 721 | 1,200 | 2 | 0.30 | See Note 2) |
| | Morning Peak | Inbound | 887 | 1,200 | 2 | 0.37 | See Note 2) |
| | | Outbound | 869 | 1,200 | 2 | 0.36 | See Note 2) |
| Parami Rd | Evening Peak | Inbound | 1,554 | 1,200 | 1 | 1.29 | See Note 2) |
| | | Outbound | 757 | 1,200 | 1 | 0.63 | See Note 2) |
| | Morning Peak | Inbound | 985 | 1,200 | 1 | 0.82 | See Note 2) |
| | | Outbound | 971 | 1,200 | 1 | 0.81 | See Note 2) |
| Min Nandar Rd | Morning Peak | Inbound | 1,266 | 1,000 | 1 | 1.27 | See Note 2) |
| | | Outbound | 1,549 | 1,000 | 1 | 1.55 | See Note 2) |
| | Evening Peak | Inbound | 1,465 | 1,000 | 1 | 1.47 | See Note 2) |
| | | Outbound | 1,564 | 1,000 | 1 | 1.56 | See Note 2) |
| Khay Mar Thi Rd | Evening Peak | Inbound | 1,007 | 1,000 | 1 | 1.01 | See Note 2) |
| | | Outbound | 1,001 | 1,000 | 1 | 1.00 | See Note 2) |
| | Evening Peak | Inbound | 966 | 1,000 | 1 | 0.97 | See Note 2) |
| | | Outbound | 1,246 | 1,000 | 1 | 1.25 | See Note 2) |
| Bayint Naung Rd | Morning Peak | Inbound | 1,005 | 1,000 | 1 | 1.01 | See Note 2) |
| | | Outbound | 875 | 1,000 | 1 | 0.87 | See Note 2) |
| | Evening Peak | Inbound | 858 | 1,000 | 1 | 0.86 | See Note 2) |
| | | Outbound | 1,000 | 1,000 | 1 | 1.00 | See Note 2) |
| Thaketa Bridge | Morning Peak | Inbound | 869 | 1,000 | 1 | 0.87 | See Note 2) |
| | | Outbound | 856 | 1,000 | 1 | 0.86 | See Note 2) |
| | Evening Peak | Inbound | 887 | 1,000 | 1 | 0.89 | See Note 2) |
| | | Outbound | 820 | 1,000 | 1 | 0.82 | See Note 2) |
| Shan Rd | Evening Peak | Northbound | 1,220 | 1,000 | 1 | 1.22 | See Note 2) |
| | | Southbound | 912 | 1,000 | 1 | 0.91 | See Note 2) |
| | Evening Peak | Northbound | 898 | 1,000 | 1 | 0.90 | See Note 2) |
| | | Southbound | 1,060 | 1,000 | 1 | 1.06 | See Note 2) |

Note 1) : Strategic Urban Development Plan of Greater Yangon, JICA, 2013

Note 2) : Traffic Counting Surveys by Study Team in 2013

Source: YUTRA Project Team

5) Administrative Classification and Task Description

The roads inside Yangon City with 33 townships are under the responsibility of YCDC and the roads outside the above mentioned 33 townships are administered by Ministry of Construction (MOC) and Yangon Region Development Committee (YRDC) under Ministry of Progress of Border Area and National Races.

The major bridges across the Yangon River, Bago River and Pazundaung Creek in Yangon City are maintained by Ministry of Construction, and the bridges across the railway track are under the responsibility of Myanmar Railways under Ministry of Railway Transportation.

6) Other Road Related Facilities

Truck Terminals and Inland Container Depot (ICD)

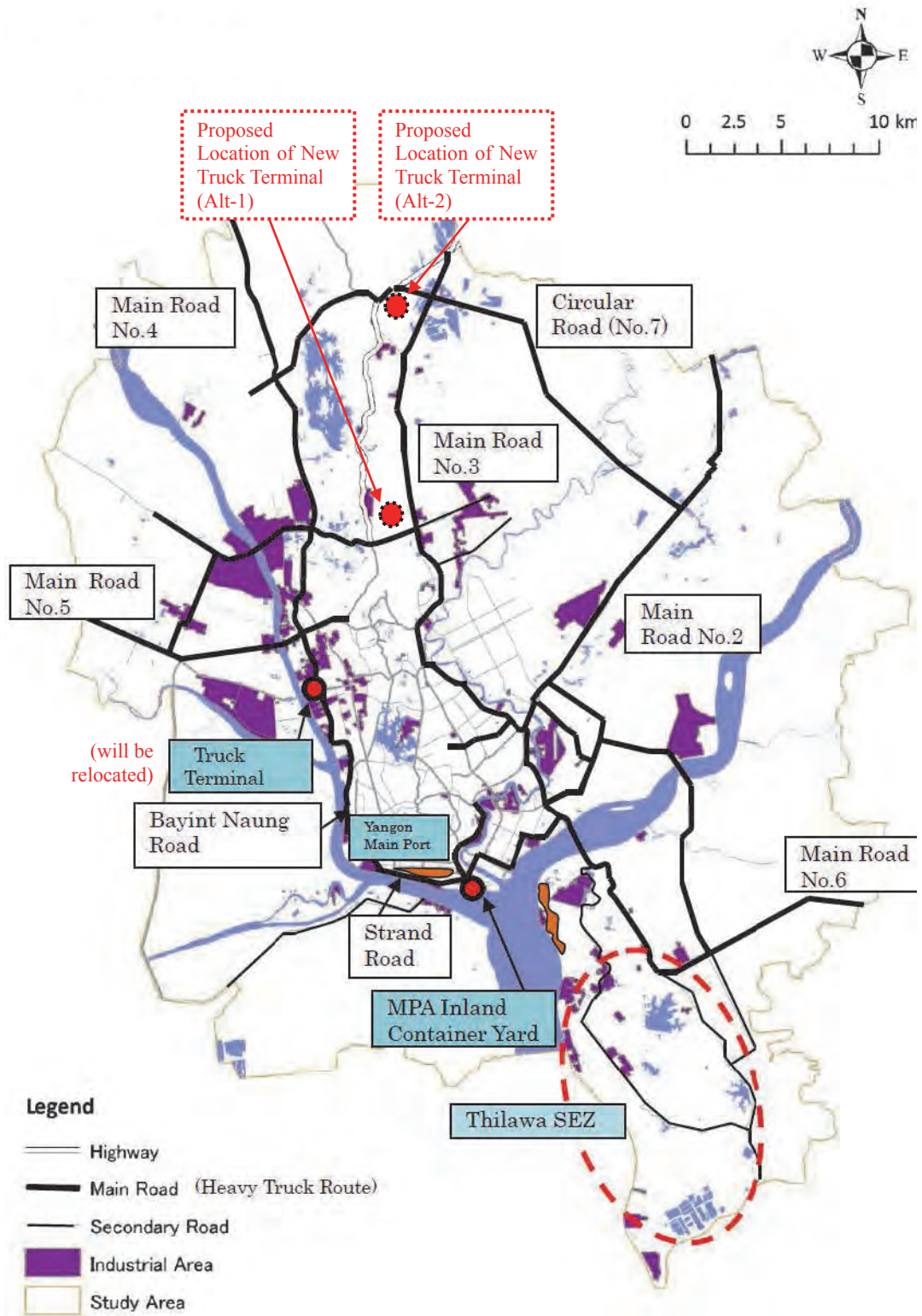
Figure 2.2.1.5 shows the main roads connecting the ports, logistic facilities and industrial areas.

Originally, industrial areas were developed along the Hlaing River in the west parts of the Yangon City and along the Bazundaung Creek. Industrial areas in the northwest area are connected with the existing Yangon Port by the main road No.4, the Bayint Naung Road and the Strand Road. The Thilawa SEZ is also linked with the CBD by the Thanlyin Bridge and the Strand Road. There are some industrial areas along the main road No.2. Another industrial area is located near the Dagon Bridge. As loading limit of the existing Thanlyin Bridge is 30 ton, many heavy trucks use the Dagon Bridge (maximum loading is 75 ton).

There are more than 30 truck centers in Yangon City and the largest one, Bayint Naung Truck Terminal, is located near the Bayint Naung Bridge. The terminal is located inside the densely developed area and causing traffic congestion in Baying Naung area which is well-known as one of serious congestion area in the city. Highway Freight Transportation Services Association (HFTSA) which operates part of the terminal is proposing Union Minister relocation of the terminal to suburban area shown in Figure 2.2.1.5. Alt-1 is located in military's land and Alt-2 is inside the land owned by YCDC and Alt-2 will be a most possible option according to HFTSA officials.

HFTSA has three check points outside Yangon City, 1) No.1(Yangon-Bago Route), 2) No.2(Yangon-Pyae Roate), 3) No.3(Yangon-Delta Route), in order to check the cargo volume of the trucks for all directions.

When the Bayingt Naung Truck Terminal is relocated to the location of Alt-2 (or Alt-1), traffic congestion inside the city will be alleviated by diversion of the truck route from the city area. The existing Main Road No.2 (Union Highway) will be one of the main logistic route to access the new terminal but the road has currently only two lanes in the suburbs and it will become difficult to handle a large number of heavy trucks generated from Yangon Port and Thilawa SEZ going and coming to/from the nationwide road network via Union Highway No.1. Therefore, it will be necessary to expand the Main Road No.2 to at least four lanes before the Thilawa SEZ is completed by 2015.



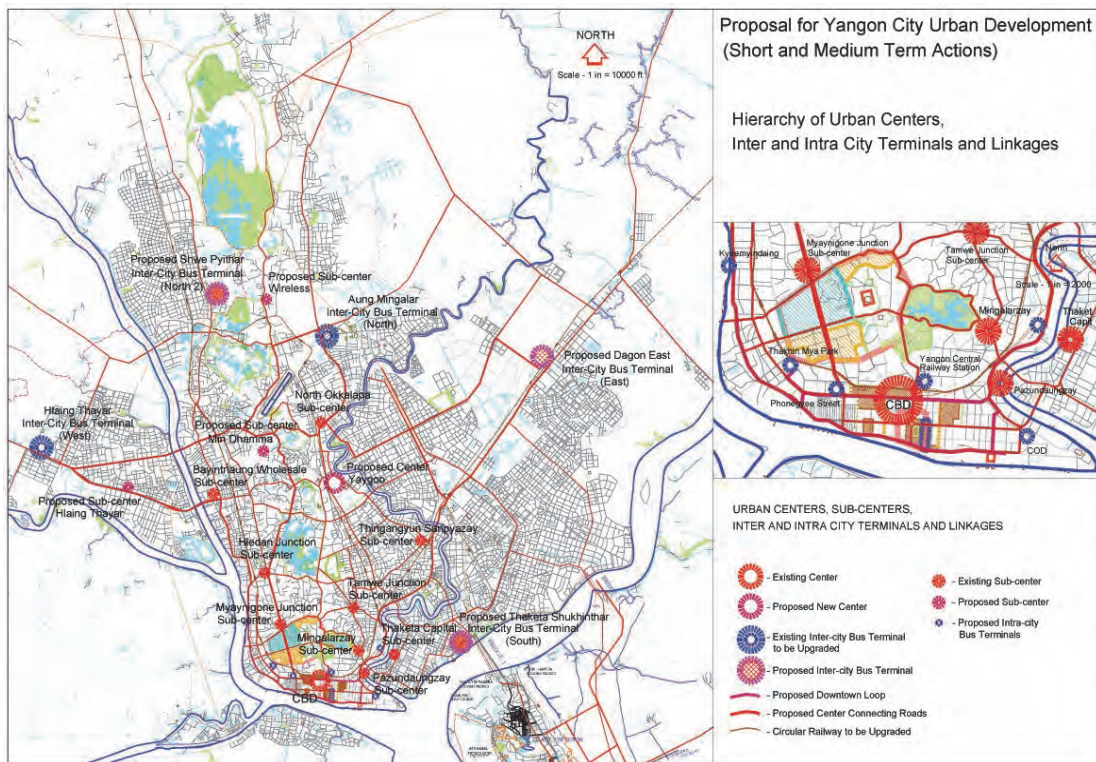
Source: based on the information from the Traffic Regulation Control Committee, YCDC

Figure 2.2.1.5 Connectivity with Ports, Logistic Facilities and Industrial Areas

Bus Terminals

To improve inter and intra city connectivity, followings are currently planned.

- Upgrading of existing bus terminals (North Okkalapa, Aung Mingalar Bus Terminal, Hlaing Thayar Bus Terminal)
- New bus terminals at Dagon East, Thaketa Shukhinthar and Shwe Pyithar
- Efficient use of the circular railway through upgrading and integration with intra-city bus terminals
- Reducing traffic congestion in Yangon downtown through setting up intra-city bus terminals/interchanges at the edges of CBD and using circular bus lines within the downtown loop



Source: DHSHD

Figure 2.2.1.6 Existing and Proposed Bus Terminals

Pedestrian Facilities/Bridges

Driver's manners are comparatively good in case of passenger cars. However, the problem is bus operations which often occupy one lane to pick up passengers alongside and occasionally stay standby a long time until the bus is full. It is pointed out also that the pedestrian priority rule is not strictly observed and crossing roads is often dangerous for pedestrians. In order to reduce the number accidents, measures such as construction of pedestrian crossing bridges and provision of pedestrian crossing with traffic signal in order to separate vehicles and pedestrian movements and establishment of bus bays are necessary together with the traffic safety education.

2.2.2 Railway

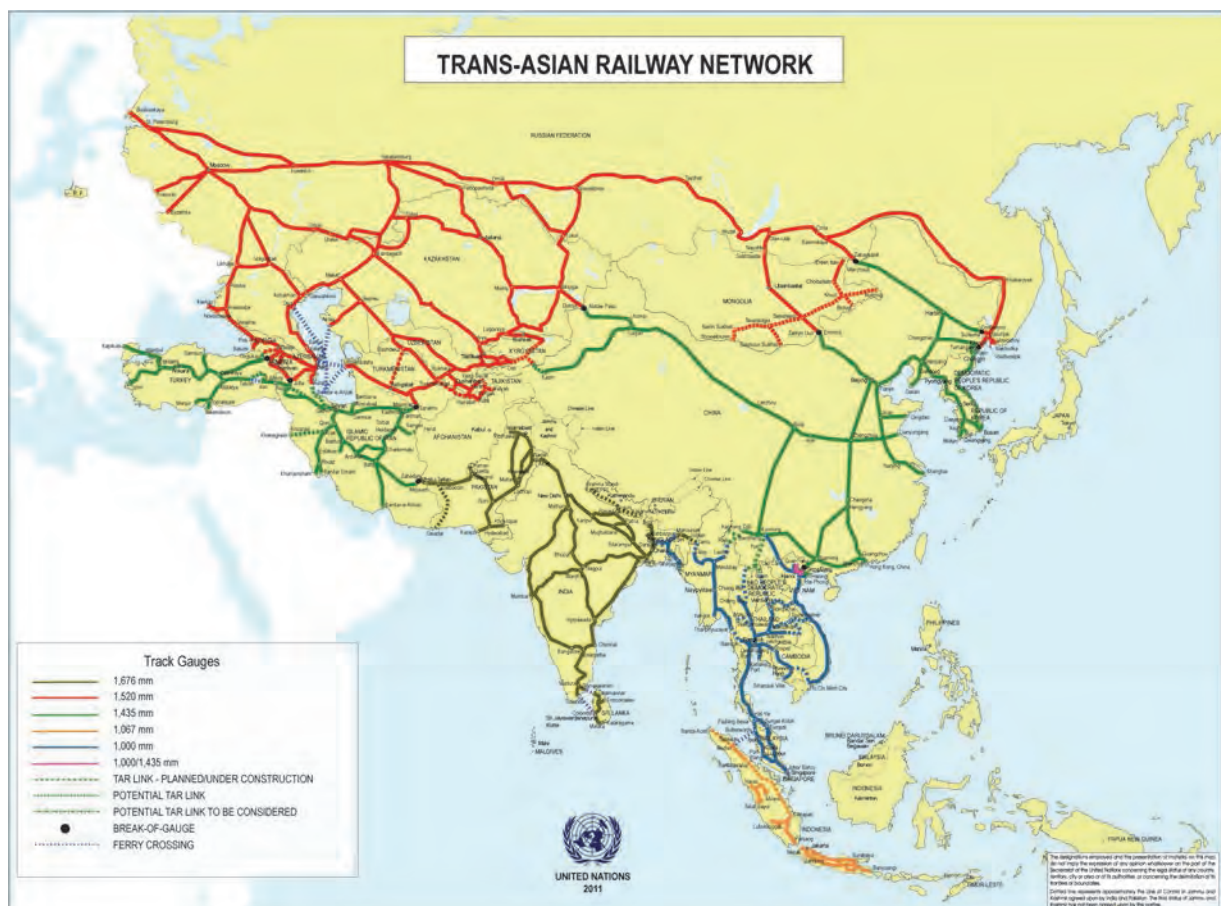
1) Railway Network and Infrastructures

(1) Overall Railway Network in Myanmar

The history of railway transportation in Myanmar had started its commencement operation between Yangon and Pyay on May 1, 1877. The Yangon–Mandalay Route is the most major track line in Myanmar. The road has been operating since March 1, 1889. The Thazi-Shwenyang Route is also one of the target routes in this survey. It was opened on March 2, 1921, about 90 years ago.

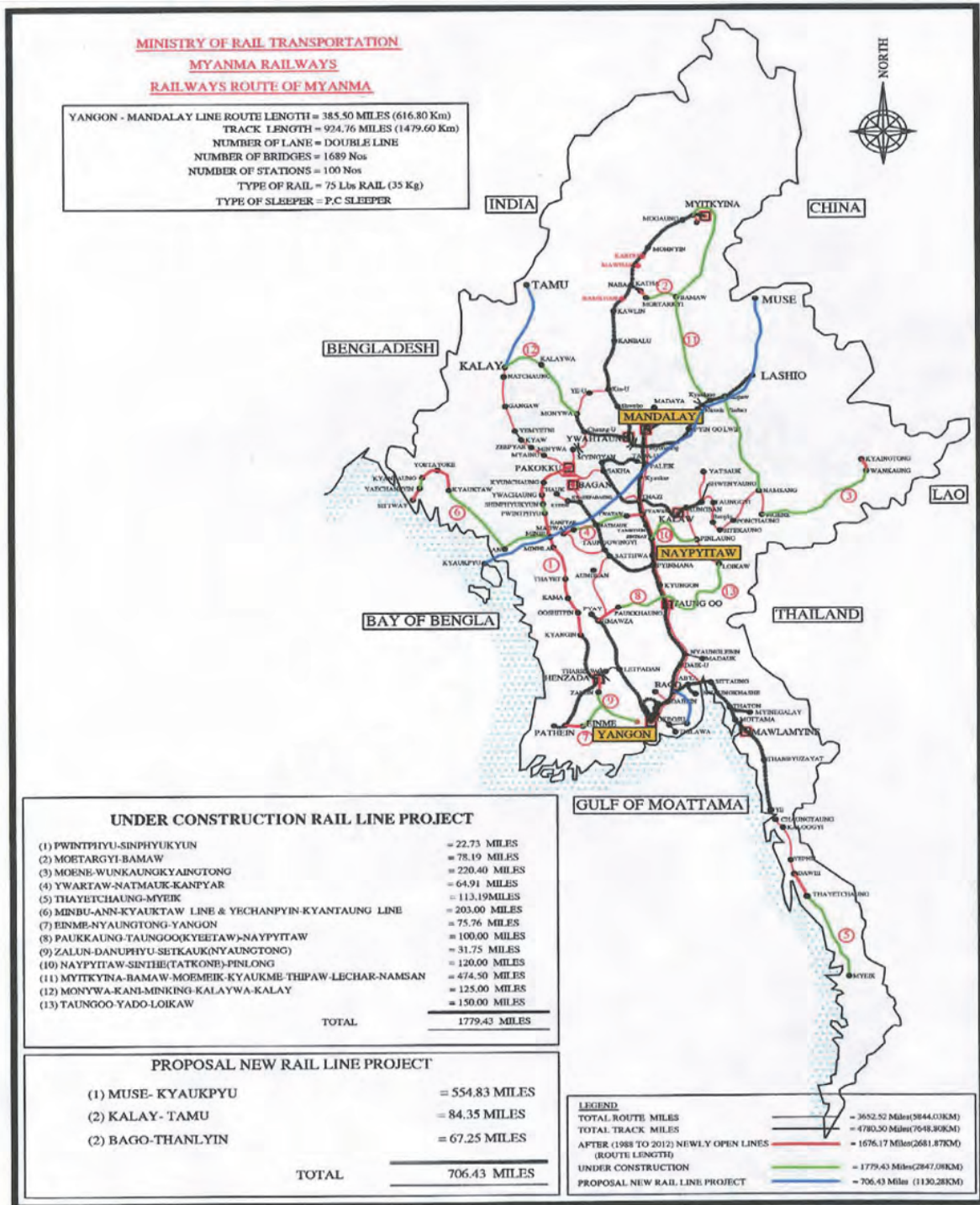
Myanmar has a 3,652.52-mile (5,878.16 km) railway transportation network, but no international rail connection with surrounding countries at this moment. There are 926 railway stations being operated by Myanmar Railways, a state-owned railway company under the Ministry of Railways as of March 2012, as shown in Table 2.2.2.1. In addition, there are 11,659 railway bridges and 12 railway tunnels in Myanmar.

Figure 2.2.2.1 shows Trans-Asian Railway Network proposed by ESCAP in 2011 and Figure 2.2.2.2 shows the existing Myanmar railway transportation network routes, under construction, to be developed in the future. ESCAP proposed 12,600 km south-east Asian corridor connecting Myanmar, Cambodia, Indonesia, Singapore, Thailand and Viet Nam.



Source : ESCAP

Figure 2.2.2.1 Trans-Asian Railway Network



Source : Myanmar Railways

Figure 2.2.2.2 Railway Transportation Network in Myanmar

The main railway transportation network in Myanmar is formed by the 19 sections in 11 lines, with a total length of 2932 mi (4717 km) as shown in Table 2.2.2.2.

Table 2.2.2.1 Railway Length and Number of Stations in Each Region

| Region | No. of Stations | Route Length | |
|--------------------|-----------------|--------------|----------|
| | | (mi) | (km) |
| Ayeyarwaddy Region | 53 | 198.50 | 319.45 |
| Bago Region | 116 | 461.09 | 742.05 |
| Chin State | - | - | - |
| Kachin State | 33 | 122.00 | 196.34 |
| Karen State | 6 | 16.00 | 25.75 |
| Kayah State | 3 | 8.59 | 13.82 |
| Magway Region | 162 | 705.35 | 1,135.15 |
| Mandalay Region | 183 | 657.43 | 1,058.03 |
| Mon State | 59 | 220.70 | 355.18 |
| Rakhaning State | 20 | 54.00 | 86.90 |
| Sagaing Region | 89 | 442.56 | 712.23 |
| Shan State | 103 | 501.86 | 807.67 |

Source: Facts about Myanmar Railways 2011-2012

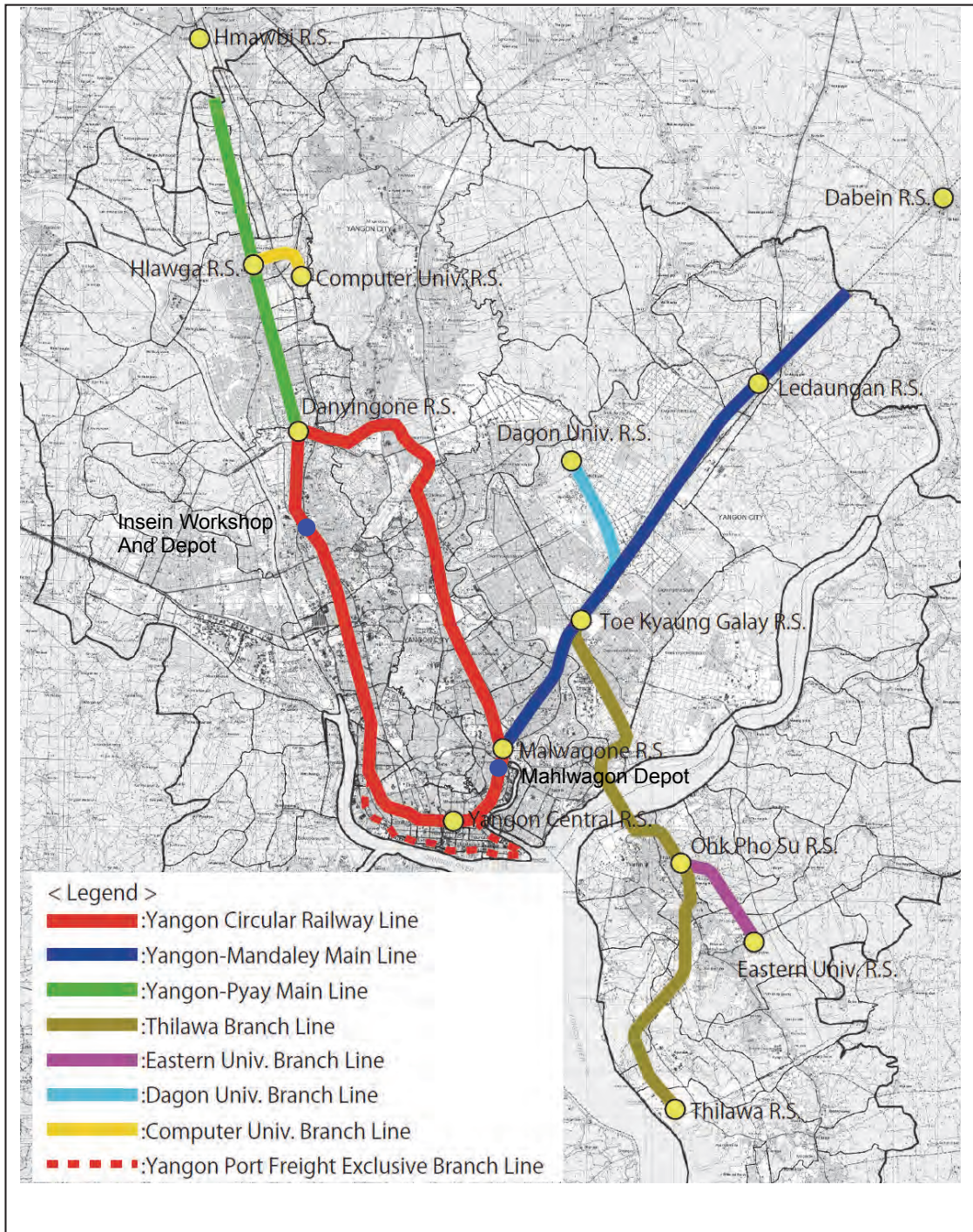
Table 2.2.2.2 The Major Track Lines and Their Lengths

| Line | Section | Route Length | |
|------------------|----------------------------|--------------|----------|
| | | (mi) | (km) |
| Mandalay | Yangon-Mandalay | 385.50 | 620.40 |
| | Mandalay-Madaya | 17.50 | 28.16 |
| Pyay | Yangon-Pyay | 161.00 | 259.10 |
| | Pyay-Satthwa | 90.35 | 145.40 |
| Mawlamyine | Yangon-Mottama | 173.00 | 278.42 |
| | Thahton-Myaingale | 28.15 | 45.30 |
| Kachin State | Myohaung-Myitkyina | 340.00 | 547.18 |
| Monywa | Ywataung-Budelin-YeU-KhinU | 136.38 | 219.48 |
| | Chaung U-Kalay | 278.40 | 448.04 |
| Northern Shan | Myohaung-Lashio | 178.00 | 286.46 |
| Southern Shan | Thazi-Lawksawk | 135.50 | 218.07 |
| | Shwenyaung-Taunggyi-Moenei | 198.13 | 318.86 |
| | Aungban-Loikaw | 104.00 | 167.37 |
| Mingyan | Thazi-Mingyan | 69.75 | 112.25 |
| | Paleik-Mingyan | 68.25 | 109.84 |
| | Sakha-Kyauk Padaung | 64.81 | 104.30 |
| Kyeeni | Pyinmana-Kyeeni | 162.25 | 261.12 |
| Ayeyarwaddy | Pathein-Kyangin | 147.00 | 236.57 |
| Mon, Tanintheryi | Mawlamyine-Ye-Dawei | 192.75 | 310.20 |
| | Total | 2,930.72 | 4,716.54 |

Source: Facts about Myanmar Railways 2011-2012

(2) Railway Network in the Study Area

The current railway network in the Study area is composed of eight lines, which include three main lines and five branch lines (including one exclusive freight line), as shown below (Figure 2.2.2.3). The features of each line are shown in Table 2.2.2.3.



Source: YUTRA Project Team

Figure 2.2.2.3 Current Railway Network in the Study Area

Table 2.2.2.3 Current Railway Routes in the Study Area

| Route Name | Section | Length (km) | No. of Railway Station (R.S.) | Single track/ Double track | No. of Daily Operated Train | Remarks |
|---|--|--|-------------------------------|---|--|---|
| Main Line | | | | | | |
| Yangon Circular Railway Line | Whole Yangon Circular Railway | 47.5 km | 38 | Double-double Track: (Yangon–Malwagone:3.6km) Double Track: (Remaining Section) | Yangon – Malwagone: 102 Malwagone – Paywateikkone: 38 Paywateikkone – Mingaladon: 34 Mingaladon – Danyingone:14 Danyingone – Insein: 54 Insein – Yangon: 79 | |
| Yangon – Mandalay Main Line | Malwagone R.S. – a point between Ledaungan R.S. and Dabein R.S. | 28.3 km | 6 | Double Track | Malwagone – Toe Kyaung Galay: 64 Toe gyau nggalay – Ywarthagyi: 16 | |
| Yangon – Pyay Main Line | Danyingone R.S.- Hlawga R.S.- a point between Hlawga R.S. and Hmawbi R.S. | 20.1 km (10.5 km +9.6 km) | 4 | Double Track: (Yangon– Hlawga) Single Track: (Hlawga – Hmawbi) | Danyingone – Hlawkar: 40 | |
| Branch Line | | | | | | |
| Thilawa Branch Line | Toe Kyaung Galay R.S. – Ohk Pho Su R.S. – Thilawa R.S. | 26.2 km | 5 | Single Track | Toe Kyaung Galay – Ohk Pho Su: 18 Ohk Pho Su – Thilawa: 4 | |
| Eastern Univ. Branch Line | Ohk Pho Su R.S. – Eastern Univ. R.S. | 5.4 km | 1 | Single Track | 12 | |
| Dagon Univ. Branch Line | Toe Kyaung Galay R.S. – Dagon Univ. R.S. | 8.0 km | 1 | Single Track | 18 | |
| Computer Univ. Branch Line | Hlawga R.S. – Computer Univ. R.S. | 2.9 km | 1 | Single Track | 4 | |
| Yangon Port Freight Exclusive Branch Line | Pazundaung R.S. – Botahtung Freight R.S. – Wadan Freight R.S. - Kyeem Myin Daing R.S | 9.9 km | 2 | Single Track | 2 to 3 (irregular trains, Botahtung Sta. / Dahnitaw Oil Sta. – Malwagone Sta.) 0 (No operation between Kyeemyindaing Sta. and Botahtung Sta.) | No Passenger service. Freight train only. |
| Total | | 148.3 km (138.4 km for passenger line) | 58 (56 for passenger station) | | 200 | No. of R.S. is except Halts. R.S. + Halts =80 (78 for Pax.) |

Source: “Traffic Data Yangon Circular Railway 2012 by MR”, interview to MR, and Google Earth

At present, Yangon Circular Railway, which runs through the mostly urbanized area of Yangon, is used by two types of commuters; i) relatively low income earners and ii) poor farmers who bring their cultivated products from the northern part of Yangon City to sell in CBD area, according to the ridership survey. It seems that upper class people tend to use bus transport and seldom use railway due to the low frequency, low punctuality, low comfortability, poor feeder service, and slow speed in spite of the low fare.

(3) Geometric Condition

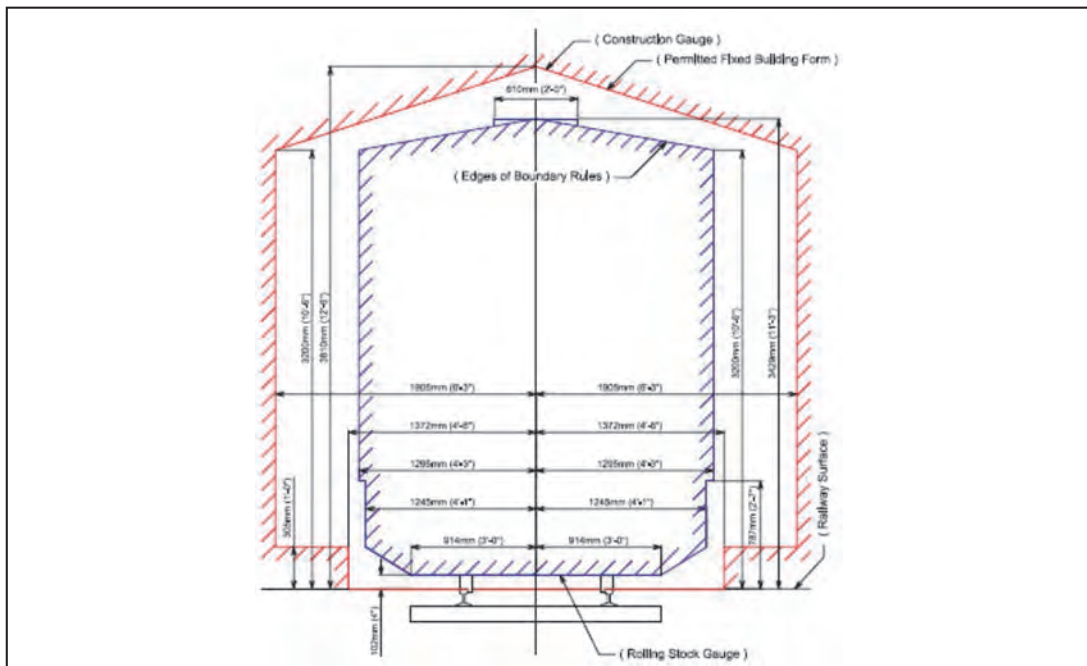
The geometric condition of Yangon Circular Railway and the Suburban Lines is shown in the table below.

Table 2.2.2.4 Geometric Condition of Yangon Circular Railway and the Suburban Lines

| Item | Applied Condition | Remarks |
|------------------|---|--|
| Gauge | Meter Gauge | |
| Axle Load | 12 ton | |
| Minimum Radius | 219 m | Whole MR: 103 m |
| Maximum Gradient | 5 mm/m (exceptional: Thanlyin Br. approach: 10mm/m) | Whole MR: 40 mm/m between Mandalay - Lasio, and Thazi - Shwe Nyaung. |
| Line interval | Main line to main line: 4.4 m Sidings: 3.8 m | |

Source: interview to MR

The construction gauge and car gauge is shown in the figure below. The figure shows the both heights are quite low in comparison with the other country's one including Japan. The low height gauge is an obstacle to not only electrification but also introducing container freight transport, used rolling stocks imported from the other countries. Therefore, it is recommended strongly to review and expand the gauges based on the other country's standard such as STRASYA in Japan.

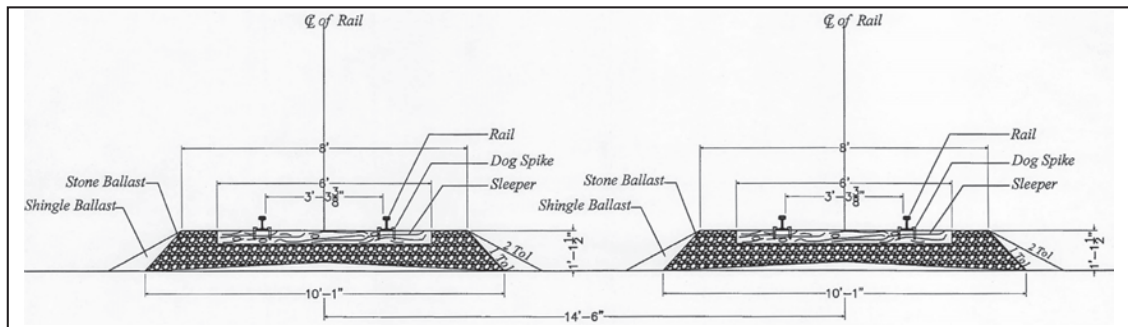


Source: Myanma Railways

Figure 2.2.2.4 Construction Gauge and Car Gauge

(4) Track Condition

Typical track cross section of Yangon Circular Railway and the Suburban Lines is shown in the figure below.

















Note: In case of single track, half to be applied.

Source: Myanma Railway

Figure 2.2.2.5 Typical Track Cross Section in Yangon Circular Railway and the Suburban Lines

A 37 kg/m rail with 12 m length, which is quite light and generally only suitable for low grade lines, is used for all lines. Most of the railheads are worn-out due to prolonged use and are recommended to be replaced immediately. The ratio of good sleeper is being increased especially in Yangon Circular Railway because MR is positively proceeding with the replacement of timber sleepers to PC sleepers which are produced by a PC sleeper plant in Bago. However, in spite of their efforts, the track condition is relatively quite poor because there are no proper ballast spreading, no proper embankment, no proper roadbed quality control and poor drainage system. It causes many derailments and extreme speed restrictions. Especially, embankment and roadbed of four branch lines recently opened after the 1990s are in quite severe condition due to sub-standard work without proper material control and compaction control. The issues of the current track are summarized as table below.

Table 2.2.2.5 Issues and the Expected Causes of the Current Track in Yangon Circular Railway and the Suburban Lines

| | | | | |
|-----------------|--|---|--|--|
| Issues | <p>Severe track irregularity</p>  | <p>Eroded slope shoulder</p>  | <p>Poor ballast arrangement</p>  | <p>Insufficient ballast tamping</p>  |
| Expected causes | <p>a) Weak roadbed b) Lack of resistance to side pressure due to insufficient side ballast c) Ballast does not play an enough role for distributing train load due to insufficient ballast thickness. d) Lack of resistance to rail bucking stress due to insufficient track tamping, especially between sleepers.</p> | <p>a) Insufficient embankment compaction b) Narrow designated bank crown width c) Leaving eroded slope shoulder without any repair work.</p> | <p>a) Few side ballast which acts as resistance to side pressure. b) Ballast spreading above sleepers which has no meaning in terms of physical aspect.</p> | <p>a) Lack of hand-tietamper. b) Importance of the appropriate ballast tamping is not recognized.</p> |
| Issues | <p>Insufficient bottom ballast thickness below sleepers</p>  | <p>Mixing ballast with mud/soil</p>  | <p>Irregular sleeper interval</p>  | <p>Severe joint depression</p>  |
| Expected causes | <p>a) Mixing ballast with muddy roadbed by many years using and lack of maintenance although there was required thickness at first. b) No additional bottom ballast spreading during sleeper replacement work.</p> | <p>a) Due to no working drainage system, track is covered with water and mixed with mud during rainy season. b) Ballast is penetrated to roadbed due to many years using and weak roadbed.</p> | <p>a) No sleeper interval control during sleeper replacement.</p> | <p>a) No sleeper under joints</p> |
| Issues | <p>Severe rail corrugation / burr</p>  | <p>Poor drainage system, submerged track during rainy season</p>  | <p>Poor track condition on and around level crossings</p>  | <p>Poor track condition at approach part around bridge</p>  |
| Expected causes | <p>a) Lack of rail surface maintenance.</p> | <p>a) Roadbed surface does not work as drainage surface due to mixing ballast with roadbed. b) No drainage slope on roadbed surface. c) Lack of installation of drainage ditch between tracks d) Drainage system is clogged up with garbbages. e) Outlet of the drainage ditch does not work.</p> | <p>a) There is difference of elevation between level crossing part and the approaches due to no settlement at level crossig and settlement at the approaches. b) Guardrail is not installed correctly.</p> | <p>a) There is difference of elevation between bridge and the approaches due to no settlement at bridge and settlement at the approaches.</p> |
| Issues | <p>Poor track condition at turnout</p>  | <p>Track covered by plants / grasses</p>  | | |
| Expected | <p>a) Lack of and insufficient track maintenance on andaround turnout due to high difficulty.</p> | <p>a) No weeding work during track maintenance.</p> | | |

Source: YUTRA Project Team

(5) Structure Condition

The list of bridge and crossing structures is shown in the table below. According to visual checks, the different types of bridges are steel girder, RC girder, and RC box culvert. In the case of Computer University branch line, although it is currently a single track, the structures are constructed for double tracks in consideration of future track doubling.

Yangon Circular Railway crosses 47 roads and 22 of them are currently grade-separated flyovers and 25 of them are level crossings at-grade. The grade-separated flyovers are concentrated to the western side of the circle which is the developed area. The remaining level crossings affects the restriction for shortening train operation intervals, because the opening/closing operation is conducted manually and a long closing time is required. The grade separation work (flyover construction) has been implemented through MR's budget and responsibility.

Table 2.2.2.6 Number of Bridge and Crossing Structures

| Line | Bridge | Level Crossing | ROB | FOB |
|--|----------------------------|----------------|-----|-----|
| Yangon Circular Railway | 42 | 25 | 22 | 33 |
| Yangon-Mandalay Main Line (Yangon Central R.S. – Tongyi R.S.) | 29 L>12m:14 L<12m:15 | 12 | 6 | 7 |
| Yangon-Pyay Main Line (Yangon Central R.S. – Taikkyi R.S.) | 135 | 16 | - | - |
| Thilawa Branch Line | 14 | 18 | - | - |
| Eastern Univ. Branch Line | 10 | - | - | - |
| Dagon Univ. Branch Line | 10 | 7 | - | - |
| Computer Univ. Branch Line | 9 | 2 | - | - |
| total | 239 | 80 | 28 | 40 |

Note: ROB means Road Flyover, FOB means overpass for pedestrian

Source: Answer to Questionnaire from MR

(6) Signal and Telecommunication System

As block system, Automatic Block Color Light Signal is applied for all Yangon Circular Railway, Danyingone R.S.-Hlawga R.S. section on Yangon-Pyay Main Line and Malwagone R.S.-Ywathagyi R.S. section on Yangon - Mandalay Main Line. The first Automatic Block Color Light Signal made in the U.S. by Westinghouse was installed for the 5.6 km section of Yangon Circular Railway in 1950. After that, Automatic Block Color Light Signals made in Germany and Korea was installed incrementally for the remaining sections from 1970 to 2000. The signalling system applies track circuit as train detection system. However, it is frequently short-circuited due to water retained on the tracks due to bad drainage during the rainy season, and the signal shows red color continuously because of fail-safe system.

Regarding the remaining four lines (Thilawa Branch Line, Eastern University Branch Line, Dagon University Branch Line, and Computer University Line), Paper Token System is applied shown in Figure 2.2.2.6.

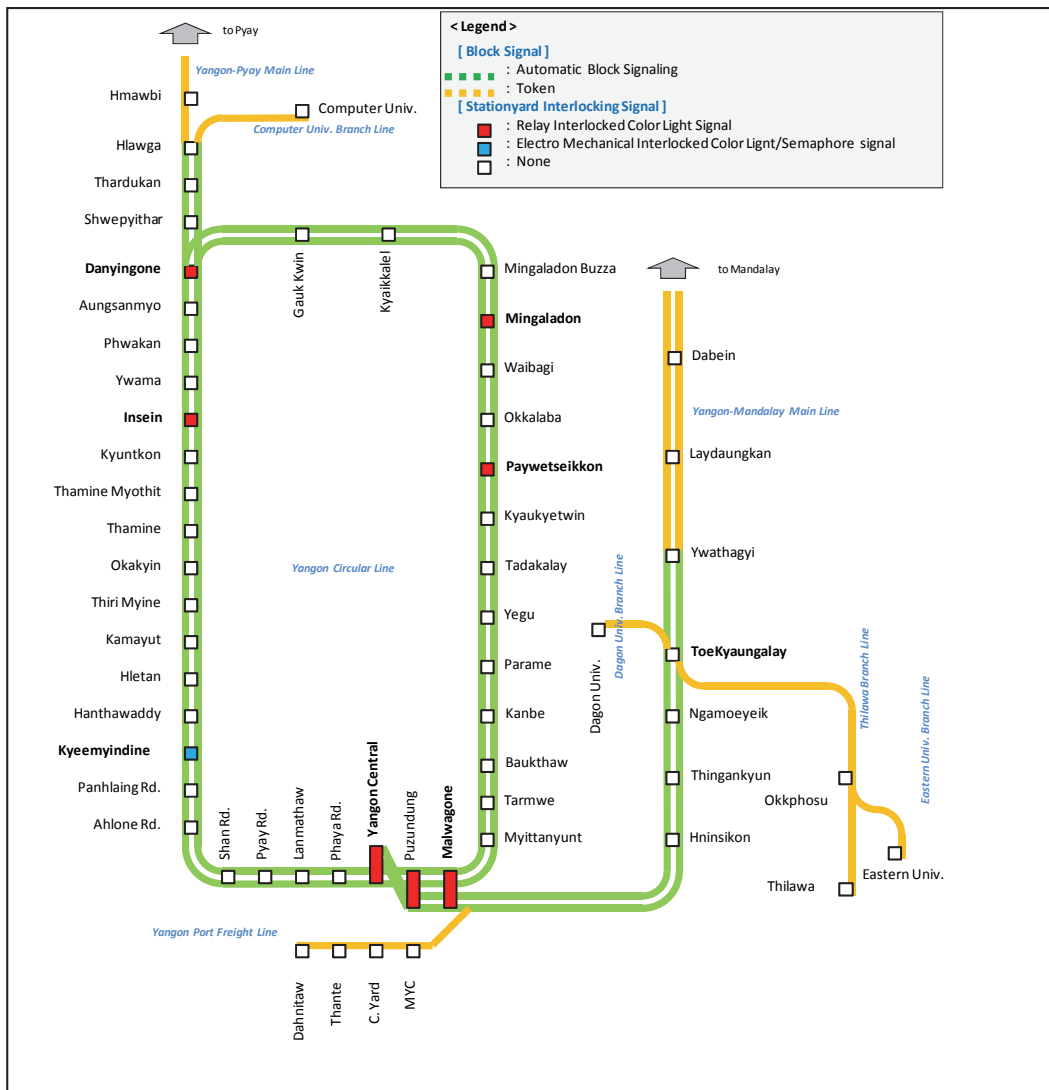
Regarding the signalling system inside main station yard in Yangon Circular Railway, seven stations have Relay Interlocked Color Light Signal and one station has Electromechanical Interlocked Color Light Signal and Semaphore Signal.

Schematic figure of the signalling system in Yangon Circular Line and the Suburban Lines are shown in Figure 2.2.2.7.



Source: YUTRA Project Team

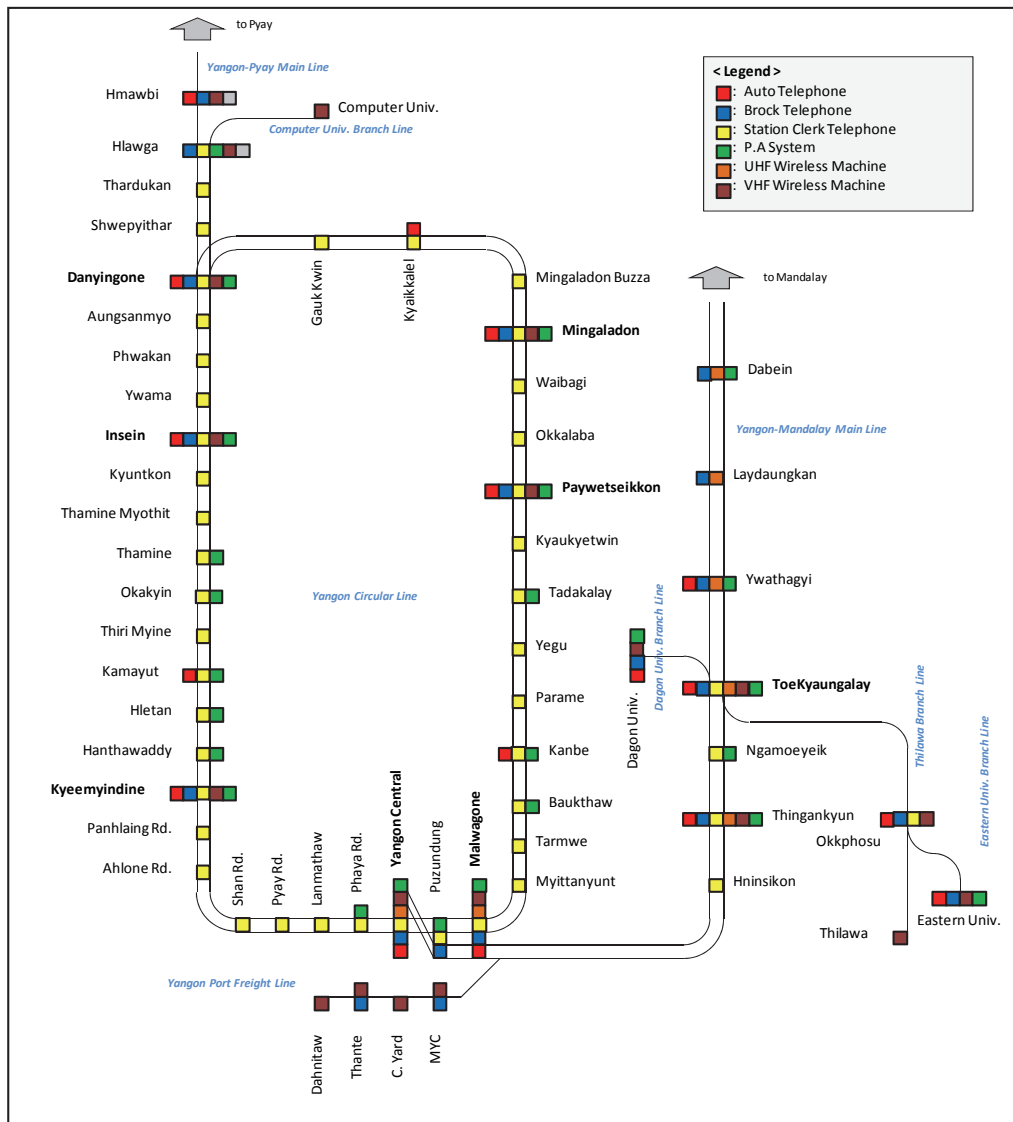
Figure 2.2.2.6 Current Automatic Block Color light Signal and Paper Token System



Source: Traffic Data Yangon Circular Railway 2012

Figure 2.2.2.7 Signaling System in Yangon Circular Railway and the Suburban Lines

In all, six types of telecommunications system are installed in Yangon Circular Railway and the Suburban Lines. All stations have Station Clerk Phone and 15 main stations have some additional systems such as UHF transceiver, VHF transceiver, auto phone, block phone, and P.A. system as shown in the figure below.



Source: Traffic Data Yangon Circular Railway 2012

Figure 2.2.2.8 Telecommunication Equipments installed in Yangon Circular Railway and the Suburban Lines

(7) Station

Low height platform is applied for all stations in Yangon Circular Railway and the Suburban Lines as shown in the figure below. The low height platform is suitable for stations in the rural area which has small number of operated trains and enough time for boarding/alighting. It is recommended to change the platform height from current low height to middle or high height in order to shorten the boarding/alighting time and be convenient for all train users from the viewpoint of the importance and high frequency train operation in Yangon Circular Railway and the Suburban Lines.

In almost stations along double tracks except large stations in Yangon Circular Railway and the Suburban Lines, two separate

platforms type, which face each other with two sets of tracks running between, is applied. On the other hand, large stations having several tracks such as Yangon Central Station, Kyeemyindaing Station, Danyingone Station, etc., have island platforms.

Almost small stations in Yangon Circular Railway have no station building except small ticket counter due to lack of space. On the other hand, main stations having several track siding for express train/freight train etc. have station building with ticket counter, kiosk, etc. In many cases, express trains with long/middle trains stop platform where is beside station building in order to be convenient for the long distance travel passengers.

Some large stations such as Yangon Central Station, Kyeemyindaing Station, etc. have large yard surrounded by fence for not only station facilities including station building, platform, main lines, but also marshaling yard, depot lines, inspection yard, etc.

(8) Rolling Stocks

For Yangon Circular Railway, 22 train sets are operated and in the Suburban Lines, and the train sets divide into two types, diesel locomotive with passenger coach-type and diesel railcar-type (rail bus). Of these, 14 train sets are "locomotive with passenger coach" and these are composed of one locomotive with five or six coaches. Both locomotive and coaches are quite deteriorated due to aging (over 30 years old) and lack of proper maintenance and therefore it is hard to accelerate/decelerate quickly. Seven train sets are "diesel railcar-type" with one or two cars and the diesel railcars are operated not in the Yangon Circular Railway but in the suburban lines. In addition, one set of second-hand



Source: YUTRA Project Team

Figure 2.2.2.9 Current Low Height Platform



Source: YUTRA Project Team

Figure 2.2.2.10 Current Two Separate Platforms

DMU composed of 5 cars with AC, which was used by JR West, was served for Yangon Circular Railway from October 2013. The number of rolling stocks for Yangon Circular Railway and the Suburban Lines is shown in the table below.

Table 2.2.2.7 Number of Rolling Stock for Yangon Circular Railway and the Suburban Lines

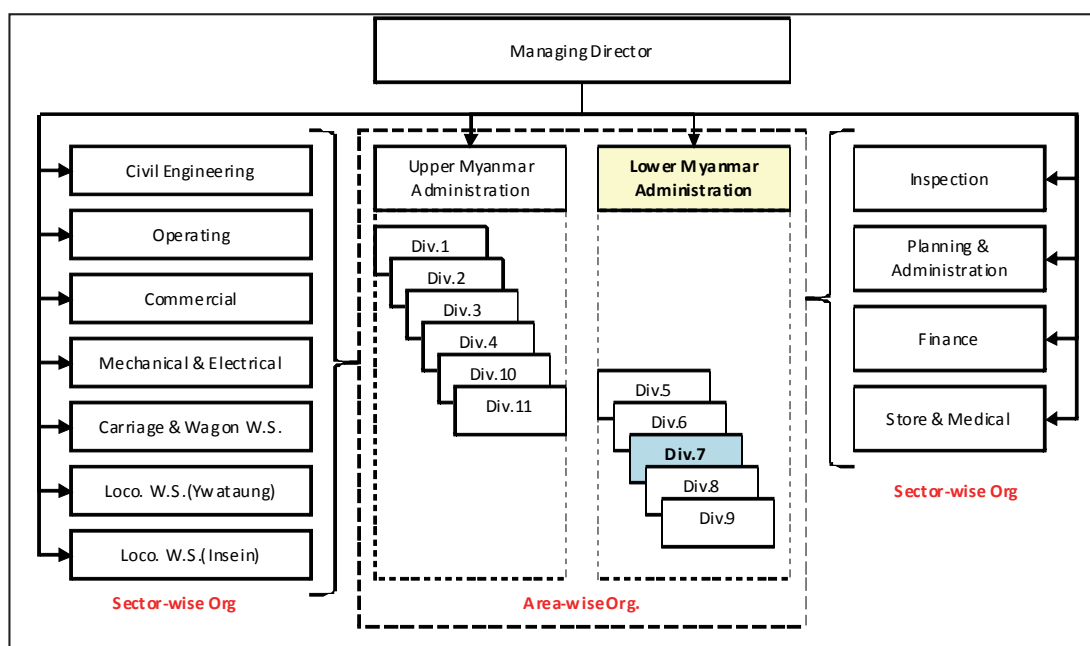
| Rolling Stock Type | Number | Remarks |
|--------------------------|--------|-------------------------------|
| Diesel Locomotive | 24 | 900HP, 1100HP, 1200HP, 1600HP |
| Passenger Coach | 68 | |
| Diesel Railcar | 17 | Manufactured in Japan |
| DMU (operated from 2013) | 5 | Manufactured in Japan |

Source: Traffic Data Yangon Circular Railway 2012

2) Railway Development, Operation and Maintenance

(1) Administration and Organization

All railway operations and management in Myanmar is conducted by Myanmar Railways (MR) which is under the umbrella of Ministry of Rail Transportation (MORT). Organizational structure of MR is shown below.



Source: Fact about Myanmar Railways 2011-2012 (partially arranged)

Figure 2.2.2.11 Organizational Chart of Myanmar Railways

Table 2.2.2.8 Number of Staff of Myanmar Railways

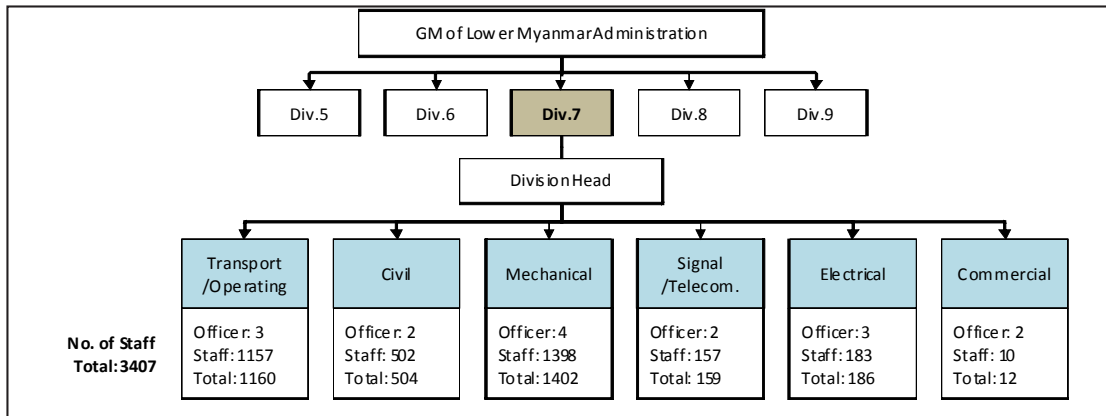
| | Enrollment Limit | Actual Number as of Mar. 2012 |
|----------|------------------|-------------------------------|
| Officers | 431 | 355 |
| Others | 31,622 | 21,844 |
| Total | 32,053 | 22,199 |

Source: Fact about Myanmar Railways 2011-2012

The organization of MR is divided sector-wise and area-wise. In terms of the area-wise aspect, MR has two administrations for Upper Myanmar and Lower Myanmar, which consist

of 11 divisions. Regarding the sector-wise aspect, there are 11 sector departments in the headquarters such as Civil Engineering, Operations, etc. and the departments dispatch their staff to regional administrations and divisions. Therefore, the staff which belong to regional administrations and divisions receive instructions and orders from both the general manager of his sector in the headquarters and of his administration.

Division 7 is in charge of Yangon Region. Organizational chart of Division 7 is shown in the figure below.



Source: interview with Head of Div.7 in MR

Figure 2.2.2.12 Organizational Chart of Division 7

Recently, Myanmar government is encouraging the development of the infrastructure through BOT schemes, etc. In line with this policy, MR is trying to proceed with the privatization of the Yangon Circular Railway and the Suburban Lines. The tender for Concession Contract was announced in September 2011 without any closing date and consequently, nine companies submitted their proposal to the management committee (as of August 2012). According to the tender document, i) the concessionaire is responsible for the maintenance of the eastern half of Yangon Circular Railway, Thilawa branch line and three university branch lines and MR will continue to be responsible for the maintenance of the western half of Yangon Circular Railway, Yangon-Mandalay Linen and Yangon-Pyay Line because long distance trains are operated in addition to suburban trains in these sections; ii) train operations system is provided by MR due to the importance of safety in the facility, iii) rolling stocks shall be procured by the concessionaire. Regarding the ownership of infrastructure, MR owns the ground track and concessionaire has elevated track according to MR although the tender document is not mentioned clearly.

According to the interview with MR, there are many issues to be solved and it is quite unclear whether the privatization will be realized successfully and when.

(2) Financial Condition of Railway Sector

Regarding finance, MORT allocates an annual budget to MR headquarters, and MR headquarters allocates it to the sector's departments in the headquarters. Then, the sector's departments decide which necessary projects will be distributed. Hence, the general manager of Lower Myanmar Administration has no authority to decide the budget

allocation.

Financial statement of MR is shown in Table 2.2.2.9. The table shows that profitability worsened after 2006 and every year thereafter and the total expense became twice the total revenue in FY2010. Although it has improved in FY2011 as a result of raising the ticket fare, it is expected to require a huge investment continuously for intercity train operations and maintenance, etc. because of the large country and the rapidly expanding railway network. It is an important issue to consider how to develop an appropriate operations and management system for urban railway.

Table 2.2.2.9 Financial Statement of MR

(unit: million MMK)

| Items | FY2006 | FY2007 | FY2008 | FY2009 | FY2010 | FY2011* |
|-------------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Revenue | | | | | | |
| - Passenger | 18,510.44 | 20,433.62 | 20,541.15 | 20,204.27 | 20,639.34 | 29456.60 |
| - Goods | 4,867.70 | 4,625.82 | 5,468.90 | 7,689.97 | 8,288.01 | 16,734.19 |
| - Others | 1,794.87 | 2,196.40 | 2,104.36 | 2,210.64 | 4,237.27 | 4,817.21 |
| Total Revenue | 25,173.01 | 27,255.84 | 28,114.96 | 30,104.88 | 33,164.62 | 51,008.00 |
| Expense | | | | | | |
| - Operation Expenses | 37,677.07 | 43,635.92 | 52,600.71 | 58,864.77 | 66,346.52 | 68,223.95 |
| - Interest | 24.24 | 27.68 | 26.50 | 36.61 | 61.66 | 37.92 |
| - Profit & Loss on Foreign Exchange | 1.49 | -6.98 | -8.85 | -5.41 | -25.22 | |
| Total Expense | 37,702.80 | 43,656.62 | 52,618.36 | 58,895.97 | 66,382.96 | 68,271.87 |
| Operation Ratio (=Expense/Revenue) | 149.68% | 160.07% | 187.15% | 195.64% | 200.16% | 133.85% |

Note: The number for FY2011 is provisional.

Source: Fact about Myanmar Railways 2011-2012, etc.

Financial statement for Yangon Circular Railway and the Suburban Lines is shown in the table below. Official financial statement for Yangon Circular Railway and the Suburban Lines was virtually non-existent because MR's financial management system is fully controlled by MR headquarters, and each office division has no data about expenditures in their jurisdiction area. The following table is prepared by a local private company based on their survey and estimation.

Table 2.2.2.10 Financial Statement of Yangon Circular Railway and the Suburban Lines (Estimation)

(unit: million MMK)

| Items | A month in 2011 |
|---|-----------------|
| Monthly Expenses | |
| - Salary | 27.807 |
| - Engine fuel (65,337 gallons) | 196.011 |
| - Maintenance expenses for YCR office, engines, coaches | 22.692 |
| - Maintenance for railways | 14.900 |
| Total | 261.410 |
| Monthly Income | |
| - Fare box revenue | 29.488 |
| - Income from shops / rental fee | 13.410 |
| Total | 42.898 |
| Income-Expenses | -218.510 |
| Operation Ratio (=Expense/Revenue) | 609% |

Source: Upgrading of the Yangon Circular Railway Project, Fact about Yangon Circular Railways, 2011

(3) Fare System

The fare table for Yangon Circular Railway and the Suburban Lines is shown below. The fare for two riding tickets was MMK 20 until November 2011. However, it was raised to MMK 100 afterwards.

Ticket of long distance train is sold since one day before. All tickets are sold manually at ticket booth in stations.

Table 2.2.2.11 Fare Table of Yangon Circular Railway and the Suburban Lines

| Type | Fare (MMK) | Remarks |
|---|------------|-----------------------------------|
| two riding tickets | 100 | For foreigner, US\$1 per one way. |
| Monthly ticket | 1,700 | |
| Monthly ticket (for Student) | 1,150 | |
| Luggage | 50 | 1 bundle, 10 viss(=16 kg) |
| Without ticket (adult) | 1,000 | As fine |
| Without ticket (child) | 500 | As fine |
| Without ticket (luggage) | 150 | As fine |
| Note: 1) 1 riding ticket is not available. 2) Same price regardless of riding length as long as inside Yangon Circular Railway and the Suburban Lines 3) 6 ticket inspection group which consist of 37 ticket inspectors conduct ticket inspection | | |

Source: Traffic Data Yangon Circular Railway 2012, and MR Presentation Material for Yangon Circular Railway

Table 2.2.2.12 Fare Table of Express train of Yangon - Mandalay Line

| (in kyat) | | | | | | | | | | |
|-----------|------------|-------------|----------|----------------------|-------------|------------------------|----------|-------------|------------|---------|
| SLEEPER | UPPER SEAT | FIRST CLASS | ORDINARY | Distance from Yangon | STATION | Distance from Mandalay | ORDINARY | FIRST CLASS | UPPER SEAT | SLEEPER |
| | | | | 0.00 | Yangon | 620.39 | 4,650 | 5,800 | 9,300 | 12,750 |
| 250 | 200 | 150 | 100 | 11.67 | Togyauhgale | 608.72 | 4,550 | 5,700 | 9,100 | 12,500 |
| 1,550 | 1,150 | 700 | 600 | 74.83 | Bago | 545.56 | 4,100 | 5,100 | 8,150 | 11,200 |
| 2,700 | 1,950 | 1,250 | 1,000 | 130.76 | DaikU | 489.63 | 3,700 | 4,600 | 7,350 | 10,050 |
| 2,900 | 2,150 | 1,350 | 1,100 | 141.22 | Pyuntaza | 479.17 | 3,600 | 4,500 | 7,150 | 9,850 |
| 3,100 | 2,250 | 1,400 | 1,150 | 149.26 | Nyaunglebin | 471.13 | 3,550 | 4,400 | 7,050 | 9,700 |
| 3,600 | 2,650 | 1,650 | 1,350 | 175.01 | Kyauktaga | 445.38 | 3,350 | 4,200 | 6,650 | 9,150 |
| 3,800 | 2,750 | 1,750 | 1,400 | 183.86 | Penewgon | 436.53 | 3,300 | 4,100 | 6,550 | 9,000 |
| 4,100 | 3,000 | 1,900 | 1,500 | 199.15 | Kanyutkwin | 421.24 | 3,150 | 3,950 | 6,300 | 8,650 |
| 4,450 | 3,250 | 2,050 | 1,650 | 216.05 | Pyu | 404.34 | 3,050 | 3,800 | 6,050 | 8,300 |
| 5,500 | 4,000 | 2,500 | 2,000 | 267.15 | Taungoo | 353.24 | 2,650 | 3,300 | 5,300 | 7,250 |
| 6,050 | 4,400 | 2,750 | 2,200 | 294.91 | Yedashe | 325.48 | 2,450 | 3,050 | 4,900 | 6,700 |
| 6,350 | 4,600 | 2,900 | 2,300 | 308.18 | Swa | 312.21 | 2,350 | 2,950 | 4,700 | 6,450 |
| 6,650 | 4,850 | 3,050 | 2,450 | 323.87 | Myohla | 296.52 | 2,250 | 2,800 | 4,450 | 6,100 |
| 6,850 | 5,000 | 3,100 | 2,500 | 331.92 | Yeni | 288.47 | 2,150 | 2,700 | 4,300 | 5,950 |
| 7,200 | 5,250 | 3,300 | 2,650 | 348.82 | Ela | 271.57 | 2,050 | 2,550 | 4,050 | 5,600 |
| 7,700 | 5,600 | 3,500 | 2,800 | 373.36 | Naypyitaw | 247.03 | 1,850 | 2,300 | 3,700 | 5,050 |
| 8,400 | 6,100 | 3,850 | 3,050 | 407.96 | Tatkon | 212.43 | 1,600 | 2,000 | 3,200 | 4,400 |
| 9,100 | 6,600 | 4,150 | 3,300 | 441.76 | Yamethin | 178.63 | 1,350 | 1,700 | 2,700 | 3,700 |
| 9,500 | 6,900 | 4,350 | 3,450 | 462.68 | Pyawbwe | 157.71 | 1,200 | 1,500 | 2,400 | 3,250 |
| 9,900 | 7,200 | 4,500 | 3,600 | 481.59 | Nyaungyan | 138.80 | 1,050 | 1,300 | 2,100 | 2,850 |
| 10,100 | 7,350 | 4,600 | 3,700 | 492.45 | Thazi | 127.94 | 1,000 | 1,200 | 1,950 | 2,650 |
| 10,650 | 7,750 | 4,850 | 3,900 | 518.60 | Thedaw | 101.79 | 800 | 950 | 1,550 | 2,100 |
| 11,500 | 8,350 | 5,250 | 4,200 | 558.43 | Myithar | 61.96 | 500 | 600 | 950 | 1,300 |
| 11,900 | 8,650 | 5,400 | 4,350 | 578.15 | Kyaukse | 42.24 | 350 | 400 | 650 | 900 |
| 12,750 | 9,300 | 5,800 | 4,650 | 620.39 | Mandalay | 0.00 | | | | |

Source: Myanma Railways

Table 2.2.2.13 Fare Table of Freight Transportation of Yangon - Mandalay Line

| Class (for fully wagon loaded) | Rate for charges per one ton per one mile | |
|--------------------------------|---|-------------------------|
| | For plain Section (US\$) | For Hill Sections(US\$) |
| Express Freight Train | 0.04 | 0.05 |
| Ordinary Freight Train | 0.05 | 0.08 |
| Special Rates | | |
| (a) For Express Freight Train | 0.05 | 0.08 |
| (b) For Ordinary Freight Train | 0.08 | 0.11 |

Special rate will be charged, when a wagon or any freight train is empty hauled in one direction

Source: Myanma Railways

(4) Transport Volume and Train Operation

Table 2.2.2.14 shows the railway transport volume, and passenger and freight from 2006 to 2012. In the last six years, passenger volume has decreased to about 4.7% while freight volume has increased to approximately 31.1%. Annual passenger and freight volumes per total railway length in 2011-2012 are about 11,000 persons/km and 609 t/km, respectively. These numbers are too small to be able to carry out a sustainable railway operation.

Table 2.2.2.14 Railway Transport Volume

| | 2006 -2007 | 2007 -2008 | 2008 -2009 | 2009 -2010 | 2010 -2011 | 2011 -2012 |
|-----------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Passenger | | | | | | |
| - No. of passengers (million) | 72.708 | 75.959 | 73.561 | 71.602 | 67.650 | 64.352 |
| - Daily passengers (million) | 0.20 | 0.21 | 0.20 | 0.20 | 0.19 | 0.18 |
| - Passenger mile (100 million·mi) | 32.970 | 33.784 | 33.489 | 33.376 | 33.287 | 31.428 |
| - Passenger km (100 million·km) | 53.060 | 54.370 | 53.895 | 53.713 | 53.570 | 50.578 |
| Freight | | | | | | |
| - Tons carried (million·t) | 2.82 | 2.93 | 2.95 | 3.33 | 3.41 | 3.58 |
| - Ton/day (thousand·t) | 7.73 | 8.03 | 8.09 | 9.12 | 9.34 | 9.83 |
| - Ton mile (10 million·mi) | 55.11 | 53.54 | 56.99 | 65.83 | 69.78 | 72.27 |
| - Ton km (10 million·km) | 88.691 | 86.164 | 91.717 | 105.943 | 112.300 | 116.307 |

Source: Facts about Myanmar Railways 2011-2012

Annual freight transport volumes and distances for main commodities from 2007 to 2012 are shown in Table 2.2.2.15. The average transport distance was approximately 270 mi (430 km), although there are variations for each year depending on the kind of commodity.

Table 2.2.2.15 Freight Transport Volume for Main Commodities

| Commodities | | 2007 -2008 | 2008 -2009 | 2009 -2010 | 2010 -2011 | 2011 -2012 |
|-----------------------------|-------------------------------------|---------------|---------------|---------------|---------------|---------------|
| Rice and rice products | - Freight ton-miles (thousand•t•mi) | 17,008.401 | 17,751.120 | 26,563.848 | 28,159.605 | 20,270.800 |
| | - Freight ton (thousand•t) | 53.908 | 62.013 | 92.800 | 103.000 | 100.600 |
| | - Freight distance (mi) | 315.5 | 286.2 | 286.2 | 273.4 | 201.5 |
| Sugar cane | - Freight ton-miles (thousand•t•mi) | 146.500 | 41.856 | 72.667 | 77.032 | 100.800 |
| | - Freight ton (thousand•t) | 10.112 | 0.288 | 0.500 | 3.200 | 0.600 |
| | - Freight distance (mi) | 14.5 | 145.3 | 145.3 | 24.1 | 168.0 |
| Forest products | - Freight ton-miles (thousand•t•mi) | 34,062.332 | 40,460.409 | 38,347.996 | 40,651.656 | 37,052.300 |
| | - Freight ton (thousand•t) | 148.843 | 179.259 | 169.900 | 242.100 | 184.800 |
| | - Freight distance (mi) | 228.8 | 225.7 | 225.7 | 167.9 | 200.5 |
| Pulses and beans | - Freight ton-miles (thousand•t•mi) | 12,772.439 | 19,084.372 | 34,039.255 | 36,084.078 | 3,993.700 |
| | - Freight ton (thousand•t) | 35.677 | 52.495 | 18.400 | 33.000 | 19.800 |
| | - Freight distance (mi) | 358.0 | 363.5 | 1,850.0 | 1,093.5 | 201.7 |
| Other agricultural products | - Freight ton-miles (thousand•t•mi) | 2,288.854 | 2,149.339 | 1,740.206 | 1,844.744 | 988.300 |
| | - Freight ton (thousand•t) | 6.086 | 5.805 | 4.700 | 6.600 | 5.900 |
| | - Freight distance (mi) | 376.1 | 370.3 | 370.3 | 279.5 | 167.5 |
| Coal and coke | - Freight ton-miles (thousand•t•mi) | 2,180.109 | 1,582.932 | 1,303.649 | 1,381.962 | 1,916.200 |
| | - Freight ton (thousand•t) | 13.257 | 10.807 | 8.900 | 9.300 | 9.600 |
| | - Freight distance (mi) | 164.4 | 146.5 | 146.5 | 148.6 | 199.6 |
| Oil | - Freight ton-miles (thousand•t•mi) | 20,241.497 | 26,989.569 | 29,681.441 | 31,464.480 | 21,743.300 |
| | - Freight ton (thousand•t) | 76.769 | 90.658 | 99.700 | 107.700 | 107.800 |
| | - Freight distance (mi) | 263.7 | 297.7 | 297.7 | 292.1 | 201.7 |
| Mine products | - Freight ton-miles (thousand•t•mi) | 8,880.564 | 10,924.385 | 8,208.112 | 8,701.194 | 7,341.900 |
| | - Freight ton (thousand•t) | 36.822 | 44.586 | 33.500 | 26.400 | 37.500 |
| | - Freight distance (mi) | 241.2 | 245.0 | 245.0 | 329.6 | 195.8 |
| Stone | - Freight ton-miles (thousand•t•mi) | 19,313.894 | 14,123.737 | 16,653.311 | 17,653.717 | 19,322.900 |
| | - Freight ton (thousand•t) | 108.337 | 75.142 | 88.600 | 118.400 | 95.800 |
| | - Freight distance (mi) | 178.3 | 188.0 | 188.0 | 149.1 | 201.7 |
| Salt | - Freight ton-miles (thousand•t•mi) | 23,385.899 | 16,626.597 | 28,053.240 | 29,738.470 | 13,897.000 |
| | - Freight ton (thousand•t) | 71.178 | 50.029 | 63.800 | 69.600 | 68.900 |
| | - Freight distance (mi) | 328.6 | 332.3 | 439.7 | 427.3 | 201.7 |
| Military | - Freight ton-miles (thousand•t•mi) | 23,340.645 | 20,030.824 | 20,174.524 | 21,386.458 | 8,511.700 |
| | - Freight ton (thousand•t) | 88.652 | 89.259 | 39.100 | 71.300 | 43.300 |
| | - Freight distance (mi) | 263.3 | 224.4 | 516.0 | 300.0 | 196.6 |
| Others | - Freight ton-miles (thousand•t•mi) | 231,435.259 | 264,420.615 | 178,488.533 | 189,210.789 | 158,181.000 |
| | - Freight ton (thousand•t) | 974.201 | 1,059.380 | 713.100 | 729.200 | 784.400 |
| | - Freight distance (mi) | 237.6 | 249.6 | 250.3 | 259.5 | 201.7 |
| Departmental parcels | - Freight ton-miles (thousand•t•mi) | 100,328.095 | 88,557.586 | 93,912.294 | 99,553.842 | 224,673.600 |
| | - Freight ton (thousand•t) | 1,077.104 | 985.416 | 1,045.000 | 903.200 | 1,113.900 |
| | - Freight distance (mi) | 93.1 | 89.9 | 89.9 | 110.2 | 201.7 |
| Other parcels | - Freight ton-miles (thousand•t•mi) | 49,957.000 | 47,126.000 | 181,063.053 | 191,939.972 | 204,685.500 |
| | - Freight ton (thousand•t) | 228.000 | 247.000 | 949.000 | 985.000 | 1,014.900 |
| | - Freight distance (mi) | 219.1 | 190.8 | 190.8 | 194.9 | 201.7 |

Source: Facts about Myanmar Railways 2011-2012

Myanmar Railways has a future annual railway transport demand plan up to 2016 as shown in Table 2.2.2.16. Included in the plan are some high priority projects such as the improvement of Yangon-Mandalay Line, enhancement of Yangon Circular Line, maintenance of railway transportation network in Shan State, and development of access lines to the neighboring countries. They also have a railway transportation network

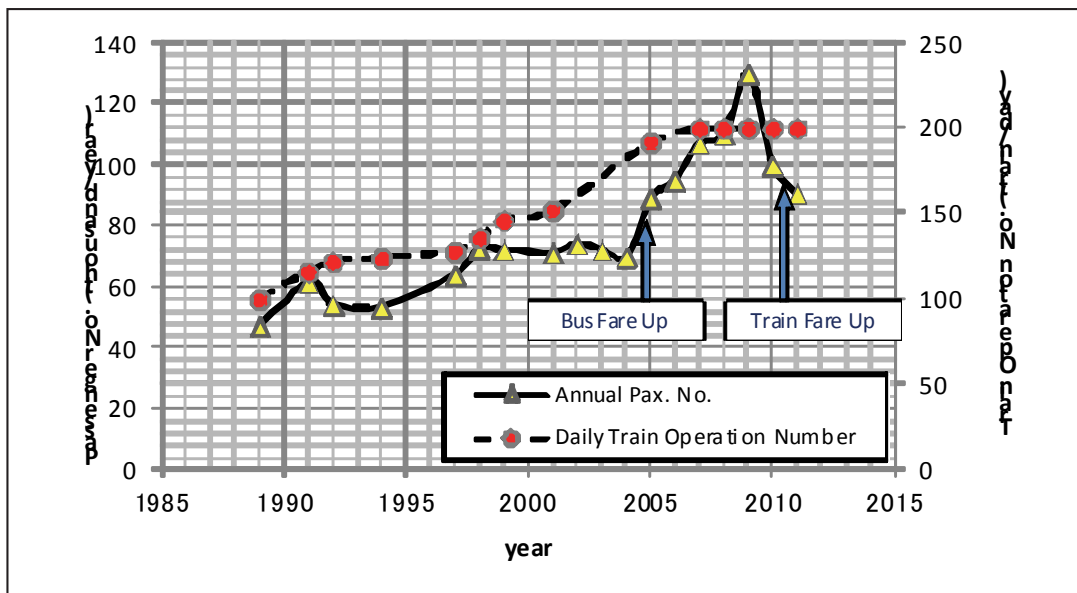
expansion plan which has a total length of 1,779.43 mi (2,863.71 km). It is expected that these plans will be developed until 2016, as well as the updating plan of the signaling and telecommunication systems.

Table 2.2.2.16 Future Railway Transport Demand from 2011/2012 to 2015/2016

| | 2011 -2012 | 2012 -2013 | 2013 -2014 | 2014 -2015 | 2015 -2016 |
|-----------------------------------|---------------|---------------|---------------|---------------|---------------|
| Passenger | | | | | |
| No. of passengers (million) | 68.012 | 69.870 | 66.200 | 67.000 | 68.000 |
| Passenger mile (100 million · mi) | 3,825.188 | 3,439.708 | 3,217.320 | 3,281.100 | 3,346.100 |
| Passenger km (100 million · km) | 6,156.043 | 5,535.673 | 5,177.775 | 5,280.419 | 5,385.026 |
| Freight | | | | | |
| Tons carried (million · t) | 3.657 | 3.768 | 3.734 | 4.115 | 4.192 |
| Ton mile (10 million · mi) | 730.949 | 755.811 | 735.598 | 810.655 | 825.824 |
| Ton km (10 million · km) | 1,176.348 | 1,216.360 | 1,183.830 | 1,304.623 | 1,329.035 |

Source: Facts about Myanmar Railways 2011-2012

The average daily ridership of Yangon Circular Railway and the Suburban Lines in FY2011 is 90,620 passengers./day and the daily number of operated trains in the lines is 200 train/day. The change in the number of annual passengers and daily operated trains by year in Yangon Circular Railway and the Suburban Lines are shown in Figure 2.2.2.13 . The figure shows that Yangon Circular Railway and the Suburban Lines are used as a means of citizens' transportation and that the number of the users showed an increasing trend as a whole until late 2000s though there is somewhat an increase or decrease within short periods. However, the number of passengers in FY2011 dropped drastically because of implementation of fare increase.



Source: Upgrading of Yangon Circular Railway Project: Facts About Yangon Circular Railways, 2011, Presentation Material by MR, and Traffic Data Yangon Circular Railway, 2012.

Figure 2.2.2.13 Change in the Number of Passengers and Train Operations of Yangon Circular Railway and the Suburban Lines

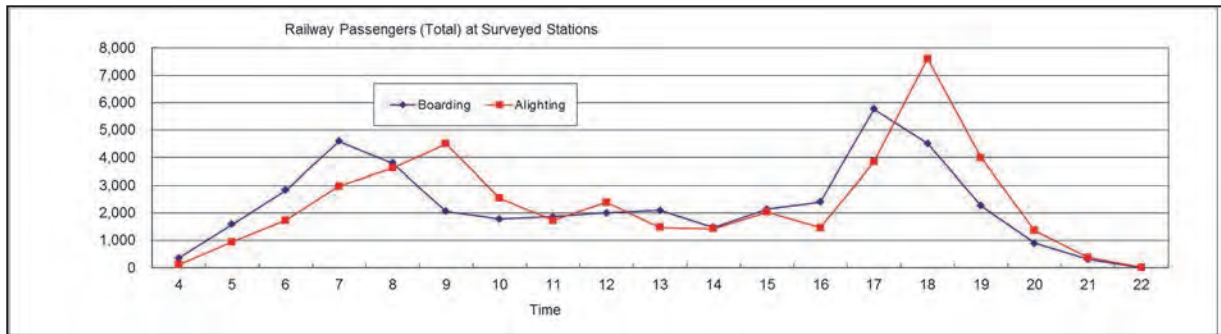
The number of operated trains among sections is shown in Figure 2.2.2.14. The figure shows that V shaped lines between Danyingone and Toe Kyaung Galay via Yangon Central Station is the most important corridor in Yangon Circular Railway and the Suburban Lines.

The figure also shows that Yangon Circular Railway and the Suburban Lines play an important role as urban transport in Yangon Region as a whole. However, the operational performance and capacity is quite poor due to the deterioration of all infrastructures and lack of proper maintenance. Even the sections in relatively good condition in Yangon Circular Railway, Yangon-Mandalay Main Line and Yangon-Pyay Main Line in Yangon Region, which are the most maintained line, the maximum speed is approximately 25-30 km/hr, while the other suburban lines are forced to operate at quite slow speeds of 5-10 km/hr due to terrible track conditions. The time it takes to make a round trip of Yangon Circular Railway, which has 47.5 km, is approximately three hours (equivalent to 15 km/hr).



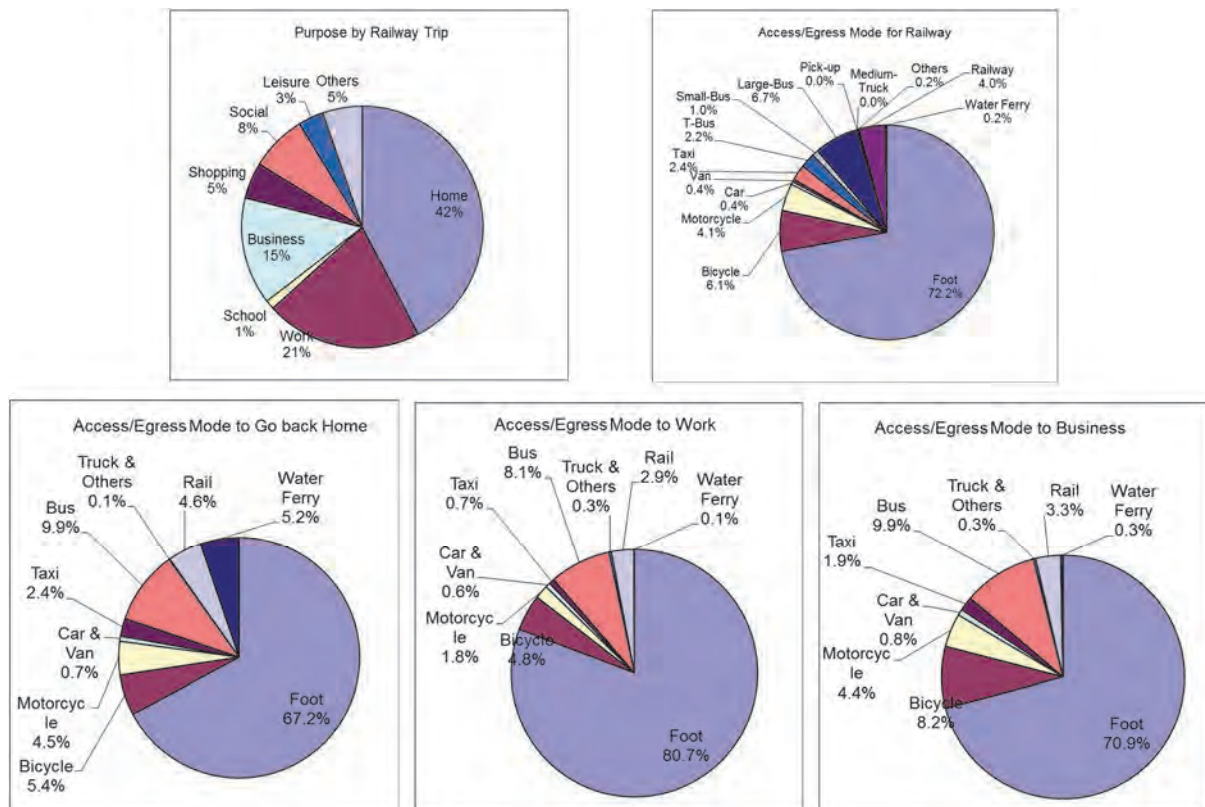
Source: Traffic Data Yangon Circular Railway, and Train Operation Diagram in Yangon Circular Railway and Yangon Suburban Line

Figure 2.2.2.14 Train Operation Number at Each Section



Source: YUTRA Project Team

Figure 2.2.2.15 Hourly Number of Passengers by Boarding and Alighting



Source: YUTRA Project Team

Figure 2.2.2.16 Trip Purpose and Access/Egress Mode

Figure 2.2.2.15 shows hourly number of passengers by boarding and alighting, Figure 2.2.2.16 shows trip purpose and access/egress mode, as a result of railway passenger OD survey by YUTRA project team.

Morning peak hour is 7:00 – 9:00 (Peak ratio: 11%) and evening peak hour is 17:00-18:00 (Peak ratio: 17%). 4 trains per hour (15 min. headway) are operated during peak hours on loop line.

42% of the rail passenger use railway for going home, and 36% for work/business.

Main access/egress mode (72%) is foot. It means poor feeder service is provides at stations. Integrated transportation station is desirable in order to make suitable transit oriented

development.

(5) Maintenance System

All rolling stocks operated in the Yangon Circular Railway and the Suburban Lines have their regular maintenance in Insein Maintenance Shed which is located beside Insein Maintenance Workshop. According to the regulations of Myanmar Railways, the conduct of regular maintenance is divided in eight (8) stages, from M-1 (lightest maintenance) to M-8 (heaviest maintenance). Insein Maintenance Shed can treat between M-1 and M-5, and more heavy maintenance is conducted in Insein Maintenance Workshop.

(6) Accidents

Many accidents are occurred due to aged infrastructures and poor maintenance on Yangon Circular Railway. According to the accident record since January 2011 to November 2011 prepared by Myanmar Railways, 34 accidents are reported for 11 months. One or two accidents per month are occurred. Therefore accident rate is calculated as follows.

$$34 \text{ accidents} / (330 \text{ days} \times 200 \text{ train per day}) = 0.05\%$$

The main reasons of the accident are derailment due to poor maintenance of track, failure of rolling stock, signal, turnout, and careless of train driver. Urgent actions should be taken for safety train operation.

(7) Privatization of Yangon Circular Railway and the Suburban Lines

Myanmar Railways has a plan of privatization of Yangon Circular Railway and the Suburban Lines. The procedure and schedule are not clear at this moment. Detailed PPP scheme including schedule, organization and responsibilities of each party should be studied for prompt and proper railway development. Some PPP railway projects in Asian countries faced big problems such as delay, cancellation, dispute, poor service, etc.

2.2.3 Traffic Management and Safety

Traffic management policy basically focuses on how to control traffic flows in the designated road network and how to use limited road spaces. Traffic management measures cover the various fields from traffic engineering to peoples' traffic behavior, such as traffic control and information system, traffic signal system and parking measures, etc., and Traffic Safety and Traffic Demand Management (TDM) or Mobility Management (MM) may be included in this traffic management sector.

So far, traffic management is considered as subsidiary and short term measures by the time when sufficient road network system would be developed. However, nowadays, from global environment viewpoint, traffic management is playing more important roles, to control inappropriate motorization causing serious traffic congestions and air pollution, so as to provide an environmentally friendly traffic society based on the public transport system.

In this chapter, we will discuss and evaluate on-going traffic management measures based on the existing traffic situation in Yangon. Firstly we will overview traffic situation in CBD as well as urbanized areas in Yangon, and then we review existing traffic management measures and evaluate their effectiveness and issues for the future traffic management policy development.

1) Current Traffic Situation and Congestions

Traffic Situation in the CBD

As already mentioned, since the time that import restriction of vehicle was liberalized, traffic congestions have rapidly worsened especially in the CBD and adjacent urbanized areas. As of July 2013, congested intersections and road sections are identified as shown in Figure 2.2.3.1 and the situations illustrated in the photos. Most of the main roads in CBD and road sections approaching the CBD have very slow traffic flows in the morning and evening peak hours.

Regarding traffic situation in the CBD, the CBD is the cradle land of Yangon, or Rangoon, which was developed in the middle of the 19th century by Alexander Fraser, an army engineer from England, as a center of commercial and administration. There are many old buildings with historical and cultural values in the area which are orderly divided by the north-south and east-west grid pattern streets. Most of the buildings here are 4- to 6-storey buildings, where lower floors are utilized for shops or offices and upper floors are for residential use. There are many small wholesalers and grocery shops, and some sections of sidewalks are occupied by street vendors. The west section of Maha Bandoola Road, the so called China Town area, is filled with people shopping and eating on the street during the evening. Most of the buildings are getting older and some of these old buildings are being replaced by new high-rise office buildings and streetscape is certainly changing.

Not only main roads but also local roads in CBD are congested due to vehicles parked on the roadside. Off-street parking and parking spaces in the buildings are very limited except in the newly constructed office and commercial buildings. There is no space for garages in the old 4 to 6-storey buildings which are the main structures in the CBD, so that only road spaces are available for parking. At this is made worse by the increased rate of motorization.



Source: YUTRA Project Team

Figure 2.2.3.1 Congested intersections and road sections in the CBD

Traffic Situation in other Urbanized Areas

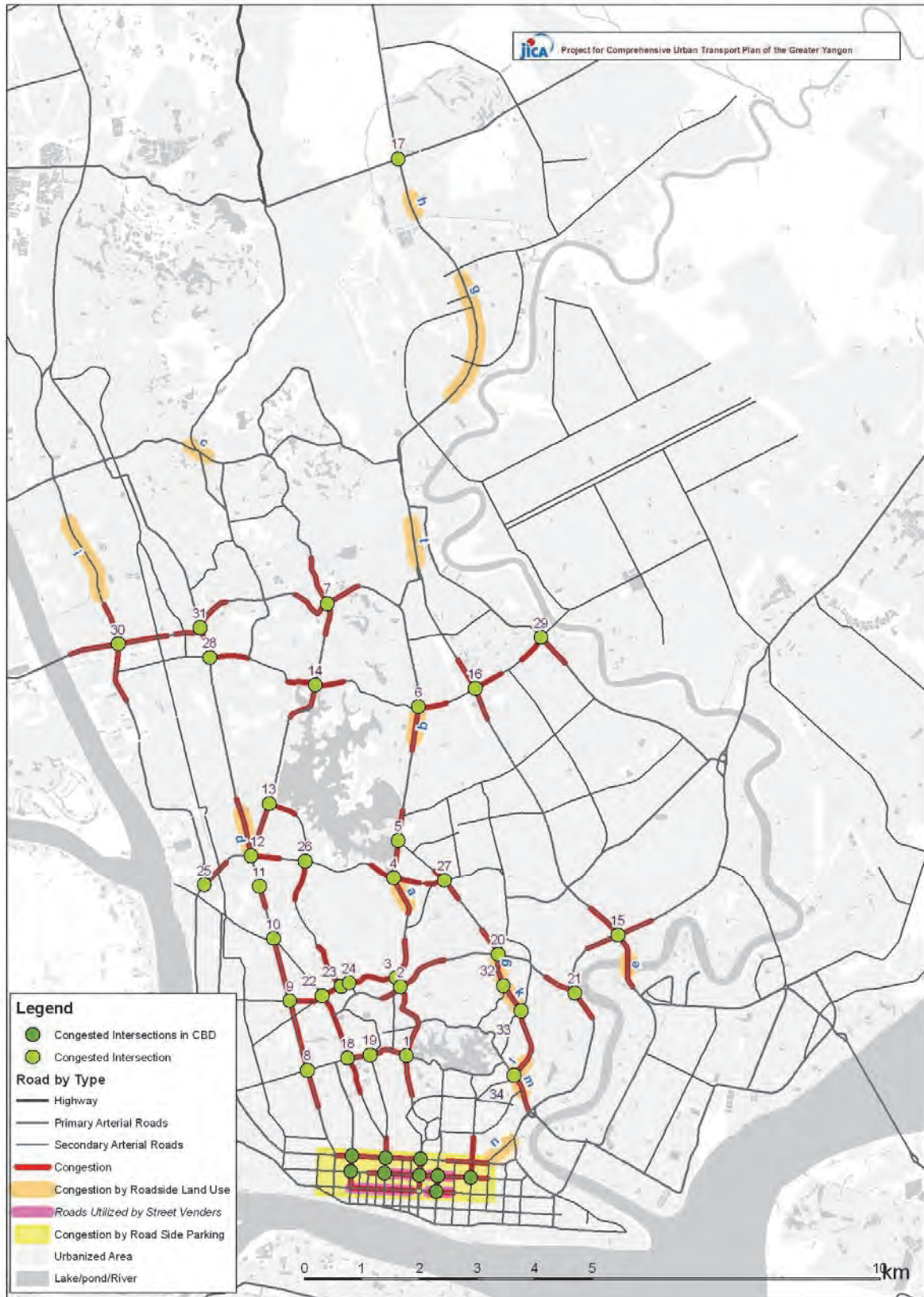
Most of the intersections between north-south and east-west main roads in the urbanized areas extending from CBD to Inya Lake are congested because of the large volume of north-

south traffic flows mixing with the large number of local traffic in the area. Moreover, due to the flyover bridge construction on Kabar Aye Pagoda Road, a lot of detour traffic avoiding the construction site are causing traffic congestions not only on the main roads but also on local roads. (See Figure 2.2.3.2)

There are at present three intersection grade-separation projects: at the Hledan Intersection which was just completed, the flyover at the intersection between Kabar Aye Pagoda Road and Shwe Gone Taing Road mentioned above, and on Bayint Naung Road. The flyovers are expected to address the most congested intersections in Yangon. However, traffic situation at the adjacent intersections, not only at the improved intersections, must be closely monitored as well. And due to the road construction works, traffic congestions have become more severe. While road works would just be for limited time period, these are not only for the three flyover projects but also for road projects scheduled for implementation to expand or improve the transport network system (not only road network but also public transport system such as BRT) in line with urban development. Therefore it is expected that traffic congestion will further result from road works and will occur anytime and anywhere.

Some of major intersections located in the north of Inya Lake are also congested with the traffic flows from north/south as well as traffic from west suburban areas (Hlaing Tharyar Township) and from east suburban areas (Okkalapa, Dagon areas). Other congested road sections and intersections can be seen along the No. (3) Main Road. Several satellite towns such as South Okkalapa and North Okkalapa are extending along the Main Road. Some of the road sections are conflicting with busy road side activities.







Although there is increased road traffic, peoples' mobility is still highly limited to the bus transport system because of the very high cost of private vehicles for most of the people and the limitation of use of 2-wheel vehicles in urbanized area. However, due to the lack of appropriate management or control system, many bus lines and buses are overlapping on specific routes or areas where many passengers are expected. In addition, at the major bus stops, people waiting for their buses are overflowing on roadways and disrupt general traffic flow.



Source: YUTRA Project Team







Figure 2.2.3.2 Congested Intersections and Road Sections

The photos of congested intersections are shown below.

| | | | |
|---|--|--|--|
| 1 | U Htaung Bo Rd-Bahan Rd 2013/07/09 Afternoon | 2 | Kaba aye Pagoda Rd-Shwe gon taing Rd 2013/07/09 Afternoon |
|  | |  | |
| 12 | Hledan Rd-Pyay Rd 2013/07/09 Afternoon | 16 | Parami Rd -Wai za yan tar Rd 2013/07/10 Morning |
|  | |  | |
| 18 | U wizara Rd-U Htaung Bo Rd 2013/07/09 Morning | 20 | U Chit Maung Rd-Shwe gon taing Rd 2013/07/09 Afternoon |
|  | |  | |

Source: YUTRA Project Team

Figure 2.2.3.3 Examples of Congested Intersections (1/2)

| | | | |
|---|---|--|--|
| 21 | Upper pazundaung Rd-Shwe gon taing Rd 2013/07/10 Morning | 22 | U wizara Rd-Dhammazededi Rd 2013/07/10 Morning |
|  | |  | |
| 23 | Inya Rd-Dhammazededi Rd 2013/07/10 Morning | 27 | No.1 Industrial Rd-University Avenu Rd 2013/07/10 Afternoon |
|  | |  | |
| 32 | Banyar Dala Rd-Pho Sein Rd 2013/07/09 Afternoon | 33 | Banyar Dala Rd-Kyaikasan Rd 2013/07/09 Afternoon |
|  | |  | |

Source: YUTRA Project Team

Figure 2.2.3.4 Examples of Congested Intersections (2/2)

2) Existing Street Parking Situation in the CBD

There are a lot of cars parking on the street in the CBD. Some are parked by the visitor and the other are by residents in CBD. Street parking could cause serious traffic congestion and traffic accidents.

The street parking survey was carried out to grasp the actual street parking condition at main arterial roads and collector roads in and south of Inya Lake in Yangon city.

The street parking is categorized as following 3 cases. Figure 2.2.3.8 to Figure 2.2.3.10 shows the result of the actual street parking condition with the 3 cases.

(1) Parking issue

Case 1: Deterioration of road capacity

One lane is occupied by cars parking on the street and it causes the deterioration of the road capacity. (See Figure 2.2.3.5) It would become problem as the traffic demand increase in the future even though there is no traffic congestion at present.

Case 2: Double parking

Double parking are found even along the on-road parking in some CBD area. The parking demand should be over the parking capacity. (See Figure 2.2.3.6)

The drivers seem to park their cars without side brake so that the cars parking inside could go out by pushing the cars outside. Otherwise the drivers leave their mobile phone number at the car and the driver parking inside can contact them.

Case 3: Deterioration of intersection capacity

Parking cars around intersection are founded at only a few intersections and it deteriorates the capacity of intersection. It could cause serious traffic congestion and traffic accidents. (See Figure 2.2.3.7)

In general, parking within 5 m from the intersection or the corner of the road is not allowed in Japan.



Figure 2.2.3.5 Case 1



Figure 2.2.3.6 Case 2



Figure 2.2.3.7 Case 3

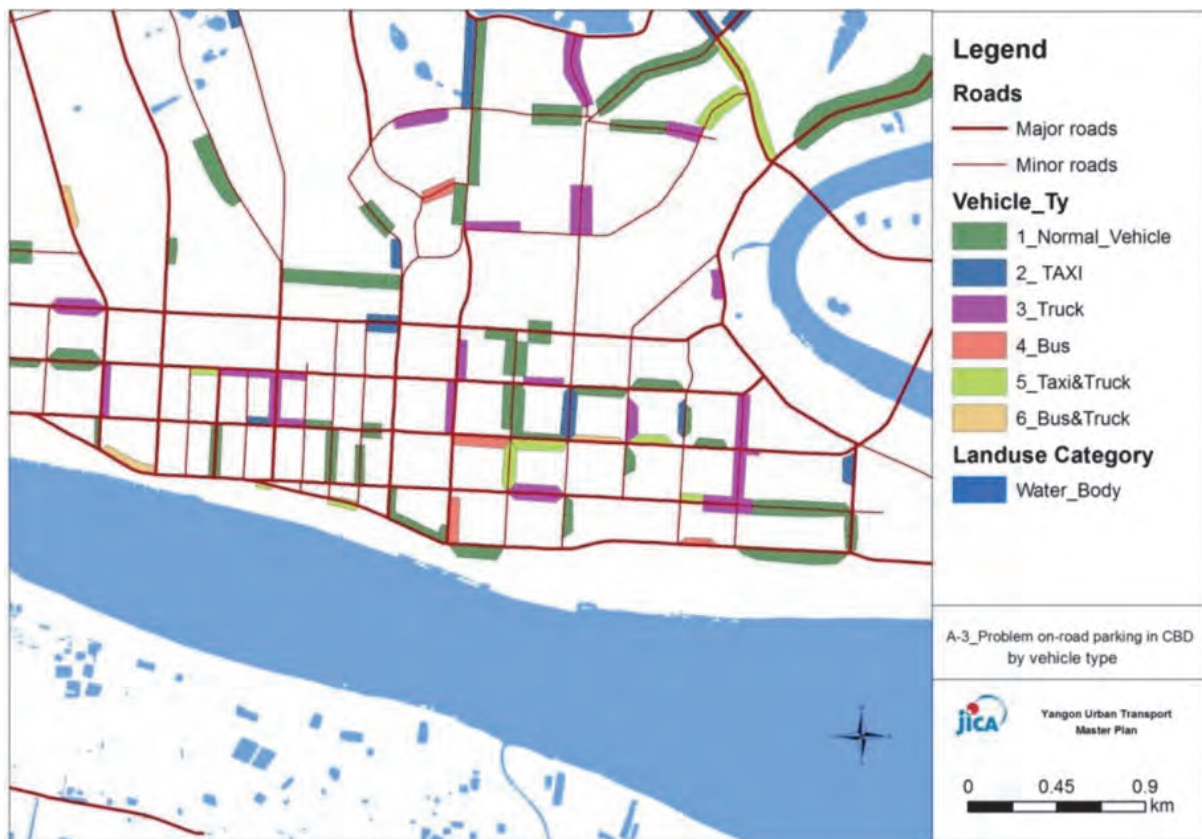


Figure 2.2.3.8 The actual condition of street parking in and south of Inya Lake in Yangon city



Source: YUTRA Study Team

Figure 2.2.3.9 The actual condition of street parking in the CBD



Source: YUTRA Study Team

Figure 2.2.3.10 The actual condition of street parking in the CBD with vehicle type

(2) Parking characteristics by building type

Parking behaviour depends on the purpose of driving. The commuter parks long hours and the deliverer parks in a short time. The parking characteristics by the use of building are observed as follows.

School

Street parking by pick-up cars occur during the student commuting time. It causes serious traffic congestion in surrounding area.

Schools do not have any parking space for pick-up cars. Passenger trucks and taxis mostly occupy roadside and then private cars follow. The street parking by pick-up car affects extensively. Not only the road in front of the school, but also the road in the other block adjoining the school are occupied by the pick-up cars especially in the CBD.

There are 2 peak for student commuting time in the morning and at noon. Most school in Myanmar adopt half day curriculum and they have 2 courses a day. Many students and pick-up cars come and go to school at noon.

Hospital

Most hospital has off-road parking. Some off-road parking are full and street parking are found around the hospital. Staff in the hospital and outpatients seem to use private cars rather than bus, especially in the large general hospital. It might be cause of their high income.

Shopping center

Many of shoppers are relatively young and visit shopping centres by bus, taxi or pick-up car. Although most shopping centre have off-road parking and some has also parking bay for taxi and pick-up car, street parking occurs and hinders traffic flow in the neighbourhood. (See Figure 2.2.3.11)

Car dealer

Many street parking occurs around the car dealers. Some car dealer showcases cars on the roadside. In addition many of them do not have any parking space for their staffs. The capacity of the road deteriorates and traffic congestion always occurs.

Shwe Dagon Pagoda and mosques

Many taxis and passenger trucks are waiting for visitors from Shwe Dagon Pagoda along the street. The capacity of the road is markedly deteriorate. The traffic flow is quite large and the walking environment is very poor. (See Figure 2.2.3.12)

Mosques do not have any parking space. Muslims, accounting for 6 % of the Myanmar population, go to mosques at noon on Friday. Passenger trucks and private cars are waiting for them near the mosque and the traffic congestion occurs during the time.

Apartment houses with store

Double parking and street parking are common sight along the street lined with apartment buildings which lower floors are used as a store in the CBD. It causes a marked deterioration in the road capacity.

Various cars such as private car or truck are parked in front of the stores regardless of the opening hour. The car users are difficult to identify. They could be shopper, employer, resident or deliverer. (See Figure 2.2.3.13)



Source: YUTRA Project Team

Figure 2.2.3.11 Actual condition of street parking at shopping centers



Source: YUTRA Project Team

Figure 2.2.3.12 Actual condition of street parking at Shwe Dagon Pagoda



Source: YUTRA Project Team

Figure 2.2.3.13 Actual condition of street parking in front of Apartment houses

Yangon traffic police attempt to strengthen regulations against street parking issue which is getting worse and worse. Parking on the street is not allowed on the 26 roads such as Pyay Road, Kabar Aye Pagoda Road, Bayln Naung Road, Strand Road, Baho Road, and Insen Road.

Parking fee of the public parking was used to be charged partly in the CBD and it became free of charge now.

3) Traffic Accident

Table 2.2.3.1 and Table 2.2.3.2 show the past trend of the number of road accidents by vehicle type in Greater Yangon.

The following characteristics are pointed out from these tables:

- (i) The number of total accidents generally increased from 2008 to 2011 for accidents which resulted in deaths and injuries; although, the numbers slightly decreased in 2010.
- (ii) Accidents in 2011 recorded the highest number in the past four years (208 died, and 1,830 injured).
- (iii) Many accidents mainly involved buses and own cars. Particularly, accidents related to buses per 10,000 vehicles shows an extremely high number (i.e., 697.5 in 2011) as compared with other vehicles. The reasons for the high accident rate of buses were due to their operation system to pick up/drop passengers on the road side, fast driving speed, and overloading of passengers.

Table 2.2.3.1 Past Trend of Road Traffic Accidents

| Vehicle Type | No. of Accidents | | | | | | | |
|--------------|------------------|------------|------------|------------|--------------|--------------|--------------|--------------|
| | Fatal | | | | Injured | | | |
| | 2008 | 2009 | 2010 | 2011 | 2008 | 2009 | 2010 | 2011 |
| Taxi | 5 | 8 | 7 | 12 | 109 | 112 | 96 | 153 |
| Bus | 64 | 63 | 71 | 61 | 609 | 778 | 501 | 823 |
| Own Car | 58 | 98 | 65 | 90 | 358 | 597 | 504 | 679 |
| Container | 19 | 26 | 23 | 35 | 66 | 99 | 91 | 142 |
| Others | 7 | 11 | 9 | 10 | 43 | 33 | 59 | 33 |
| Total | 153 | 206 | 175 | 208 | 1,185 | 1,619 | 1,251 | 1,830 |

Source: Traffic Police, Ministry of Home Affairs

Table 2.2.3.2 Number of Accidents per 10,000 Vehicles

| Vehicle Type | No. of Accidents per 10,000 vehicles | | | | | | | |
|--------------|--------------------------------------|--------------|-------------|-------------|--------------|--------------|--------------|--------------|
| | Fatal | | | | Injured | | | |
| | 2008 | 2009 | 2010 | 2011 | 2008 | 2009 | 2010 | 2011 |
| Taxi | 3.59 | 5.64 | 4.90 | 7.44 | 78.16 | 79.00 | 67.26 | 94.88 |
| Bus | 59.53 | 59.12 | 63.22 | 51.69 | 566.46 | 730.04 | 446.09 | 697.46 |
| Own Car | 4.58 | 7.39 | 4.60 | 6.10 | 28.26 | 45.03 | 35.69 | 45.98 |
| Container | 8.05 | 10.67 | 8.59 | 13.02 | 27.95 | 40.62 | 33.98 | 52.83 |
| Others | 7.04 | 10.70 | 7.98 | 8.76 | 43.25 | 32.10 | 52.30 | 28.90 |
| Total | 8.27 | 10.72 | 8.55 | 9.72 | 64.08 | 84.29 | 61.10 | 85.56 |

Source: Traffic Police, Ministry of Home Affairs

The numbers of accidents by township in 2011 are summarized in Table 2.2.3.5.

The highest numbers of accidents were observed in Hlaing Tharyar Township (268) and Mingalardon Township (237). In Mingalardon Township, Main Roads No. 1 and No. 3 run in the north to south direction at the center of the township. Hlaing Tharyar Township is located at the entrance of the busiest road, that is, Main Road No. 4.

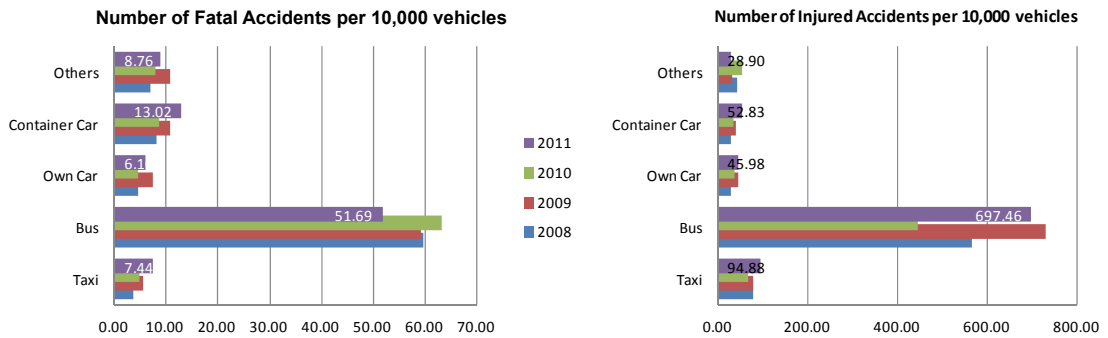
In order to eliminate the influence of the area of townships, the number of accidents per square mile was calculated as well. As shown in Table 2.2.3.3 below, the highest accident density (per square mile) was observed in the CBD with an average of 46.7 per square mile. Other townships with high accident density are Bahan (34.3), Sanchaung (51.0) and Kamaryut (30.4), which are also located in the Inner Urban Ring zone and connected to the CBD via Main Roads No. 1, No. 3 and No. 4.

Table 2.2.3.3 Number of Accidents by Township (2011)

| N | Township | No..of Accidents | | | Population (2011) | Area (s.q.m) | Per 10,000 | Per s.q. |
|----|--------------------------|------------------|-------------|-------------|-------------------|--------------|-------------|-------------|
| | | Death | Injury | Total | | | | |
| 1 | Pazuntaung | 2 | 8 | 10 | 53,648 | 0.39 | 1.86 | 25.6 |
| 2 | Botahtaung | 2 | 47 | 49 | 49,134 | 0.96 | 9.97 | 51.0 |
| 3 | Kyauktada | | 21 | 21 | 34,797 | 0.28 | 6.04 | 75.0 |
| 4 | Lanmadaw | 6 | 21 | 27 | 43,137 | 0.54 | 6.26 | 50.0 |
| 5 | Latha | | 12 | 12 | 34,125 | 0.31 | 3.52 | 38.7 |
| 6 | Pabedan | 1 | 9 | 10 | 37,551 | 0.28 | 2.66 | 35.7 |
| | CBD | 11 | 118 | 129 | 252,392 | 2.76 | 5.11 | 46.7 |
| 7 | Dagon | 1 | 41 | 42 | 24,492 | 1.96 | 17.15 | 21.4 |
| 8 | Bahan | 11 | 106 | 117 | 100,695 | 3.41 | 11.62 | 34.3 |
| 9 | Seikkan | 2 | | 2 | 2,241 | 6.41 | 8.92 | 0.3 |
| 10 | Dawbon | 2 | 25 | 27 | 87,284 | 1.47 | 3.09 | 18.4 |
| 11 | Kyeemyindaing | 5 | 25 | 30 | 115,841 | 4.81 | 2.59 | 6.2 |
| 12 | Mingalar Taung Nyunt | 2 | 37 | 39 | 155,767 | 1.96 | 2.50 | 19.9 |
| 13 | Ahlon | 1 | 20 | 21 | 65,510 | 1.04 | 3.21 | 20.2 |
| 14 | Sanchaung | 2 | 47 | 49 | 105,208 | 0.96 | 4.66 | 51.0 |
| 15 | Tarmwe | 2 | 40 | 42 | 191,114 | 1.71 | 2.20 | 24.6 |
| | Inne r Urban Ring | 28 | 341 | 369 | 848,152 | 23.7 | 4.35 | 15.5 |
| 16 | Dala | n.a. | n.a. | n.a. | 181,087 | 3.90 | n.a | n.a |
| 17 | Seik gyi Kha Naung To | n.a. | n.a. | n.a. | 38,425 | 2.27 | n.a | n.a |
| | South of CBD | | | | 219,512 | 6.17 | | |
| 18 | North Okkalapa | 5 | 53 | 58 | 333,484 | 10.32 | 1.74 | 5.6 |
| 19 | South Okkalapa | 4 | 40 | 44 | 191,388 | 3.93 | 2.30 | 11.2 |
| 20 | Thaketa | 9 | 50 | 59 | 253,284 | 4.93 | 2.33 | 12.0 |
| | Older Suburbs | 18 | 143 | 161 | 778,156 | 19.1 | 2.07 | 8.4 |
| 21 | Hlaing | 15 | 85 | 100 | 151,014 | 5.26 | 6.62 | 19.0 |
| 22 | Kamaryut | 1 | 72 | 73 | 87,881 | 2.40 | 8.31 | 30.4 |
| 23 | Thingangyun | 8 | 99 | 107 | 231,621 | 4.40 | 4.62 | 24.3 |
| 24 | Yankin | 2 | 34 | 36 | 125,909 | 1.94 | 2.86 | 18.6 |
| | Outer Ring Zone | 26 | 290 | 316 | 596,425 | 14.0 | 5.30 | 22.6 |
| 25 | Insein | 13 | 138 | 151 | 311,200 | 13.52 | 4.85 | 11.2 |
| 26 | Mingalardon | 31 | 206 | 237 | 288,858 | 43.57 | 8.20 | 5.4 |
| 27 | Mayangone | 11 | 139 | 150 | 205,403 | 9.78 | 7.30 | 15.3 |
| | Northe m Suburbs | 55 | 483 | 538 | 805,461 | 66.87 | 6.68 | 8.0 |
| 28 | South Dagon | 13 | 51 | 64 | 370,403 | 30.55 | 1.73 | 2.1 |
| 29 | North Dagon | 6 | 23 | 29 | 221,200 | 23.27 | 1.31 | 1.2 |
| 30 | East Dagon | 11 | 54 | 65 | 145,505 | 35.15 | 4.47 | 1.8 |
| 31 | Dagon Seikkan | 8 | 42 | 50 | 120,161 | 32.97 | 4.16 | 1.5 |
| 32 | Shwe Pyi Thar | 3 | 46 | 49 | 295,993 | 25.76 | 1.66 | 1.9 |
| 33 | Hlaing Thar Yar | 29 | 239 | 268 | 488,768 | 26.32 | 5.48 | 10.2 |
| | New Suburbs Zone | 70 | 455 | 525 | 1,642,03 | 174. | 3.20 | 3.0 |
| | Sub-Total | 208 | 1830 | 2038 | 5,142,12 | 306. | 3.96 | 6.6 |

Source: Traffic Police, Ministry of Home Affairs

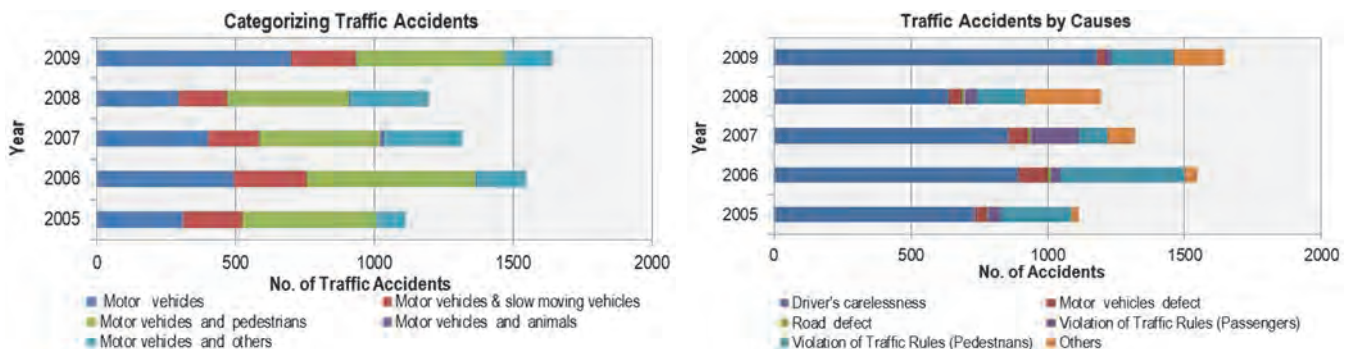
It is observed that driver's manners are comparatively good in case of passenger cars. However, problem is bus operations which occupy one lane to pick up passengers and occasionally standby long time until the bus is full. The traffic accident rate of buses per 10,000 vehicles is extremely high as shown in Figure 2.2.3.14. The reasons of high accident rate of buses are due to their operation system to pick up/ drop passengers on road side, higher driving speed, and overloading of passengers.



Source: YUTRA Project Team based on the data provided from Traffic Police

Figure 2.2.3.14 Number of Accidents per 10,000 Vehicles

It is pointed out also that the pedestrian priority rule is not strictly kept and crossing roads is in dangerous situation for pedestrians. In order to reduce the number accidents, measures such as construction of pedestrian crossing bridges in order to separate vehicles and pedestrians movements and establishment of bus bays are also necessary measures together with the traffic safety education.



Source: YUTRA Project Team based on the data provided from Traffic Police

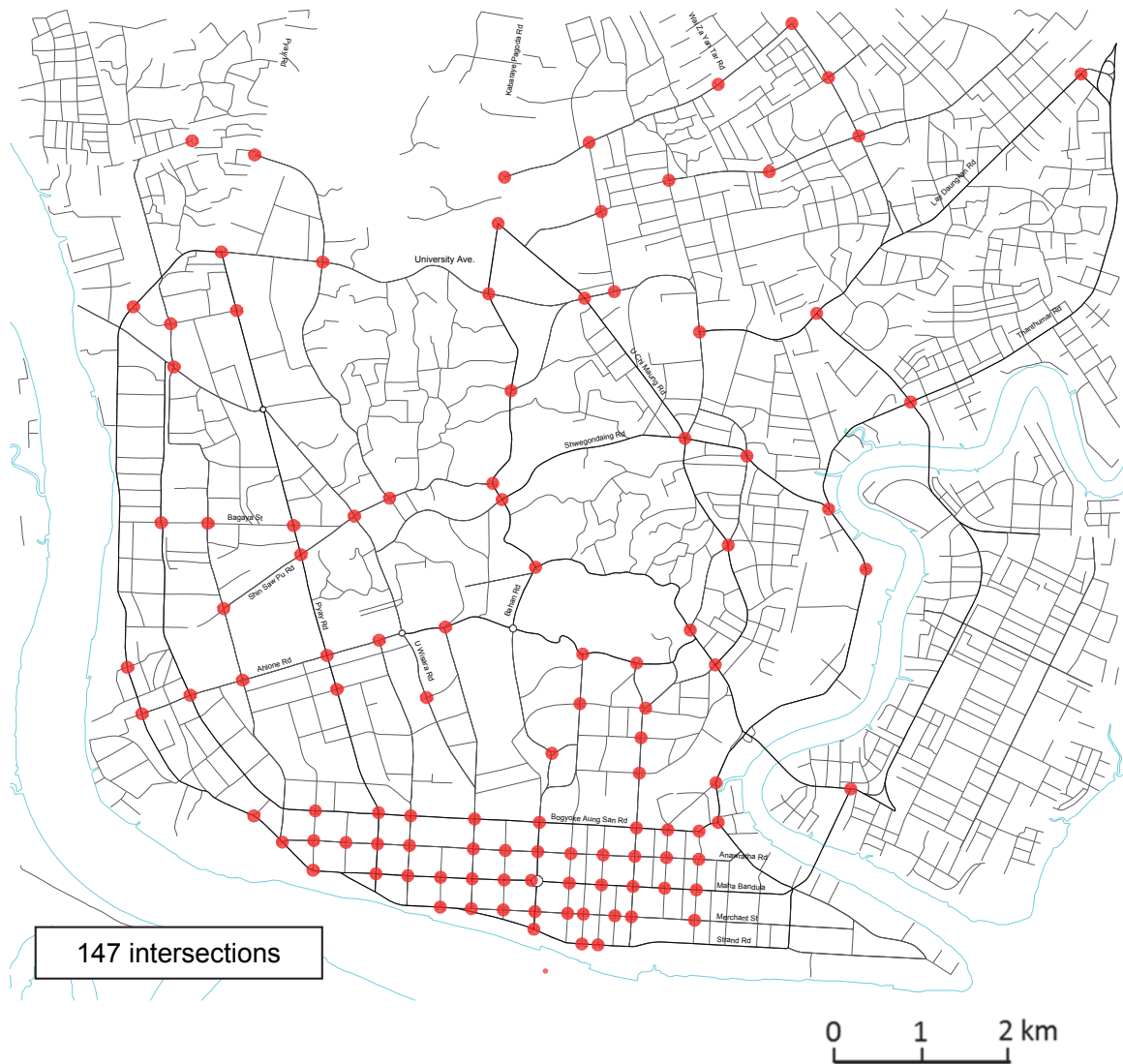
Figure 2.2.3.15 Number of Accidents by Vehicle type and by Causes

4) Traffic Management Facilities

(1) Traffic Signal

At intersections in Yangon City, traffic congestion was also observed. The intersections in Yangon City are generally classified into 1) signalized intersections, 2) non-signalized intersection, and 3) roundabouts.

Figure 2.2.3.16 shows the locations of signalized intersections in Yangon City.



Source: YUTRA Project Team

Figure 2.2.3.16 Locations of Existing Signalized Intersections

Regarding intersection configuration, improvements such as adding more lanes will be necessary considering the long queues at intersections.

YCDC is constructing flyovers at seriously congested intersections. Further construction of flyovers may also be considered.

(2) Road Markings

Road markings for the center lines and side lanes are done on the main roads and are well-maintained in the CBD and urban areas. However, markings on main roads in the suburbs are not clear, and sometimes such markings are completely gone in the case of minor roads.

(3) Road Signs

Some problems are identified on the road traffic signs installed in the Study Area. They are; (i) improper sign location, (ii) invisible sign in the night, and (iii) insufficient sign installation, etc. The existing road information boards are mainly provided on the major intersections to show the destinations for each direction. The number of road information boards are not

sufficient and should be displayed not only in Myanmar letters but also in alphabetical for easy understanding of foreigners.

5) Existing Traffic Management and Safety Measures

(1) Traffic Control and Management Measures

YCDC and the Regional Government have implemented numerous transport and traffic measures on the passenger transport system (bus and circular rail as abovementioned) and traffic management issues, as follows:

- Control of Vehicle Import: the Government allows only a few thousand cars to be imported each year. However, the Government reduced the regulations in September 2011 in order to promote replacement of the old and non-emission control cars by vehicles manufactured after 2007.
- Prohibition of old model cars: over 20 years old of manufactured cars are registered out of the Yangon City Development Area.
- Control of usage of Motorcycle in Yangon: Number of motorcycle shares 30% of the total registered vehicles in Myanmar. However, in Yangon Division, the share is less than 20% because of the prohibition of motorcycle in YCDC area (31 townships out of 33 townships in YCDC). The motorcycle ban is contributing to the easy traffic flows and traffic safety in YCDC.
- NMV (Non-Motorized Vehicle) Countermeasures: NMV such as bicycles and trishaws are limited to CBD of Cities during day time. Bicycles and trishaws are used in the suburban of Yangon and other major Cities.
- Besides above countermeasures, YCDC employs the following countermeasures to alleviate traffic congestions and problems:
 - Traffic police patrols are placed along the main roads of Yangon
 - Use of one-way road system
 - Identification of no entry zone for slow moving vehicles
 - Identification of no entry zone for over 3-ton vehicles
 - Prohibition of car parking at particular roads
 - Prohibition of car parking at particular roads in the morning and evening hour
 - Permit only passenger buses to use right of way
 - Identification of "No Horn Zone" in CBD
 - Prohibition of light truck buses in downtown areas

YCDC has been implementing Yangon City as a Green and Clean City. The committee is continuously carrying out for expansion and construction of the roads, construction of the bridges and maintaining as well within the YCDC area of Yangon City in pace with rapidly increasing in motor vehicles growth rate. Furthermore, YCDC has been posted road direction sign and notification boards for vehicles and non-motorized vehicles whenever necessary in order to reduce traffic congestion, traffic accidents, and any road damages.

Moreover, in order to develop Yangon City more efficiently and effectively, YCDC sets the

following laws and regulations in accordance with Yangon City Development Law No. 33 (a). There are a total of five (5) laws and regulations relating with urban transportation in Yangon City. Laws and Order Letter No. 11/91 is for Road and Bridges, No. 1/95 is for Parking Restricted Zones, No. 4/96 is for Vehicle Trading Areas, No. 5/96 is for Parking for Vehicles and Non-Motorized Vehicles, and No. 1/99 is for Non-Motorized Vehicles (Trishaw) Restricted Zones. The outlines of each laws and regulations are mentioned in Table 2.2.3.4.

Table 2.2.3.4 Yangon City Development Committee's Laws and Regulations

| No. | Title | Outlines |
|-------|---|---|
| 11/91 | Road and Bridges | <p>For roads and bridges constructions and maintenance, construction of flyover, pedestrian bridges, and underground roads, YCDC has the right to do it by itself or as a contract system.</p> <p>YCDC has the right to dispose the whole or any parts of gutters into the Yangon River, Hlaing River, Bago River, and Nga Moeyeik creek. Moreover, YCDC can dispose outside of the city area in which YCDC should negotiate with the development committee of relevant districts.</p> <p>Any person who wants to construct self-owned road needs to submit the application form in accordance with YCDC prescribed orders. After construction of this road, either the owner of the road or the residents on that road can apply to YCDC in order to convert it to a public road. In that case, YCDC must announce the application to the public. If there is no objection, YCDC can identify it as a public road.</p> <p>YCDC can levy on wheel tax and parking fee on any registered motor vehicles. YCDC shall carry out the following tasks.</p> <p>Setting traffic signals if necessary</p> <p>Setting direction sign, road signs and lane marking</p> <p>Setting no-entry, no-parking area and one-way street</p> <p>Setting parking restricted zones and collecting parking fees</p> <p>Setting of bus stops and terminals</p> <p>Setting no-entry areas for over limited tons</p> <p>Non-motorized vehicles restricted areas</p> <p>Restriction of vehicle speed</p> |
| 1/95 | Parking Restricted Zones | <p>The following streets are declared as parking restricted zones since 1 September 1995.</p> <p>Bo Aung Kyaw Street</p> <p>Lanmadaw Street</p> <p>Bogyoke Aung San Street</p> <p>Kannar Street</p> <p>Any vehicles parked in these streets between 8:00 to 18:00 are required to pay parking fees.</p> |
| 4/96 | Vehicle Trading Area | <p>No one is allowed for vehicle trading within city area except the following restricted places.</p> <p>Vehicle Trading Compound, Botahtaung, Botahtaung Township (For under 1 ton vehicles and Motorcycles)</p> <p>Vehicle Trading Compound, Yamona, Dawbon Township (For any vehicles)</p> <p>Vehicle Trading Compound, Hantharwaddy, Sanchaung Township (For any vehicles)</p> |
| 5/96 | Parking for Vehicles and Non-Motorized Vehicles | <p>In order to reduce road damage, traffic congestion and accidents, YCDC declares the following regulations:</p> <p>Vehicle washing, repairing, and parking for long period is not allowed on the streets.</p> |

| | | |
|------|---|---|
| | | <p>Parking of any break down and non-motorized vehicles for long period is not allowed.</p> <p>Buses, trucks and any other vehicles are not allowed to park in no-parking zones and on the streets.</p> |
| 1/99 | Non-Motorized Vehicles (Trishaw) Restricted Zones | <p>The following streets are declared as non-motorized vehicles (Trishaw) restricted zones.</p> <p>Theinphyu Street Merchant Street Lanmadaw Street Bogyoke Aung San Street</p> <p>Any non-motorized vehicles (Trishaw) are not allowed to enter in these streets between 5:00 to 22:00.</p> |

Source: YCDC Laws and Regulations

(2) Traffic Regulation for Large Trucks

Routes (roads) for container trailers, log trucks and heavy trucks are designated by the Yangon Region as shown in Figure 2.2.3.17. Container trucks mainly use the road paralleling Strand Road and Bayint Naung road paralleling the Yangon River to/from the Haling Thar industrial area and other industrial zones along No. (4) main road. Other north-south truck route is No. (3) main road stretching from the 0 mile point of the Yangon – Mandalay Expressway in the north, passing through the Mingaladon Industrial Park, down to south along Thanthumar road. This route is also heavily used by buses owned by companies in the industrial zone along the main road No. (3).

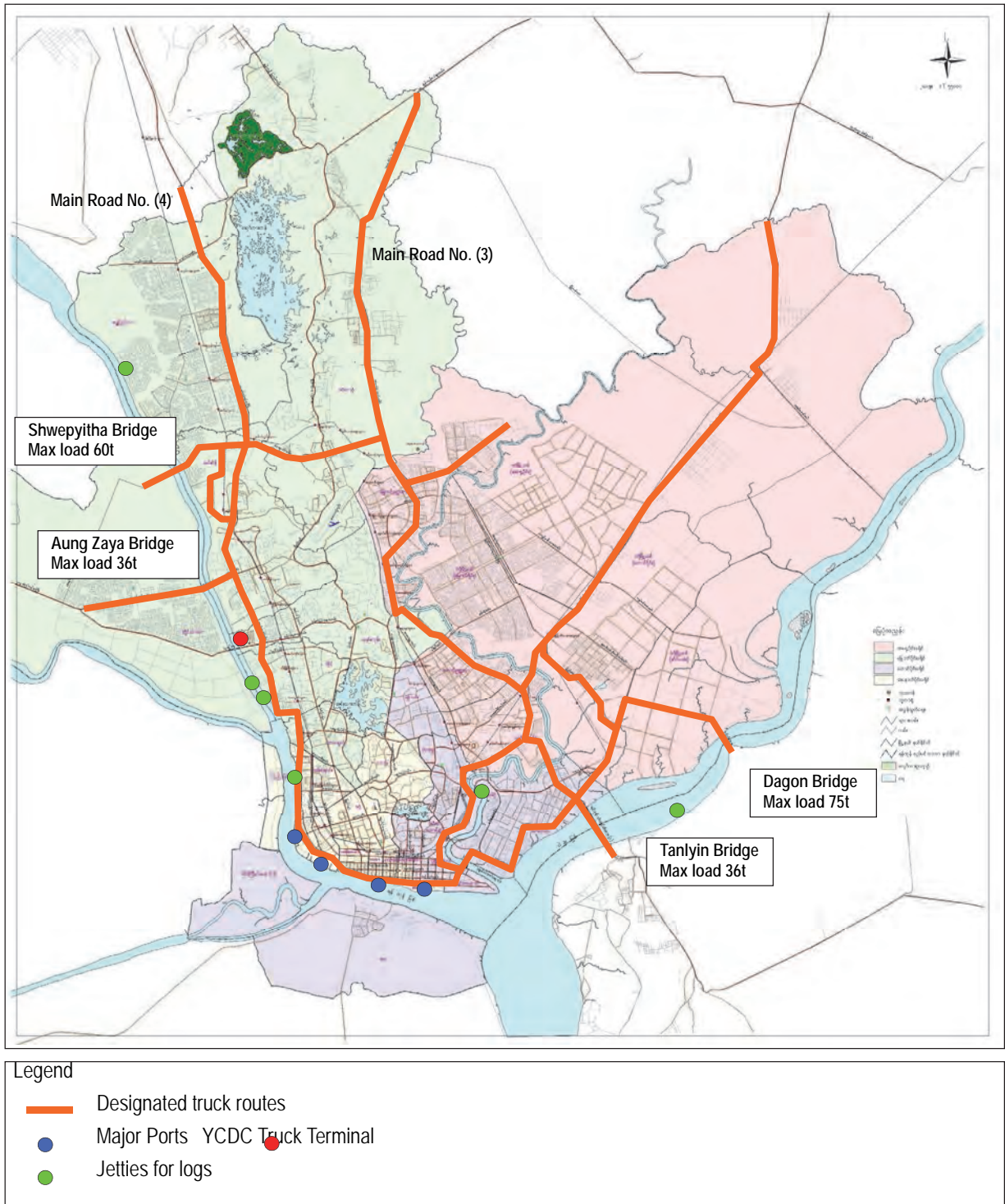


Figure 2.2.3.17 Designated Truck Routes

(3) Intelligent Transport System (ITS)

To enhance the traffic capacity of the existing road network, ITS technology is well known to be quite effective. In CBD, due to many traffic signal intersections and existing traffic signals are independently operated without linking each other, long delay and long queues are often observed at these intersections. ITS technologies such as ATCS (Area Traffic Control System) will be one of measures to enhance the capacity of the intersections and

the traffic data recorded by ATCS will be able to use for future city/road planning. Also for buses, ITS technology such as bus location system will contribute for effective bus operation.

In Yangon, some of ITS facilities have been introduced as shown below. However these facilities are not well utilized and not synchronized each other.



Figure 2.2.3.18 Existing ITS Facilities in Yangon

6) Examination of Causes of Traffic Congestion

Current traffic situations in the urbanized areas in Yangon were discussed in the previous section and the causes of congestion are examined in this section. Traffic congestion is a phenomenon that takes place when traffic demand exceeds the capacity of a road section or intersection. The capacity would be influenced by roadside activities and road geometric conditions such as lane width, lateral clearance, vertical/horizontal alignment, etc. Radical infrastructure improvements which require large amount of investment and land acquisition will be the medium- or long-term measures. But for the short-term measures, focus will be on the efficient usage of the existing road spaces and traffic operation/ management as well as minor infrastructure improvements which do not require large amount of investment.

Based on the observation survey conducted, 13 causes of traffic congestions are identified which may be addressed by short-term mitigation measures. Sections which are highly-congested are caused by a number of reasons which makes traffic flow in these sections more complicated.

- (1) On-street parking and illegal parking
- (2) Insufficient traffic signal operation
- (3) Exceeding capacity of roundabout
- (4) Improper boarding and alighting behavior of bus passenger (due to buses not stopping at designated bus stops and instead stop in the middle of carriageway for passengers to get on and off)
- (5) Illegal roadside parking and queuing of taxies waiting for passengers
- (6) Deteriorated road pavement due to lack of proper maintenance (particularly during

the rainy season)

- (7) Flooding of road way (insufficient road drainage system)
- (8) Schools and regional facilities and sites with high concentration of people during same time period of time along the main roads
- (9) Large scale commercial facilities along main roads
- (10) Busy roadside activities such as shops and restaurant (commercial area)
- (11) Street vendors and street markets
- (12) Road works
- (13) Large volume of Lorries and Trucks, etc.

The parking problems are more serious in the CBD rather than the ones in the suburb. Along the main roads such as Kabar Aye Pagoda Road and Pyey Road, on-street parking is controlled effectively. But in the dense commercial areas in the CBD and adjacent urbanized areas, drivers have no choice but to park along the streets due to lack of sufficient off-street parking spaces. Moreover, because of the rapidly increasing rate of motorization, on-street parking spaces are not sufficient enough so that vehicle traffic looking for an available parking space is already causing traffic congestion (see Figure A.2).

At the intersections, there are two issues raised: one is the signal control system and another is the roundabout. Existing signal control system in Yangon is fixed phasing (one phasing pattern for whole day) with long signal cycle. However, due to the peak hour large traffic demand on the specific directions, length of the waiting traffic queue would extend rapidly and sometimes paralyze the function of the adjacent intersection. Thus it is important to assign appropriate green time according to the directional traffic demand. When the capacity is saturated, priority may be provided to the traffic flows on the main roads.

In case of the roundabout, the advantage of a roundabout is its ability to provide smooth turning traffic flows without stopping. However, its disadvantage is its limited capacity. When traffic demand is relatively low, the roundabout works effectively, but once it has exceeded its limited capacity, the traffic flows are sometimes deadlock in the roundabout. There are some roundabout intersections in the entrance points to the CBD where large traffic demands are concentrated. In the morning and evening peak hours, traffic demands are definitely exceeding the capacities. While traffic police are assigned at the congested roundabout intersections, it is however not an easy task to undo the already tangled traffic flows in the roundabout. In order to increase the roundabout capacity, measures that may be adopted will be either installing traffic-actuated signal or constructing grade separation structure (underpass or flyover).

Congestions due to the public passenger buses are observed in the CBD during the evening and morning peak hours. The buses line up bumper to bumper and a number of buses approaching the bus stop at the same time blocks the traffic lanes for passengers to board and alight. The situations are more severe on the sections where on-street parking is allowed or street vendors are very active.

Insufficient road maintenance sometimes becomes the cause of congestion. In the low land areas along the rivers, road pavement is deteriorated because of long periods of rainy

season and insufficient road drainage system. Road sections with large number of heavy vehicles are more severe. Currently, YCDC has installed concrete pavement instead of the asphalt pavement which will be more solid. However, many road sections have remained without proper maintenance and pavement conditions have deteriorated. There are also many road sections that experience flooding during onset of heavy rain. Flooding does not only disrupt traffic flows but also cause damage to the road pavement, even on solid concrete pavement. And since the Yangon region has a long period of rainy season, it is necessary to have a proper drainage system in place.

Large commercial buildings, religious facilities and schools located along the main roads are also causing traffic congestions at a particular period of time. Congestions in areas where there are commercial buildings normally happen on weekends. School zones on the other hand are highly congested during peak hours in the morning, noon and evening by school buses, taxis and private cars for school children during school days. The roads leading to and where there are Islamic temples are congested on Fridays.

Regarding the congestions caused by the road side activities, loading/unloading of goods, street market, street vendors, and shoppers overflow on the sidewalk (walking on the roads) and sometimes entertainment activities are seen commonly not only in the CBD but also in suburban areas. Impact to the congestions in CBD is much higher than the ones in suburban areas, but risk of accident would be higher in the suburban areas because of the higher vehicle running speed.

Basically, urban roads have several kinds of functions such as traffic function, access to the adjacent land use, urban space, attracting economic activities, etc. Therefore, the road network system should be formulated based on functions: main road will strengthen the traffic function, while local road will be for road side activities. However, current road use of the roads in Yangon are mostly mixed and complicated except for some main roads. During the era of low motorization, the mix function does not have much impact to the traffic, but once there is increased motorization, this now become the main cause of traffic congestion. It now becomes imperative that a review of the road function and introduction of appropriate traffic management system according to their respective functions be made.

Capacity reduction by the large vehicles is concentrated on the designated truck routes such as Bayint Naung Road, No. (3)- and No. (4)- and No.(2)- Main Road, etc. Those main roads are running through low land areas and have periodic flooding, which accelerates deterioration of the pavement condition. Thus proper drainage system should be developed as soon as possible.

2.2.4 Public Transport Services

Buses can be considered as the main workhorse of public transportation in Yangon Region. The modal share indicates that bus share 84% in 2009 compared with 6% by private cars, 5% by taxi, 3% by circular railway, and 2% by other modes. Within Yangon City limits, it is illegal to drive trishaws, bicycles, and motorcycles. The bus transport, therefore, would continue to remain as the main mode of public transportation despite the facts that its level of service is not very satisfactory.

1) Bus Transport Industry Structure

Currently bus services are provided through a multiplicity of mechanisms by a mix of public and private sector operators. Generally, it can be categorized as 3 main groups in the provision of bus services in Yangon Region. These are:

- (i) Bus services provided by private bus companies
- (ii) Bus services provided by individual private bus owners and managed by bus supervisory committees (BSC)
- (iii) Bus services provided by bus line committees (BLC)

There are total 18 bus committees and all are under the supervision of Yangon Region Central Supervisory Committee for Motor Vehicles and Vessels (locally known as Ma-htha-Central).

Private Bus Companies

The private bus companies are large-scale bus operators who provide bus services with their own vehicles, drivers and conductors. At present, there are two private bus companies in Yangon.

- (i) Bandoola Transportation Co. Ltd. operating Parami bus route
- (ii) Myanmar Golden City Link Co. Ltd. operating Shweeithe bus route

Bus Supervisory Committees (BSC)

Bus supervisory committees are non-government organizations. The committees do not engage themselves in any bus service supply of their own vehicles rather they monitor and supervise bus operation and individual bus operators. Their main responsibilities are control of service frequency, approval of number of vehicles and trips performed on each route. The committee installs small booth at origin and destination of each bus route and assigns staff to record the bus arrival and departure time (see Figure 2.2.4.1). They employ dispatchers, route supervisory staff and office staff including accountants. Their revenue comes mainly from the commission fee paid by individual bus operators (2% of total daily revenue from each bus operator).



Source: YUTRA Study Team

Figure 2.2.4.1 Small Booth

The bus supervisory committees are:

- (i) Yangon Region Bus Supervisory Committee (known as Ma-htha-tha) for Intra-city (established in 1962)
- (ii) Yangon Region Bus Supervisory Committee (known as Ma-htha-tha) for highway
- (iii) Bus Supervisory Committee (Eastern District) (established in 1997)
- (iv) Bus Supervisory Committee (Western District) (established in 1993)
- (v) Bus Supervisory Committee (Southern District)

(vi) Bus Supervisory Committee (Northern District) (established in 1998)

Among them, Ma-hta-tha, which operates 117 bus routes, i.e. 32% of total bus routes, is the biggest bus supervisory committee in Yangon Region. It comprises registered vehicles 2,143 out of which 1,522 vehicles are operating daily and carrying about 1,534,776 passengers a day in Yangon Region (As of 2012).

The individual bus operators own the bus vehicles and hire the bus crews. They are usually small family business with 1-10 vehicles without formally qualified professional staff. They must belong to one of the bus supervisory committees in order to engage in bus operation in Yangon Region and they are obliged to follow the committee's requirements. More importantly, they are required to pay the management fee to the committee on a daily basis.

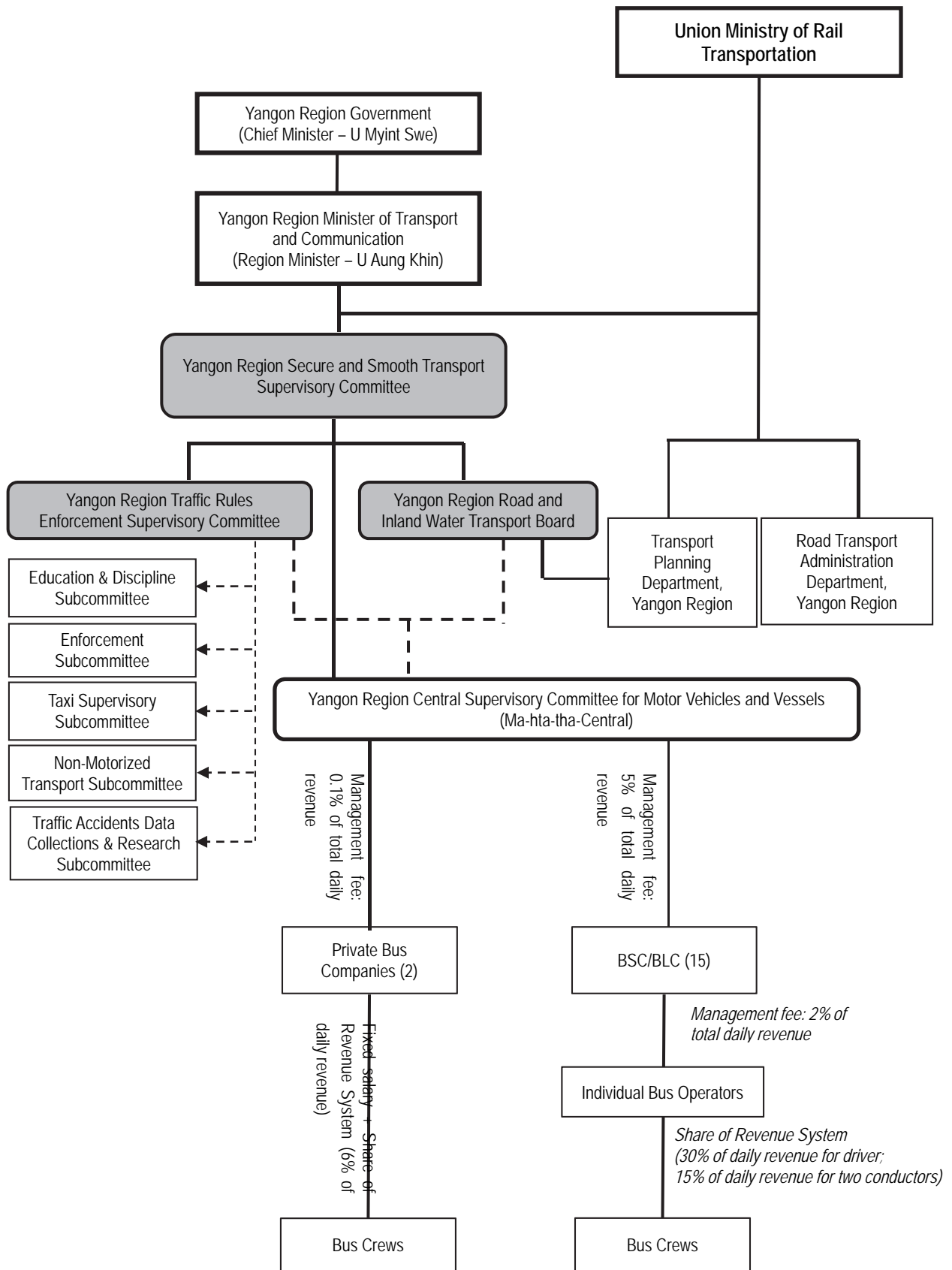
Bus Line Committees (BLC)

Bus Line Committees are also non-government organizations and similar function with Bus Supervisory Committees. There are 10 bus lines committees in Yangon Region.

- (i) Than Myan Thu Bus Line Committees (established in 1996)
- (ii) ShweInnwa Bus Line Committee
- (iii) YCDC Bus Line Committee
- (iv) Myanmar Tharkaung Bus Line Committee
- (v) Kandayawaddy Bus Line Committee
- (vi) Yangon War Veteran Organization (Inner YCDC)
- (vii) Yangon War Veteran Organization (Outer YCDC)
- (viii) Shwe Yangon Bus Line Committee
- (ix) Shwe Myin Pyan Bus Line Committee
- (x) GEC Bus Line Committee

2) Institutional Arrangement and Regulations

The institutional arrangement and regulations for urban bus transportation in Yangon are described in Figure 2.2.4.2 and Table 2.2.4.1, respectively.



Source: YUTRA Project Team based on information obtained from Interview with Yangon Region Transport Planning Department, Ma-hta-tha-Central, Traffic Police Divisional Department & Ma-hta-tha (September 2012)

Figure 2.2.4.2 Bus Transport Industry Structure and Institutional Arrangement

Table 2.2.4.1 Regulation of Urban Bus Transportation in Yangon Region

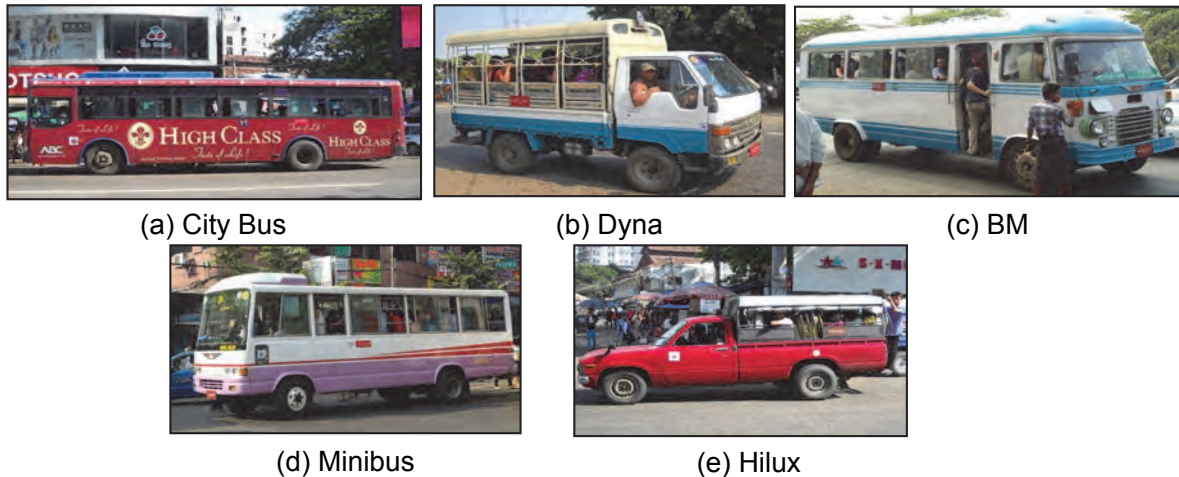
| I. FINANCIAL REGULATION | | | |
|---|--|--|---|
| Fare regulation | Controlled by Yangon Region Government (No clear criteria for setting up fare level& increment of fare level) | | |
| Financial operating assistance | | | |
| (i) Finance for bus-related infrastructure | YCDC is responsible for construction and maintenance of bus stops. | | |
| (ii) Subsidies for operating deficits | No | | |
| (iii) Subsidies for vehicle purchase | No | | |
| Fare structure | Under BSC & BLC | Golden City Link Co. Ltd. | Bandoola Transportation Co. Ltd. |
| | Flat fare & Distance-based fare | Flat fare | Flat fare & Distance-based fare |
| Fare level (Fare structure effective June, 2013) | Mini: 50 kyat Increased amount: 50 kyats (based on no. of bus stops which varies among bus route) Max: 200/250/300 kyat Special bus fare: 200 kyats | 300 kyats | Flat fare (special bus): 200/300 kyats Distance-based: same as used by BSC & BLC |
| Fare collection system | On-board conductors | | |
| Forms of payment | Cash | | |
| Revenue control system | <pre> graph LR BP[Bus Passengers] -- Bus fare --> BC[Bus crews] BC -- Fare Revenue --> BO[Bus Operators] BO -- Share of revenue --> BC BO -- Fixed salary + % of revenue (or) --> BC </pre> | | |
| Contract between operators and drivers | Individual Operators Share of revenue (30% of daily revenue for driver; 15% of daily revenue for two conductors) | Bus Companies Fixed salary + commission payment from daily revenue (6% of daily revenue) | |
| II. OPERATIONAL REGULATION | | | |
| Market Regulation | | | |
| (i) Market entry rule | <p>Firstly, vehicle registration is required at Road Transport Administration Department (RTAD). Under 1963 Road and Inland Water Transport Law, any person who engages in road transport business requires to hold operating license that is issued by Transport Planning Department (TPD). In practice, TPD tends to follow the recommendations of RTAD which inspect the vehicle in accordance with the regulations.</p> <p>At this moment, TPD will issue Type "C" license. After that, operator needs to apply in one of the BSC which eventually will transfer the application form to Ma-hta-tha-Central. Ma-hta-tha-Central will hold committee meeting which is chaired by Yangon Region Transport Minister and committee members are TPD, RTAD, Myanmar Oil & Gas Enterprise, Traffic Police Divisional Department, Ma-hta-tha-Central and BSC/BLC/private companies representatives. The discussion result of committee meeting will be submitted to Yangon Region Government through Ma-hta-tha-Central if operator is allowed to enter the bus market. Once get approval from Yangon Region Government, then TPD will reissue Type "B" license. And then operator can start bus transport service in Yangon Region.</p> | | |
| (ii) Competition | Competition in the market | | |
| (iii) Type of ownership of bus operation | A mix of public and private | | |
| Procurement of services | | | |
| (i) Bus service contracting | Individual bus operator must belong to one of the bus supervisory committees. | | |
| (ii) Route permission | Given by Ma-hta-tha-central | | |
| (iii) Licensing of bus operators | License name: Type "B" – Transportation of passenger {Valid period: 1 year} | | |
| (iv) Licensing of bus crews | License name: Type "E" for bus driver {Valid period: 3 years} License name: Type "F" for bus conductor {Valid period:5 years} | | |
| (v) Regulation on service frequency | For bus companies: self-controlled For individual bus operators: controlled by BSC | | |
| (vii) Passenger information provision | No information for schedule, map, name of stops, fare {fare information is provided in inside of the some bus} | | |
| III. VEHICLE REGULATION | | | |
| (i) Regulation on no. of vehicles | None | | |
| (ii) Regulation on vehicle type | None | | |
| (iii) Regulation on vehicle age | None Government started an auto replacement program that offering old vehicles owners to import new ones since November 2012. However most of the imported vehicles are passenger cars. | | |
| (iv) Regulation on passenger capacity | None | | |
| III. SAFETY REGULATION | | | |
| (i) Regulation on vehicle maintenance | Buses are inspected by RTAD every year when vehicle registration is renewed. | | |
| (ii) Regulation on bus speed | None | | |
| (iii) Regulation on drivers' working hrs | None | | |

Source: Information obtained from Interview with Ma-hta-tha (Central) (As of June, 2013)

3) Bus-related Facilities

Bus Fleets & Bus Routes Distribution

Bus services are provided by using various types of vehicles ranging from conventional buses to converted trucks and pickups (see Figure 2.2.4.3). Table 2.2.4.2 shows the capacity of bus by its type, reviewed by Kato et al. Since February 2010, converted light trucks bus fleets have been forbidden to run in CBD area.



Source: YUTRA Project Team

Figure 2.2.4.3 Type of Bus Fleets in Yangon Region

Table 2.2.4.2 Capacity of Bus by Type

| Vehicle Type | Capacity(Passengers) |
|--------------------------------|----------------------|
| City bus (air-conditioned) | 50 |
| City bus (non-air-conditioned) | 45-52 |
| Mini bus | 30 |
| Dyna | 25-35 |
| Hilux | 12-20 |
| Other type | 25-35 |

Source: Kato et al, Cost Structure of Urban Bus Operations in Yangon, Myanmar,2013

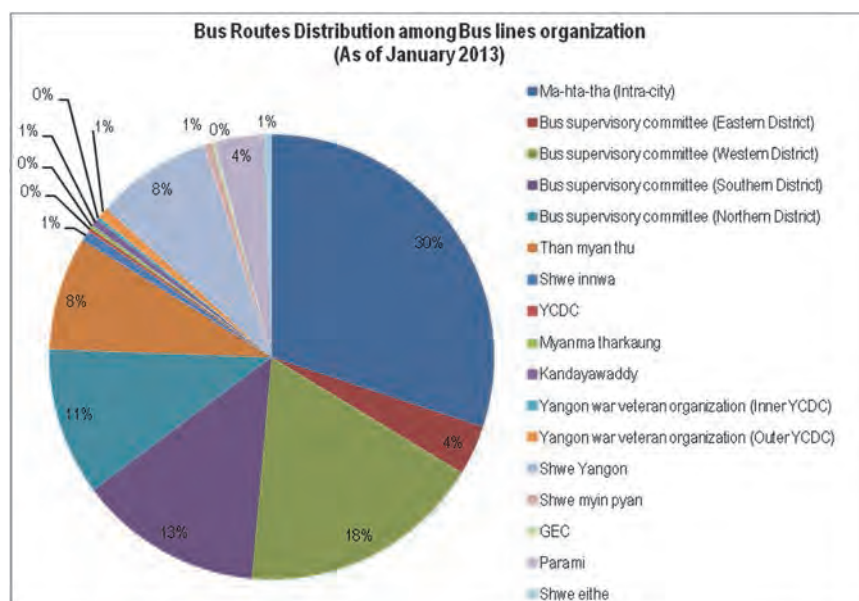
Table 2.2.4.3 describes total bus routes and the number of bus fleets by vehicle type belongs to each BSC/BLC/private bus companies. Share of bus routes among those organizations are shown in Figure 2.2.4.4. Figure 2.2.4.5 presents the distribution of bus fleets by type. The city buses account for 45% of all buses in Yangon Region. Figure 2.2.4.6 shows the distribution of existing bus routes. They are set mainly on main roads, such as No.1 Main Road, No.3 Main Road, Pyay Road, Bayint Naung Road.

Table 2.2.4.3 Total Bus Routes & Type of Bus Fleets

| No. | Name | Total Bus Routes | Type of Vehicles | | | | | Total |
|--------------|--|------------------|------------------|------------|--------------|------------|------------|--------------|
| | | | City bus | Mini bus | Dyna (Truck) | Hilux | BM | |
| 1 | Ma-hta-tha (Intra-city) | 117 | 1503 | 196 | 462 | 131 | 42 | 2334 |
| 2 | Bus Supervisory Committee (Eastern District) | 14 | 32 | - | 148 | - | 151 | 331 |
| 3 | Bus Supervisory Committee (Western District) | 69 | 115 | 68 | 636 | 260 | 116 | 1195 |
| 4 | Bus Supervisory Committee (Southern District) | 52 | 319 | - | - | 128 | - | 447 |
| 5 | Bus Supervisory Committee (Northern District) | 42 | 214 | 28 | 220 | 234 | - | 696 |
| 6 | Than Myan Thu Bus Line | 32 | 51 | 15 | 410 | - | 7 | 483 |
| 7 | ShweInnwa Bus Line | 3 | 31 | - | - | - | - | 31 |
| 8 | YCDC Bus Line | 1 | 6 | - | - | - | - | 6 |
| 9 | MyanmaTharkaung Bus Line | 1 | - | - | 1 | - | - | 1 |
| 10 | Kandayawaddy Bus Line | 2 | - | - | 21 | - | - | 21 |
| 11 | Yangon War Veteran Organization (Inner YCDC) | 1 | - | - | - | 46 | - | 46 |
| 12 | Yangon War Veteran Organization (Outer YCDC) | 3 | - | - | - | 52 | - | 52 |
| 13 | Shwe Yangon Bus Line | 33 | 161 | 18 | 54 | 65 | 4 | 302 |
| 14 | ShweMyinPyan Bus Line | 2 | - | - | 20 | - | - | 20 |
| 15 | GEC Bus Line | 1 | - | - | 13 | - | - | 13 |
| 16 | Parami Bus Line (Bandoola Transport Co. Ltd.) | 14 | 415 | - | - | - | - | 415 |
| 17 | ShweEithe Bus Line (Myanmar Golden City Link Co. Ltd.) | 2 | 80 | - | - | - | - | 80 |
| Total | | 389 | 2,928 | 325 | 1,984 | 916 | 320 | 6,473 |

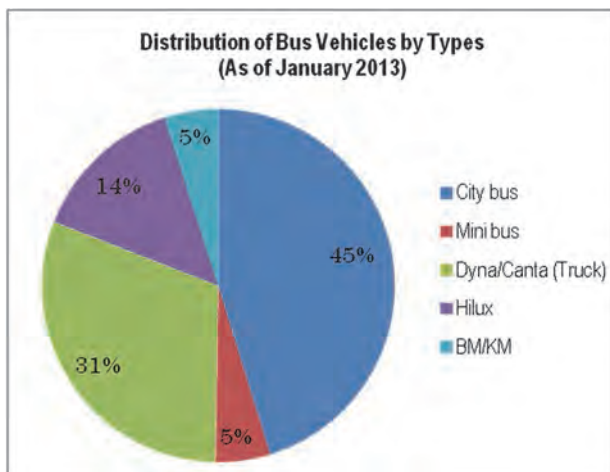
Bus Supervisory committees
 Bus Line Committees
 Private bus companies

Source: YUTRA Project Team based on data from Ma-hta-tha-Central, As of January, 2013



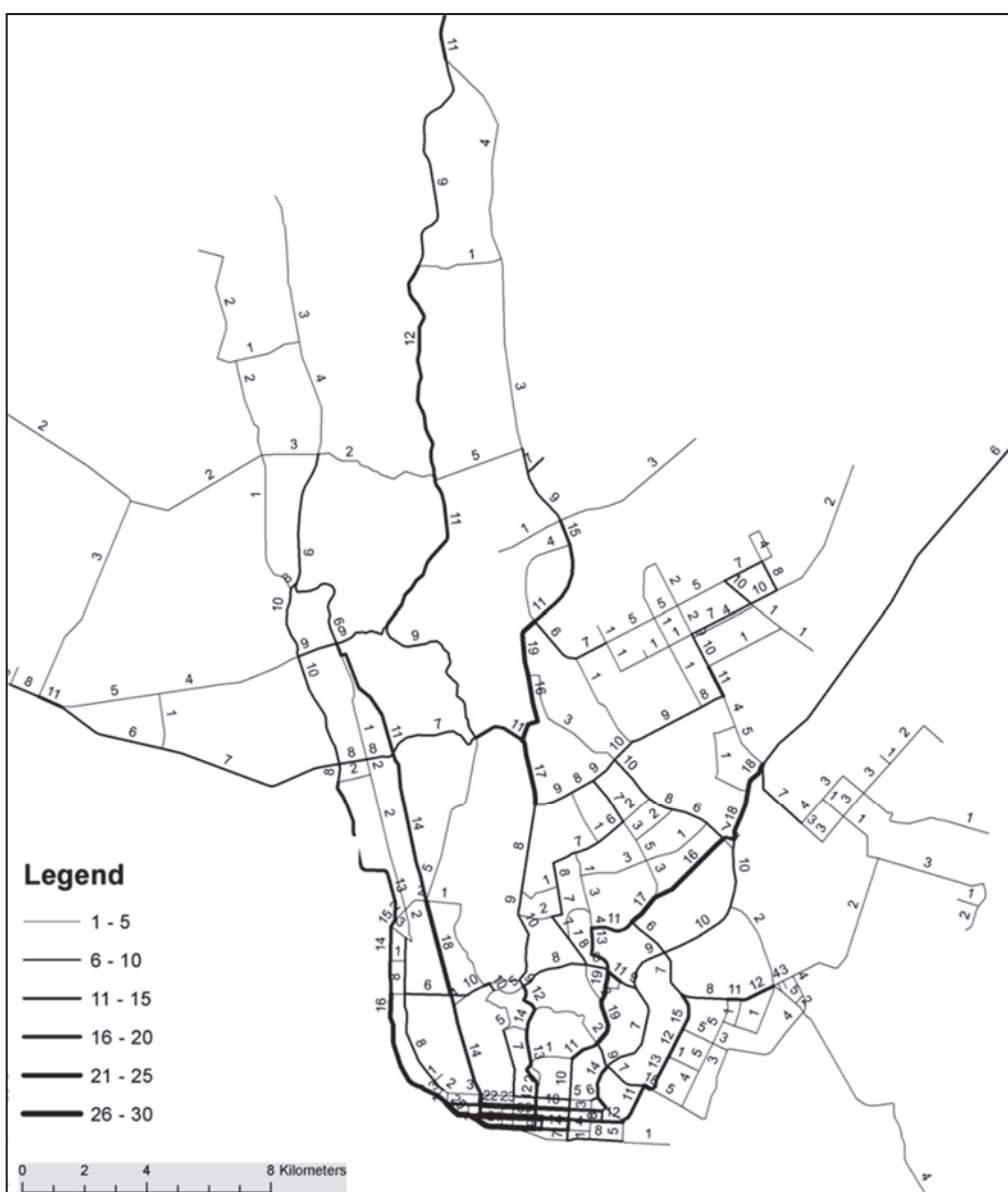
Source: YUTRA Project Team based on data from Ma-hta-tha-central

Figure 2.2.4.4 Bus Routes Distribution



Source: YUTRA Project Team based on data from Ma-hta-tha-central

Figure 2.2.4.5 Distribution of Bus Vehicles by Types



Source: SUDP Study Team based on the information from Ma-hta-tha-central

Figure 2.2.4.6 Existing Bus Routes Distribution

Bus Stop

It is observed that the majority of bus stops mainly set by YCDC do not provide bus stop sign on a pole or flag to make the location in order to avoid passenger confusion. Moreover, bus stop lay-bys are also not provided to enable buses to stop out of the traffic stream. Other bus stop infrastructure such as shelters, seating facilities for passengers waiting at bus stops are also limited except some bus stops. Some pictures of bus stops in Yangon are shown in Figure 2.2.4.7.



Source: YUTRA Project Team

Figure 2.2.4.7 Bus Stops in Yangon Region

Service Level

Currently, the urban bus transportation has a number of problems, such as poor / old bus vehicles, inadequate bus network, and unsatisfactory provision of service information. These problems cause the low quality of bus service.

2.2.5 Water Transport

1) Existing Situation of Inland Waterway

(1) Inland Waterway in Myanmar

The ASEAN region is generously endowed with some 51,000 km navigable inland waterways and plays an active role in transport development, especially in Viet Nam, Cambodia, Lao PDR, Myanmar and Thailand.

The main navigable inland water ways in Myanmar comprises the following river systems: the Ayeyarwady, Chindwin, Kaladan and Thanlwin systems as shown in the following figure. These rivers, with their numerous tributaries, offer 6,650 km of commercially navigable

waterways. (Figure 2.2.5.1)

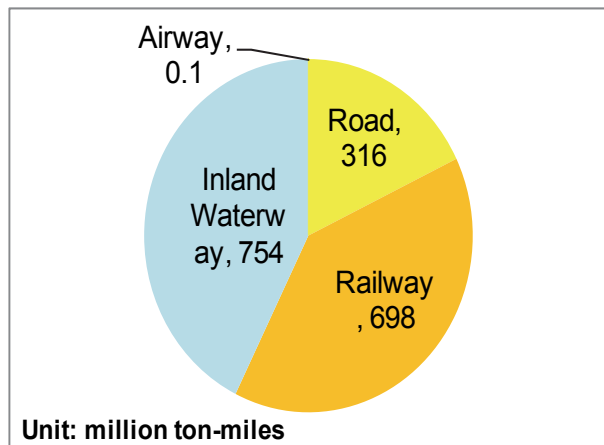


Source: YUTRA Project Team made based on IWT's documents

Figure 2.2.5.1 Main Inland Waterway in Myanmar

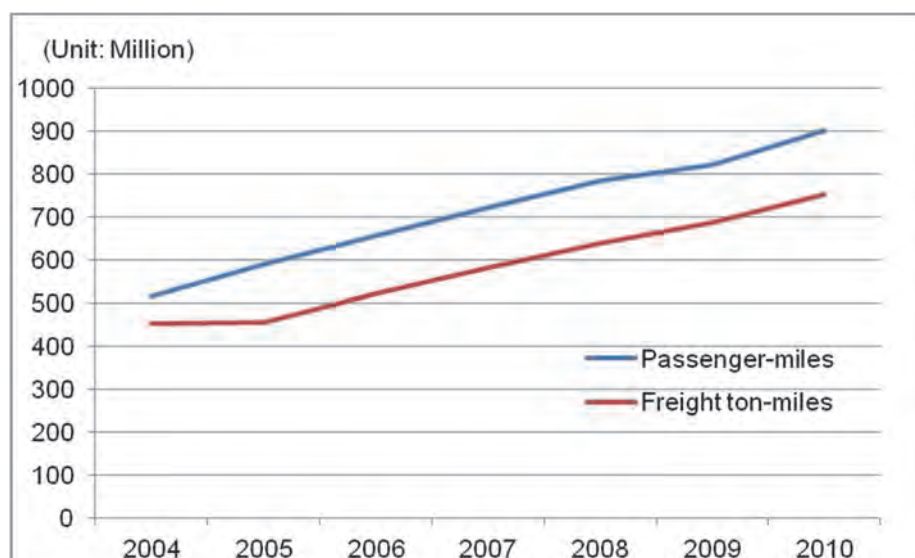
Inland waterway is the most fundamental transport mode in Myanmar, and its cargo throughput (public transport) in 2010-2011 was 754 million ton-miles (42.6%) (Figure 2.2.5.2).

Both public passenger transport (passenger-mile) and public cargo transport (freight ton-mile) have drastically increased along national economic growth as shown in Figure 2.2.5.3. Annual growth rate of passenger and cargo transport from 2004 to 2010 are 9.8% and 8.8% respectively.



Source: Statistical Year Book 2011

Figure 2.2.5.2 Freight Modal Share of Myanmar in 2010



Source: Statistical Year Book 2011

Figure 2.2.5.3 Trend of Passenger and Freight Volume (2004-2010)

(2) Inland Waterway in the Study Area

There are seven main inland waterway routes in the Study Area, namely Yangon River, Bago River, Hlaing River, Panhlaing River, Twante Canal, Pazundaung Creek and Khanaungto Creek as mentioned below (see Figure 2.2.5.4). Among these routes, Yangon River is the most significant route which supports national logistics, and the national gateway port, Yangon Port is located along Yangon River.

Yangon River

Yangon Port locates 32km from the mouth of Yangon River, and navigational channel maintains the minimum water depth of 6m at low tide by annual maintenance dredging at the fork of Bago River, so-called Monkey Point. Channel width of 100m is maintained at the Monkey Point. Channel width of 500m was maintained at the rest of the channel. Navigable dimensions of vessel are mentioned below.

Table 2.2.5.1 Restrain of Calling Vessels of Yangon Main Port

| Items | Dimensions |
|----------------------|-------------------------|
| Maximum Ship Size | 15,000 DWT |
| Length Overall (LOA) | 167m |
| Maximum Draft | 9.0m (Rain), 8.5m (Dry) |

Source: YUTRA Project Team

Bago River

Thaketa Wharves, which are operated by Myanmar Five Star Line (MFSL), and oil terminals locate the right bank of mouth of Bago River. Several port facilities locate along the bank up to the Yangon-Tyanlyin Bridge. Transport activities of Bago River are not so thriving due to winding shape and shallow depth.

Hlaing River

There are few resident or commercial areas along the Hlaing River especially in upstream

areas. Hlaing River has an important role of irrigation for paddy field, and it observed that transport activities are not thriving.

Panhlaing River

Hlaing Industrial Zone locates the left bank of Panhlaing River, and several factories have jetties. Many sand shops and their jetties also locate the left bank of Panhlaing River. Approximately 10 km length of downstream is navigable, thus transport activities in upstream is not observed.

Twante Canal

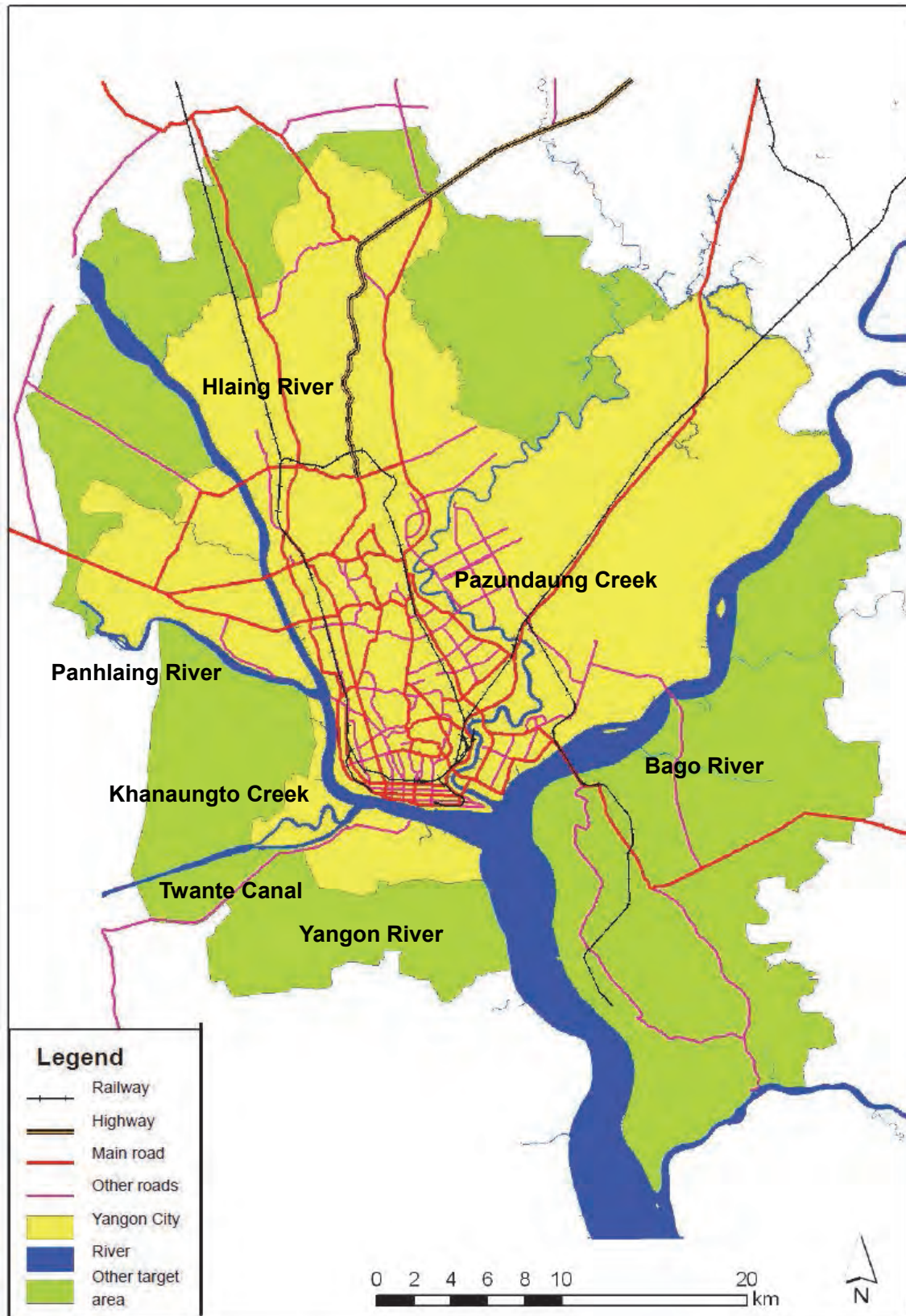
The Twante Canal is only the canal connecting the Yangon River and the Ayeyarwaddy River. All cargo vessels heading for the Delta, Mandalay and upper Myanmar area pass through the Twante Canal. In front of the jetties at the Lammadaw Township is the entrance of the Twante canal.

Pazundaung Creek

Pazundaung Creek flows down the center of Yangon and meets the Yangon River. Many gravel/sand shops and fish jetties locate along the river bank. River gravels which are being used as concrete material are transported by river barge from around Pyey. Fine sand for concrete material or reclamation fill material is dredged near the Monkey Point in the Yangon River and transported by micro dredgers.

Khanaungto Creek

Khanaungto Creek is a natural winding river, which separates Ttantay Township and Seikgyikanaungto Township. IWT operates ferry to/from the jetty of CBD at nine round trips per day. There is no bridge between Seikgyikanaungto Township and CBD, thus ferry is essential transport mode to connect CBD. Fish Jetties and Dock Yards locates along creek bank.



Source: YUTRA Project Team

Figure 2.2.5.4 Inland Waterway Route in the Study Area

(3) Registered Vessels

IWT registered 431 vessels, of which 232 for powered vessels, 160 for non powered vessels and 39 for station pontoons as shown in the following table.

Table 2.2.5.2 Registered Vessels by IWT

| Division | Powered Vessels | Non Powered Barges | Station Pontoons |
|------------|-----------------|--------------------|------------------|
| Cargo | 77 | 135 | 0 |
| Delta | 71 | 0 | 25 |
| Ayeyarwady | 37 | 8 | 6 |
| Chindwin | 20 | 15 | 0 |
| Thanlwin | 11 | 0 | 5 |
| Rakhine | 16 | 2 | 3 |
| (SubTotal) | 232 | 160 | 39 |
| (Total) | 431 | | |

Source: IWT

(4) Transport Charge of Ferry

IWT operates passenger ferry boats to/from CBD in the Yangon and plies five ferry routes. Transport charge for passenger and hand-carry good of five plying routes are the same amount as mentioned below.

It is noted that hand-carry, bed, backpack, baskets and laptop, LCD/LED TV, monitor, computer, VCD, DVD, EVD and receiver and household appliances, which do not exceed the weight 18 lb or size 1.5'x1.5'x1.5' (1.125 cubic feet) or not for sale are allowed to be free of charge.

Table 2.2.5.3 Charge of Passenger and Hand-Carry Good

| No. | Item | One Way Charge (kyats) | Note |
|-----|------------------------------------|------------------------|---|
| 1 | Adult | 100.00 kyats | |
| 2 | Child | 50.00 kyats | |
| 3 | Foreigner | USD 2.00 | |
| 4 | Monks / Nuns | FOC | |
| 5 | Bicycle | 60.00 kyats | |
| 6 | Trishaw | 160.00 kyats | |
| 7 | Motor Cycle | 360.00 kyats | |
| 8 | General Cargo(hand carry 15~20 kg) | 30.00 kyats | Personal luggage |
| 9 | General cargo above 25 kgs | 150.00 kyats | Fishery product, bamboos, hand-made product |

Source: YUTRA Project Team

Table 2.2.5.4 Transport Charge of Commodity

| No. | Commodity | Amount (Kyats) |
|-----|--------------------------|----------------|
| 1 | TV/ LCD/LED | 320 |
| 2 | Computer and accessories | 320 |
| 3 | Washing Machines | 320 |
| 4 | Copier Machines | 320 |
| 5 | Refrigerators | 320 |
| 6 | Motorcycles | 360 |
| 7 | Trishaw | 160 |
| 8 | Bicycle | 60 |

Source: YUTRA Project Team

(5) Operation Cost

Procurement and Maintenance Cost of Ferry

It is roughly estimated that presently plying ferry boat (LOA: 48.5 m, Draft: 1.8m, Speed: 8 knots, Engine: 2 cylinders) is USD 2 million. Maintenance cost for newly build ship is required. In general, 1.0% of procurement cost is annually required for 10 years, 1.5% for 11-20 years, 2.0% for 21-30 years, 2.5% for 31-40 years and 3.0% for 41- 50 years.

Incidentally, small wooden boat which can accommodate several passengers, so-called “Than-ban” costs 1 million Kyats without motor and 1.3 million Kyats with motor.

Operation Cost (Fuel)

It could be estimated that annual fuel consumption cost is 766.5 million Kyats by following formula.

$$\begin{aligned} \text{Annual Consumption Fuel Cost} &= 20 \text{ [gallon/hr]} \times 15 \text{ [hrs]} \times 2 \text{ [unit of Engines/vessel]} \times \\ & 3500 \text{ [Kyat/gallon]} \times 365 \text{ [days/year]} \\ &= 766,500,000 \text{ [Kyats/year/vessel]} \end{aligned}$$

Here,

Power Unit: 2 Engines

Hourly consumption volume: 20 gallon/hr

Fuel price as of June 2013: 3500 Kyats/gallon

Daily operation period: 15 hours

(6) Maritime Law and Regulation

Myanmar has laws and regulations as to port and maritime activities as shown below, however it is observed that considerable clauses do not meet present conditions, and currently Government of Myanmar forwards amending outmoded laws and regulations.

Table 2.2.5.5 Summary of Maritime Law and Regulation

| Subsector | Law/Regulation |
|--------------------|---|
| Inland Waterways | The Inland Steam Vessels Act, 1917 |
| | The Obstruction in Fairways Act, 1881 |
| | Nationalization of Rakhine Water Transportation Act, 1948 |
| | Inland Water Transportation Act, 1952 |
| | Nationalization of Rakhine Water Transportation Act, 1953 |
| Commercial Vessels | The Burma Merchant Shipping Act, 1923 |
| | The Burma Registration of Ships Act, 1841 |
| | Maritime Travelling Contracts Act, 1952 |
| | Nationalization of Rakhine Water Transportation Act, 1953 |
| | Ship Travelling Administration Acts, 1954 |
| Port | The Ports Act, 1908 |
| | The Rangoon Port Act, 1905 |
| | The Out Ports Act, 1914 |
| | The Pilot Act, 1884 |
| | Thyanmar Lighthouse Act, 1937 |
| Others | The Conservation of Water Resources and Rivers Law, 2006 |
| | The Sea Customs Act, 1878 |
| | The Dock Labors Act, 1934 |
| | The Bills of Lading Act 1856 |
| | The Burma Carriage of Goods by Sea Act. 1952. |

2) Administrative Organization

Myanmar Port Authority (MPA), Inland Water Transport (IWT) and Department of Water Resources and Improvement of River System (DWIR) under the control of Ministry of Transport (MOT) manage the inland waterway transport. Those functions and organizations are explained in section 2.4.

3) Port-related Facilities in Yangon

(1) Passenger Transport

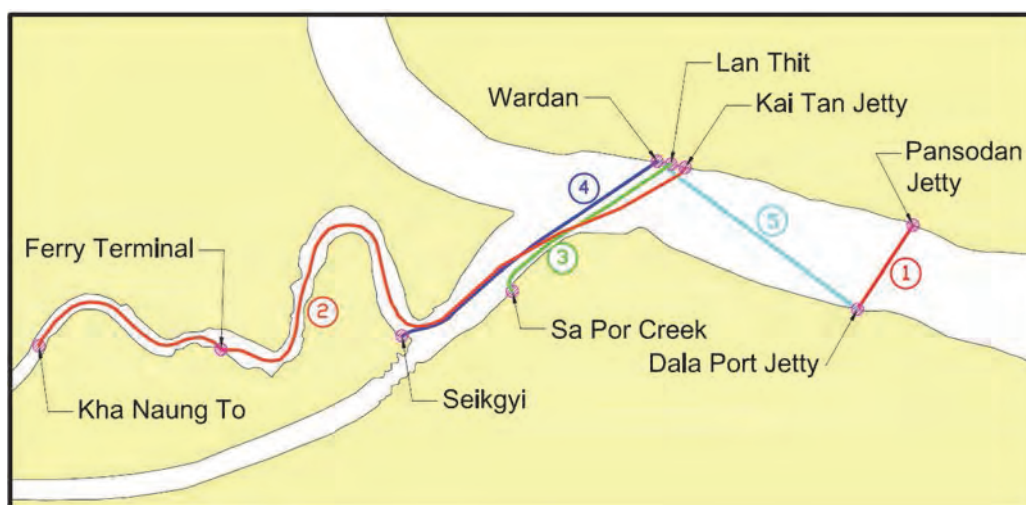
Main Ferry Route

IWT operates passenger ferry boats to/from CBD in the Yangon and plies five ferry routes as shown in Table 2.2.5.6 and Figure 2.2.5.5, of which Pansodan Jetty - Dala Port Jetty is main route to cross the Yangon River. Two ferry boats, which have an accommodating capacity of 700, ply this main route. More than 800 passengers embark the ferry boat at the rush hour congestion. In consideration of safety and comfortable issues, three ferry boats, which have an accommodating capacity of 1,000 is schedule to be procured by Japanese gratis fund aid, and will launch at the end of 2014.

Table 2.2.5.6 Outline of Main Passenger Ferry to/from CBD in Yangon

| No. | Jetty at Seikkan Town Ship | Destination | Vessel Trips per Day, Number of Plying Vessels | Roughly Number of Passenger per Day (one way) | Note |
|-----|----------------------------|-----------------|--|---|---|
| 1 | Pansodan Jetty | Dala Port Jetty | 46, 2 | 30,000 | |
| 2 | Kai Tan Jetty | Kha Naung To | 9, 3 | 3,000 | |
| 3 | Lan Thit | Sa Por Creek | 8, 1 | 2,500 | " Thida No.1" provided by Japan in 1965 |
| 4 | Wardan | Seikgyi | 2, 1 | 250 | |
| 5 | Wardan | Dala Port Jetty | 6, 2 | 120 | Car Ferry(Ro/Ro) |

Source: YUTRA Project Team made based on IWT' Information



Note: Mentioned number means Route No. in above table

Source: YUTRA Project Team made based on IWT' Information

Figure 2.2.5.5 Route Map of Main Passenger Ferry to/from CBD in Yangon

Jetties in Yangon Port (for Cargo/Passenger)

MPA owns 50 jetties in Yangon as shown in Table 2.2.5.7 and Figure 2.2.5.6, and ITW and private firms use these jetties and ply passenger and cargo ships.

Result of OD Survey

The Study Team conducted ferry passenger OD survey to obtain the number of ferry and small boat passengers across rivers and the trip information.

The survey obtaining trip information was implemented by conducting interview with boarding passenger at seven townships, namely Kyeemyindaing, Ahlone, Seikkan, Pazundang, Okkalapa (South), Okkalapa (North) and Kyauktan.

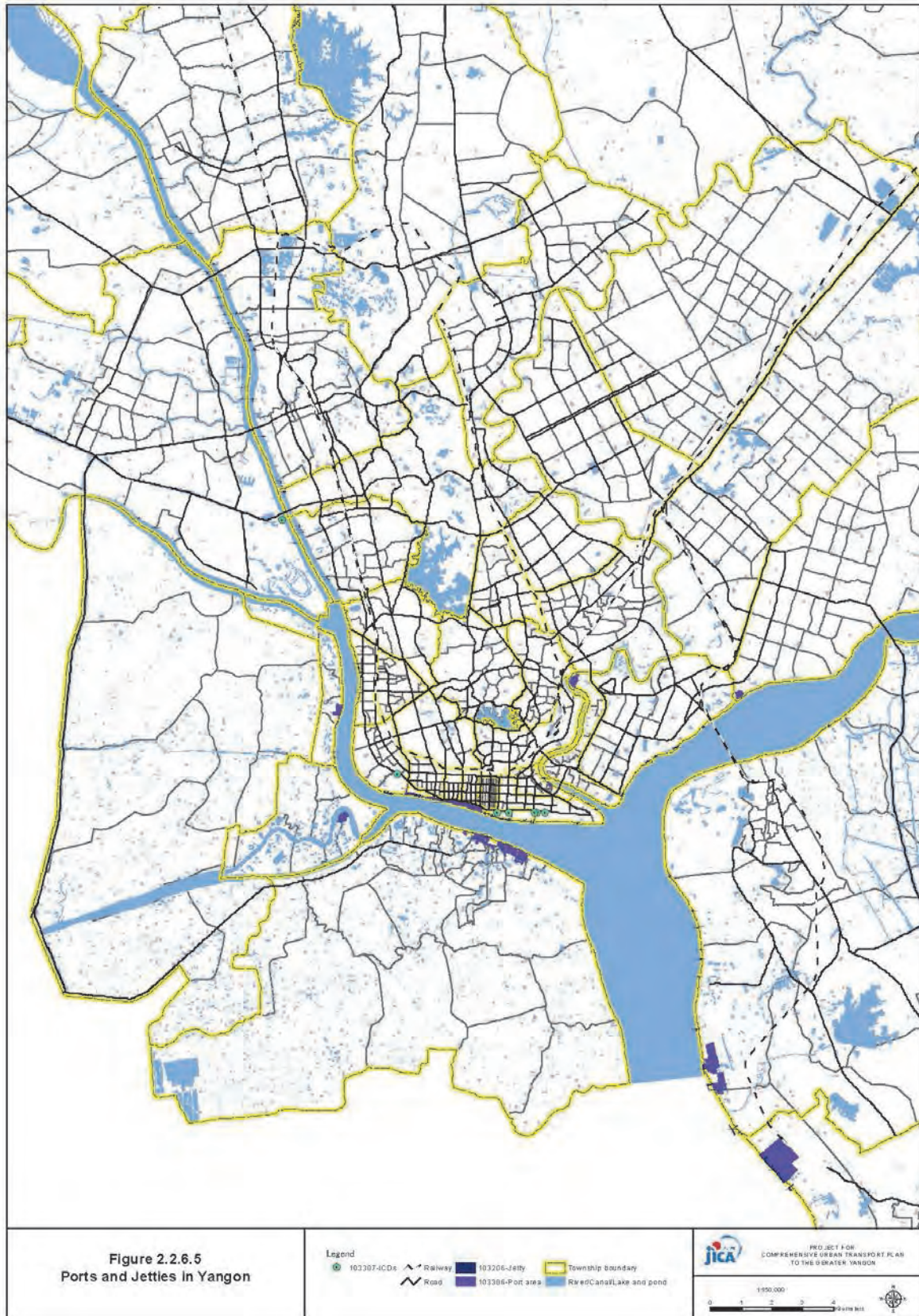
Target sample rate was more than 10% of boarding passengers. The survey was conducted at one day of weekday and the survey duration is 16 hours (from 6:00 to 22:00) or operating time.

OD matrix is shown in Table 2.2.5.8 and the number of passenger of seven survey sites by destination is summarized in Figure 2.2.5.7. 65,651 persons a day use ferry or small boat to cross the river, of which 40,982 persons (62.4%) travels between Seikkan Township and Dala Township.Q.

Table 2.2.5.7 Outline of MPA-Owned Jetty in Yangon

| No. | Name of Jetty | Operation | Usage | Destination | Remarks |
|-----|----------------------------|-----------|-----------------|----------------|------------------------------|
| 1 | Chaungwa Jetty | | Cargo | Coastal | New R.C Approach |
| 2 | Kyeemyindine Jetty 3 | Private | Cargo | Delta | |
| 3 | Kyeemyindine Jetty 5 | Private | Cargo | Delta | |
| 4 | Bazar Road Jetty | Private | Cargo | Delta | |
| 5 | Bagaya Jetty No.1 | Private | Cargo | Coastal | |
| 6 | Bagaya Jetty No.2 | Private | Cargo | Coastal | |
| 7 | Bagaya Jetty No.3 | Private | Cargo | Coastal | |
| 8 | Bagaya Concrete Jetty | Private | Cargo | Delta | |
| 9 | Wardan Jetty 1 | - | - | - | Floating Restaurant |
| 10 | Wardan Jetty 2 | - | - | - | Pontoon moved to other place |
| 11 | Wardan Jetty 3 | Private | Cargo | Coastal&Delta | |
| 12 | Wardan Jetty 4 | Private | Cargo | Coastal&Delta | |
| 13 | Ro/Ro Jetty | IWT | Cargo | Ferry to Dalla | |
| 14 | Wardan Jetty 5 | - | Cargo | - | Not used |
| 15 | Wardan Jetty 6 | Private | Cargo | Coastal | |
| 16 | Concrete Jetty (1) | - | - | - | Not used |
| 17 | Kaingdan Jetty 1 | Private | Cargo | Coastal | |
| 18 | Concrete Jetty (2) | | | | Demolished |
| 19 | Kaingdan Jetty 2 | IWT | Cargo&Passenger | Delta | |
| 20 | Concrete Jetty (3) | | Cargo&Passenger | Delta | |
| 21 | Lan Thit Jetty | IWT | Passenger | Delta | |
| 22 | Hledan Jetty 1 | IWT | Cargo&Passenger | Delta | |
| 23 | Hledan Jetty 2 | Private | Cargo | Delta | |
| 24 | Concrete Jetty (4) | - | - | - | Private Jetty |
| 25 | Phoegyilan Jetty 1 | IWT | Cargo | Delta | |
| 26 | Concrete Jetty (5) | Private | Cargo | Delta | |
| 27 | Phoegyilan Jetty 2 | IWT | Cargo&Passenger | Delta | Pier CGI Roof is added |
| 28 | Shwe Taung Dan Jetty 1 | Private | Cargo | Delta | |
| 29 | Shwe Taung Dan Jetty 2 | Private | Cargo | Delta | |
| 30 | Lanmadaw Jetty 1 | Private | Cargo | Delta | |
| 31 | Lanmadaw Jetty 2 | Private | Cargo | Delta | |
| 32 | Sin Oh Dan 1 | Private | Cargo | Delta | |
| 33 | Sin Oh Dan 2 | Private | Cargo | Delta | |
| 34 | Port Health Jetty 2 | MPA | MPA Dragger | Coastal | |
| 35 | Port Health Jetty 3 | - | - | - | Not used |
| 36 | Pansodan Jetty | IWT | Passenger | Delta | |
| 37 | Nan Thi Da 1 | MPA | MPA Boat | - | VIP(Special Guest) |
| 38 | Nan Thi Da 2 | MPA | MPA Boat | - | VIP(Special Guest) |
| 39 | Thein Byu Jetty | MPA | Oil Burge | - | Change the Pontoon&Sponson |
| 40 | Workshop Pontoon Jetty | - | - | - | Not used |
| 41 | Botatoung Jetty 2 | - | - | - | Not used |
| 42 | Botatoung Jetty 3 | IWT,MPA | Cargo | Delta | |
| 43 | Botatoung Jetty 4 | MPA | Cargo | Delta | |
| 44 | Botatoung Jetty 5 | MPA | Cargo | Delta | |
| 45 | Botatoung Jetty 6 | IWT,MPA | Cargo | Delta | |
| 46 | Min Ye Kyaw Thu Jetty | IWT | Passenger | Delta | |
| 47 | Dalla Port Jetty | IWT | Passenger | Delta | |
| 48 | Ant Gyi Jetty | MPA | MPA Boat | Yangon Area | |
| 49 | Crane Jetty in King's Bank | | | | Not used |
| 50 | King's Bank Jetty | MPA | MPA Boat | Yangon Area | |

Source: YUTRA Project Team made based on IWT Information



(including Thilawa port)

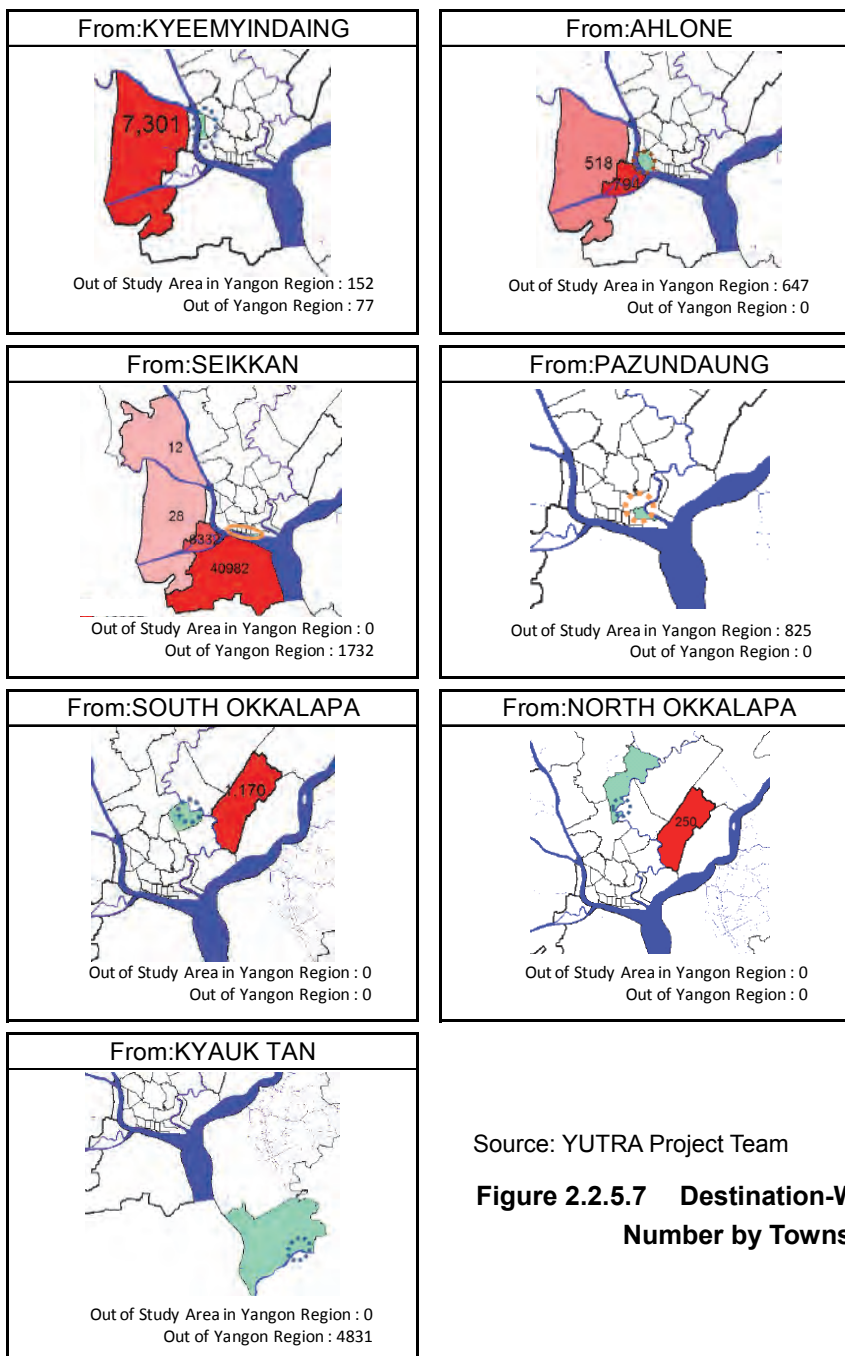
Source: YUTRA Project Team

Figure 2.2.5.6 Major Ports and Jetties in Yangon

Table 2.2.5.8 OD Matrix by the Survey

| | | Survey Point | | | | | | | (Total) |
|-------------|-----------------------|----------------|--------|---------|------------|----------------|----------------|----------|---------|
| | | Kyeemyin daing | Ahlone | Seikkan | Pazundaung | South Okkalapa | North Okkalapa | Kyauktan | |
| Destination | Hlaingtharya | | | 12 | | | | | 12 |
| | Twantay | 7,301 | 518 | 28 | | | | | 7,847 |
| | Seikgyikanaungto | | 794 | 6,332 | | | | | 7,126 |
| | Dala | | | 40,982 | | | | | 40,982 |
| | Dagon Myothit | | | | | 1,170 | 250 | | 1,420 |
| | Out of Yangon Region | 77 | | 1,732 | | | | | 1,809 |
| | Out of the Study Area | 152 | 647 | | 825 | | | 4,831 | 6,455 |
| | (Total) | 7,530 | 1,959 | 49,086 | 825 | 1,170 | 250 | 4,831 | 65,651 |

Source: YUTRA Project Team



Source: YUTRA Project Team

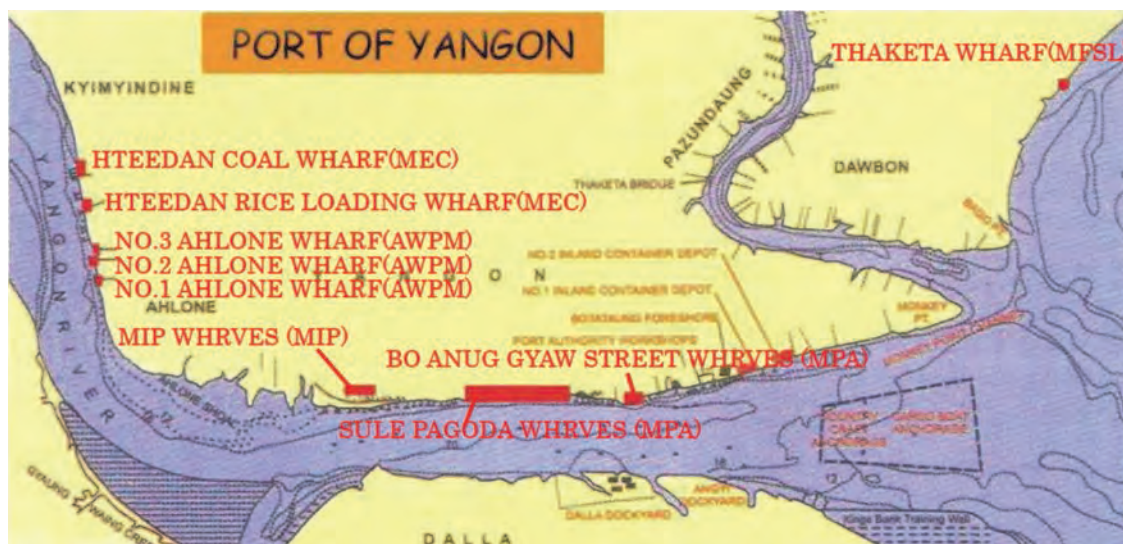
Figure 2.2.5.7 Destination-Wise Passenger Number by Township

(2) Cargo Transport (Seaborne)

Yangon Port has handled about 90% of the total national cargo volume in Myanmar. Yangon Ports consists of “Yangon Main Port” and “Thilawa Area Port” which locates in the study area. Yangon Main Port is located about 32 km from the mouth of the Yangon River, and Thilawa Area Port is located about 16 km downstream and extends on the left bank of Yangon River.

Major Terminals (Wharves) in Yangon Main Port

Yangon Main Port has six main cargo handling facilities as mentioned below.



Source: MPA

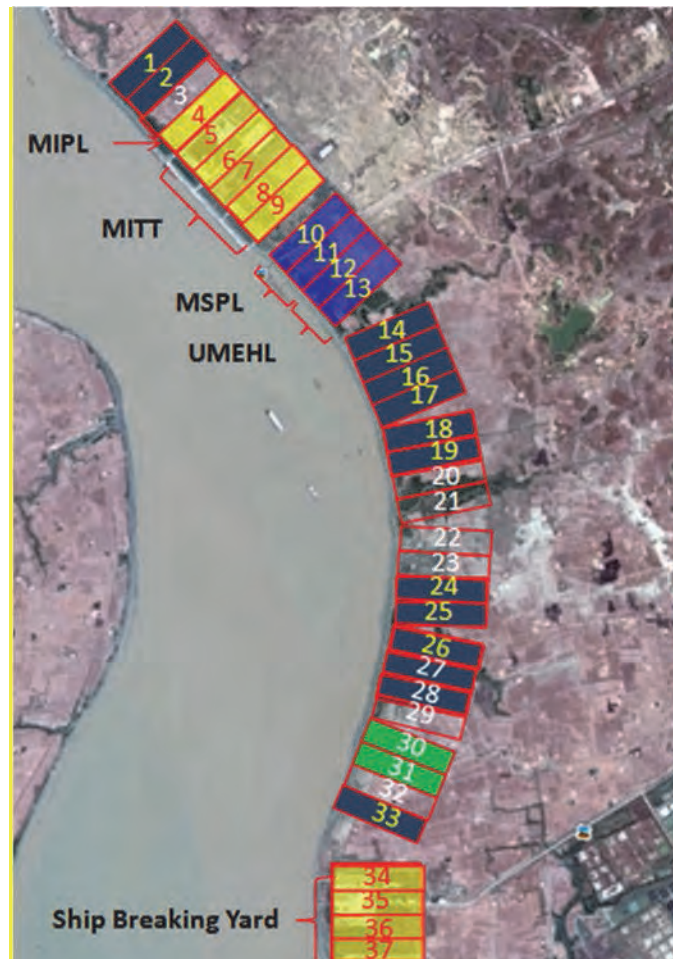
Figure 2.2.5.8 Wharf Location of Yangon Main Port

- (i) **Asia World Port Terminal (AWPT):** Asia World Port Terminal (AWPT) was constructed under BOT scheme as the first privatized terminal at Yangon Port. Asia World Port Management Co., Ltd (AWPM), a subsidiary of Asia World Co., Ltd, developed No. 1, 2, 3, and 4 wharves with the permission from the Myanmar Investment Commission in accordance with the Myanmar Citizens Investment Law, 1994.
- (ii) **Myanmar Industrial Port Terminal (MIP):** Myanmar Industrial Port Terminal (MIP) started operation in April 2003 under BOT scheme by Myanmar Annawa Swan-er-shin Group (S) Co. Ltd. The terminal's two berths have an overall quay length of 310 meters. Major commodities are cement which is exported, and wood which is imported.
- (iii) **Sule Pagoda Wharves Terminal (SPW):** Sule Pagoda Wharves Terminal (SPW) has seven berths, the total quay length is 1,040 meters. MPA has operated the terminal, and mainly handled cement, grain and wood.
- (iv) **Bo Aung Gyaw Wharves Terminal (BSW):** Lann Pyi Marine Co., Ltd., a subsidiary of Union of Myanmar Economic Holding Ltd. has operated the terminal since 2010. BSW has three berths, which have a combined quay length of 457 meters. No. 3 Container Wharf can handle containers, equipped with a gantry crane.

- (v) **Thaketa Wharves:** Myanmar Five Star Line (MFSL) has operated terminal. MFSL was the only international trade ship owner previously, however recently private shipping lines own vessels and ply the international routes. Thaketa Wharves has two berths, which have a combined quay length of 220 meters. Wharves have accommodated general cargo vessels and passenger vessels.
- (vi) **Hteedan Coal and Rice Berth:** Myanmar Economic Corporation (MEC) has operated terminal, which have accommodated the general cargo vessel (LOA: 140m, Draft: 9m).

Thilawa Area Port

Thilawa Area Port has an area of 7.4 km in length and 750 m in width, and has 37 berths, so-called "Plots" (Figure 2.2.5.9). MPA has vended most of Plots to private firms. Myanmar Integrated Port Ltd. (Plot-4), Myanmar International Terminal Thilawa (Plot-5, 6, 7, 8, 9) and Myanmar Economic Corporation (Plot-34, 35, 36, 37) are in operation at present. Plot-23, 24, 25, 26 are schedule to be developed by Japanese ODA.



Source: MPA

Figure 2.2.5.9 Plots in Thilawa Area Port

Cargo Throughput

International cargo throughput of Yangon Port has sharply increased from 9,939,609 tons in 2006 to 20,673,890 tons in 2011, and its annual average growth rate was 15.8%. However coastal cargo throughput of Yangon Port has slightly fluctuated since 2006. (Table 2.2.5.9)

On the other hand, inland waterway transport cargo throughput of Yangon Port by IWT has decreased from 1,484,585 tons in 2003 to 574,735 tons in 2011. (Table 2.2.5.10)

Table 2.2.5.9 International/Coastal Cargo Throughput of Yangon Port

Unit: ton

| Port | Breakdown | | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---------------------|---------------|-------------|------------|------------|------------|------------|------------|------------|
| Main Port | International | Import | 3,696,507 | 4,666,074 | 5,075,561 | 8,401,014 | 10,478,230 | 11,894,990 |
| | | Export | 3,616,940 | 4,032,683 | 4,555,790 | 4,741,898 | 4,408,795 | 5,714,969 |
| | | (Sub-Total) | 7,313,447 | 8,698,757 | 9,631,351 | 13,142,912 | 14,887,025 | 17,609,959 |
| | Coastal | Unload | 613,105 | 614,589 | 523,711 | 458,674 | 599,712 | 649,417 |
| | | Load | 402,318 | 393,431 | 388,960 | 448,163 | 466,960 | 399,036 |
| | | (Sub-Total) | 1,015,423 | 1,008,020 | 912,671 | 906,837 | 1,066,672 | 1,048,453 |
| | (Total) | | 8,328,870 | 9,706,777 | 10,544,022 | 14,049,749 | 15,953,697 | 18,658,412 |
| Thilawa Port | International | Import | 1,313,081 | 959,461 | 551,203 | 632,391 | 1,229,454 | 1,916,926 |
| | | Export | 1,313,081 | 1,193,248 | 1,220,723 | 1,463,782 | 1,255,490 | 1,147,005 |
| | | (Sub-Total) | 2,626,162 | 2,152,709 | 1,771,926 | 2,096,173 | 2,484,944 | 3,063,931 |
| | Coastal | Unload | | | | | | |
| | | Load | | | | 1,527 | | |
| | | (Sub-Total) | 0 | 0 | 0 | 1,527 | 0 | 0 |
| | (Total) | | 2,626,162 | 2,152,709 | 1,771,926 | 2,097,700 | 2,484,944 | 3,063,931 |
| Yangon Port (Total) | International | Import | 5,009,588 | 5,625,535 | 5,626,764 | 9,033,405 | 11,707,684 | 13,811,916 |
| | | Export | 4,930,021 | 5,225,931 | 5,776,513 | 6,205,680 | 5,664,285 | 6,861,974 |
| | | (Sub-Total) | 9,939,609 | 10,851,466 | 11,403,277 | 15,239,085 | 17,371,969 | 20,673,890 |
| | Coastal | Unload | 613,105 | 614,589 | 523,711 | 458,674 | 599,712 | 649,417 |
| | | Load | 402,318 | 393,431 | 388,960 | 449,690 | 466,960 | 399,036 |
| | | (Sub-Total) | 1,015,423 | 1,008,020 | 912,671 | 908,364 | 1,066,672 | 1,048,453 |
| | (Grand Total) | | 10,955,032 | 11,859,486 | 12,315,948 | 16,147,449 | 18,438,641 | 21,722,343 |

Source: MPA

Table 2.2.5.10 Inland Waterway Transport Cargo Throughput of Yangon Port (by IWT)

Unit: ton

| Items | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---------|-----------|-----------|-----------|---------|---------|---------|---------|---------|---------|
| Unload | 832,530 | 722,282 | 613,116 | 576,657 | 492,561 | 453,130 | 370,890 | 379,050 | 403,692 |
| Load | 652,055 | 442,860 | 443,416 | 378,135 | 365,621 | 178,911 | 226,905 | 214,957 | 171,043 |
| (Total) | 1,484,585 | 1,165,142 | 1,056,532 | 954,792 | 858,182 | 632,041 | 597,795 | 594,007 | 574,735 |

Source: MPA

Table 2.2.5.11 Container Throughput of Yangon Port

Unit = TEU

| Wharf name | Owner | Year | 2010 | 2011 | 2010 | 2011 |
|---|-------|-----------|---------|---------|--------|--------|
| Ahlone Wharves | AWPM | Import | 108,135 | 131,644 | 62.4% | 66.8% |
| | | Export | 100,128 | 124,775 | | |
| | | Sub-total | 208,263 | 256,419 | | |
| Myanmar Industrial Port | MIP | Import | 25,770 | 46,899 | 16.8% | 24.8% |
| | | Export | 30,203 | 48,473 | | |
| | | Sub-total | 55,973 | 95,372 | | |
| Bo Aung Gyaw Wharves | UMEHL | Import | 28,173 | 14,772 | 16.9% | 7.8% |
| | | Export | 28,361 | 15,188 | | |
| | | Sub-total | 56,534 | 29,960 | | |
| Myanmar International Terminals Thilawa | MITT | Import | 5,943 | 1,067 | 3.9% | 0.6% |
| | | Export | 7,200 | 1,172 | | |
| | | Sub-total | 13,143 | 2,239 | | |
| Yangon Total | | | 333,913 | 383,990 | 100.0% | 100.0% |

Source: Myanmar Port Authority

2.2.6 Goods Transport (Land)

This section discusses the current situation of goods movement within the study area including a discussion on identified problems and corresponding planning issues of urban transport management and development with respect to the movement of freight in the urban environment.

Major freight-related traffic generators in the study area include industrial zones, commercial centres, traditional markets, ports, inland container depots (ICD), truck terminals and freight rail stations. The location of these facilities is shown in Figure 2.2.6.1.

Within the city of Yangon there is a total of 4,362 ha allocated to industrial zone activity. This activity is outside the circular railway, but in close proximity to existing residential areas.

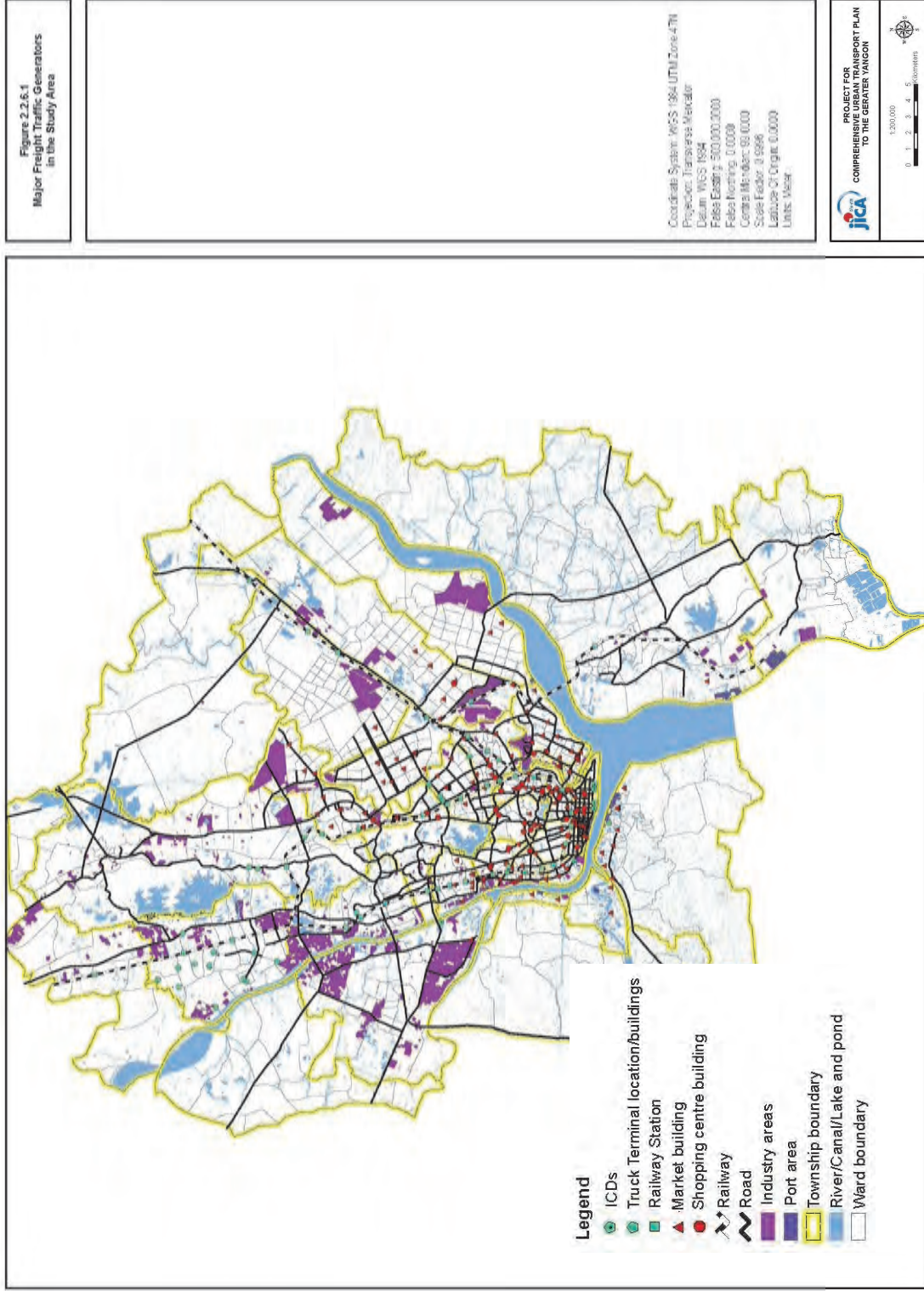
There are thirty-eight modern shopping centres popular with the residents of Yangon and in addition there are 169 traditional markets. Bogyoke Aung San Market is one of the better known traditional markets located in the heart of Yangon. This market includes more than 1,500 shops selling various goods. It is one of the most popular tourist destinations in Yangon.

There are four major international ports in the downtown area, namely Asia World Port Terminal (AWPT), Myanmar Industrial Port (MIP), Sule Pagoda Wharf (SPW), and Bo Aung Kyaw Wharf (BSW). Another international port is developed in Thilawa area which consists of thirty-seven plots. Jetties for inland water transport are located in front of Lanmadaw Township.

There is one large public truck terminal owned by YCDC near the Bayint Naung bridge crossing the Yangon River. There are three freight rail stations, namely Yangon rail station cargo centre No. 1 and 2, Botahtaung station, and Sat San station in Yangon. In addition there is one rail station for oil transportation at Danidaw.

The above is described in detail in the following ten subsections:

- (i) Industrial Zones;
- (ii) Commercial Centres;
- (iii) Traditional Markets;
- (iv) International Ports;
- (v) Freight Railway stations;
- (vi) General Cargo trucks;
- (vii) Container Trucks;
- (viii) Movement of Logs;
- (ix) Freight Traffic Movement; and
- (x) Problems and Planning Issues



Source: YUTRA Study Team

Figure 2.2.6.1 Major Freight Traffic Generators in the Study Area

1) Industrial Zones

The Myanmar Industrial Development Committee (MIDC), which was established in 1995, designated 18 industrial zones in the country. Twelve industrial zones were designated in the Yangon Region in the north, east, west and south districts. Accordingly the Department of Human Settlement and Housing Development (DHSHD), Ministry of Construction established industrial zones or parks in Yangon.

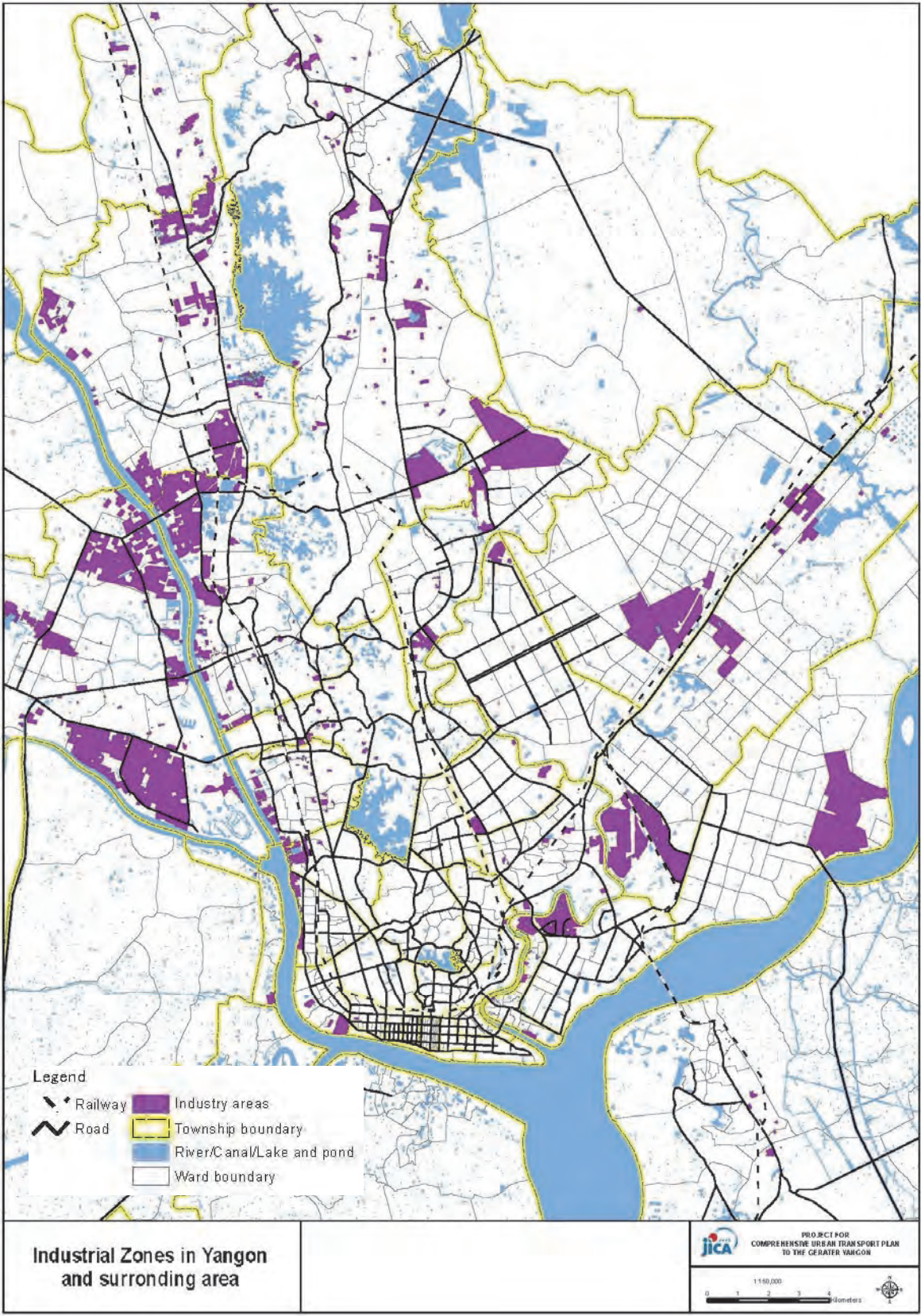
The industrial zones now in existence or about to be established in the near future are shown in Table 2.2.6.1. The land area of currently operating industrial zones developed by DHSHD is 3,668 ha. In addition, there are four private industrial zones with a total land area of 694 ha. A total allocation of 4,362 ha for industrial zones now exists in the city of Yangon (see Figure 2.2.6.2). Another 743 ha of new private industrial zones will be available.

Recently the Government of Japan expressed an interest to the development of Special Economic Zone (SEZ) in Thilawa area. An industrial area of 1,560 ha will be made available to invite foreign investors and some major local industries.

Table 2.2.6.1 Industrial Zones in the City of Yangon

| No. | Industrial Zone | Developer | Opening Year | Area (ha) |
|-----|---|-----------------------------|-------------------|--------------|
| 1 | Shwe Pyi Thar Industrial Zone (1) | DHSHD | 1989 | 136 |
| 2 | South Dagon Industrial Zone (1) | DHSHD | 1992 | 192 |
| 3 | South Dagon Industrial Zone (2) | DHSHD | 1992 | 87 |
| 4 | South Dagon Industrial Zone (3) | DHSHD | 1992 | 22 |
| 5 | Shwe Paukkan Industrial Zone | DHSHD | 1992 - 1993 | 38 |
| 6 | Hlaing Tharyar Industrial Zone (1-7) | DHSHD | 1994 | 780 |
| 7 | Shwe Pyi Thar Industrial Zone (2-4) | DHSHD | 1998 - 2000 | 400 |
| 8 | North Okkalapa Industrial Zone | DHSHD | 1998 | 45 |
| 9 | Dagon Seikan Industrial Zone | DHSHD | 1998 | 490 |
| 10 | Thaketa Industrial Zone | DHSHD | 1999 | 81 |
| 11 | East Dagon Industrial Zone | DHSHD | 2000 | 202 |
| 12 | South Okkalapa Industrial Zone | DHSHD | 2001 | 15 |
| 13 | Shwe Lin Ban Industrial Zone | DHSHD | 2002 | 445 |
| 14 | War Ta Yar Industrial Zone | DHSHD | 2004 | 445 |
| 15 | East Dagon Industrial Zone (extension) | DHSHD | completed | 115 |
| 16 | Thilawa Industrial Zone | DHSHD | completed | 175 |
| | Sub-total | | | 3,668 |
| 17 | Mingalardon Industrial Park | Mingalardon Industrial Park | 1998 | 89 |
| 18 | Yangon Industrial Park | Zaykabar | 2000 | 400 |
| 19 | Thardu Kan Industrial Zone | TOSTA High Rise | 2002 | 195 |
| 20 | North Dagon Industrial Zone | YCDC | completed | 10 |
| | Sub-total | | | 694 |
| 21 | Anaw Yah Tar and Shwe Taung Industrial Zone | Mahar Shwe Taung | under development | 315 |
| 22 | December Industrial Zone | December | under development | 142 |
| 23 | Mya Sein Yaung Industrial Zone | War War Win | under development | 118 |
| 24 | Shwe Thann Lyin Industrial Zone | Shwe Thann Lyin | under development | 168 |
| | Sub-total | | | 743 |
| 25 | Thilawa SEZ | to be named | under planning | 1,560 |
| | Total excluding Thilawa SEZ | | | 5,105 |
| | Total | | | 6,665 |

Source: The Project for the Strategic Urban Development Plan of the Greater Yangon Final Report 1, JICA, 2013



Source: YUTRA Study Team

Figure 2.2.6.2 Industrial Zones in Yangon and Surrounding Area

2) Commercial Centres

Myanmar Travel Information 2012¹ suggests that there are twenty four (24) major shopping centers in Yangon for visitors (see Table 2.2.6.2). Whilst a total of thirty eight (38) shopping centers are designated in YUTRA GIS as of July 2013, which includes some medium-scale shopping buildings which are mostly visited by local residents such as YUZANA Plaza (see Table 2.2.6.3).

Many of those shopping centres are located in downtown and along the major roads in Yangon (see Figure 2.2.6.3). Major issues associated with these shopping centres are:

- Public transport access: bus services (lines)
- Parking spaces: the number of parking spaces for visitors
- Floor area: the floor area (net and gross) to estimate traffic generation
- Cargo generation: movement pattern of cargo generated by those major shopping centres.

The Person Trip survey and transport modelling by the YUTRA JICA Study Team will bring some detailed information about the trip generation of those major shopping centres associated with person trips.

Table 2.2.6.2 Major Shopping Centers suggested by Myanmar Travel Information 2012

| | Major Shopping Centers in Yangon | Location (township) |
|----|-------------------------------------|-------------------------|
| 1 | Excel Shopping Mall | Bahan Township |
| 2 | MarketPlace City Mart | Bahan Township |
| 3 | La Pyayt Wun Plaza | Dagon Township |
| 4 | Sein Gay Har Super Centre | Dagon Township |
| 5 | Taw Win Centre Shopping Mall | Dagon Township |
| 6 | Capital Hipermarket | Daw Pone Township |
| 7 | Victoria Shopping Mall | Hlaing Tharyar Township |
| 8 | Blazon | Kamaryut Township |
| 9 | Junction Square Shopping Centre | Kamayut Township |
| 10 | Ruby Mart | Kyauktada Township |
| 11 | Junction Center (Maw Tin) | Lanmadaw Township |
| 12 | Gamone Pwint | Mayangone Township |
| 13 | Gandamar Wholesale | Mayangone Township |
| 14 | Junction 8 Shopping Centre | Mayangone Township |
| 15 | Ocean Super Market | Mayangone Township |
| 16 | FMI Centre | Pabedan Township |
| 17 | East Point Shopping Center | Pazundaung Township |
| 18 | City Mart Supermaket (Myae Ni Gone) | Sanchaung Township |
| 19 | Dagon Centre Shopping Mall II | Sanchaung Township |
| 20 | Dagon Centre Shopping Mall | Sanchaung Township |
| 21 | Ga Mone Pwint | Sanchaung Township |
| 22 | Super One | Tamwe Township |
| 23 | Waizayantar Shopping Center | Thingangyun Township |
| 24 | Yankin Centre Shopping Mall | Yankin Township |

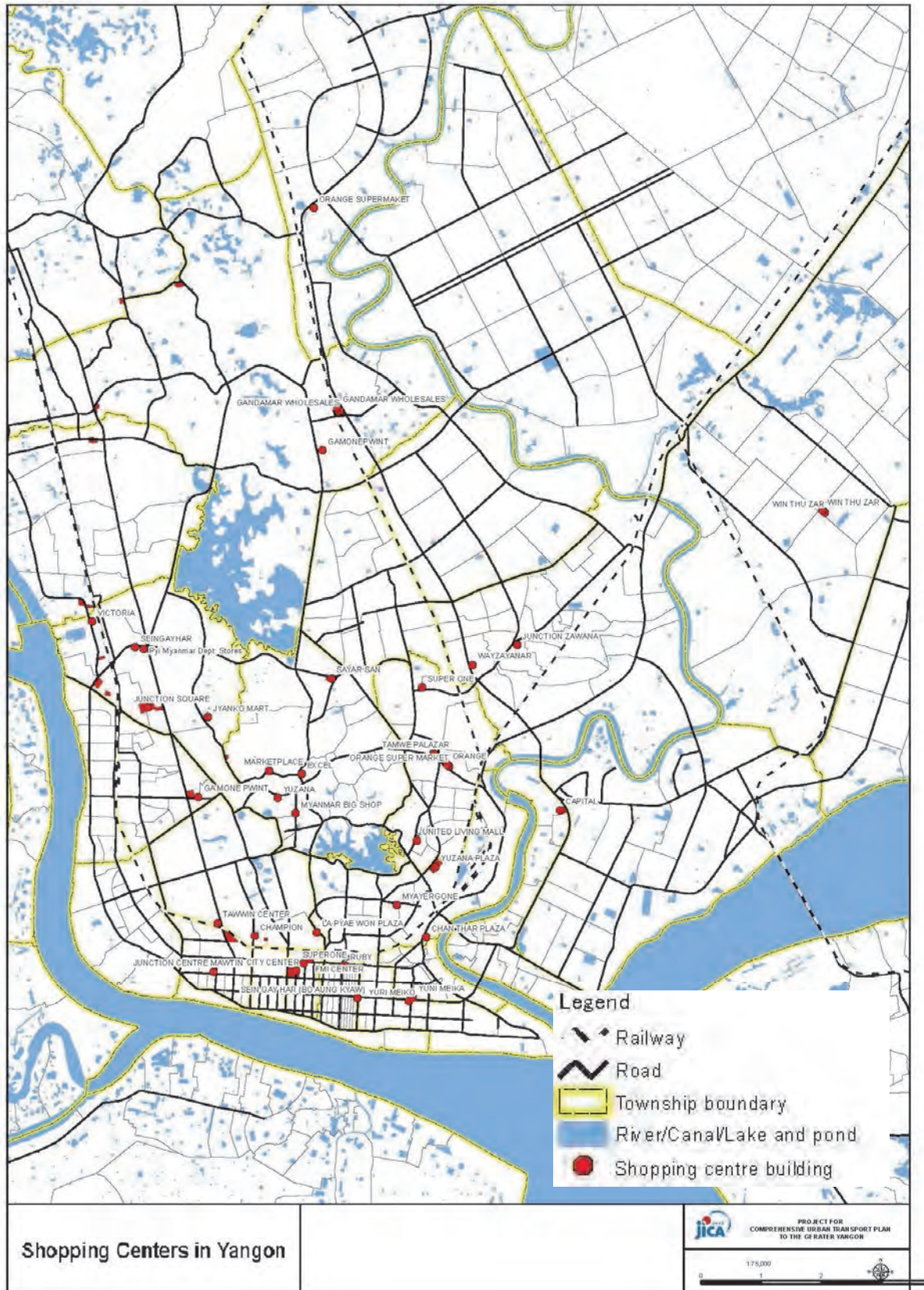
Source: <http://myanmartravelinformation.com/yangon-where-to-shop/yangon-shopping-centre.html>

¹ Myanmar Travel Information 2012 (<http://myanmartravelinformation.com/yangon-where-to-shop/yangon-shopping-centre.html>)

Table 2.2.6.3 Major Shopping Centers

| No. | Name | TS_Name | Ward_Name |
|-----|-----------------------------|--------------------|--------------------------|
| 1 | EXCEL | BAHAN | Gya Daw Ya |
| 2 | SAYAR SAN | BAHAN | Saya San |
| 3 | MARKETPLACE | BAHAN | Shwe Taung Kyar Quarter |
| 4 | MYANMAR BIG SHOP | BAHAN | Yae Tar Shae Quarter |
| 5 | YUZANA | BAHAN | Yae Tar Shae Quarter |
| 6 | YURI MEIKO | BOTAHTAUNG | No. 05 |
| 7 | TAWWIN CENTER | DAGON | Pyay Road (West) Quarter |
| 8 | CHAMPION | DAGON | U Wisara Quarter |
| 9 | LA PYAE WON PLAZA | DAGON | Yawmin Gyee |
| 10 | CAPITAL | DAWBON | Factory |
| 11 | VICTORIA | KAMARYUT | No. 04 |
| 12 | JUNCTION SQUARE | KAMARYUT | No. 08 |
| 13 | Pyi Myanmar Dept: Stores | KAMARYUT | No. 08 |
| 14 | SEINGAYHAR | KAMARYUT | No. 08 |
| 15 | JYANKO MART | KAMARYUT | No. 10 |
| 16 | RUBY | KYAUKTADA | No. 05 |
| 17 | SEIN GAY HAR (BO AUNG KYAW) | KYAUKTADA | No. 09 |
| 18 | JUNCTION CENTRE MAWTIN | LANMADAW | 10 Quarter |
| 19 | GANDAMAR WHOLESALERS | MAYANGONE | No. 08 |
| 20 | GAMONEPWINT | MAYANGONE | No. 09 |
| 21 | MYAYERGONE | MINGALARTAUNGNYUNT | Mingalar Taung Nyunt |
| 22 | TAW WIN PLAZA | MINGALARTAUNGNYUNT | Mingalar Taung Nyunt |
| 23 | CHAN THAR PLAZA | MINGALARTAUNGNYUNT | Taung Lon Pyan |
| 24 | YUZANA PLAZA | MINGALARTAUNGNYUNT | Tharyar Gon |
| 25 | ORANGE SUPERMAKET | NORTH OKKALAPA | Nga |
| 26 | CITY CENTER | PABEDAN | No. 02 |
| 27 | FMI CENTER | PABEDAN | No. 05 |
| 28 | SUPERONE | PABEDAN | No. 05 |
| 29 | YUNI MEIKA | PAZUNDAUNG | No. 01 |
| 30 | GA MONE PWINT | SANCHAUNG | Myaynigone Ward (North) |
| 31 | WIN THU ZAR | SOUTH DAGON | No. 20 |
| 32 | ORANGE SUPER MARKET | TARMWE | Natchaung |
| 33 | UNITED LIVING MALL | TARMWE | Pon Na Gon |
| 34 | TAMWE PALAZAR | TARMWE | Tarmwe Gyi (Kha) |
| 35 | SUPER ONE | TARMWE | Tarmwe Lay |
| 36 | JUNCTION ZAWANA | THINGANGYUN | Na Nwin Gon |
| 37 | WAYZAYANAR | THINGANGYUN | Za/South |
| 38 | YANKIN CENTRE | YANKIN | No. 02 |

Source: YUTRA GIS, July 2013



Source: YUTRA Project Team, July 2013

Figure 2.2.6.3 Shopping Centers in Yangon

3) Traditional Markets

A business establishment survey (BES) carried out by the JICA Study Team for the Strategic Urban Development Plan of Greater Yangon reports that there are 169 traditional markets in Yangon City as of 2012. While, the number of traditional market location identified in the YUTRA GIS at present is 131 as shown in Table 2.2.6.4.

The traditional markets can be categorized into five types according to BES, namely Market class A (21 locations in total), Market class B (49 locations), Market class C (60 locations), Market class D (28 locations) and Tax free market (11 locations).

One of the popular traditional markets in Yangon for visitors is Bogyoke Aung San Market. The market building of colonial style was built in 1926. There are more than 1,500 small shops selling variety of goods including clothing, cotton and silk fabrics, food, gems, medicine, wood and ivory carvings, etc.

Table 2.2.6.4 Traditional Markets (1/3)

| No. | Name | TS_Name | Ward_Name |
|-----|--------------------------|-------------------------|--------------------------------|
| 1 | AH LONE | AHLONE | Saw Yan Paing (South) Quarter |
| 2 | NONAME | AHLONE | Saw Yan Paing (South) Quarter |
| 3 | SINMIN | AHLONE | Sin Min Quarter |
| 4 | BAHAN MARKET | BAHAN | Shwe Nant Thar |
| 5 | BO CHO | BAHAN | Bo Cho(1) |
| 6 | PANTRA | DAGON | Paya Gyee Quarter |
| 7 | 93 ZAY | DAGON SEIKKAN | Quarter 93 |
| 8 | YUZANA MYODAW | DAGON SEIKKAN | Quarter 94, Yuzana Garden City |
| 9 | AUNGZAYYA | DALA | Ba-nyar-dala |
| 10 | DALAZAY | DALA | Myoma(1) |
| 11 | HMAWSET | DALA | Hmaw Sei Ward |
| 12 | KAMARKASIT | DALA | Ka-ma-ka-hsit Ward |
| 13 | KYAUNGSU | DALA | Sarparchaung Ward |
| 14 | WARDZAY | DALA | Ta Dar Chaung |
| 15 | WINHTANEINYAR | DALA | Sarparchaung Ward |
| 16 | BO TUN SAN MARKET | DAWBON | Bo Tun Zan |
| 17 | DAWPON MARKET | DAWBON | Myo Thin |
| 18 | MARKET | DAWBON | Zayar Thiri |
| 19 | NAWREAT | DAWBON | Zayar Thiri |
| 20 | No.2 (East Dagon Market) | EAST DAGON | No.(8) |
| 21 | 5 WARD | HLAING | (5) Quarter |
| 22 | HLAING | HLAING | (1) Quarter |
| 23 | HLAING THAR YAR | HLAING | (2) Quarter |
| 24 | HLAING YADANAR | HLAING | (1) Quarter |
| 25 | NEW THIRI MINGALAR | HLAING | (4) Quarter |
| 26 | SHWE HIN THER | HLAING | (11) Quarter |
| 27 | YADANARMON | HLAING | (3) Quarter |
| 28 | HTIKE THU SANN | HLAINGTHAYA | PANHLAING HOUSING |
| 29 | HLEDAN MARKET | KAMARYUT | (3) Ward |
| 30 | J'DONUTS | KAMARYUT | (10) Ward |
| 31 | NEW MYAY-NI-GONE MARKET | KAMARYUT | (10) Ward |
| 32 | PYIMYANMAR | KAMARYUT | (3) Ward |
| 33 | SIN MA LITE | KAMARYUT | (5) Ward |
| 34 | TAX FREE MARKET | KAMARYUT | (7) Ward |
| 35 | VICTORIA | KAMARYUT | (4) Ward |
| 36 | 38 PLAZA | KYAUKTADA | No.7 |
| 37 | KYAW | KYAUKTADA | No.4 |
| 38 | SAMSUNG | KYAUKTADA | No.3 |
| 39 | BAHO SANPYA | KYEEMYINDAING LEFT BANK | Magyidan Ward (West North) |
| 40 | CENTRAL FISH MARKET | KYEEMYINDAING LEFT BANK | Magyidan Ward (West North) |

Source: YUTRA Project Team

Table 2.2.6.5 Traditional Markets (2/3)

| No. | Name | TS_Name | Ward_Name |
|-----|----------------------------|--------------------------|----------------------------|
| 41 | COCONUT & BANANA | KYEEMYINDAING LEFT BANK | Magyidan Ward (West South) |
| 42 | KANN NARR | KYEEMYINDAING LEFT BANK | Magyidan Ward (West North) |
| 43 | Kyee Myin Daing Nya Market | KYEEMYINDAING LEFT BANK | Magyidan Ward (East South) |
| 44 | ORANGE | KYEEMYINDAING LEFT BANK | Thida Ward |
| 45 | THIRI MINGALAR MARKET | KYEEMYINDAING LEFT BANK | Htee Tan Ward |
| 46 | PYAN KYA [ALAT CHAUNG] | KYEEMYINDAING RIGHT BANK | Setsan Ward |
| 47 | SATE KYI | KYEEMYINDAING RIGHT BANK | Wayone Seikayeywa (West) |
| 48 | NYAUNG PIN LAY ZAY | LANMADAW | 7 Quarter |
| 49 | LANMATAW PLAZA | LATHA | 1 Quarter |
| 50 | THEIN GYI ZAY-E | LATHA | No.7 |
| 51 | ASIALIGHT | MINGALARTAUNGNYUNT | Tharyar Gon |
| 52 | CHICKEN N DUCK | MINGALARTAUNGNYUNT | Pathein Nyunt |
| 53 | MAX | MINGALARTAUNGNYUNT | Tha Pyay Gon |
| 54 | MINGALER MON ZAY | MINGALARTAUNGNYUNT | Tha Pyay Gon |
| 55 | MINGALERTGNYUNT | MINGALARTAUNGNYUNT | Mingalar Taung Nyunt |
| 56 | MINGALERZAY | MINGALARTAUNGNYUNT | Tha Pyay Gon |
| 57 | SANPYANYAZAY | MINGALARTAUNGNYUNT | Mingalar Taung Nyunt |
| 58 | TAW WIN | MINGALARTAUNGNYUNT | Mingalar Taung Nyunt |
| 59 | THAIN PHYU | MINGALARTAUNGNYUNT | Kantaw Galay(South) |
| 60 | 43 WARD | NORTH DAGON | No.(43) |
| 61 | 44 WARD | NORTH DAGON | No.(44) |
| 62 | BO MIN YAUNG | NORTH DAGON | No.(42) |
| 63 | DAGON SHWE PYI | NORTH DAGON | No.(30) |
| 64 | No.(4) Market | NORTH DAGON | No.(35) |
| 65 | PIN LON YADANAR MARKET | NORTH DAGON | No.(32) |
| 66 | Ward (39) Market | NORTH DAGON | No.(39) |
| 67 | 21 | NORTH OKKALAPA | 21 |
| 68 | GA GYI MARKET | NORTH OKKALAPA | Ga Gyi |
| 69 | KYAUK YAY TWIN | NORTH OKKALAPA | Ga Gyi |
| 70 | MAY DAR WI | NORTH OKKALAPA | Ga Nga Ward |
| 71 | MYA NAN DAR | NORTH OKKALAPA | Hta Wun Be |
| 72 | NO. 12 | NORTH OKKALAPA | 11/1 |
| 73 | NO.2 MARKET | NORTH OKKALAPA | (2) |
| 74 | SHWEPAUKKAN | NORTH OKKALAPA | 17 |
| 75 | THI RI YA DANAR | NORTH OKKALAPA | Hta Wun Be |
| 76 | WAY BERGI NEW TOWN | NORTH OKKALAPA | Waibargi Myothit Ward |
| 77 | YA DA NAR TEIN GI | NORTH OKKALAPA | Sa Lein |
| 78 | YADANAR THEINGYI | NORTH OKKALAPA | Za Myin Zwe |
| 79 | BOGYOKE ZAY | PABEDAN | No.(5) |
| 80 | BOGYOKE ZAY THIT | PABEDAN | No.(2) |
| 81 | LAYHARPYIN | PABEDAN | No.(2) |
| 82 | THEIN GYI ZAY-A | PABEDAN | No.(2) |
| 83 | THEIN GYI ZAY-B | PABEDAN | No.(2) |
| 84 | PAZUNTAUNG MARKET | PAZUNDAUNG | No.(6) |
| 85 | YAE KYAW | PAZUNDAUNG | No.(9) |
| 86 | CITY MART | SANCHAUNG | Shin Saw Pu Ward |
| 87 | GWA | SANCHAUNG | Kyuntaw Ward (North) |
| 88 | SHAN LANN | SANCHAUNG | Kyuntaw Ward (North) |
| 89 | U SHWE HMAN | SANCHAUNG | Wailuwun Ward (North) |
| 90 | SEIK KYI | SEIKGYIKANAUNGTO | Seik Gyi Ward (East) |
| 91 | SEIK KYI ZAY LAY | SEIKGYIKANAUNGTO | Kha Naung To Ward (East) |
| 92 | AH KHON LOTT ZAY | SOUTH DAGON | No(26) |
| 93 | BAHO SI | SOUTH DAGON | No.(71) |
| 94 | DAGON THERI MARKET | SOUTH DAGON | No.(57) |
| 95 | NO.1 | SOUTH DAGON | No.(25) |
| 96 | NO.2 | SOUTH DAGON | No.(20) |
| 97 | SATT MU ZONE ZAY | SOUTH DAGON | No.(64) |
| 98 | THITSATE | SOUTH DAGON | No.(22) |
| 99 | MYINTHAR | SOUTH OKKALAPA | No.(15) |
| 100 | NAN NA WON | SOUTH OKKALAPA | No.(4) |

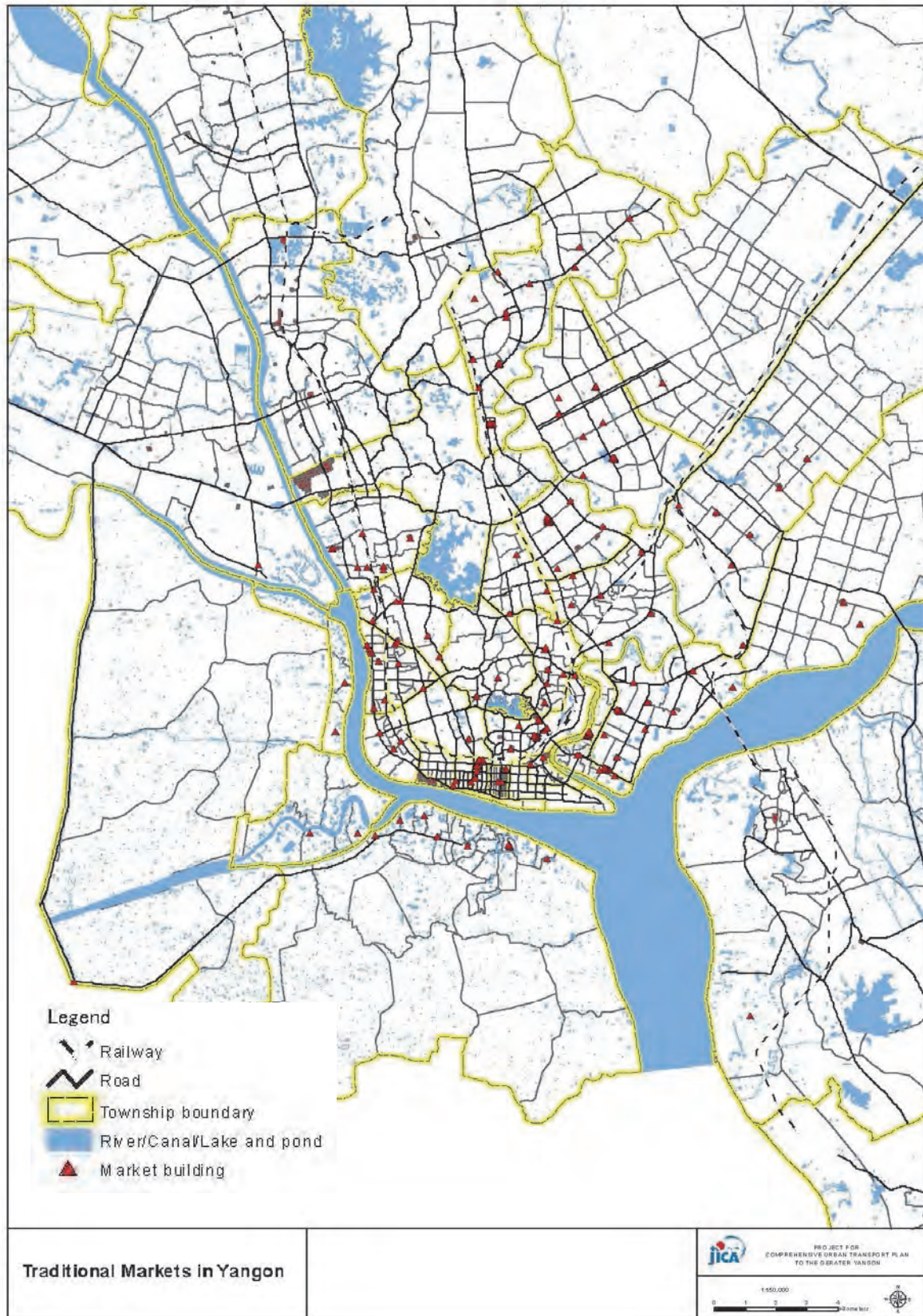
Source: YUTRA Project Team

Table 2.2.6.6 Traditional Markets (3/3)

| No. | Name | TS_Name | Ward_Name |
|-----|--------------------------|----------------|-------------------------|
| 101 | PADAMYAR | SOUTH OKKALAPA | No.(4) |
| 102 | THIRI MYIN THAR | SOUTH OKKALAPA | No.(14) |
| 103 | YARZATHINGYAN | SOUTH OKKALAPA | No.(11) |
| 104 | AH YOE GONE | TARMWE | Ahyogon |
| 105 | DAGONNYUT | TARMWE | Mahlawgon Htay Kyew(Ka) |
| 106 | KYAIAKKASAN MOTOR CAR&PA | TARMWE | Tarmwe Lay |
| 107 | KYAUK MYAUNG MARKET | TARMWE | Kya Kwatthit |
| 108 | TARMAWE (Temp) MARKET | TARMWE | Tarmwe Gyi (Ka+Ga) |
| 109 | TAX FREE MARKET | TARMWE | Tarmwe Lay |
| 110 | BAMAR | THAKETA | No.10(North) |
| 111 | KHINE SHWE WAR | THAKETA | No.10(South) |
| 112 | NO.(2) | THAKETA | No.3(Yanpyae) |
| 113 | NO.(3) | THAKETA | No.3(Manpyae) |
| 114 | NO.(5) | THAKETA | No.5 |
| 115 | NO.(7) | THAKETA | No.7(Wast) |
| 116 | NO.1 | THAKETA | No.1(Anawmar) |
| 117 | OO YIN Market (No.10) | THAKETA | No.10(North) |
| 118 | PETRO A P M | THAKETA | Sethmut Letmut |
| 119 | SHUE KHIN THAR | THAKETA | No.3(Manpyae) |
| 120 | AKHON LOOT ZAY | THANLYIN | Kyaung Kone Seik Gyi |
| 121 | BAWGA | THINGANGYUN | Za/South |
| 122 | NGA MOE YEIK SANPYA MARK | THINGANGYUN | Nga Moe Yeik |
| 123 | THINGANGYUN MARKET | THINGANGYUN | U San Pe |
| 124 | TUWANA MARKET | THINGANGYUN | Thwana(29) |
| 125 | YADANAR | THINGANGYUN | No.(16/1) |
| 126 | YAENANTHAR | THINGANGYUN | Thwana(24) |
| 127 | NONAME | TWAN TAY | Peik Swei |
| 128 | BAUKHTAW | YANKIN | No.(13) |
| 129 | KANBE | YANKIN | No.(12) |
| 130 | THAR YAR SHWE PAY | YANKIN | No.(16) |
| 131 | YANKIN | YANKIN | No.(2) |

Source: YUTRA Project Team

It is safe to say that most of these traditional markets service local residents, accordingly the trip lengths generated by those markets could be relatively short that is the service coverage might be small in comparison with the major shopping centers. Major access/egress modes by visitors to these markets could be dominated by walk and public transport. Such details will be available after completion of the on-going Person Trip survey by the YUTRA Project Team.



Source: YUTRA Project Team, July 2013

Figure 2.2.6.4 Traditional Markets in Yangon

4) International Ports

Yangon port is the largest international gateway port of Myanmar which is located about 32 km upstream from the Yangon River mouth. Most international cargo is handled in this area. International container handling volume is approaching the level of 400,000 TEU per year. Basically 15,000 DWT ships with a draft of 9m depth are able to be accommodated.

(i) Ahlong Wharf - Asia World Port Management Co., Ltd. (AWPM)

Ahlong wharf is located about 2km upstream from Myanmar Industrial Port (MIP). This is the first private international wharf in Myanmar. It is operated by APWM and commenced operation in 1996.

Port expansion work (No.4 Ahlong Wharf, length=238m) is on-going, and the progress of work is estimated at approximately 80% as of May 2013. After completion of this No.4 Wharf, the total length of Ahlong wharves will be 852m.

(ii) Sule Pagoda Wharves (SPW)

Myanma Port Authority (MPA) is accelerating privatization of port operation and actually 4 berths listed in Sule Pagoda wharves (No.1~4) are under negotiation with private companies (See Table 2.2.6.7).

(iii) Myanmar Industrial Port (MIP)

MIP is located about 2km upstream from Sule Pagoda Wharves (SPW). It will consist of 2 wharves (length=310m in total). No.2 berth is currently under construction. In addition to the No. 2 berth, MIP has a plan of constructing No.3 berth.

(iv) Hteedan Wharves

Hteedan Wharves are located next to AWPM in its upstream side. Renovation work of the 2 wharves in Hteedan commenced in 2010, and one of them has been completed, the other one is currently under construction.

Shwe Nar Wah Company Limited, which is under Asia World Co., Ltd and fellow subsidiary of AWPM, manages this terminal.

(v) New Terminal Development

Naung Thor Company is developing a new terminal at the upstream side of MIP.

A total of about 380 thousand TUE of containers was handled at the ports in Yangon in 2011 (See Table 2.2.6.8). 67 percent, that is, about 260 thousand TEU traffic is generated at the Asian World Port, and the major destination of those containers is the industrial zones in the west bank area of the Yangon River (Hlaing Tharyar industrial area).

Table 2.2.6.7 Ports in Yangon

| Name of Wharves | Length | Apron | Storage Area | | Owner | Remarks |
|---------------------------------|---------|-----------|--------------|----------|-------|----------------------|
| | (m) | Width (m) | Yard(m2) | Shed(m2) | | |
| Hteedan Berth | 180.0 | 21.0 | 21,738.6 | - | MEC | General Cargo |
| Hteedan Rice Berth | 139.0 | 12.5 | - | 6,688.8 | MPA | Rice & Rice Products |
| Ahlon Wharves | | | | | | |
| No.1 | 198.0 | 30.5 | 43,630.0 | 2,675.5 | AWPM | Container & G.C |
| No.2 | 156.0 | 19.5 | 3,483.0 | 1,895.0 | AWPM | Container & G.C |
| No.3 | 260.0 | 30.5 | 7,928.0 | 1,859.0 | AWPM | Container & G.C |
| Sub-total | 614.0 | 80.5 | 55,041.0 | 6,429.5 | | |
| Myanmar Industrial Port Wharves | 310.0 | 18.0 | 102,385.0 | 6,140.0 | MIP | Container & G.C |
| Sule Pagoda Wharves | | | | | | |
| No.1 | 137.0 | 12.2 | 6,967.5 | 5,016.6 | MPA | General Cargo |
| No.2 | 137.0 | 12.2 | 5,574.0 | 5,202.4 | MPA | General Cargo |
| No.3 | 137.0 | 12.2 | 10,683.5 | 3,855.4 | MPA | General Cargo |
| No.4 | 137.0 | 12.2 | 3,251.5 | 6,688.8 | MPA | General Cargo |
| No.5 | 160.0 | 15.2 | 6,038.5 | 17,595.3 | MPA | General Cargo |
| No.6 | 160.0 | 15.2 | 3,251.5 | 16,062.4 | MPA | General Cargo |
| No.7 | 158.5 | 15.2 | 1,042.3 | 13,098.9 | MPA | General Cargo |
| Sub-total | 1,026.5 | 94.4 | 36,808.8 | 67,519.7 | | |
| Bo Aung Gyaw Wharves | | | | | | |
| No.1 | 137.0 | 15.2 | | | UMEHL | Container & G.C |
| No.2 | 137.0 | 15.2 | 48,000.0 | 400.0 | UMEHL | Container & G.C |
| No.3 | 183.0 | 30.0 | | | UMEHL | Container |
| Sub-total | 457.0 | 60.4 | 48,000.0 | 400.0 | | |

Source: Myanmar Port Authority (MPA)

MEC: Myanmar Economic Cooperation (MPA leased the operation in 2010)

AWPM: Asia World Port management Co., Ltd.

UMEHL: LANN PYI MARINE CO., LTD. under Union of Myanmar Economic Holding Limited. (Note: MPA leased the operation in 2010.)

Table 2.2.6.8 Container traffic at ports in Yangon

Unit = TEU

| Wharf name | Owner | Year | 2010 | 2011 | 2010 | 2011 |
|---|-------|-----------|----------------|----------------|---------------|---------------|
| Ahlon Wharves | AWPM | Import | 108,135 | 131,644 | | |
| | | Export | 100,128 | 124,775 | 62.4% | 66.8% |
| | | Sub-total | 208,263 | 256,419 | | |
| Myanmar Industrial Port | MIP | Import | 25,770 | 46,899 | | |
| | | Export | 30,203 | 48,473 | 16.8% | 24.8% |
| | | Sub-total | 55,973 | 95,372 | | |
| Bo Aung Gyaw Wharves | UMEHL | Import | 28,173 | 14,772 | | |
| | | Export | 28,361 | 15,188 | 16.9% | 7.8% |
| | | Sub-total | 56,534 | 29,960 | | |
| Myanmar International Terminals Thilawa | MITT | Import | 5,943 | 1,067 | | |
| | | Export | 7,200 | 1,172 | 3.9% | 0.6% |
| | | Sub-total | 13,143 | 2,239 | | |
| Yangon Total | | | 333,913 | 383,990 | 100.0% | 100.0% |

Source: Myanmar Port Authority

(vi) Ports in Thilawa Area

Because of limited backyards in downtown Yangon and limited ship entry capacity into the Yangon Port, further development will be made in the Thilawa Port area (about 25km upstream from the mouth of the Yangon River), which is planned to accommodate 20,000 DWT with 9m depth.

The Thilawa Port will be comprised of 37 plots as ultimate development and currently

some of them are already in operation. Lot No.4 is operated by Myanmar Integrated Port Limited (MIPL) and mainly handles fertilizer as import and logs as export. Lot No. 5 to 9 are under Myanmar International Terminal Thilawa (MITT) which is an investment of Hutchison Port Holding Company. MITT has 5 berths with a total of 1,000m length and a service area behind of 750m.

5) Freight Rail Stations

There are four rail stations which handle rail cargo in Yangon, namely Yangon rail station cargo centre No. 1 and 2, Botahtaung cargo centre, and Sat San cargo centre.

(1) Yangon Station

The Yangon rail station handles various commodity goods including clothes, food stuff, medicine, etc. carried by passenger trains (express and mail train) (Table 2.2.6.9).

Table 2.2.6.9 Yangon Station Rail Passenger cum Cargo (May 2013)

Express Train

| No | Train Number | From Station | To Station | Passenger | | Cargo | | Total Income | The number of days in operation | Average per day | |
|----|--------------|--------------|------------------|-----------|----------------|-------|----------------|--------------|---------------------------------|---------------------|----------------|
| | | | | Number | Income (Kyats) | Ton | Income (Kyats) | | | Number of Passenger | Income (Kyats) |
| 1 | 03-UP | Yangon | Mandalay | 38,986 | 103,535,248 | 195.1 | 8,522,200 | 112,057,448 | 31 | 1,258 | 3,614,756 |
| 2 | 04-DOWN | Mandalay | Yangon | 32,671 | 87,664,157 | 149.1 | 6,829,850 | 94,494,007 | 31 | 1,054 | 3,048,194 |
| 3 | 05-UP | Yangon | Mandalay | 23,879 | 84,815,464 | 243.8 | 9,053,369 | 93,868,833 | 31 | 770 | 3,028,027 |
| 4 | 06-DOWN | Mandalay | Yangon | 22,156 | 79,335,611 | 185.8 | 8,458,250 | 87,793,861 | 31 | 715 | 2,832,060 |
| 5 | 07-UP | Yangon | Naypyitaw | 11,481 | 24,065,715 | 50.3 | 1,487,550 | 25,553,265 | 31 | 370 | 824,299 |
| 6 | 08-DOWN | Naypyitaw | Yangon | 11,126 | 27,024,099 | 6.1 | 1,513,850 | 28,537,949 | 31 | 359 | 920,579 |
| 7 | 11-UP | Yangon | Mandalay | 35,521 | 59,721,841 | 300.5 | 11,260,304 | 70,982,145 | 31 | 1,146 | 2,289,747 |
| 8 | 12-DOWN | Mandalay | Yangon | 29,802 | 51,313,396 | 86.5 | 2,762,850 | 54,076,246 | 31 | 961 | 1,744,395 |
| 9 | 175-UP | Yangon | Dawei(Port) | 26,606 | 52,852,028 | 240.0 | 4,965,936 | 57,817,964 | 31 | 858 | 1,865,096 |
| 10 | 176-DOWN | Dawei(Port) | Yangon | 22,003 | 50,135,619 | 372.6 | 7,554,618 | 57,690,237 | 31 | 710 | 1,860,975 |
| 11 | 31-UP | Yangon | Naypyitaw | 15,141 | 22,746,320 | 3.5 | 207,500 | 22,953,820 | 31 | 488 | 740,446 |
| 12 | 32-DOWN | Naypyitaw | Yangon | 19,545 | 28,418,165 | 1.5 | 82,500 | 28,500,665 | 31 | 630 | 919,376 |
| 13 | 35-UP | Yangon | Mawlamyaing | 6,784 | 17,646,312 | 103.4 | 2,093,650 | 19,739,962 | 31 | 219 | 636,773 |
| 14 | 36-DOWN | Mawlamyaing | Yangon | 8,590 | 22,956,981 | 163.0 | 3,193,000 | 26,149,981 | 31 | 277 | 843,548 |
| 15 | 61-UP | Yangon | Bagan | 8,366 | 19,647,213 | 32.8 | 1,026,750 | 20,673,963 | 31 | 270 | 666,902 |
| 16 | 62-DOWN | Bagan | Yangon | 7,020 | 17,944,849 | 51.6 | 2,875,500 | 20,820,349 | 31 | 226 | 671,624 |
| 17 | 71-UP | Yangon | Pyay | 18,144 | 23,583,323 | 19.4 | 441,100 | 24,024,423 | 31 | 585 | 774,981 |
| 18 | 72-DOWN | Pyay | Yangon | 21,919 | 33,140,746 | 39.3 | 397,550 | 33,538,296 | 31 | 707 | 1,081,881 |
| 19 | 89-UP | Yangon | Mawlamyaing | 15,171 | 18,846,357 | 183.7 | 3,636,550 | 22,482,907 | 31 | 489 | 725,255 |
| 20 | 90-DOWN | Mawlamyaing | Yangon | 14,929 | 20,641,431 | 474.2 | 7,619,150 | 28,260,581 | 31 | 482 | 911,632 |
| | | | Sub-total (UP) | 200,079 | 427,459,821 | 1,373 | 42,694,909 | 470,154,730 | | 6,454 | 15,166,282 |
| | | | Sun-total (Down) | 189,761 | 418,575,054 | 1,530 | 41,287,118 | 459,862,172 | | 6,121 | 14,834,264 |
| | | | TOTAL | 389,840 | 846,034,875 | 2,902 | 83,982,027 | 930,016,902 | | 12,575 | 30,000,545 |

MAIL TRAIN

| No | Train Number | From Station | To Station | Passenger | | Cargo | | Total Income | The number of days in operation | Average per day | |
|----|--------------|--------------|------------------|-----------|----------------|-------|----------------|--------------|---------------------------------|---------------------|----------------|
| | | | | Number | Income (Kyats) | Ton | Income (Kyats) | | | Number of Passenger | Income (Kyats) |
| 1 | 1-UP | Yangon | Mandalay | 9,382 | 7,579,621 | 4,085 | 104,918,768 | 112,498,389 | 31 | 303 | 3,384,476 |
| 2 | 2-DOWN | Mandalay | Yangon | 11,527 | 8,748,553 | 1,819 | 34,227,632 | 42,976,185 | 31 | 372 | 1,104,117 |
| 3 | 9-UP | Yangon | Pyinmanar | 9,005 | 15,335,768 | 874 | 19,343,605 | 34,679,373 | 31 | 290 | 623,987 |
| 4 | 10-DOWN | Pyinmanar | Yangon | 6,386 | 3,995,840 | 49 | 532,700 | 4,528,540 | 31 | 206 | 17,184 |
| | | | Sub-total (UP) | 18,387 | 22,915,389 | 4,959 | 124,262,373 | 147,177,762 | | 593 | 4,008,464 |
| | | | Sun-total (Down) | 17,913 | 12,744,393 | 1,868 | 34,760,332 | 47,504,725 | | 578 | 1,121,301 |
| | | | TOTAL | 36,300 | 35,659,782 | 6,827 | 159,022,705 | 194,682,487 | | 1,171 | 5,129,765 |

Source: Myanma Railway (May 2013)

Small trucks and pick-ups are normally used to bring and pick-up those commodities at the Yangon rail station. Cargo generation in May 2013 was 9,729 ton for the month, which is equivalent to 314 ton per day in average (about 130 truck of 2.5t). This is not a significantly large volume.

(2) Sat San Station

The Sat San station in Miingalar Taung Nyunt township was developed to provide express freight services in 2006. This station handles the largest volume of cargo generated in Yangon. Most of the cargo is heading to Myo Haung (Mandalay) and Taungoo (Bago). Directional freight volume from Yangon to Mandalay is about 685 tons per day, whilst that from Mandalay to Yangon is 138 tons per day in 2011/2012.

There are three tracks, and mainly two tracks are used for loading and unloading cargo with no machinery but undertaken by about 120 labourers.

The number of express train service is two trains per day. One train is composed of one locomotive, fifteen wagons, one rest car and one brake van. It takes about 21 hours from Yangon to Mandalay.

An average dwell time of the express freight train at the station is about 12 hours because loading and unloading time given to forwarders at the station is 6 hours each.

The departure time of the express freight train from Mahlwagone yard is limited to between 13:00 hours to 22:00 hours.

In total 1,022 forwarders use this station as of early 2013. Most are small truck owners. A maximum of two forwarders are allowed to share one wagon.

(3) Botahtaung Station

There are six tracks in the station, and two tracks are mainly used for loading and unloading cargo without machinery using around 100 labours.

The number of express freight train service is six per month between Yangon and Myitkyina. One express freight train is composed of one locomotive, fourteen wagons, one rest car and one brake van. It takes about 72 hours from Yangon to Myitkyina.

In addition ordinary freight train service is provided between Yangon and Mandalay at this station, thirteen to eighteen trains per month. The ordinal freight train is composed of one locomotive, eleven wagons, one rest car and one brake van.

Unloading and loading time allowed to forwarders at this station is 24 hours each, so the likely dwell time at Botahtaung station is 48 hours.

In total 320 forwarders use the express freight service at this station, whilst 19 forwarders use the ordinary service. A maximum of five forwarders is allowed to share one wagon according to the agreement between Myanmar Railway and forwarders.

(4) Danidaw Station

The Danidaw station is specialized for oil transportation which is under the control of the Pazundaung station. All the facilities including tracks (three tracks) are owned by Myanmar Petroleum Products Enterprise (MPPE) which is responsible for retail and wholesale distribution of petroleum products in Myanmar.

Oil is transported via the pipeline from the oil berth near Mee Pya street in Botahtaung township (near the mouth of the Pazundaung creek) to the Danidaw station oil loading site.

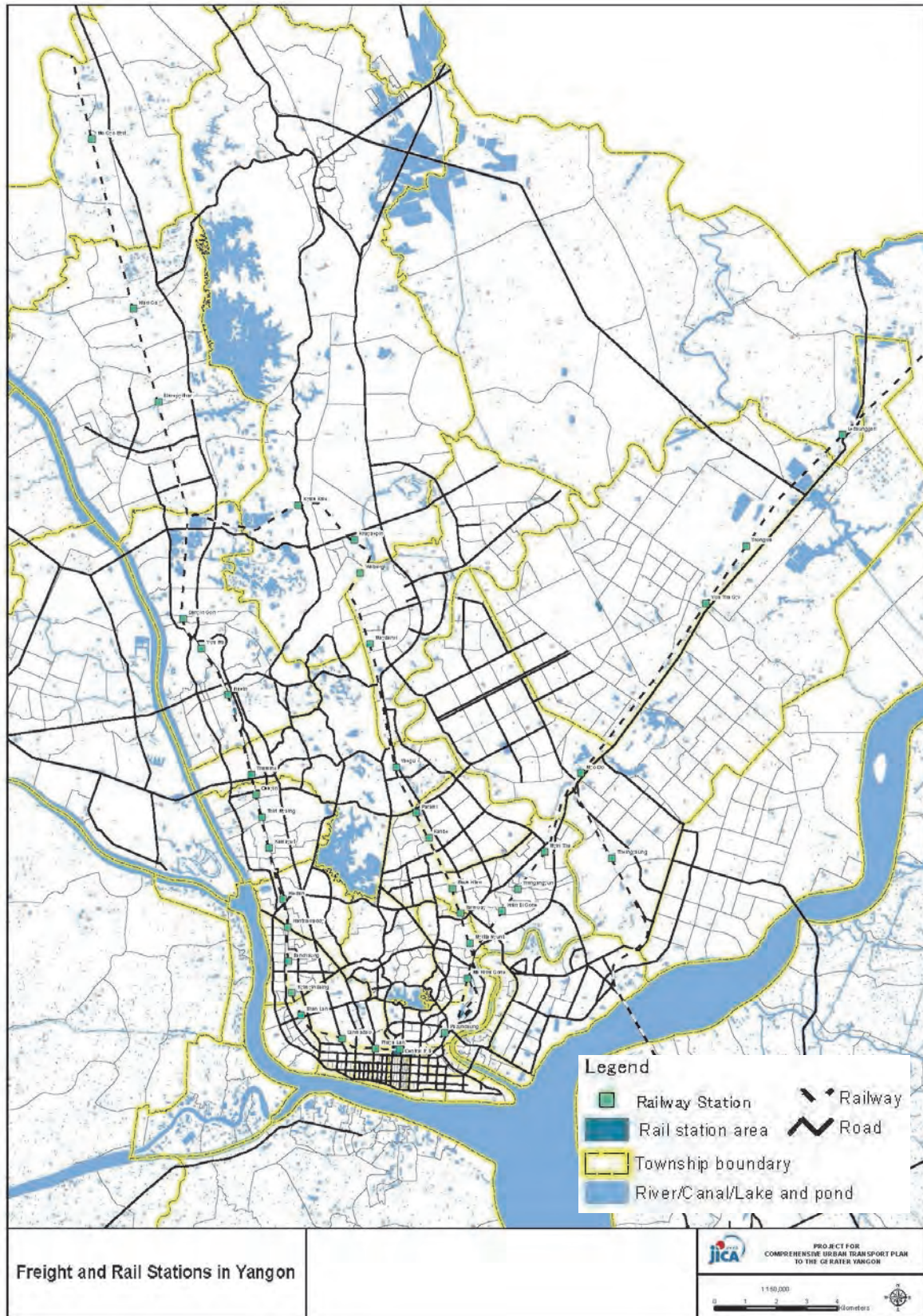
Then, oil wagons are transported to destinations namely Shwenyaung, Thazi, Pyinmana and Mawlamyine. A block train (express freight train) for the oil transport is composed of eleven oil wagons. An express passenger train is also used to transport oil by adding two to three oil wagons.

The number of oil wagons per month currently transported to each destination is as follows:

- Shwenyaung - 72;
- Thazi – 32;
- Pyinmana – 234; and
- TMawlamyine – 6.

There are a total of 344 wagons per month.

MPPE has another oil wagon handling area in Mandalay to transfer the oil from the rail wagon to trucks. Myitkyina is served by both trucks and freight trains in terms of oil transportation, but most of the areas in the upper Myanmar are served by trucks only.



Source: YUTRA PROJECT TEAM, July 2013

Figure 2.2.6.5 Freight Rail Stations in Yangon

6) General Cargo Trucks

The Highway Freight Transportation Service Association (HFTSA) is an association of truck transport (general cargo) service providers under the Ministry of Commerce and the Regional Government (Table 2.2.6.10). All the truck companies (owners) having over 4.5 ton cargo truck(s) and doing business in Yangon must join HFTSA. About 400 companies (operating around 17,600 trucks) belong to this association of which 320 companies have their offices in the Bayint Naung Warehouse (YCDC Truck Terminal).

There are three roadside check points operated by HFTSA in order to check the performance of the member companies' activities. According to the survey carried out during the week of 16 – 22 February 2013, an average of about 11,000 ton general cargo was carried by about 730 trucks per day on the Yangon – Bago route which connects Yangon and Mandalay and the northern area of the country. Similarly, general cargo of about 1,400 ton was carried by about 120 trucks per day on the Yangon – Pyay route, and about 1,100 ton of cargo by about 110 trucks on the Yangon – Delta route. In total about 1,000 inter-city (long-distance) truck trips are generated in Yangon (at the Bayint Naung Warehouse). The Bayint Naung Warehouse (YCDC Truck Terminal), which is located near the Bayint Naung bridge in Insein Township of Yangon is the only truck terminal in the city of Yangon, so almost all the long-distance truck trips are generated at this terminal.

Table 2.2.6.10 Average Daily Truck Traffic Volume Passing HFTSA checkpoints in the week of 16 - 22 February 2013

| | Inbound (to Yangon) | | | Outbound (from Yangon) | | |
|-----------|---------------------|-------|--------------|------------------------|-------|--------------|
| | Vehicles | Tons | Average load | Vehicles | Tons | Average load |
| 6 wheels | 56 | 505 | 9.00 | 116 | 1,044 | 9.00 |
| 8 wheels | - | - | | 1 | 6 | 10.00 |
| 10 wheels | 30 | 386 | 13.00 | 80 | 1,046 | 13.00 |
| 12 wheels | 162 | 2,426 | 15.00 | 226 | 3,390 | 15.00 |
| 18 wheels | 0 | 9 | 30.00 | 1 | 39 | 30.00 |
| 22 wheels | 16 | 555 | 35.00 | 40 | 1,410 | 35.00 |
| Total | 264 | 3,881 | 14.72 | 465 | 6,934 | 14.93 |

* weekly total volumes are divided by 7 days

Check-point No. 2: Yangon - Pyay Route

| | Vehicles | Tons | Average load |
|-----------|----------|-------|--------------|
| 6 wheels | 69 | 621 | 9.00 |
| 8 wheels | 0 | 3 | 10.00 |
| 10 wheels | 15 | 195 | 13.00 |
| 12 wheels | 33 | 495 | 15.00 |
| 18 wheels | 0 | 9 | 30.00 |
| 22 wheels | 2 | 65 | 32.50 |
| Total | 120 | 1,387 | 11.60 |

Check-point No. 3: Yangon - Delta Route

| | Vehicles | Tons | Average load |
|-----------|----------|-------|--------------|
| 6 wheels | 95 | 851 | 9.00 |
| 8 wheels | - | - | |
| 10 wheels | 3 | 41 | 13.00 |
| 12 wheels | 11 | 171 | 15.00 |
| 18 wheels | - | - | |
| 22 wheels | - | - | |
| Total | 109 | 1,063 | 9.74 |

Source: Highway Freight Transportation Services Association

Note: The data shown in the HFTSA web site may not be correct. For example, average loading factors are same in all direction.

7) Container Trucks

There is an association of container truck owners named Myanmar Container Trucks Association (MCTA). 44 national companies are members of this association as of early 2013.

In total there are 827 container trucks owned by the member companies as of early 2013, which carry about 350 containers a day in average (Table 2.2.6.11). Assuming one container truck handles 1.3 TEUs (30%: 40 ft container 70%: 20 ft container), a maximum container carrying capacity by the existing container trucks (MCTA) is calculated at 392 thousand TEUs (1.3 TEUs x 827 vehicles x 365 days) per year, which is almost equal to the containers currently handled at the Yangon ports (about 380 thousand TEU per year).

Table 2.2.6.11 Containers handled by Container Trucks Association

Unit = the number of container

| | Direction | For export | Import from overseas | Total | Daily Average | 40 feet container | 20 feet container |
|---------------|-----------------------------|------------|----------------------|--------|---------------|-------------------|-------------------|
| November 2012 | Within Yangon Downtown | 2,581 | 5,489 | 8,070 | 269 | 80 | 189 |
| | From Yangon to Nay Pyi Taw | - | 103 | 103 | 3 | 1 | 2 |
| | From Yangon to Mandalay | - | 9 | 9 | 0 | - | 0 |
| | Sub-total | 2,581 | 5,601 | 8,182 | 273 | 81 | 192 |
| December 2012 | Within Yangon Downtown | 3,041 | 6,759 | 9,800 | 316 | 94 | 222 |
| | From Yangon to Nay Pyi Taw | - | 79 | 79 | 3 | 1 | 2 |
| | From Yangon to Mandalay | - | 2 | 2 | 0 | - | 0 |
| | From yangon to Hlaingtet | - | 1 | 1 | 0 | - | 0 |
| | Sub-total | 3,041 | 6,841 | 9,882 | 319 | 95 | 224 |
| January 2013 | Within Yangon Downtown | 3,589 | 7,700 | 11,289 | 364 | 109 | 255 |
| | From Yangon to Nay Pyi Taw | - | 89 | 89 | 3 | 1 | 2 |
| | From Yangon to Mandalay | - | 20 | 20 | 1 | - | 1 |
| | From yangon to Pyin-oo-lwin | - | 2 | 2 | 0 | - | 0 |
| | Sub-total | 3,589 | 7,811 | 11,400 | 368 | 110 | 258 |
| February 2013 | Within Yangon Downtown | 3,098 | 6,651 | 9,749 | 348 | 104 | 244 |
| | From Yangon to Nay Pyi Taw | - | 54 | 54 | 2 | - | 2 |
| | From Yangon to Mandalay | - | 13 | 13 | 0 | - | 0 |
| | Sub-total | 3,098 | 6,718 | 9,816 | 351 | 104 | 247 |

Note: Hlaingtet is between Meiktila and Kalaw

Pyinoolwin is between Mandalay and Lasho

Unit: the number of containers including 20 and 40 ft.

Empty containers are not included in the figures.

Yangon - Mandalay 40 ft : 20 ft ratio = 30:70

Other movement 40 ft : 20 ft ratio = 40:60

Source: Container Trucks Association, Myanmar

Most of the loaded containers are transported from international ports, namely Asia World Port Terminal (AWPT), Myanmar Industrial Port (MIP), Bo Aung Kyaw Wharf (BSW) and Myanmar International Terminals Thilawa (MITT) to the industrial zones in Yangon. Whilst unloaded containers, many of them are empty, are transported to Inland Container Depot (ICD).

8) Movement of Logs

The Myanma Timber Enterprise (MTE), originally named State Timber Extraction Organisation, was established immediately after the country attained independence in 1948. This is an organization under the Ministry of Environmental Conservation and Forestry

(MOECA), which is solely in charge of cutting woods (teak and hardwood) and selling logs (teak and hardwood).

There are twenty eight log storage yards and eight jetties for unloading and storage, most of them are located along the Yangon River.

Logs are produced in Mandalay and Sagaing States, and most of them are transported by inland waterway to those storage yards in Yangon. Then they are transported to wood processing factories in the city or to the international ports for export from the storage after auction.

About 80% of the exported logs are transported by trailer trucks and the remaining 20% by barge vessels. About 2.5 million tons of logs are exported annually.

9) Freight Traffic Management

Routes (roads) for container trailers, log trucks and heavy trucks are designated by the Yangon Region as shown in Figure 2.2.3.17. Container trucks mainly use the road paralleling Strand Road and Bayint Naung road paralleling the Yangon River to/from the Haling Thar industrial area and other industrial zones along No. (4) main road. Other north-south truck route is No. (3) main road stretching from the 0 mile point of the Yangon – Mandalay Expressway in the north, passing through the Mingaladon Industrial Park, down to south along Thanthumar road. This route is also heavily used by buses owned by companies in the industrial zone along the main road No. (3).

The maximum loading capacity of Thanlyin bridge is 36t (gross), while that of Dagon bridge crossing upstream of the Bago River is 75t (gross). Since the access roads to Thanlyin bridge are congested and the bridge itself is narrow, many heavy trucks use the Dagon bridge to the Thilawa area.



Source: YUTRA Study Team

Figure 2.2.6.6 Dagon Bridge



Source: YUTRA Study Team

Figure 2.2.6.71 Thanlyin Bridge

The maximum loading capacity of Aung Zaya bridge is 36t (gross), whilst that of Shwepyitha bridge is 60t (gross). Since the Aung Zaya bridge is close to the Hlaing Tharyar industrial area, many trucks use the Aung Zaya bridge.



Source: YUTRA Study Team

Figure 2.2.6.8 Aung Zaya Bridge



Source: YUTRA Study Team

Figure 2.2.6.9 Shwepyitha Bridge

2.2.7 Implications with National Transport

Yangon, the former capital of Myanmar, has been recognized to date as the sole international gateway of the country since its establishment as the capital under the British Burma in 1885. Accordingly national level transport systems such as international ports, international airport, and central rail station focus on Yangon. These national systems have been developed and upgraded since that period. The national highway system has also been developed with the focus as Yangon to north, east and west, connecting major cities in the plain area of the country.

It is expected that Yangon whilst no longer the national capital will remain the focus of national transport. All indications are that Yangon and its surroundings will remain the principal international gateway for the country. Yangon, itself will maintain its role as the national gateway for the foreseeable with most if not all national transport centring on this city.

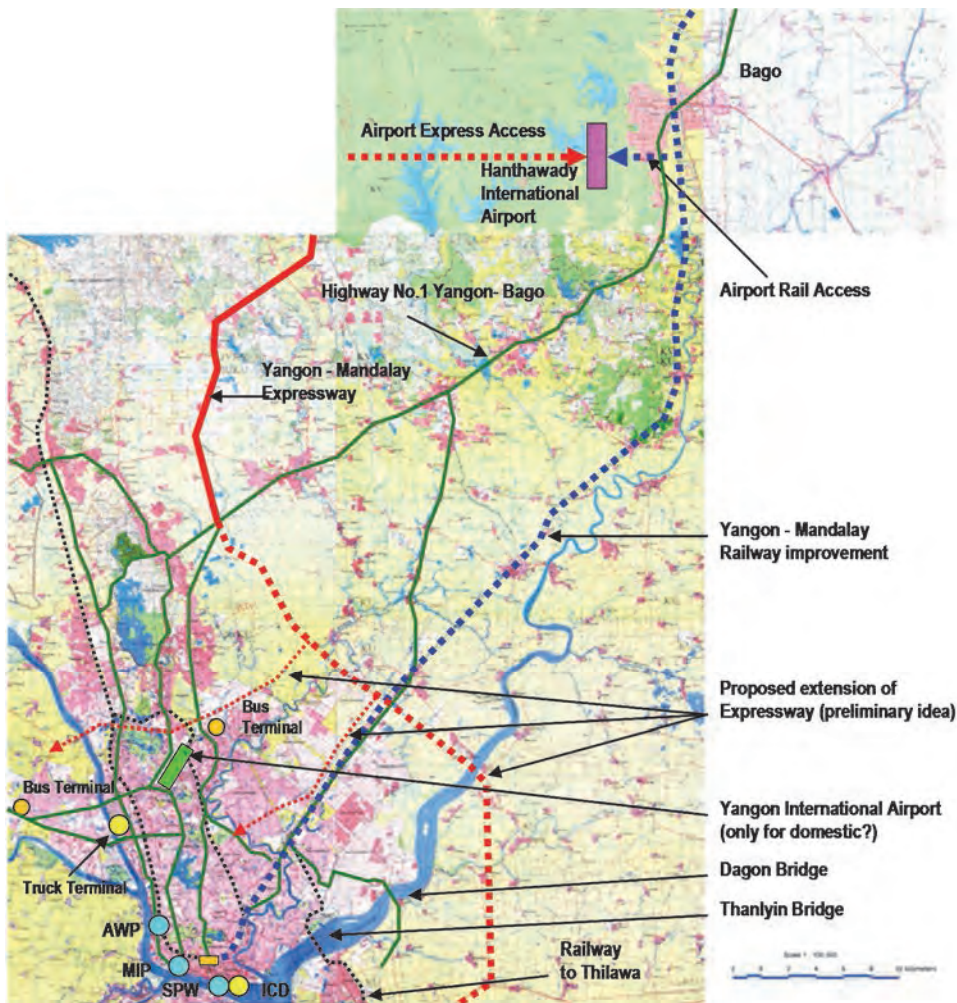
In 2009 the first motorway, named the Yangon-Mandalay Expressway, was open to the public to connect the new capital city of Nay Pyi Taw and Yangon, which was consequently extended to Mandalay / Sagain, the second largest city and the former capital of the country prior to the establishment of British Burma.

This section discusses the current situation of the national level transport systems within the study area (Yangon and surrounding area) including identified problems and corresponding planning issues with respect to traffic impacts caused by those systems in the context of future urban transport management.

Detailed discussion is made in the following five subsections:

- (i) International Ports (see Section 2.2.5);
- (ii) Yangon International Airport;
- (iii) Hanthawaddy International Airport Project
- (iv) Yangon Rail Station;
- (v) Inter-city bus terminal; and,
- (vi) Expressway

The location of the facilities is shown in following figure.



Source: YUTRA Project Team

Figure 2.2.7.1 National Level Transport Systems

(1) International Ports

The current status and the future of the port structure are discussed earlier in the previous section 2.2.6.

(2) Yangon International Airport

Yangon International Airport (YIA) is located about 18 km north of Yangon City. Originally it was built by the Calcutta Metropolitan Airports Authority in 1947, and recently it has been upgraded under a BOT scheme. YIA has a 3,414m long and 61m wide runway, which can accommodate B747-400. The existing international passenger terminal building opened in May 2007. It has a total floor space of 31,920 m², and its design capacity is 2.7 million passengers per annum (MPPA). The domestic passenger terminal building is old, and seriously congested during the busy hours in the morning, requiring immediate improvement.

The passenger terminal and apron area of YIA are surrounded by air force property to the northeast (from northern edge of the existing apron along the parallel taxiway) and the lakes and the army property from the east to south. As a result of these constraints, expansion of the apron and hence airport capacity is limited.

The currently on-going YIA Project is a 30-year Build-Operate-Transfer (BOT) project, and will expand the terminal capacity to 6.0 MPPA by utilizing the limited land area available for civil aviation.

After completion of this project, the passenger travel demand generated at the YIA will be almost doubled, which will add some significant traffic congestion to the surrounding roads in Yangon.

Assuming all of the international airlines move to the new international airport (Hanthawaddy International Airport) in the future, this YIA area will remain as a domestic airport.

(3) Hanthawaddy International Airport Project

The Hanthawaddy International Airport (HIA) Project is a 30-year BOT project for development of a new international airport 77 km northeast of Yangon. Table 2.2.7.1 summarizes an outline of facility requirements.

Table 2.2.7.1 Outline of HIA Facility Requirements

| | | Phase 1 | Phase 2 |
|-----------------------------|---------------|-----------------------|-----------------------|
| Operation Start | | Year 2018 | Year 2028 |
| Annual Passengers | International | 12 MPPA | 24 MPPA |
| | Domestic | - | 6 MPPA |
| | Total | 12 MPPA | 30 MPPA |
| Runway Length | | 3,600m x 1 | 3,600m x 2 |
| Apron | Code E | 15 | 26 |
| | Code C | 21 | 51 |
| | Total | 36 | 77 |
| Passenger Terminal Building | International | 192,000m ² | 256,200m ² |
| | Domestic | - | 24,000m ² |
| | Total | 192,000m ² | 280,200m ² |

Source: YUTRA Project Team, 2013

Since this new international airport is built at 77km distance from the downtown Yangon, it will likely need to have a rail access in the future like Kuala Lumpur International Airport (KLIA), Malaysia.

(4) Yangon Station

Yangon Central Railway Station and the first railway in Myanmar (British Burma at that time), Irrawaddy State Railway was built by the British, and began operation between Yangon and Pyay (259 km) in 1877. The original station building was destroyed during World War II, and the existing Yangon Central Railway Station was built in 1954, which serves both inter-state and urban (circular) rail passengers, and cargo (see Section 2.2.6).

The station is located in downtown Yangon, which is accessible from only north, that is, from Gyo Phyu street or Pansodan street. A large space between the station building and Bo Gyoke road is used for stabling yards and workshop. A future opportunity is the upgrading of the circular rail and the main rail line. Then at that time, the station area and building are available for redevelopment to achieve better use of the property.

(5) Inland Container Depot

The on-going National Transport Master Plan suggests development of Inland Container Depot (ICD) to serve the Greater Yangon region near the Ywatargyi rail station in East Dagon Township where Myanma Railways (MR) has a large area for future development (it

was proposed to develop a new MR central station sometime ago). YUTRA need to consider this proposal together with possible relocation of the existing highway truck terminal in Mayangone Township.

(6) Expressway

There is only one continuous stretch of motorway in the country from Yangon to Mandalay via Nay Pyi Taw (The Yangon-Mandalay Expressway) as of today. This expressway project was initiated in 2000. The construction package was divided into three sections:

- Yangon – Nay Pyi Taw section;
- Nay Pyi Taw – Sagaing section;
- Sagaing – Tagonedine section.

These sections are further described in Table 2.2.7.2. The complete expressway was inaugurated in December, 2011. The expressway is planned as 8 lanes of carriageway as ultimate development but currently is constructed and operated at 4 lanes with concrete pavement. At present, large vehicles over 10 tons excluding buses are prohibited from using the expressway.

It is safe to say that accessibility to the expressway from downtown Yangon is poor because of distance (about 40 km from the downtown area) and condition of roads. Pyay road is normally used to reach the expressway. Pyay road, which is one of the north-south spines in the city, is usually congested especially in downtown area. It sometimes takes nearly one hour and half to reach the toll gate of the expressway (0 mile). Another access road to the expressway is Highway No. 3. There are many factories and several industrial zones along this road, accordingly a ratio of heavy vehicle is higher than other roads in Yangon, leading to a lower travel speed.

Table 2.2.7.2 Expressway from Yangon to Mandalay

| Section | Construction Period | Length (Mile / Furlong) | | | Length (Km) | Opened to Public |
|-------------------------------|---------------------|-------------------------|-------|--------|-------------|------------------|
| | | From | To | Length | | |
| Yangon – Nay Pyi Taw | 10/2005-03/2009 | 0/0 | 202/1 | 202/1 | 323.4 | 25/03/2009 |
| Nay Pyi Taw – Sagaing | 07/2008-12/2010 | 202/1 | 352/6 | 150/5 | 241.0 | 29/12/2010 |
| Sagaing – Tadaoo - Tagonedine | 01/2011-12/2011 | 352/6 | 366/3 | 13/5 | 21.8 | 23/12/2011 |
| Total Length | | | | 366/3 | 586.2 | |

Source: Department of Public Works, Ministry of Construction (MOC)

(7) Inter-city bus terminal

There are two inter-city bus terminals in the study area, namely Aung Mingalar Highway Bus Terminal in Mingalardon Township and Dagon Ayer Highway Bus Terminal in Hlaing Tharyar Township. Most destinations in the country are served at the Aung Mingalar Highway Bus Terminal, whilst the Dagon Ayer Highway bus terminal serves Ayeyarwady Delta area.

The existing Aung Mingalar Highway Bus Terminal was originally a local market, located northeast the Yangon International Airport, outside the circular rail. Entry and exit gates are sometimes very congested according to a visual observation by the JICA study team (early 2013). Terminal accessibility is not well developed and the internal circulation system is not well organized either at present.

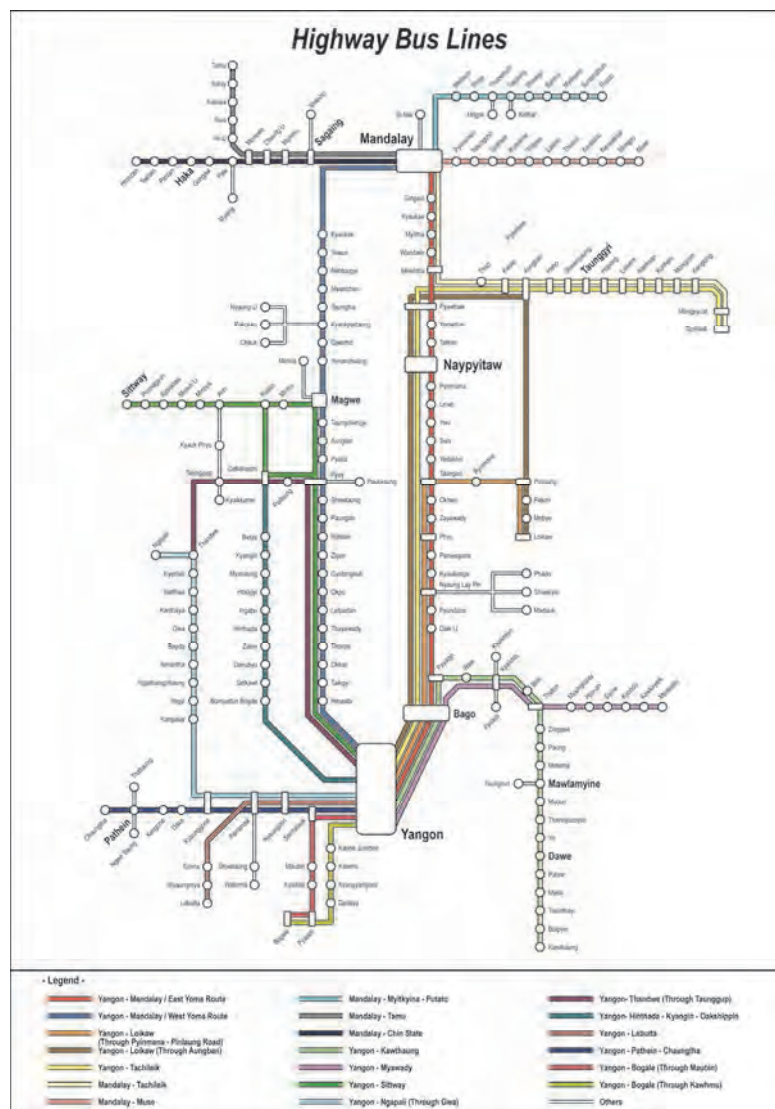
After completion of the expressway, inter-city bus services have been significantly improved by private companies, whilst the railway has lost patronage. Since the accessibility to the bus terminals is generally poor in terms of cost and time, the rail has a chance to increase its patronage if the train service is improved (Yangon station is preferred by residents in Yangon).

The principal intercity bus route structure is shown in Figure 2.2.7.2 and the distribution of services is provided in Table 2.2.7.3.

Table 2.2.7.3 Daily Service Frequency of Inter-city Bus by Terminal

| Origin / Destination | Service Frequency per Day (no.) | Composition |
|----------------------|---------------------------------|-------------|
| Yangon | 1,048 | 87% |
| Mandalay | 107 | 9% |
| Nay Pyi Taw | 35 | 3% |
| Others | 16 | 1% |
| Total | 1,206 | 100% |

Source: YUTRA Project Team, based on Myanmar Travels and Tours Directory 2013



Source: YUTRA Project Team, based on Myanmar Travels and Tours Directory 2013

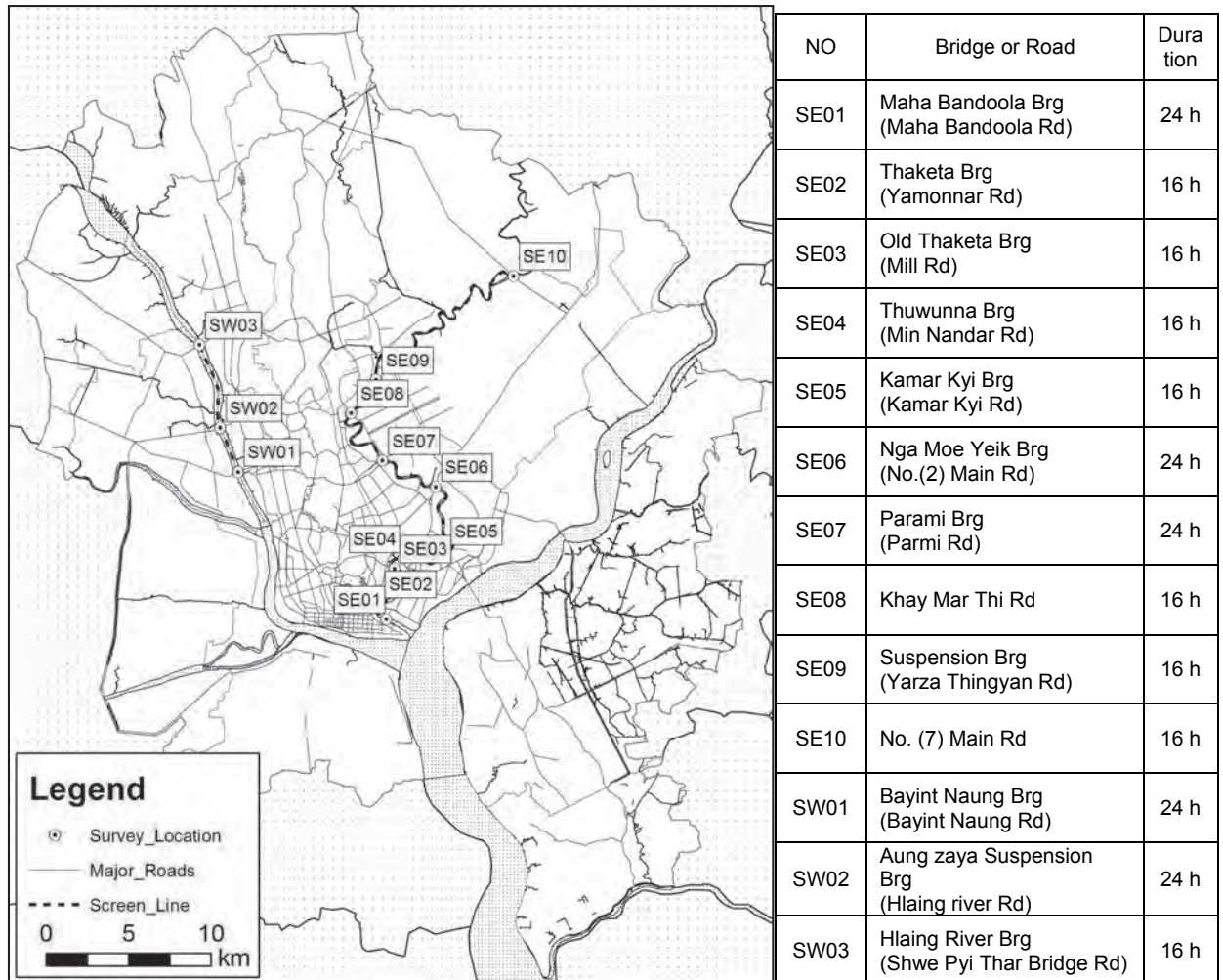
Figure 2.2.7.2 Inter-city Bus Routes in Myanmar

2.3 Transport Demand Characteristics

2.3.1 Road Traffic Volume

The YUTRA screen-line surveys were undertaken in February 2013 at the stations shown in Figure 2.3.1.1. The outline of the survey is described in Chapter 1 of Volume II.

Two screen-lines were set at the east side along the Nga Moe Yeik Creek and the west side along the Hlaing/Yangon River. Road traffic observed by the surveys is summarized in Table 2.3.1.1. On the West Screen, traffic volume of trucks is relatively high due to the tuck terminal located near SW01 and SW02.



Source: YUTRA Project Team

Figure 2.3.1.1 Screen-line Survey Location, 2013

Table 2.3.1.1 Total Traffic Volume across Screen-lines by Vehicle Type and Direction, 2013

| | Vehicle Trips (Vehicles / day) | | | | Person Trips (Trips / day) | | | |
|-------------------|--------------------------------|----------|------------------|----------|----------------------------|----------|------------------|----------|
| | East Screen (SE) | | West Screen (SW) | | East Screen (SE) | | West Screen (SW) | |
| | Inbound | Outbound | Inbound | Outbound | Inbound | Outbound | Inbound | Outbound |
| 2 Bicycle | 12,238 | 12,145 | 4,147 | 4,367 | 13,947 | 13,840 | 4,726 | 4,976 |
| 3 Motorcycle | 3,861 | 3,674 | 2,852 | 3,271 | 5,600 | 5,329 | 4,137 | 4,743 |
| 4 Car | 21,809 | 22,696 | 4,574 | 5,071 | 48,462 | 50,432 | 10,163 | 11,269 |
| 5 Van | 2,783 | 2,316 | 848 | 813 | 8,034 | 6,686 | 2,447 | 2,347 |
| 6 Taxi | 33,215 | 31,977 | 6,998 | 7,150 | 76,241 | 73,400 | 16,063 | 16,413 |
| 7 Passenger-Truck | 12,040 | 11,786 | 5,791 | 5,660 | 223,988 | 219,263 | 107,735 | 105,298 |
| 8 Small-Bus | 3,105 | 2,952 | 806 | 596 | 74,801 | 71,107 | 19,417 | 14,368 |
| 9 Large-Bus | 3,497 | 3,162 | 1,037 | 1,021 | 150,486 | 136,055 | 44,638 | 43,917 |
| 10 Pick-up | 3,269 | 3,079 | 1,746 | 2,112 | 7,870 | 7,414 | 4,204 | 5,086 |
| 11 Medium-Truck | 4,111 | 4,257 | 2,064 | 2,296 | 17,711 | 18,342 | 8,894 | 9,893 |
| 12 Large-Truck | 604 | 811 | 664 | 707 | 1,460 | 1,963 | 1,606 | 1,711 |
| 13 Trailer | 435 | 471 | 505 | 666 | 1,037 | 1,121 | 1,202 | 1,586 |
| 14 Others | 403 | 305 | 366 | 402 | 1,011 | 765 | 919 | 1,008 |
| Total | 101,370 | 99,631 | 32,398 | 34,132 | 630,648 | 605,717 | 226,151 | 222,615 |

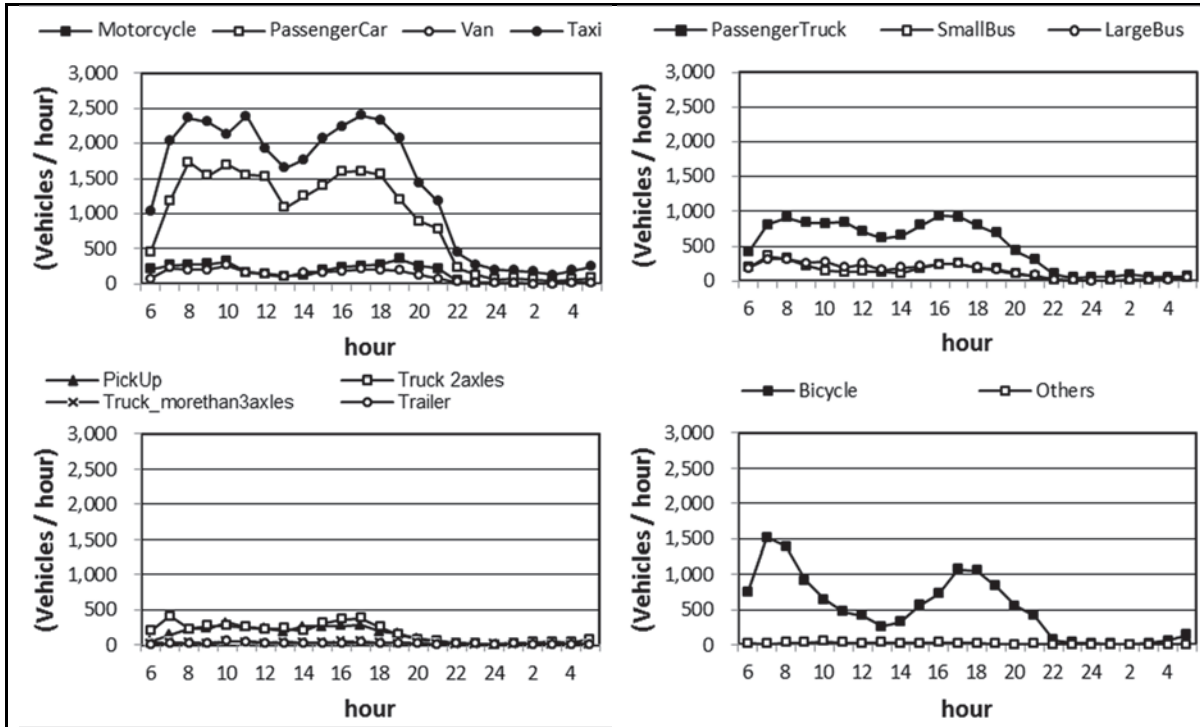
Source: YUTRA Screen-line Survey

Figure 2.3.1.2 through Figure 2.3.1.5 show hourly variation of traffic volume on the East Screen-line (SE01-SE10) and the West Screen-line (SW01-SW03) by direction and by vehicle type. Note that the indicated traffic volume is the total of all survey locations on the Screen-lines.

On the East Screen-line, car and taxi are the dominant modes. Especially, taxi traffic is high. For taxi and car of inbound direction, there are two peaks in the morning and the evening. For outbound direction, hourly traffic volume is distributed relatively equally from morning till evening with somewhat clear peaks in the evening.

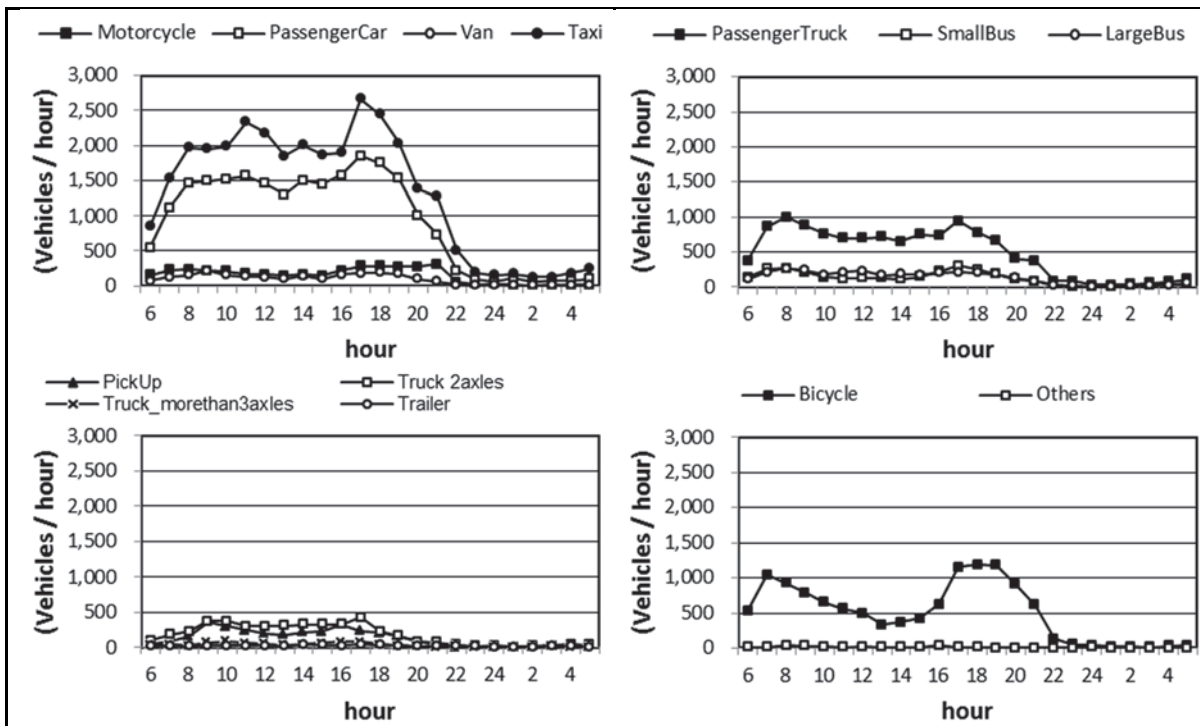
On the West Screen-line, the dominant mode is taxi, followed by car and passenger-truck. They have peaks around 7 a.m. in the morning for both directions. The traffic volume of passenger trucks is relatively high on the West Screen-line compared to the East Screen-line.

In the Screen-line survey, occupancy (no. of passengers on board including driver) was counted by ocular survey on a sampling basis. Average occupancy on the Screen-line is shown by mode and by vehicle type in Table 2.3.1.2. Its hourly fluctuation is shown in Figure 2.3.1.6. Average occupancy of vehicles except for bus and 2-axle truck does not largely fluctuate throughout the day. The occupancy of 2-axle trucks varies largely due to the fact that trucks are often used in Yangon for transporting workers to factories, construction sites, etc.



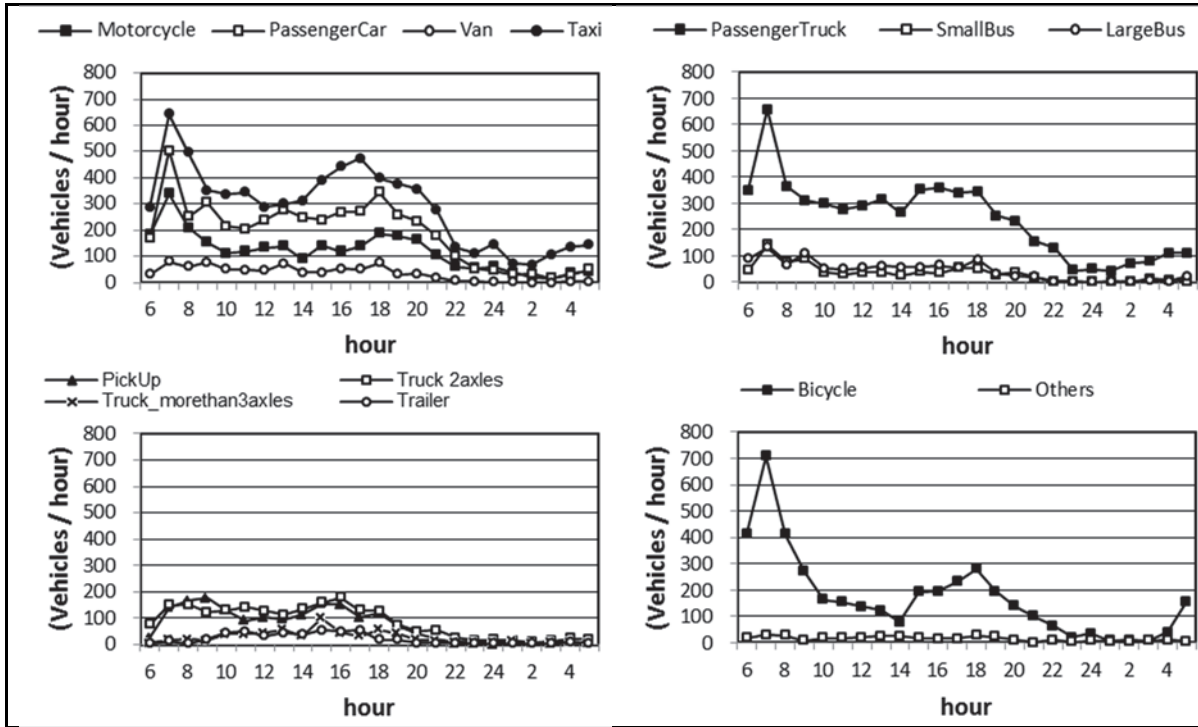
Source: YUTRA Screen-line Survey

Figure 2.3.1.2 Hourly Variation of Traffic Volume on East Screen-line (Inbound), 2013



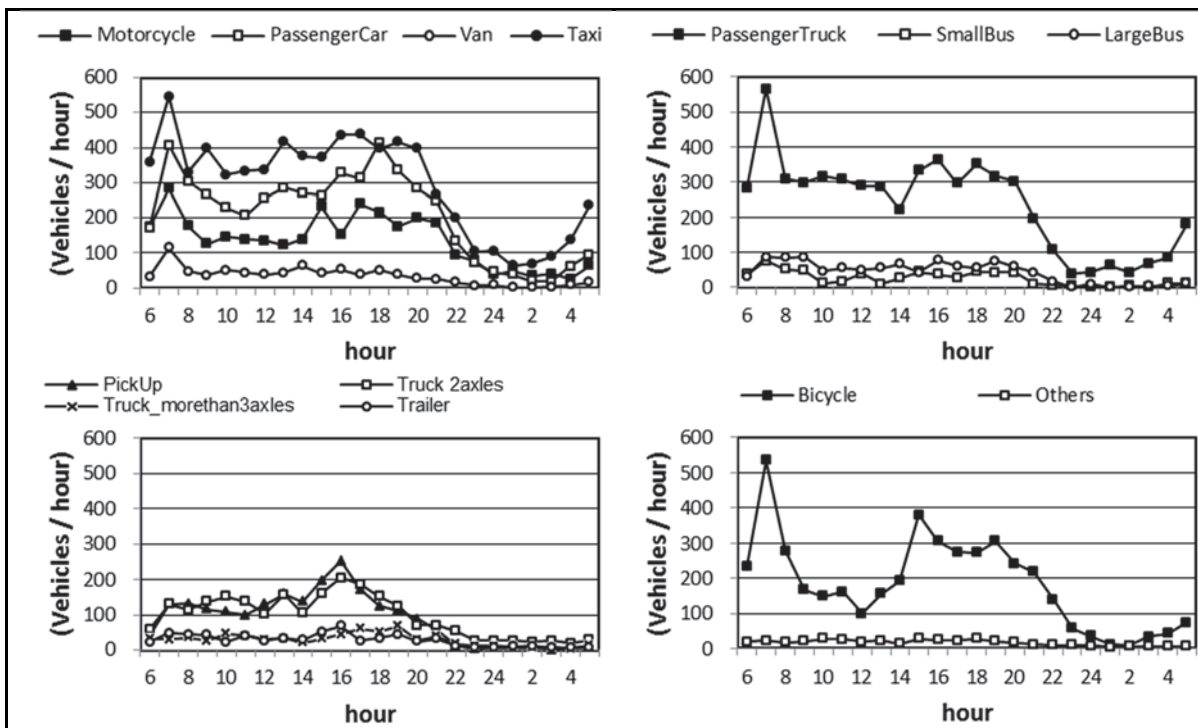
Source: YUTRA Screen-line Survey

Figure 2.3.1.3 Hourly Variation of Traffic Volume on East Screen-line (Outbound), 2013



Source: YUTRA Screen-line Survey

Figure 2.3.1.4 Hourly Variation of Traffic Volume on West Screen-line (Inbound), 2013



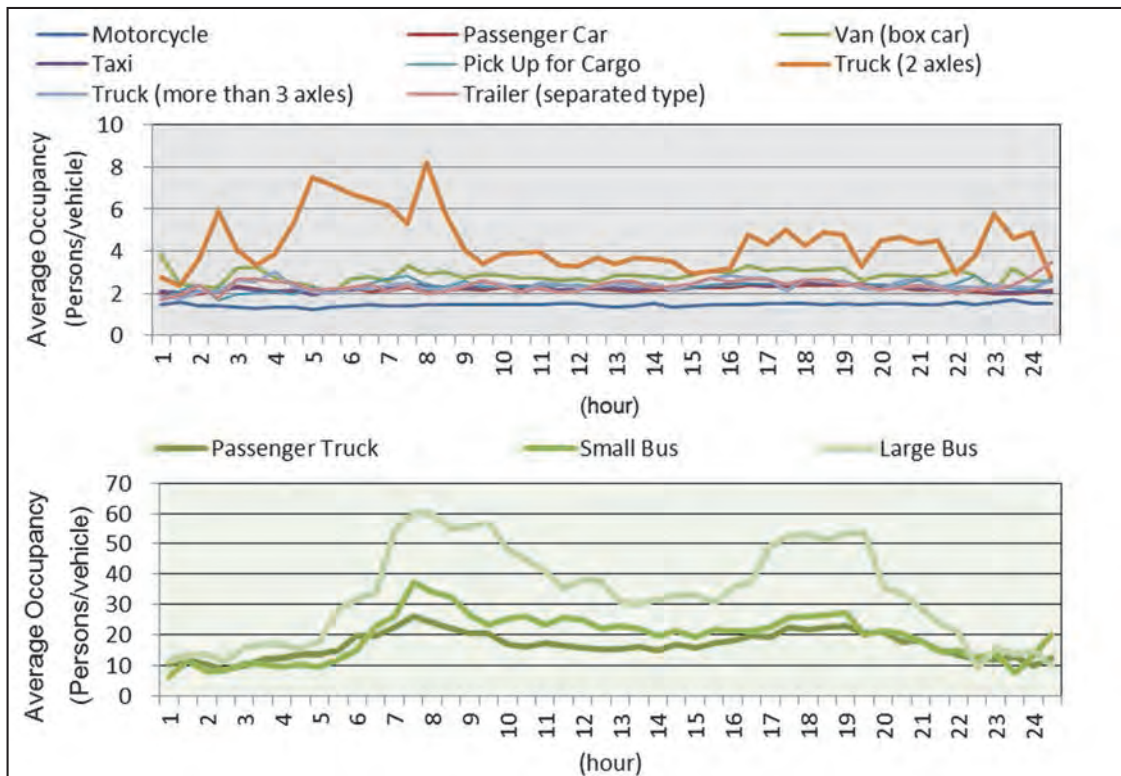
Source: YUTRA Screen-line Survey

Figure 2.3.1.5 Hourly Variation of Traffic Volume on West Screen-line (Outbound), 2013

Table 2.3.1.2 Average Occupancy on Screen Line, 2013

| Mode | Average Occupancy (Persons/ Vehicle) |
|--|--------------------------------------|
| 2 Bicycle & Tricycle (including taxi) | 1.14 |
| 3 Motorcycle (including motorcycle taxi) | 1.45 |
| 4 Passenger Car | 2.22 |
| 5 Van (box car) | 2.89 |
| 6 Taxi | 2.30 |
| 7 Passenger Truck | 18.60 |
| 8 Small Bus | 24.09 |
| 9 Large Bus | 43.03 |
| 10 Pick Up for Cargo | 2.41 |
| 11 Truck (2 axles) | 4.31 |
| 12 Truck (more than 3 axles) | 2.42 |
| 13 Trailer (separated type) | 2.38 |
| 14 Others Motorized Vehicles | 2.51 |

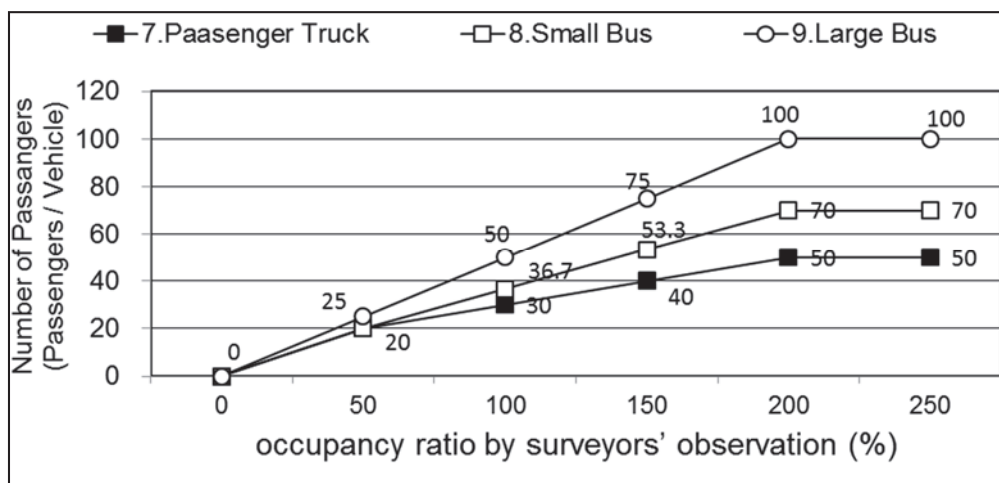
Source: YUTRA Screen-line Survey
 Note: Including Driver



Source: YUTRA Screen-line Survey
 Note: Including Driver

Figure 2.3.1.6 Fluctuation of Average Occupancy by Vehicle Type, 2013

Bus occupancy was observed by ocular survey as well. Due, however, to the difficulty to accurately count the number of passengers from outside the vehicle, surveyors recorded the approximate occupancy in terms of percentage during the survey. To estimate the number of passengers on board, the recorded ratio was converted by the following formula shown in Figure 2.3.1.7.



Source: YUTRA Screen-line Survey

Figure 2.3.1.7 Assumption to Estimate Bus Occupancy, 2013

2.3.2 External Traffic Volume

YUTRA Cordon Survey was conducted along the outer boundary of the study area and at the Yangon International Airport shown in Figure 2.3.2.1. Traffic volume was counted continuously and interview survey was carried out on a sampling basis. Interviewed results were expanded later by location, direction and vehicle type.

Survey Station CR14 (Thanlyin Bridge) and CR15 (Dagon Bridge) are not on the cordon, but were surveyed in the same manner as reference points for the Project for Construction of Bago River Bridge. Traffic volume counted at these stations is shown in Chapter1 of Volume II.



| No. | Survey Station | Duration |
|------|---|----------|
| CR01 | Yangon-Bago RD | 24 h |
| CR02 | No.(2) Main RD | 16 h |
| CR03 | No.(6) Main RD | 16 h |
| CR04 | Unknown | 16 h |
| CR05 | Danoat RD. | 16 h |
| CR06 | Dala Twan Tay RD | 24 h |
| CR07 | Yangon-Twantay | 16 h |
| CR08 | No.(5) Main RD | 16 h |
| CR09 | Unknown(Near university of west Yangon) | 16 h |
| CR10 | No.(4) Main RD | 16 h |
| CR11 | Unknown | 16 h |
| CR12 | Yangon-Pyay RD | 24 h |
| CR13 | Yankin ST | 16 h |
| CR14 | Thanlyin Bridge | 24 h |
| CR15 | Dagon Bridge | 16 h |
| CA01 | Airport RD | 24 h |
| CA02 | Airport RD | 24 h |

Source: YUTRA Project Team

Figure 2.3.2.1 Locations of Cordon-line Survey, 2013

1) Study Area Boundary

The external traffic volume observed by the Cordon Survey is summarized in Table 2.3.2.1. Note that the traffic volume of Thanlyin Bridge (CR14), Dagon Bridge (CR15) and Yangon International Airport (CA01 and CA02) is not included from this table.

Table 2.3.2.1 Traffic Volume Across Study Area Boundary, 2013

| | Samples of Interview Survey | Average Occupancy (pax/veh.) | Vehicle Trips (vehicles / day) | | Person Trips (trips / day) | |
|-------------------|-----------------------------|------------------------------|--------------------------------|---------------|----------------------------|----------------|
| | | | Inbound | Outbound | Inbound | Outbound |
| 2 Bicycle | 76 | 1.71 | 2,061 | 1,824 | 3,525 | 3,120 |
| 3 Motorcycle | 780 | 1.94 | 11,289 | 10,644 | 21,941 | 20,688 |
| 4 Car | 1320 | 2.86 | 3,518 | 3,095 | 10,074 | 8,863 |
| 5 Van | 437 | 5.48 | 485 | 580 | 2,657 | 3,177 |
| 6 Taxi | 945 | 5.10 | 1,340 | 1,368 | 6,838 | 6,980 |
| 7 Passenger-Truck | 395 | 12.84 | 3,818 | 3,037 | 49,006 | 38,981 |
| 8 Small-Bus | 71 | 19.27 | 331 | 322 | 6,378 | 6,204 |
| 9 Large-Bus | 76 | 25.34 | 1,661 | 1,573 | 42,093 | 39,863 |
| 10 Pick-up | 496 | 3.52 | 590 | 1,110 | 2,078 | 3,910 |
| 11 Medium-Truck | 1184 | 3.19 | 1,990 | 2,086 | 6,357 | 6,663 |
| 12 Large-Truck | 336 | 2.60 | 555 | 704 | 1,445 | 1,833 |
| 13 Trailer | 132 | 2.57 | 391 | 410 | 1,004 | 1,053 |
| 14 Others | 31 | 5.77 | 495 | 527 | 2,858 | 3,043 |
| Total | 6279 | | 28,523 | 27,278 | 156,254 | 144,379 |

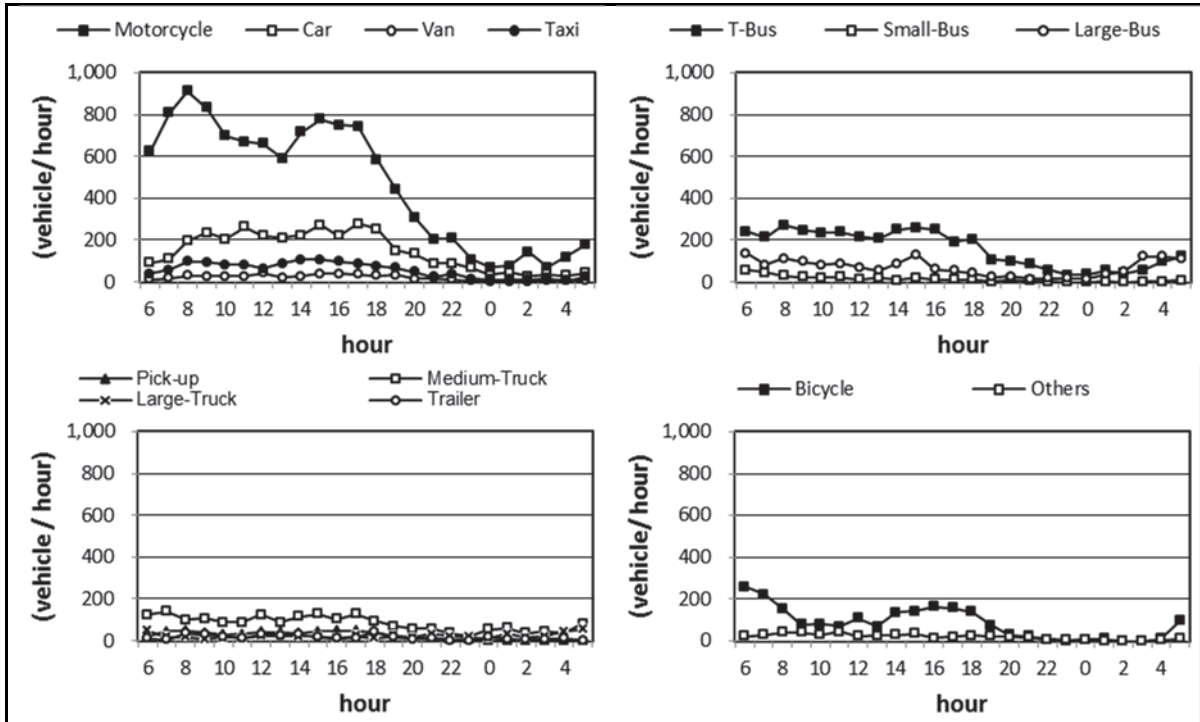
Source: YUTRA Cordon-line Survey

Note: No. of Person trips was obtained from no. of vehicle trips and average occupancy

Figure 2.3.2.2 and Figure 2.3.2.3 show hourly variation of traffic volume at the cordon by direction and by vehicle type.

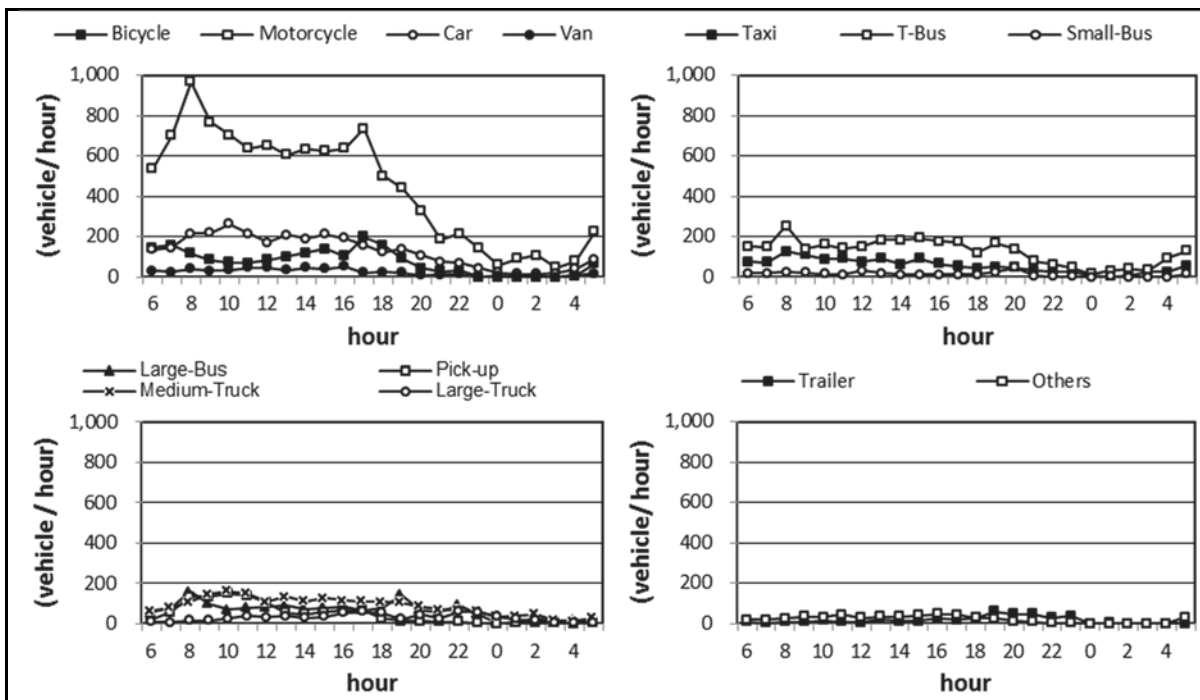
On the cordon, the dominant mode is motorcycle. For inbound direction, motorcycle traffic has a peak at around 8 a.m., while for outbound direction, there are two peaks at 8 a.m. and 5.p.m. Traffic of large bus has a peak at around 8 a.m.

Although motorcycle is prohibited in the center of YCDC, it is the most important transport mode in the peripheral area of the Greater Yangon.



Source: YUTRA Cordon-line Survey
 Note: Bago bridges and airport are not included

Figure 2.3.2.2 Hourly Variation of Traffic Volume at Cordon (Inbound), 2013



Source: YUTRA Cordon-line Survey
 Note: Bago bridges and airport are not included

Figure 2.3.2.3 Hourly Variation of Traffic Volume at Cordon (Outbound), 2013

2) Airport

Airport access and egress traffic was also surveyed at the access roads of the airport by traffic count and road side interview (sample basis).

Table 2.3.2.2 shows the volume of airport access/egress traffic by vehicle type. It is the sum of the two access roads of the airport. Through interview survey, the number of person trips was also obtained.

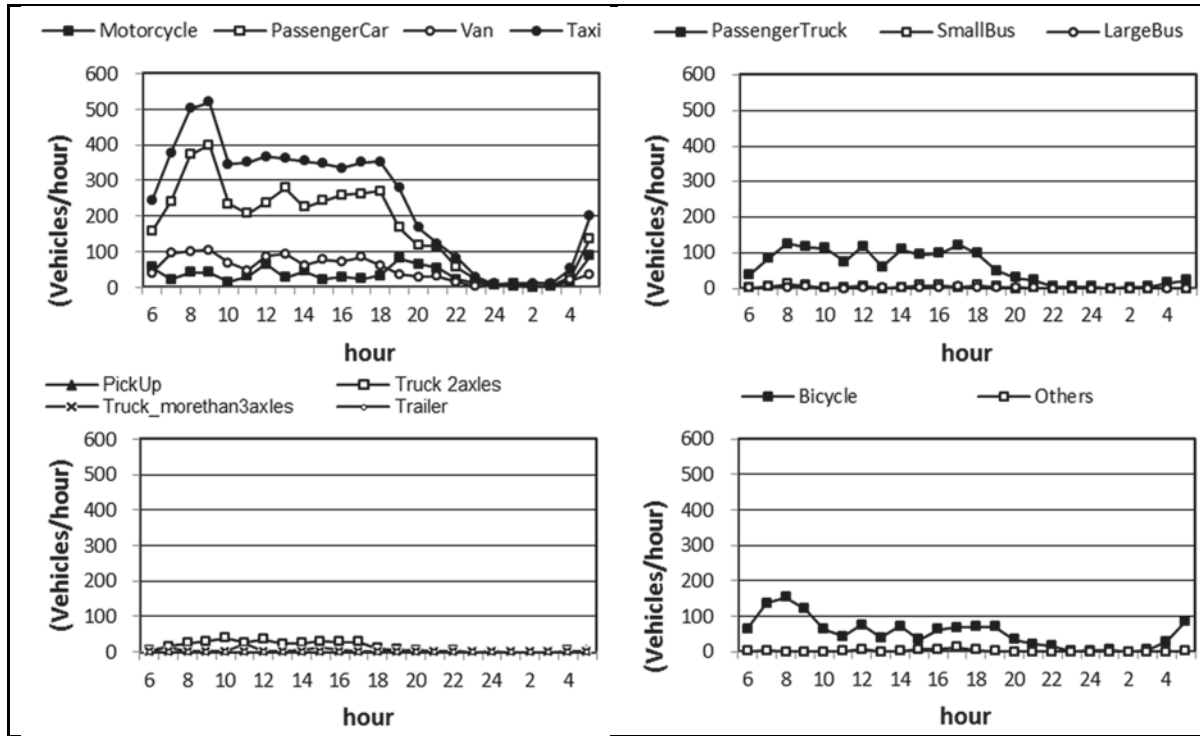
Figure 2.3.2.4 and Figure 2.3.2.5 show hourly variation of airport access/egress traffic by vehicle type. For the access traffic, passenger car and taxi have a peak at 9 a.m. From 10.a.m. to 6.p.m, hourly traffic volume is distributed almost equally. The egress traffic is distributed relatively equally from 9.a.m. to 7.p.m. without noticeable peaks.

Table 2.3.2.2 Airport Access/Egress Trips (Vehicle and Person) by Vehicle Types, 2013

| | Samples of Interview Survey | Average Occupancy (passenger/vehicle) | Vehicle Trips (Vehicles/day) | | Person Trip (Trips/day) | |
|----------------------|-----------------------------|---------------------------------------|------------------------------|------------|-------------------------|------------|
| | | | For Access | For Egress | For Access | For Egress |
| Bicycle | 0 | - | 1,000 | 1,267 | | |
| Motorcycle | 0 | - | 590 | 793 | | |
| Passenger Car | 389 | 3.48 | 3,555 | 4,044 | 12,371 | 14,073 |
| Van | 157 | 5.25 | 1,007 | 1,169 | 5,287 | 6,137 |
| Taxi | 1055 | 3.15 | 5,013 | 5,778 | 15,791 | 18,201 |
| Passenger Truck | 73 | 6.56 | 846 | 1,424 | 5,550 | 9,341 |
| Small Bus | 13 | 3.31 | 100 | 78 | 331 | 258 |
| Large Bus | 4 | 13.00 | 33 | 45 | 429 | 585 |
| Pick Up Cargo | 160 | 3.28 | 657 | 94 | 2,155 | 308 |
| Truck 2axles | 76 | 2.57 | 167 | 349 | 429 | 897 |
| Truck_morethan3axles | 0 | - | 2 | 0 | | |
| Trailer | 0 | - | 2 | 0 | | |
| Others | 0 | - | 107 | 48 | | |

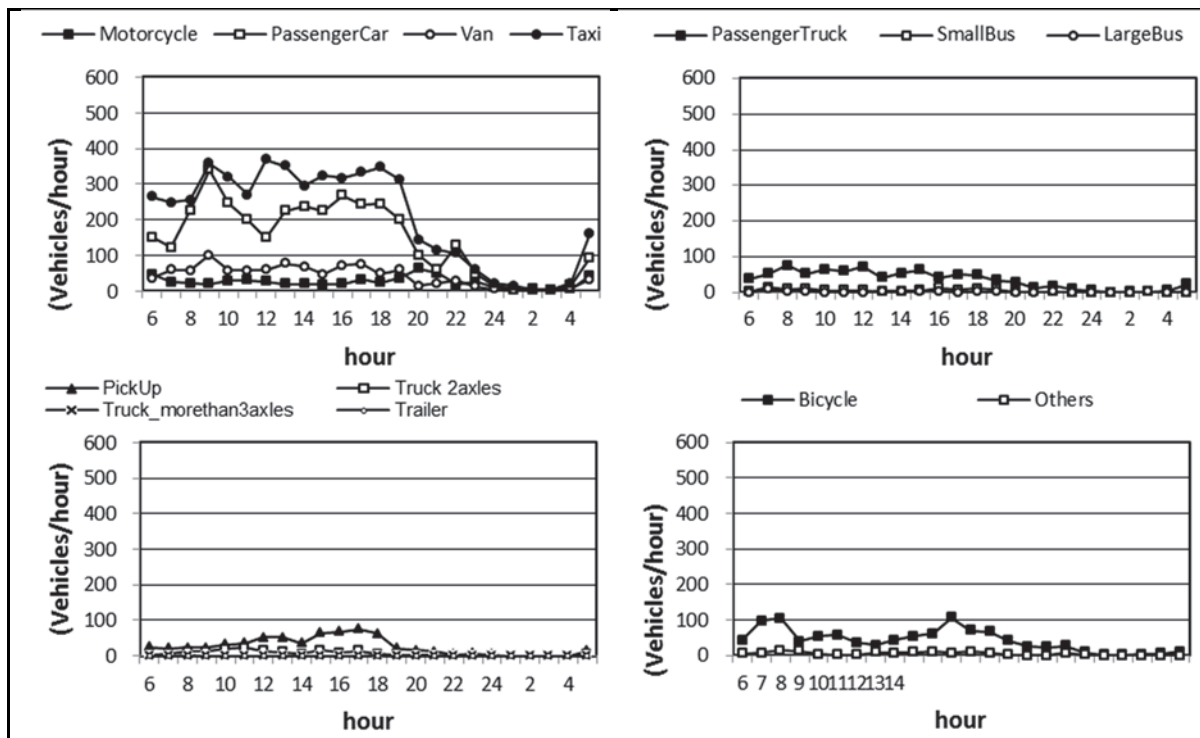
Source: YUTRA Cordon-line Survey

Note: Average occupancy includes driver



Source: YUTRA Cordon-line Survey

Figure 2.3.2.4 Hourly Variation of Airport Access Traffic Volume, 2013



Source: YUTRA Cordon-line Survey

Figure 2.3.2.5 Hourly Variation of Airport Egress Traffic Volume, 2013

2.3.3 Person Trips

In the study area, about 11 million trips are made in a normal weekday in 2013 as shown in Table 2.3.3.1. However, about 4.78 million trips or 42% of the total trips are of walking. Excluding walking, about 6.5 million trips are made in a normal weekday.

Table 2.3.3.1 Number of Person Trips in the Study Area by Mode, 2013

| Mode | Groups | The number of Trips (Trips /day) | Modal Share by Each Mode (%) | | | Modal Share by Group (%) | | |
|-----------------|-------------|----------------------------------|------------------------------|----------------|------------------------------|--------------------------|----------------|------------------------------|
| | | | For all Trips | Excluding Walk | Excluding Non-Motorized Mode | For all Trips | Excluding Walk | Excluding Non-Motorized Mode |
| Walk | Walk | 4,777,672 | 42.2 | - | - | 42.2 | - | - |
| Bicycle | Bicycle | 1,471,790 | 13.0 | 22.5 | - | 13.0 | 22.5 | - |
| Motorcycle | Motorcycle | 471,386 | 4.2 | 7.2 | 9.3 | 4.2 | 7.2 | 9.3 |
| Car | Car/Van | 440,759 | 3.9 | 6.7 | 8.7 | 4.7 | 8.1 | 10.5 |
| Van | | 88,885 | 0.8 | 1.4 | 1.8 | | | |
| Taxi | Taxi | 501,689 | 4.4 | 7.7 | 9.9 | 4.4 | 7.7 | 9.9 |
| Sc / Co Bus | Bus | 603,674 | 5.3 | 9.2 | 11.9 | 28.5 | 49.4 | 63.8 |
| Passenger Truck | | 390,923 | 3.5 | 6.0 | 7.7 | | | |
| Small-Bus | | 377,662 | 3.3 | 5.8 | 7.5 | | | |
| Large-Bus | | 1,856,273 | 16.4 | 28.4 | 36.7 | | | |
| Pick-up | Truck | 63,619 | 0.6 | 1.0 | 1.3 | 0.8 | 1.3 | 1.7 |
| Medium-Truck | | 13,963 | 0.1 | 0.2 | 0.3 | | | |
| Large-Truck | | 5,544 | 0.0 | 0.1 | 0.1 | | | |
| Trailer | | 5,073 | 0.0 | 0.1 | 0.1 | | | |
| Railway | Railway | 71,215 | 0.6 | 1.1 | 1.4 | 0.6 | 1.1 | 1.4 |
| Water Ferry | Water Ferry | 160,200 | 1.4 | 2.5 | 3.2 | 1.4 | 2.5 | 3.2 |
| Others | Others | 12,858 | 0.1 | 0.2 | 0.3 | 0.1 | 0.2 | 0.3 |
| Total | | 11,313,185 | 100 | 100 | 100 | 100 | 100 | 100 |

Source: YUTRA Person Trip Survey

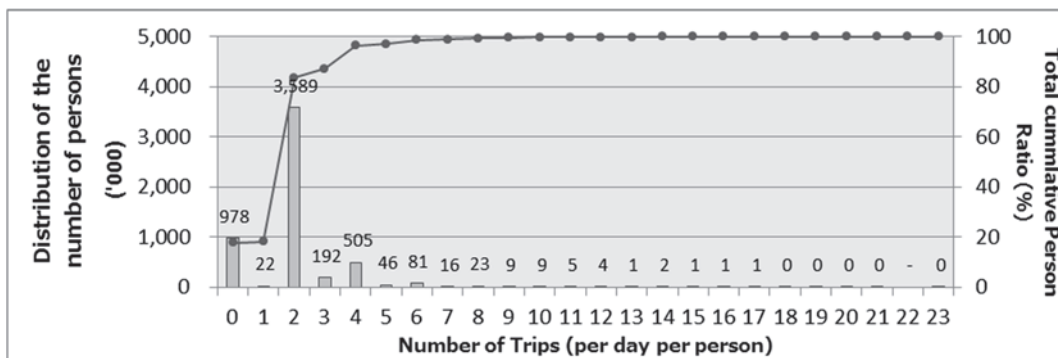
Table 2.3.3.2 shows the daily trip rates (number of trips per day divided by population) of the Greater Yangon. On average, the residents in the Greater Yangon make 2.04 trips a day including walking or 1.18 trips a day excluding walking. Female makes less trips than male. However, female makes more walking trips than male.

Table 2.3.3.2 Average Trip Rate per Person per Day, 2013

| | Male | Female | Total |
|-------------------|-------|--------|-------|
| All Trips | 2.199 | 1.904 | 2.042 |
| Excluding Walking | 1.472 | 0.923 | 1.179 |

Source: YUTRA Person Trip Survey

Figure 2.3.3.1 shows the distribution of trip makers by number of trips made in a day per person. The number of persons who make more than 9 trips per day is negligibly small at less than 0.2 %. More than 80 % make 3 trips or less per day.



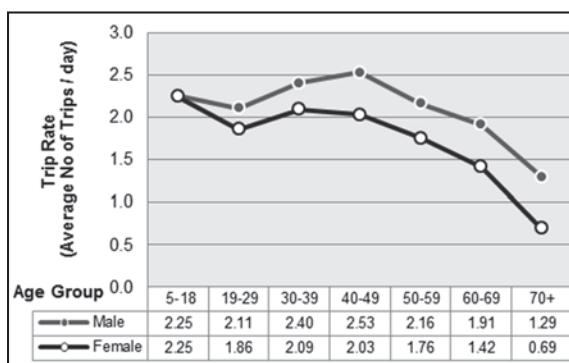
Source: YUTRA Person Trip Survey

Figure 2.3.3.1 Distribution of Trip Makers by Number of Daily Trips, 2013

Figure 2.3.3.2 to Figure 2.3.3.6 show the relations between trip rates and attributes of trip makers.

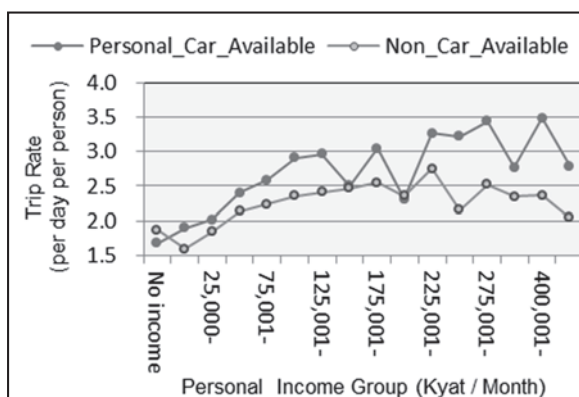
For school-age people (18 years old or less), trip rates are 2.25 and it is almost the same for both male and female. Trip rates of 20 – 29 years old are less than that of school-age. At ages of 30 – 49, trip rates are high. It suggests that this generation is highly active in the society. Except for the school-age, trip rates of female are lower than male in all age groups (see Figure 2.3.3.2).

For almost all personal income levels, person who answered that personal car was available makes more trips than non-car available person. Therefore, if car becomes more widely used in the future, the number of trips will inevitably increase (see Figure 2.3.3.3).



Source: YUTRA Person Trip Survey

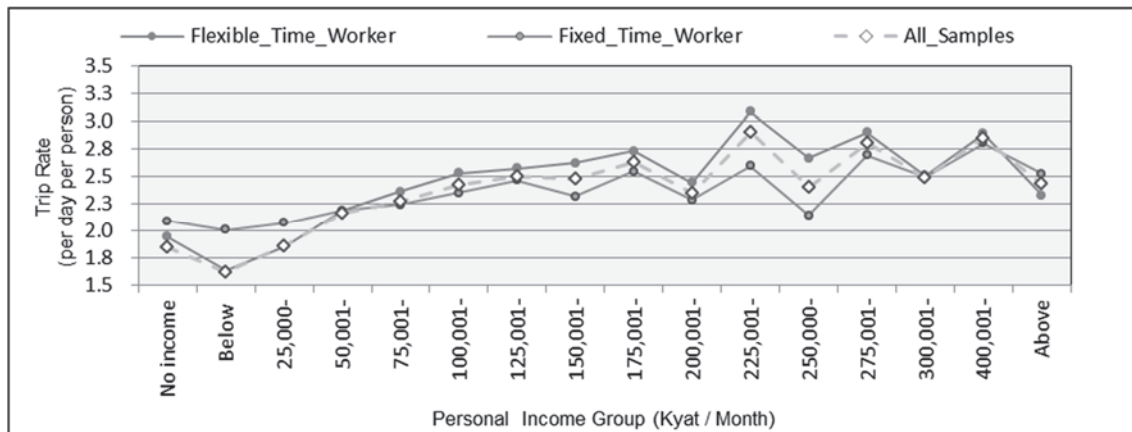
Figure 2.3.3.2 Trip Rate by Age & Gender, 2013



Source: YUTRA Person Trip Survey

Figure 2.3.3.3 Trip Rate by Personal Income & Car Availability, 2013

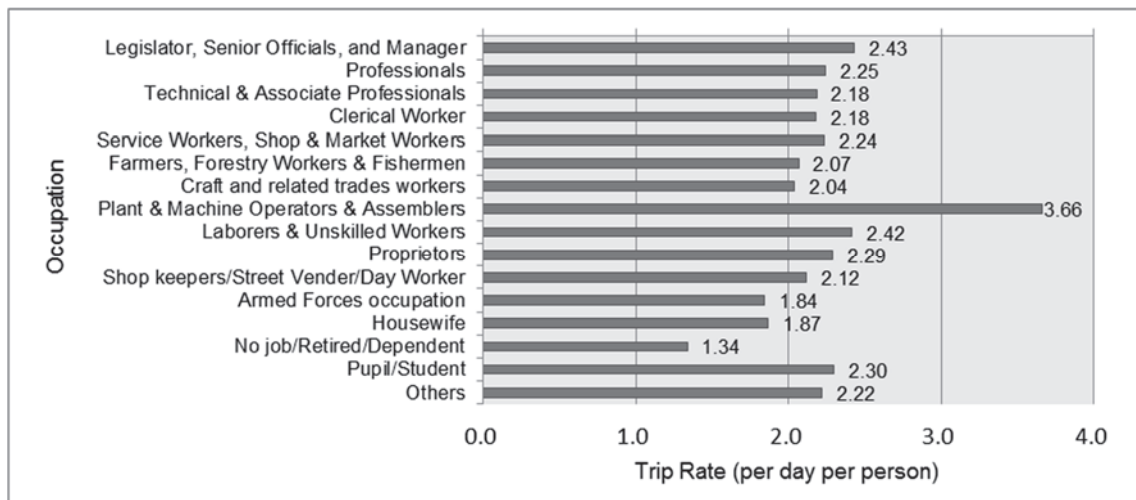
The trip rate increases according to the personal income level. For lower income classes trip rates are comparatively low. In most personal income ranges, trip rate of flexible time worker tends to be a little higher than that of fixed time worker (see Figure 2.3.3.4).



Source: YUTRA Person Trip Survey

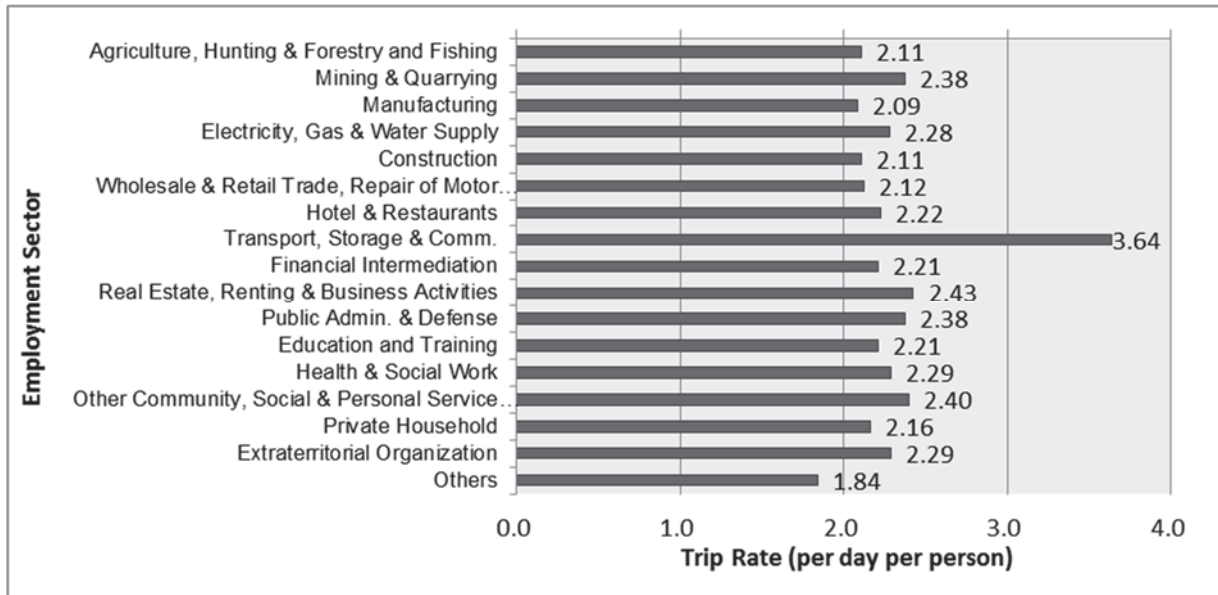
Figure 2.3.3.4 Trip Rate by Personal Income and Working Condition, 2013

“Plant & Machine Operators” in occupation and “Transport, Storage & Commercial” in employment have higher trip rates than others. Their jobs need frequent movements for their services (see Figure 2.3.3.5 and Figure 2.3.3.6).



Source: YUTRA Person Trip Survey

Figure 2.3.3.5 Trip Rate by Occupation, 2013

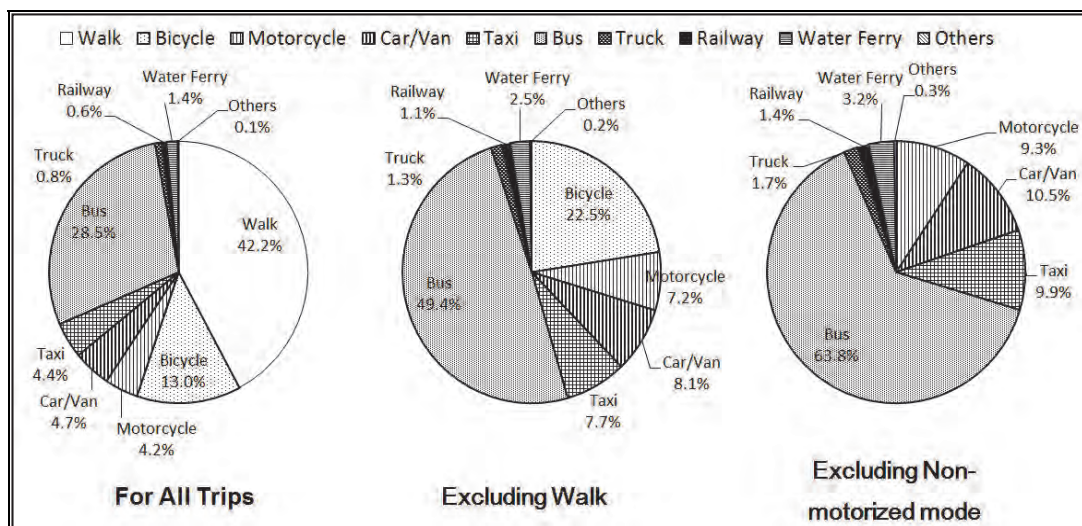


Source: YUTRA Person Trip Survey

Figure 2.3.3.6 Trip Rate by Employment Sector, 2013

2.3.4 Modal Share

Overall modal shares as obtained by the YUTRA person trip survey is summarized in Figure 2.3.4.1. It is to be noted that the share of walking is remarkably high at 42.2 % in the Greater Yangon. Excluding walking, bus has the largest share at 49.4 %, followed by bicycle (22.5 %), car/van (8.1%), taxi (7.7 %), motorcycle (7.2 %), etc. Railway shares only 1.1 % and water ferry 2.5 %. The combined share of public transport (bus, taxi, railway and water ferry) is 60.7 % (excluding walking). Since motorcycle is prohibited in CBD, the percentage of motorcycle is low.



Source: YUTRA Person Trip Survey

Figure 2.3.4.1 Modal Share, 2013

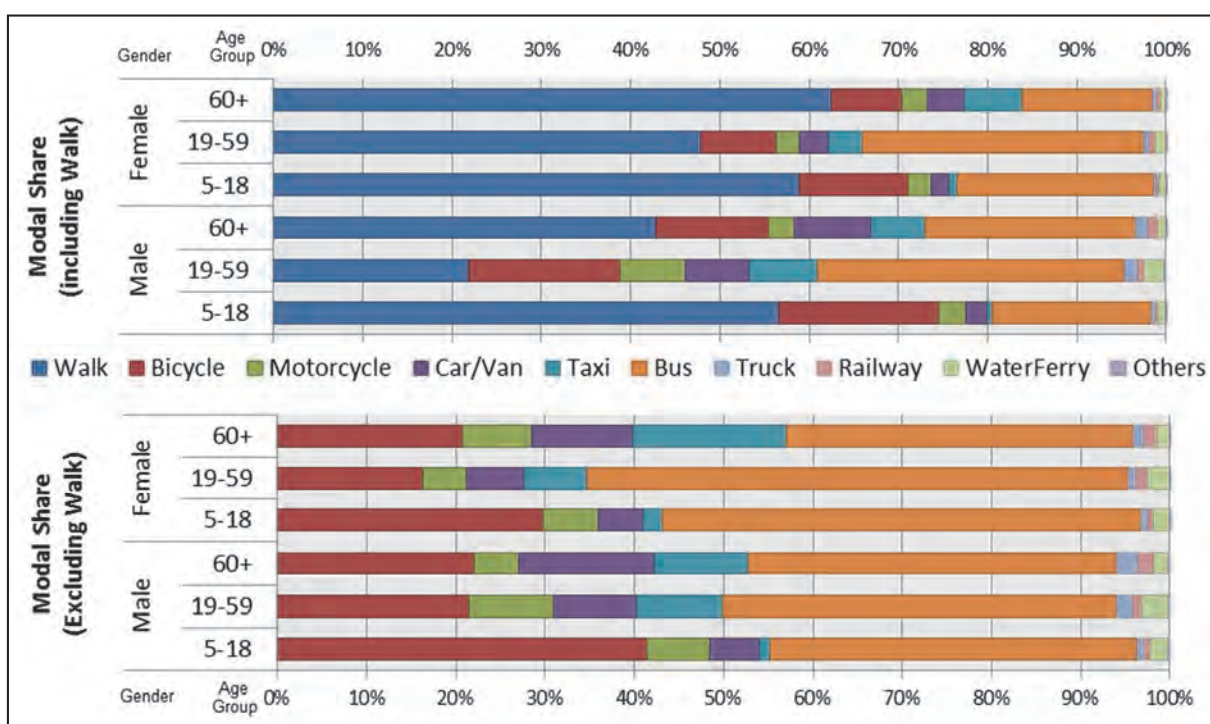
Table 2.3.4.1 and Figure 2.3.4.2 present modal shares by gender and by age group. For all groups, people largely depend on walking, but the walking's share of male at 18-59 years

old is relatively low reflecting their travel needs by motorized transport for commuting and working. Bicycle is used mainly by younger age groups. As a result, more than 70 % of total trips made by 5–18 age groups are by non-motorized modes.

Table 2.3.4.1 Modal Share by Gender and Age Group, 2013

| | Modal Share Including Walk (%) | | | | | | | | Modal Share Excluding Walk (%) | | | | | | | |
|-------------|--------------------------------|-------|------|--------|-------|------|------|--------|--------------------------------|-------|------|--------|-------|------|------|--------|
| | Male | | | Female | | | Male | Female | Male | | | Female | | | Male | Female |
| | 5-18 | 19-59 | 60+ | 5-18 | 19-59 | 60+ | | | 5-18 | 19-59 | 60+ | 5-18 | 19-59 | 60+ | | |
| Walk | 56.6 | 22.0 | 42.9 | 58.9 | 47.8 | 62.6 | 33.0 | 51.6 | - | - | - | - | - | - | - | - |
| Bicycle | 18.0 | 16.8 | 12.6 | 12.2 | 8.5 | 7.8 | 16.6 | 9.4 | 41.4 | 21.5 | 22.0 | 29.7 | 16.3 | 20.7 | 24.8 | 19.3 |
| Motorcycle | 3.1 | 7.4 | 2.9 | 2.6 | 2.5 | 2.9 | 5.8 | 2.6 | 7.0 | 9.4 | 5.0 | 6.2 | 4.8 | 7.7 | 8.6 | 5.3 |
| Car/Van | 2.4 | 7.2 | 8.7 | 2.1 | 3.4 | 4.3 | 6.2 | 3.1 | 5.6 | 9.3 | 15.2 | 5.0 | 6.5 | 11.4 | 9.3 | 6.5 |
| Taxi | 0.5 | 7.6 | 6.0 | 0.9 | 3.7 | 6.4 | 5.6 | 3.2 | 1.1 | 9.7 | 10.5 | 2.1 | 7.1 | 17.1 | 8.4 | 6.7 |
| Bus | 17.9 | 34.4 | 23.6 | 22.1 | 31.6 | 14.6 | 29.0 | 28.0 | 41.2 | 44.1 | 41.3 | 53.7 | 60.6 | 38.9 | 43.4 | 57.9 |
| Truck | 0.3 | 1.4 | 1.3 | 0.3 | 0.5 | 0.4 | 1.1 | 0.4 | 0.7 | 1.8 | 2.4 | 0.7 | 0.9 | 1.2 | 1.7 | 0.9 |
| Railway | 0.3 | 0.8 | 1.1 | 0.2 | 0.7 | 0.5 | 0.7 | 0.6 | 0.6 | 1.0 | 1.9 | 0.6 | 1.4 | 1.4 | 1.0 | 1.2 |
| Water Ferry | 0.9 | 2.3 | 0.9 | 0.8 | 1.2 | 0.5 | 1.8 | 1.1 | 2.0 | 2.9 | 1.6 | 1.8 | 2.3 | 1.4 | 2.7 | 2.2 |
| Others | 0.1 | 0.2 | 0.1 | 0.0 | 0.1 | 0.1 | 0.2 | 0.1 | 0.3 | 0.3 | 0.2 | 0.1 | 0.1 | 0.1 | 0.3 | 0.1 |

Source: YUTRA Person Trip Survey



Source: YUTRA Person Trip Survey

Figure 2.3.4.2 Modal Share by Gender and Age Group, 2013

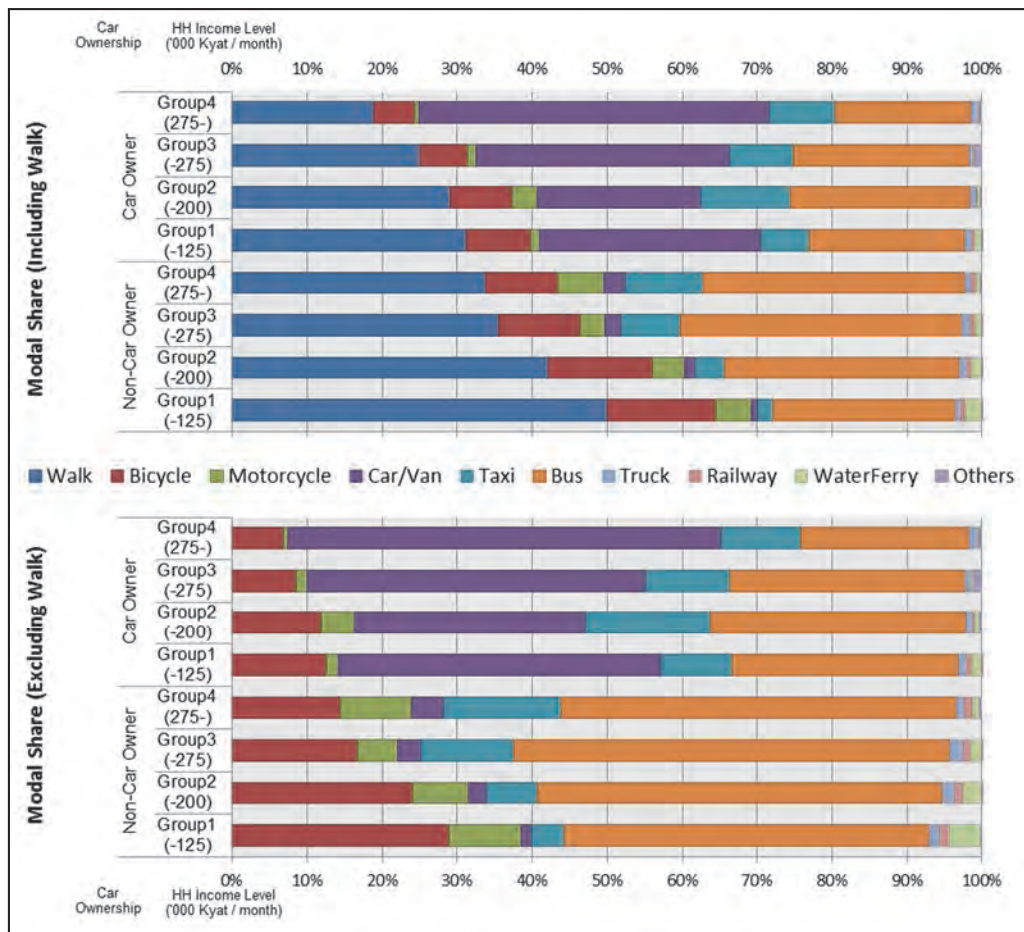
Table 2.3.4.2 and Figure 2.3.4.3 show modal shares by vehicle ownership (car owning household member or not) and income level. Public transport including bus plays an important role for all groups. The share of bus is more than 20 % (excluding walk) even for car owners of high income class. Car owner use cars more frequently than non-car owners in the same income group. Motorcycle is used mainly by non-car owning households.

Table 2.3.4.2 Modal Share by Vehicle Ownership and Household Income Level, 2013

| Modal Share Including Walk (%) | | | | | | | | | | |
|-------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-----------|
| HH Car Ownership | Non-Car Owner | | | | Car Owner | | | | Non-Car Owner | Car Owner |
| HH Income Level ('000 Kyat / month) | Group1 (-125) | Group2 (-200) | Group3 (-275) | Group4 (275-) | Group1 (-125) | Group2 (-200) | Group3 (-275) | Group4 (275-) | | |
| Walk | 50.1 | 42.2 | 35.6 | 33.9 | 31.2 | 29.1 | 25.0 | 18.9 | 44.4 | 26.9 |
| Bicycle | 14.5 | 13.9 | 10.8 | 9.6 | 8.7 | 8.4 | 6.4 | 5.5 | 13.8 | 7.5 |
| Motorcycle | 4.8 | 4.3 | 3.4 | 6.2 | 1.1 | 3.2 | 1.2 | 0.5 | 4.5 | 2.1 |
| Car/Van | 0.7 | 1.5 | 2.0 | 2.9 | 29.6 | 21.9 | 33.8 | 46.9 | 1.3 | 29.1 |
| Taxi | 2.1 | 3.9 | 7.9 | 10.3 | 6.5 | 11.8 | 8.4 | 8.7 | 3.7 | 9.9 |
| Bus | 24.4 | 31.3 | 37.5 | 35.0 | 20.8 | 24.1 | 23.5 | 18.2 | 29.3 | 22.8 |
| Truck | 0.6 | 0.9 | 1.1 | 0.6 | 0.8 | 0.7 | 0.5 | 0.9 | 0.8 | 0.7 |
| Railway | 0.7 | 0.7 | 0.7 | 0.7 | 0.4 | 0.2 | 0.1 | 0.1 | 0.7 | 0.2 |
| Water Ferry | 2.1 | 1.4 | 0.9 | 0.6 | 0.9 | 0.4 | 0.2 | 0.1 | 1.6 | 0.4 |
| Others | 0.1 | 0.1 | 0.0 | 0.2 | 0.1 | 0.2 | 0.9 | 0.2 | 0.1 | 0.4 |

| Modal Share Excluding Walk (%) | | | | | | | | | | |
|-------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-----------|
| Car Ownership in HH | Non-Car Owner | | | | Car Owner | | | | Non-Car Owner | Car Owner |
| HH Income Level ('000 Kyat / month) | Group1 (-125) | Group2 (-200) | Group3 (-275) | Group4 (275-) | Group1 (-125) | Group2 (-200) | Group3 (-275) | Group4 (275-) | | |
| Walk | - | - | - | - | - | - | - | - | - | - |
| Bicycle | 28.9 | 24.0 | 16.8 | 14.4 | 12.6 | 11.8 | 8.5 | 6.8 | 24.7 | 10.3 |
| Motorcycle | 9.6 | 7.5 | 5.3 | 9.4 | 1.6 | 4.5 | 1.5 | 0.6 | 8.0 | 2.8 |
| Car/Van | 1.5 | 2.5 | 3.1 | 4.4 | 43.0 | 30.8 | 45.1 | 57.8 | 2.3 | 39.9 |
| Taxi | 4.2 | 6.7 | 12.3 | 15.6 | 9.4 | 16.7 | 11.2 | 10.7 | 6.6 | 13.6 |
| Bus | 48.8 | 54.1 | 58.3 | 52.9 | 30.2 | 34.0 | 31.3 | 22.5 | 52.7 | 31.2 |
| Truck | 1.3 | 1.5 | 1.7 | 1.0 | 1.1 | 0.9 | 0.7 | 1.1 | 1.4 | 0.9 |
| Railway | 1.3 | 1.2 | 1.0 | 1.1 | 0.6 | 0.3 | 0.1 | 0.1 | 1.2 | 0.3 |
| Water Ferry | 4.1 | 2.3 | 1.4 | 1.0 | 1.3 | 0.6 | 0.2 | 0.2 | 2.8 | 0.5 |
| Others | 0.2 | 0.1 | 0.1 | 0.3 | 0.1 | 0.3 | 1.2 | 0.2 | 0.1 | 0.5 |

Source: YUTRA Person Trip Survey



Source: YUTRA Person Trip Survey

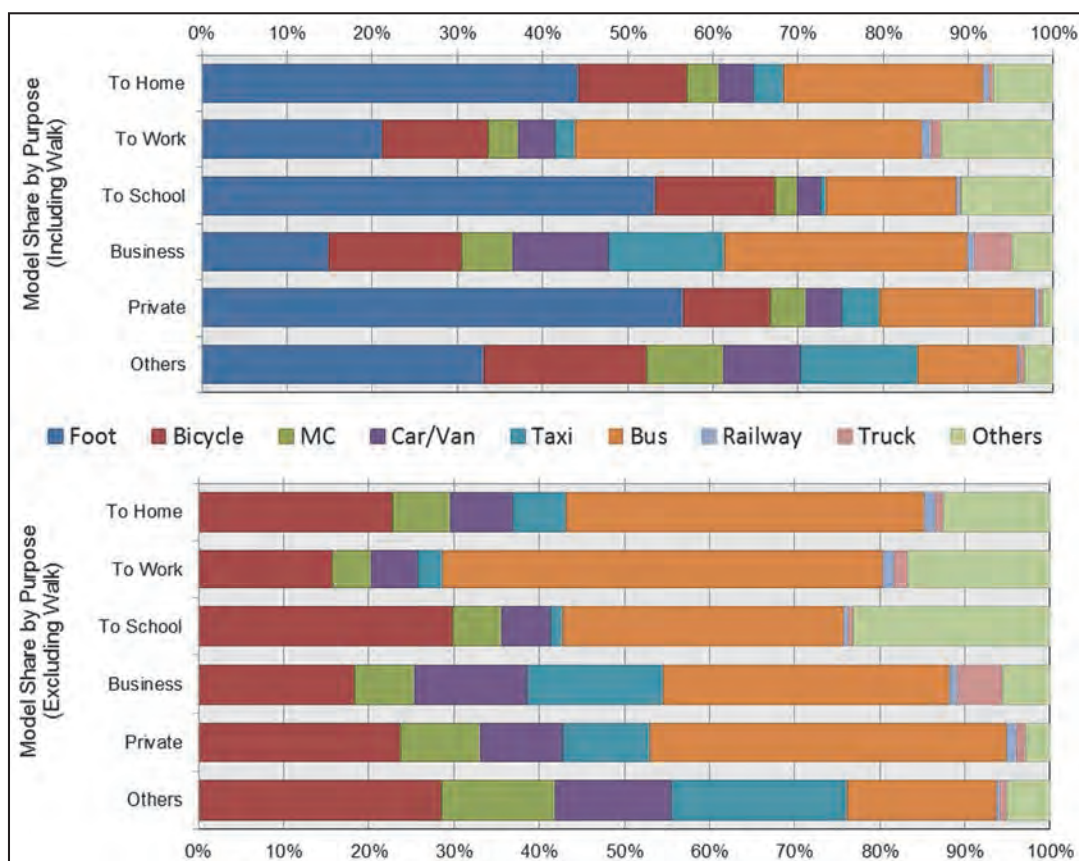
Figure 2.3.4.3 Modal Share by Vehicle Ownership and Household Income Level, 2013

Table 2.3.4.3 and Figure 2.3.4.4 show modal shares by trip purpose. For “to school” and “private” trip, people largely depend on walking. It suggests that such activities are done mainly within the distance people can go by walking. For business trips, car and taxi are used more frequently than other purposes. More than half of all workers use bus for commuting.

Table 2.3.4.3 Modal Share by Trip Purpose, 2013

| | Modal Share Including Walk (%) | | | | | | Modal Share Excluding Walk (%) | | | | | |
|--|--------------------------------|--------------|--------------|------------|--------------|------------|--------------------------------|--------------|------------|------------|------------|------------|
| | To Home | To Work | To School | Business | Private | Others | To Home | To Work | To School | Business | Private | Others |
| Walk | 44.3 | 21.3 | 53.4 | 14.9 | 56.5 | 33.2 | - | - | - | - | - | - |
| Bicycle | 12.7 | 12.4 | 13.9 | 15.6 | 10.3 | 19.1 | 22.8 | 15.8 | 29.9 | 18.3 | 23.7 | 28.5 |
| Motorcycle | 3.8 | 3.6 | 2.7 | 6.0 | 4.1 | 9.0 | 6.8 | 4.6 | 5.7 | 7.1 | 9.5 | 13.5 |
| Car/Van | 4.1 | 4.3 | 2.7 | 11.3 | 4.2 | 9.1 | 7.3 | 5.5 | 5.8 | 13.2 | 9.6 | 13.6 |
| Taxi | 3.5 | 2.3 | 0.7 | 13.7 | 4.4 | 13.8 | 6.3 | 3.0 | 1.5 | 16.1 | 10.2 | 20.7 |
| Bus | 28.9 | 50.8 | 25.5 | 31.7 | 18.4 | 13.4 | 51.9 | 64.5 | 54.6 | 37.2 | 42.3 | 20.0 |
| Truck | 0.5 | 1.2 | 0.2 | 4.5 | 0.5 | 0.5 | 1.0 | 1.5 | 0.5 | 5.3 | 1.1 | 0.7 |
| Railway | 0.7 | 1.1 | 0.3 | 0.8 | 0.5 | 0.3 | 1.2 | 1.4 | 0.6 | 0.9 | 1.2 | 0.4 |
| Water Ferry | 1.4 | 2.8 | 0.6 | 1.4 | 1.0 | 1.6 | 2.5 | 3.6 | 1.3 | 1.6 | 2.2 | 2.3 |
| Others | 0.1 | 0.2 | 0.0 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 | 0.3 | 0.2 | 0.2 |
| Total number of Trips ('000 trips/day) | 5,226 | 1,420 | 1,374 | 606 | 1,900 | 788 | 2,909 | 1,119 | 640 | 516 | 825 | 526 |

Source: YUTRA Person Trip Survey



Source: YUTRA Person Trip Survey

Figure 2.3.4.4 Modal Share by Trip Purpose, 2013

2.3.5 Trip Generation and Attraction

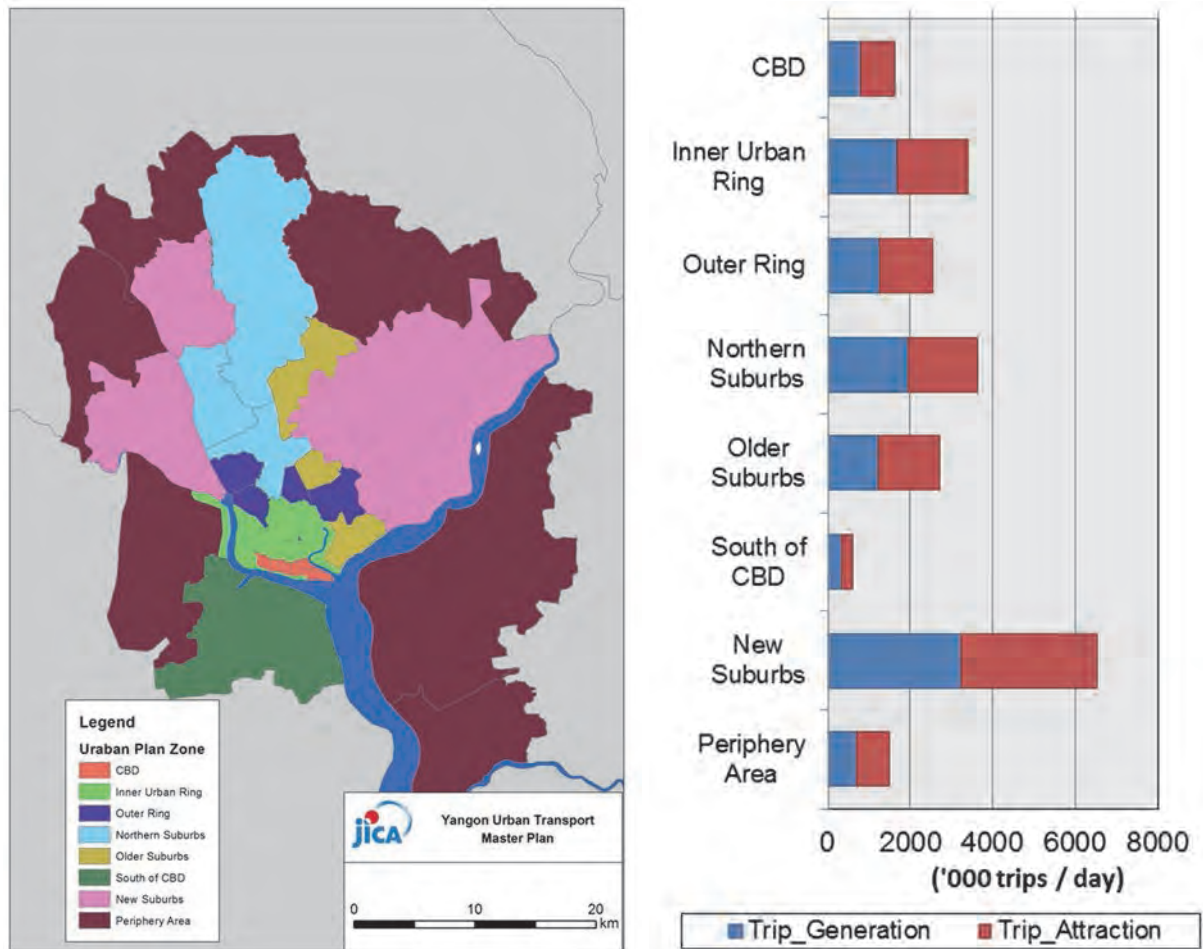
Table 2.3.5.1 and Figure 2.3.5.1 summarize the total trip generation/attraction by township and trip purpose. New suburban area (28 to 33) generates and attracts a greater number of trips. In existing CBD area, a great number of “To work” and “To school” trips are attracted to its small area.

Table 2.3.5.1 Trip Generation and Attraction by Township & Purpose, 2013

| Township | Trip Generation (000 Trips/day) | | | | | | | Trip Attraction (000 Trips/day) | | | | | | | |
|--------------|----------------------------------|------------|------------|------------|------------|------------|--------------|----------------------------------|------------|------------|------------|------------|------------|--------------|--------------|
| | To Work | To School | Business | Private | Others | To Home | Total | To Work | To School | Business | Private | Others | To Home | Total | |
| 1 | La Thar | 8 | 7 | 5 | 12 | 7 | 73 | 112 | 24 | 10 | 11 | 33 | 11 | 24 | 112 |
| 2 | Lanmadaw | 12 | 7 | 10 | 16 | 11 | 72 | 128 | 31 | 8 | 12 | 29 | 13 | 35 | 127 |
| 3 | Panbetan | 9 | 5 | 8 | 14 | 6 | 109 | 150 | 43 | 4 | 24 | 50 | 10 | 21 | 151 |
| 4 | Kyauktada | 9 | 6 | 17 | 17 | 10 | 116 | 175 | 58 | 6 | 30 | 35 | 19 | 25 | 173 |
| 5 | Botataung | 11 | 11 | 12 | 21 | 9 | 82 | 146 | 30 | 24 | 12 | 16 | 19 | 45 | 147 |
| 6 | Pazundaung | 8 | 10 | 7 | 14 | 9 | 58 | 106 | 22 | 7 | 11 | 22 | 7 | 36 | 105 |
| 7 | Alone | 15 | 14 | 11 | 24 | 7 | 60 | 130 | 22 | 12 | 10 | 21 | 8 | 59 | 132 |
| 8 | Kyeemyindaing | 29 | 22 | 20 | 39 | 21 | 96 | 228 | 31 | 16 | 20 | 40 | 18 | 102 | 227 |
| 9 | San Chaung | 22 | 22 | 15 | 49 | 20 | 99 | 228 | 26 | 18 | 14 | 44 | 19 | 106 | 228 |
| 10 | Dagon | 9 | 7 | 8 | 11 | 8 | 77 | 120 | 23 | 18 | 11 | 27 | 18 | 23 | 121 |
| 11 | Bahan | 25 | 21 | 13 | 38 | 14 | 112 | 224 | 45 | 22 | 13 | 35 | 17 | 91 | 224 |
| 12 | Tarmwe | 42 | 32 | 21 | 57 | 31 | 135 | 318 | 37 | 22 | 19 | 56 | 25 | 159 | 319 |
| 13 | Mingalar Taung Nyunt | 32 | 26 | 15 | 38 | 25 | 132 | 269 | 53 | 15 | 23 | 54 | 18 | 108 | 270 |
| 14 | Seikkan | 1 | 1 | 1 | 0 | 3 | 13 | 20 | 7 | 1 | 4 | 3 | 4 | 2 | 20 |
| 15 | Dawpon | 25 | 23 | 9 | 39 | 10 | 60 | 167 | 14 | 15 | 7 | 22 | 7 | 100 | 166 |
| 16 | Kamayut | 26 | 19 | 13 | 37 | 19 | 142 | 257 | 42 | 45 | 20 | 41 | 25 | 84 | 257 |
| 17 | Hlaing | 41 | 35 | 20 | 59 | 26 | 149 | 330 | 47 | 27 | 19 | 61 | 23 | 154 | 331 |
| 18 | Yankin | 30 | 27 | 17 | 39 | 23 | 110 | 245 | 29 | 25 | 15 | 41 | 19 | 117 | 246 |
| 19 | Thingankyun | 47 | 53 | 24 | 75 | 32 | 207 | 438 | 46 | 53 | 23 | 82 | 34 | 200 | 438 |
| 20 | Mayangone | 55 | 52 | 32 | 68 | 36 | 233 | 476 | 90 | 48 | 35 | 71 | 36 | 198 | 478 |
| 21 | Insein | 86 | 89 | 32 | 115 | 47 | 288 | 658 | 71 | 78 | 28 | 109 | 46 | 326 | 659 |
| 22 | Mingalardon | 126 | 118 | 34 | 136 | 57 | 362 | 832 | 66 | 62 | 20 | 76 | 37 | 264 | 525 |
| 23 | North Okkalapa | 67 | 67 | 27 | 91 | 46 | 232 | 529 | 56 | 78 | 26 | 109 | 50 | 324 | 643 |
| 24 | South Okkalapa | 46 | 42 | 16 | 71 | 23 | 131 | 330 | 28 | 35 | 19 | 68 | 26 | 194 | 370 |
| 25 | Tharkayta | 52 | 51 | 21 | 61 | 25 | 156 | 366 | 38 | 52 | 17 | 81 | 32 | 240 | 461 |
| 26 | Dala | 26 | 27 | 6 | 19 | 16 | 54 | 148 | 14 | 33 | 7 | 20 | 17 | 101 | 193 |
| 27 | Seikgyikanaungto | 28 | 33 | 8 | 30 | 10 | 98 | 206 | 5 | 14 | 1 | 9 | 3 | 37 | 68 |
| 28 | Shwepyitar | 117 | 113 | 28 | 144 | 34 | 316 | 751 | 71 | 81 | 19 | 93 | 26 | 303 | 592 |
| 29 | Hlaingtaryar | 95 | 91 | 38 | 128 | 41 | 329 | 723 | 112 | 130 | 39 | 151 | 44 | 444 | 921 |
| 30 | North Dagon | 46 | 47 | 12 | 72 | 23 | 136 | 336 | 24 | 45 | 16 | 79 | 26 | 225 | 414 |
| 31 | South Dagon | 102 | 124 | 48 | 179 | 63 | 402 | 919 | 69 | 96 | 28 | 137 | 45 | 382 | 756 |
| 32 | East Dagon | 31 | 37 | 12 | 46 | 17 | 142 | 284 | 27 | 86 | 10 | 49 | 20 | 177 | 370 |
| 33 | Dagon Seikan | 38 | 31 | 12 | 40 | 13 | 86 | 220 | 25 | 24 | 9 | 37 | 12 | 142 | 249 |
| 34 | Kyauktan | 19 | 20 | 8 | 17 | 12 | 66 | 143 | 14 | 18 | 6 | 12 | 7 | 55 | 113 |
| 35 | Thanlyin | 42 | 46 | 13 | 39 | 22 | 141 | 302 | 41 | 88 | 16 | 50 | 32 | 183 | 410 |
| 36 | Hlegu | 11 | 8 | 3 | 9 | 2 | 23 | 55 | 5 | 2 | 1 | 5 | 1 | 18 | 32 |
| 37 | Hmawbi | 17 | 15 | 4 | 12 | 6 | 45 | 99 | 14 | 21 | 2 | 5 | 4 | 45 | 91 |
| 38 | Htantabin | 10 | 8 | 2 | 10 | 3 | 38 | 72 | 8 | 28 | 2 | 7 | 4 | 45 | 94 |
| 39 | Twantay | 5 | 7 | 3 | 9 | 1 | 11 | 34 | 3 | 6 | 1 | 6 | 1 | 30 | 47 |
| 1-6 | CBD | 57 | 46 | 59 | 94 | 52 | 510 | 817 | 208 | 59 | 100 | 185 | 79 | 186 | 815 |
| 7-15 | Inner Urban Ring | 200 | 168 | 113 | 295 | 139 | 784 | 1,704 | 258 | 139 | 121 | 302 | 134 | 750 | 1,707 |
| 16-19 | Outer Ring | 144 | 134 | 74 | 210 | 100 | 608 | 1,270 | 164 | 150 | 77 | 225 | 101 | 555 | 1,272 |
| 20-22 | Northern Suburbs | 267 | 259 | 98 | 319 | 140 | 883 | 1,966 | 227 | 188 | 83 | 256 | 119 | 788 | 1,662 |
| 23-25 | Older Suburbs | 165 | 160 | 64 | 223 | 94 | 519 | 1,225 | 122 | 165 | 62 | 258 | 108 | 758 | 1,474 |
| 26-27 | South of CBD | 54 | 60 | 14 | 49 | 26 | 152 | 354 | 19 | 47 | 8 | 29 | 20 | 138 | 261 |
| 28-33 | New Suburbs | 429 | 443 | 150 | 609 | 191 | 1,411 | 3,233 | 328 | 462 | 121 | 546 | 173 | 1,673 | 3,302 |
| 34-39 | Periphery Area | 104 | 104 | 33 | 96 | 46 | 324 | 705 | 85 | 163 | 28 | 85 | 49 | 376 | 787 |

Source: YUTRA Person Trip Survey

Note: Part of the townships in Periphery Area(34-39) is outside the study area. Figures in bold letters relate to “Urban Planning Zone” defined by the SUDP, JICA, 2013. Refer to the figure below.



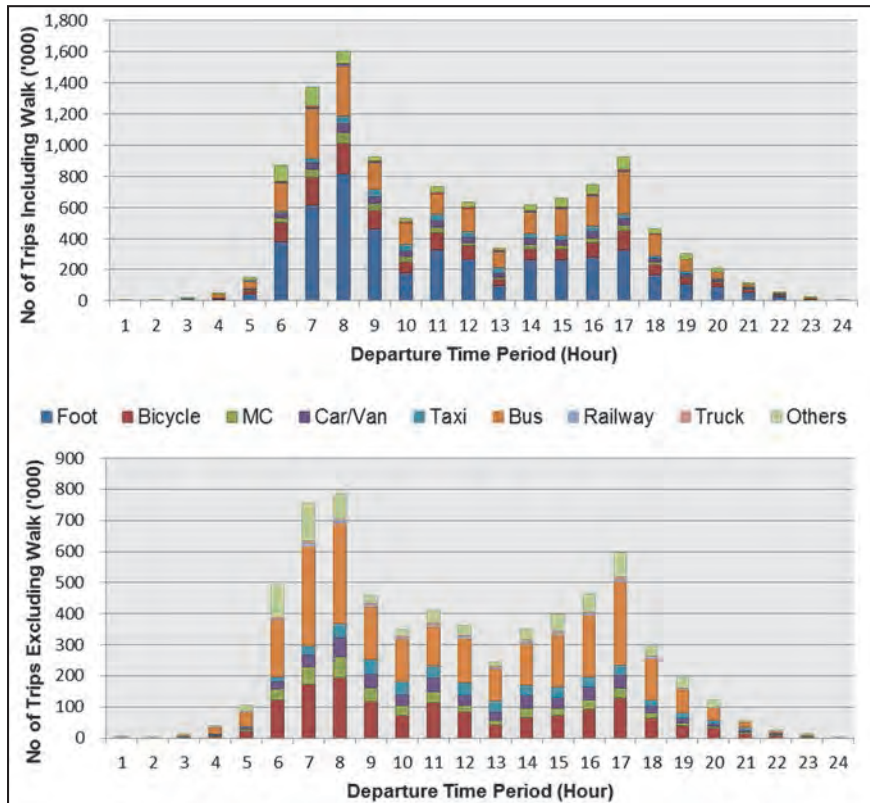
Source: YUTRA Person Trip Survey
 Note: Urban Planning Zone was defined by the SUDP, JICA, 2013

Figure 2.3.5.1 Trip Generation/Attraction by Urban Planning Zone, 2013

2.3.6 Hourly Distribution of Trips

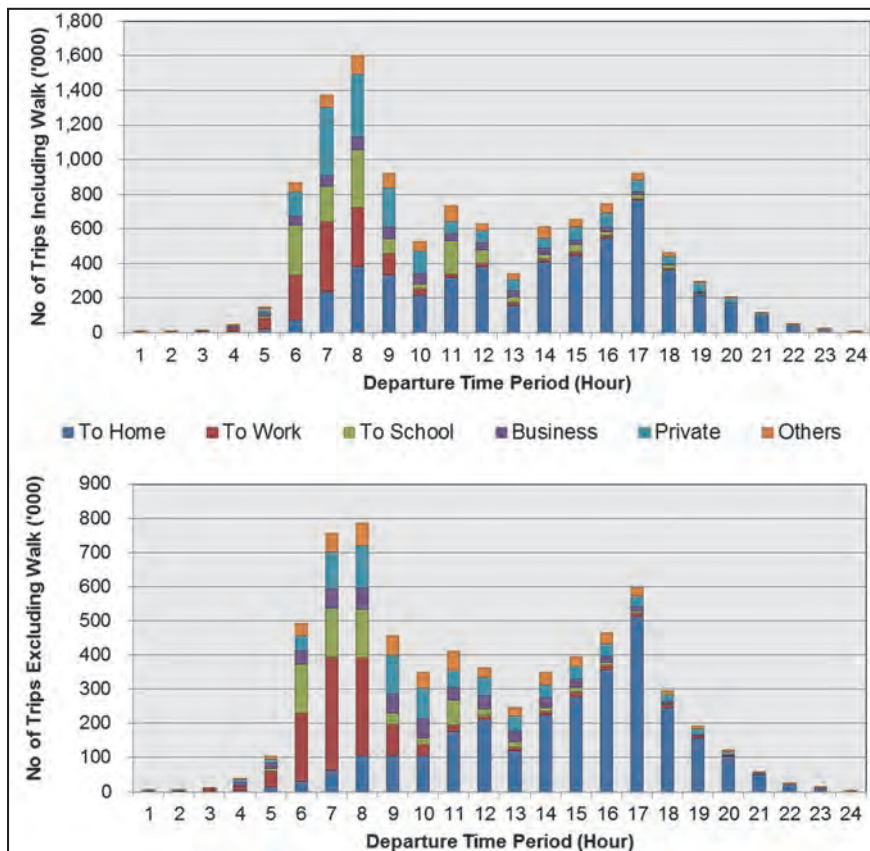
Figure 2.3.6.1 and Figure 2.3.6.2 show hourly distribution of trips generated by time of the day, classified by mode and by trip purpose. For morning hours, there is a peak around 7-8 a.m. In the afternoon, there is a peak at around 5 p.m.

The number of trips at night is small compared to daytime. In the morning peak, a large number of walk trips are made. Bus is used relatively constantly during daytime from 6 a.m. to 6 p.m.



Source: YUTRA Person Trip Survey

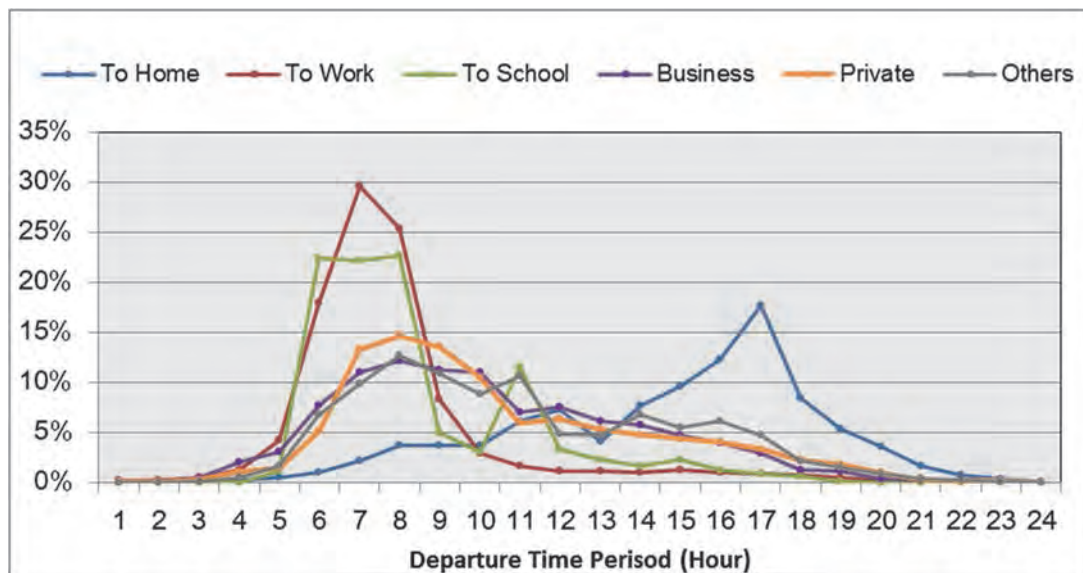
Figure 2.3.6.1 Hourly Distribution of Generated Trips by Travel Mode, 2013



Source: YUTRA Person Trip Survey

Figure 2.3.6.2 Hourly Distribution of Generated Trips by Trip Purpose, 2013

In the morning, “to work” and “to school” are the major trip purpose naturally, while “to home” trips becomes the dominant trip purpose from afternoon to evening. This tendency is also seen in Figure 2.3.6.3. “to work” trips make a sharp peak around 7-8 a.m. Although “to school” trips also make a peak around 7-8 a.m., another small peak is found around 11-12 a.m. This is due to the two-shift education system adopted by a considerable number of primary, middle and high schools in Myanmar. “Business”, “Private” and “Others” trips are made mainly in the morning period. “To Home” trips are made mainly in the afternoon to evening, making a peak around 5 p.m.



Source: YUTRA Person Trip Survey

Figure 2.3.6.3 Pattern of Generated Trips by Trip Purpose (Excluding walk), 2013

2.3.7 Travel Time and Speed

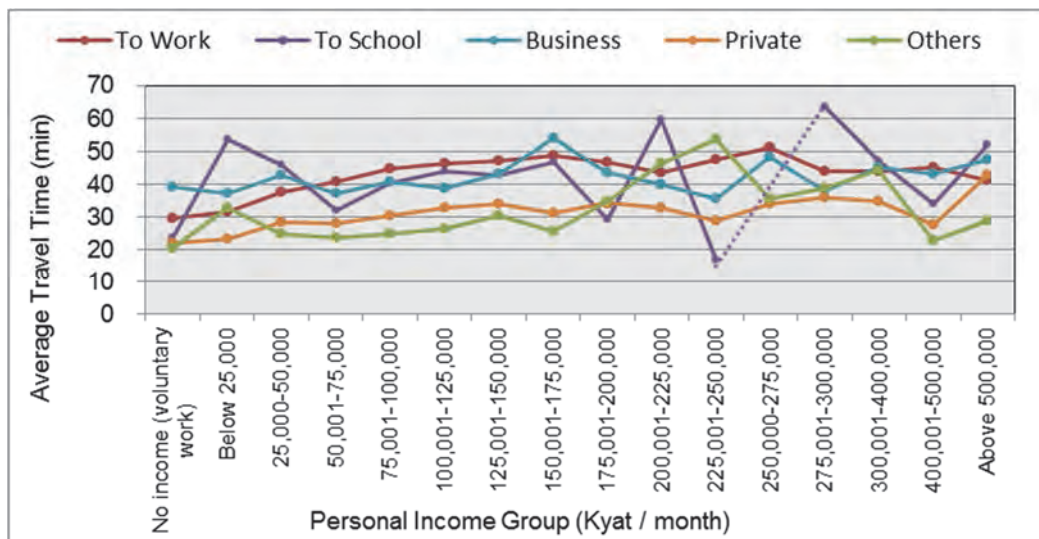
Table 2.3.7.1 shows the distribution of travel time by purpose. The average travel time of Yangon residents is about 31.6 minutes as a whole. About 60% trips are less than 30 minutes. However, about 19% of the trips exceed 60 minutes. Specific congested road sections and intersection are shown in Figure 2.2.3.2.

Figure 2.3.7.1 shows the average travel time by purpose and personal income level. Except for “other purpose” trips, the average travel time increases according to the personal income. Low income people may not afford the cost of long distance trips.

Table 2.3.7.1 Number of Trips by Travel Time and Trip Purpose, 2013

| Travel Time | No. of Trips by Trip Purpose (000/day) and Share by trip purpose (%) | | | | | | Total |
|---------------------------|--|--------------|--------------|--------------|--------------|--------------|----------------|
| | To Home | To Work | To School | Business | Private | Others | |
| -10min | 688 (13%) | 106 (7%) | 227 (17%) | 52 (9%) | 310 (16%) | 119 (15%) | 1,501 (13%) |
| -20min | 1916 (37%) | 298 (21%) | 610 (44%) | 146 (24%) | 825 (43%) | 321 (41%) | 4,116 (36%) |
| -30min | 498 (10%) | 129 (9%) | 133 (10%) | 64 (11%) | 192 (10%) | 95 (12%) | 1,110 (10%) |
| -40min | 674 (13%) | 218 (15%) | 162 (12%) | 100 (16%) | 215 (11%) | 100 (13%) | 1,469 (13%) |
| -50min | 280 (5%) | 137 (10%) | 62 (5%) | 55 (9%) | 84 (4%) | 45 (6%) | 662 (6%) |
| -60min | 125 (2%) | 66 (5%) | 24 (2%) | 16 (3%) | 29 (2%) | 12 (2%) | 271 (2%) |
| -75min | 443 (8%) | 204 (14%) | 72 (5%) | 74 (12%) | 102 (5%) | 50 (6%) | 946 (8%) |
| -90min | 144 (3%) | 83 (6%) | 21 (2%) | 23 (4%) | 35 (2%) | 9 (1%) | 316 (3%) |
| -120min | 276 (5%) | 121 (9%) | 46 (3%) | 42 (7%) | 63 (3%) | 21 (3%) | 569 (5%) |
| 120 min+ | 182 (3%) | 58 (4%) | 16 (1%) | 35 (6%) | 46 (2%) | 17 (2%) | 354 (3%) |
| Total Trips | 5,226 | 1,420 | 1,374 | 606 | 1,900 | 788 | 11,313 |
| Average Travel Time (min) | 32.1 | 43.6 | 24.0 | 41.2 | 25.8 | 25.8 | 31.6 |

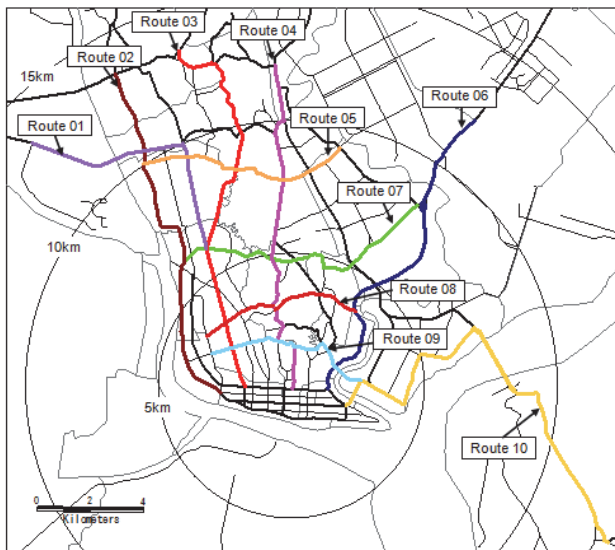
Source: YUTRA Person Trip Survey



Source: YUTRA Person Trip Survey

Figure 2.3.7.1 Average Travel Time by Trip Purpose & Personal Income Level, 2013

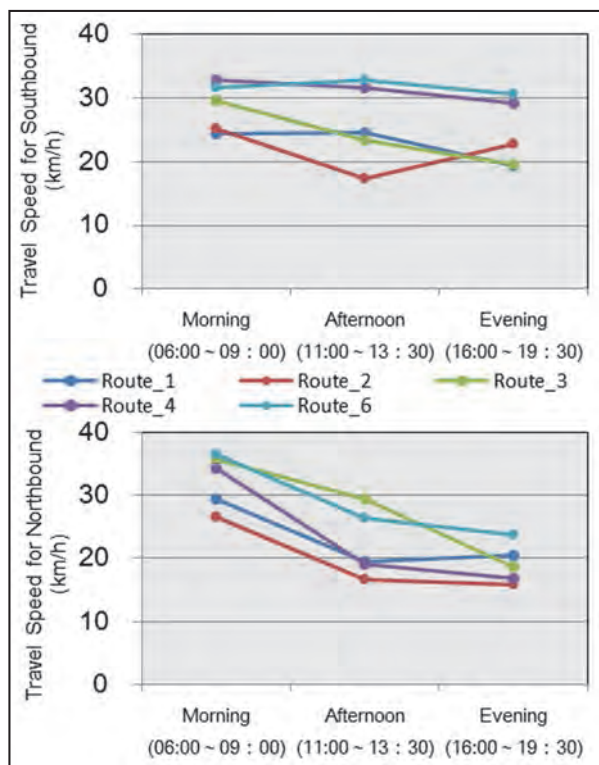
Figure 2.3.7.2 to Figure 2.3.7.4 show the result of YUTRA travel speed survey. Major roads in the Study Area show a speed of 20 to 40 km/h in the morning (6:00 – 9:00). In the afternoon (11:00 - 13:30) and the evening (16:00 - 19:30), however, travel speed becomes lower than in the morning. This survey didn't cover the roads in the existing CBD, but this survey indicates that serious traffic congestion exists on the roads to/from the CBD.



Source: YUTRA Travel Speed Survey

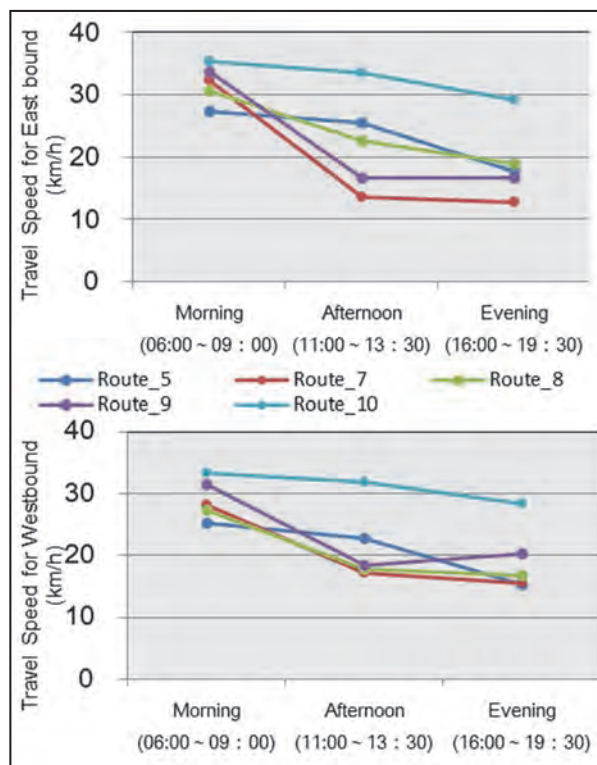
| No | Route |
|----|---|
| 01 | NO.(5) Main Rd and Nawaday Rd -Yangon-Insein Rd and Hledan Rd |
| 02 | Hlaing river Rd and Bayint Naung Rd-Kyee Myin Daing Kanner Rd and Aung Yadanar Rd |
| 03 | Pyay Rd and Lan Thit Rd -Pyay Rd and Bogyoke Aung San Rd |
| 04 | Thu Dhamar Rd and Airport Rd - Upper Pansodan St and Bogyoke Aung San Rd |
| 05 | Parami Rd and Thanthumar Rd -Parami Rd and Bayint Naung Rd |
| 06 | No.(2) Main Rd and Anawrahta Rd -Upper Pazundaug Rd and Bogyoke Aung San Rd |
| 07 | Lay Daungkan Rd and Thanthumar Rd - Hledan Rd and Bayint Naung Rd |
| 08 | Thamain Bayan Rd and Thanthumar Rd - Shin Saw Pu Rd and Shan Rd |
| 09 | Yamonnar Rd and Maha Bandoola Rd - Ahlone Rd and Shan Rd |
| 10 | Kyaik Khauk Pagoda Rd and No.(6) Main Rd --Maha bandoola Rd and San Da Koo St |

Figure 2.3.7.2 Survey Routes for Travel Speed Survey, 2013



Source: YUTRA Travel Speed Survey

Figure 2.3.7.3 Average Travel Speed on Selected Roads (South-North), 2013



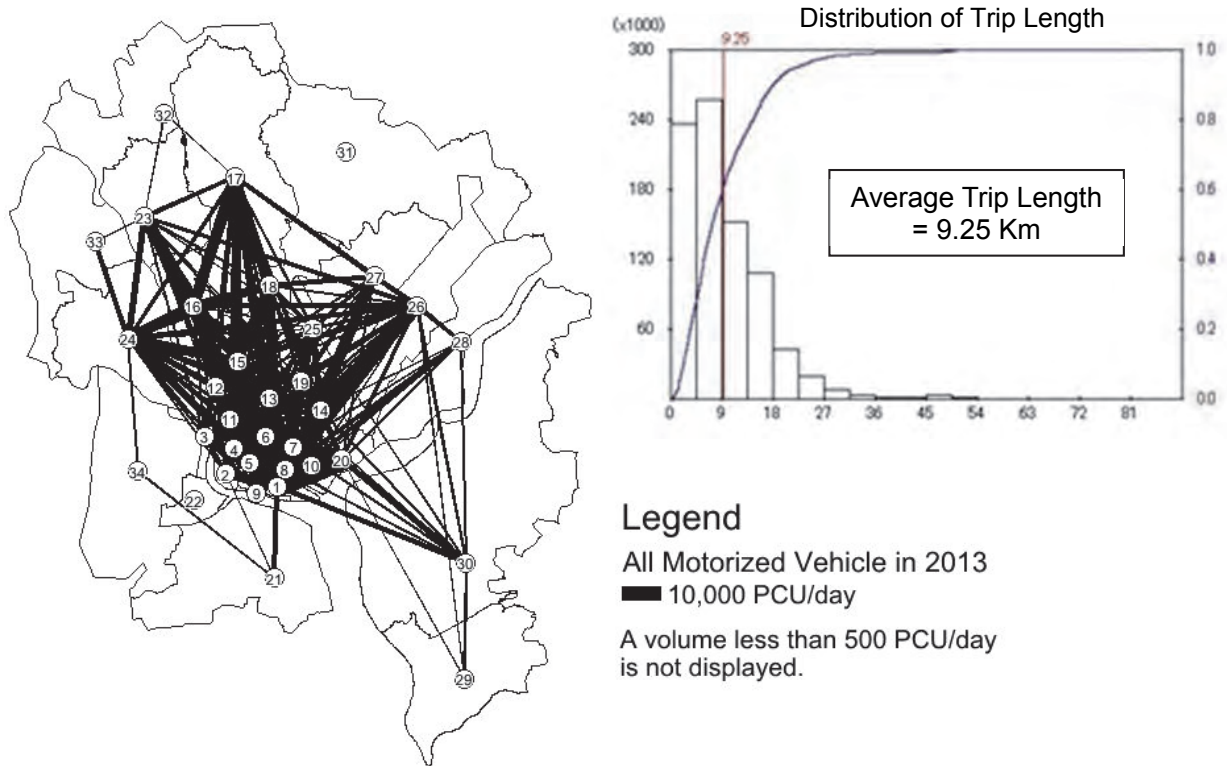
Source: YUTRA Travel Speed Survey

Figure 2.3.7.4 Average Travel Speed on Selected Roads (East-West), 2013

2.3.8 Trip Length and Distribution by Mode

Figure 2.3.8.1 illustrates the trip length and distribution of all motorized vehicles, while Figure 2.3.8.2 to Figure 2.3.8.6 show the same by mode. Truck and public mode including bus have a relatively long trip length compared to other modes. Motorcycle shows a scattered trip distribution mainly in the outskirt areas reflecting the current government regulation of motorcycle use in Yangon. Passenger car and taxi show a concentrated distribution around the central area of Yangon.

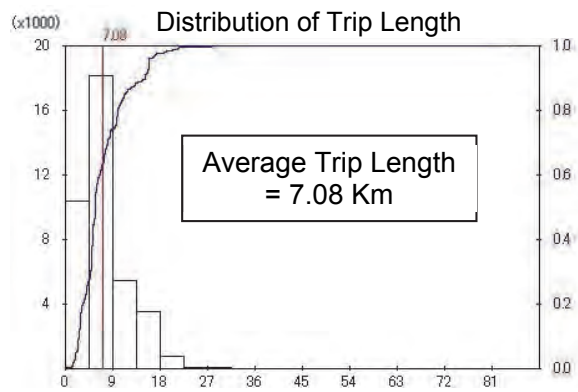
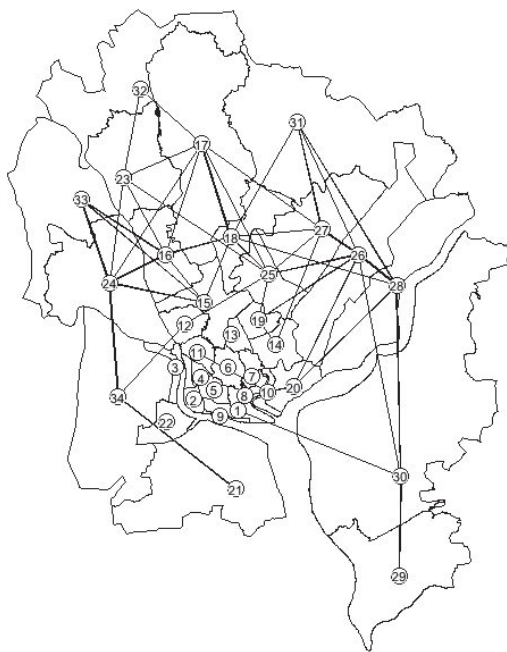
All Motorized Vehicles



Source: YUTRA Person-trip Survey

Figure 2.3.8.1 Trip Length and Distribution of All Motorized Vehicles

Motorcycle



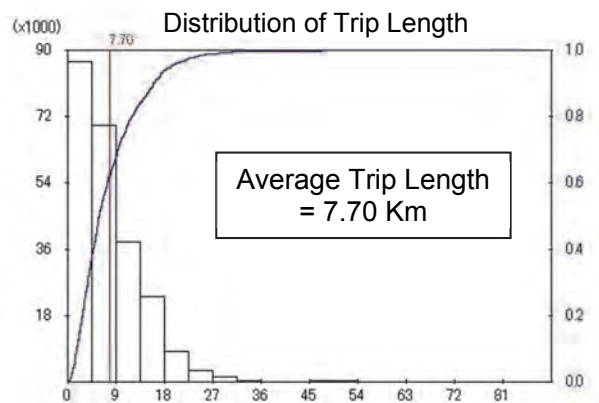
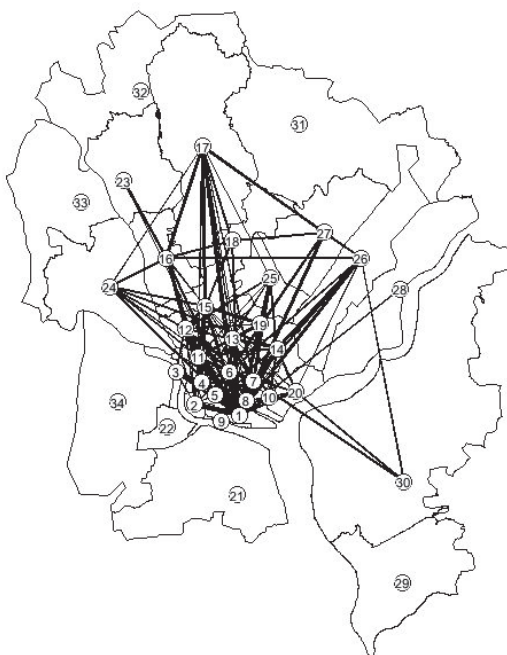
Legend

Motorcycle in 2013
 ■ 10,000 PCU/day
 A volume less than 50 PCU/day is not displayed.

Source: YUTRA Person-trip Survey

Figure 2.3.8.2 Trip Length and Distribution of Motorcycle

Passenger Car



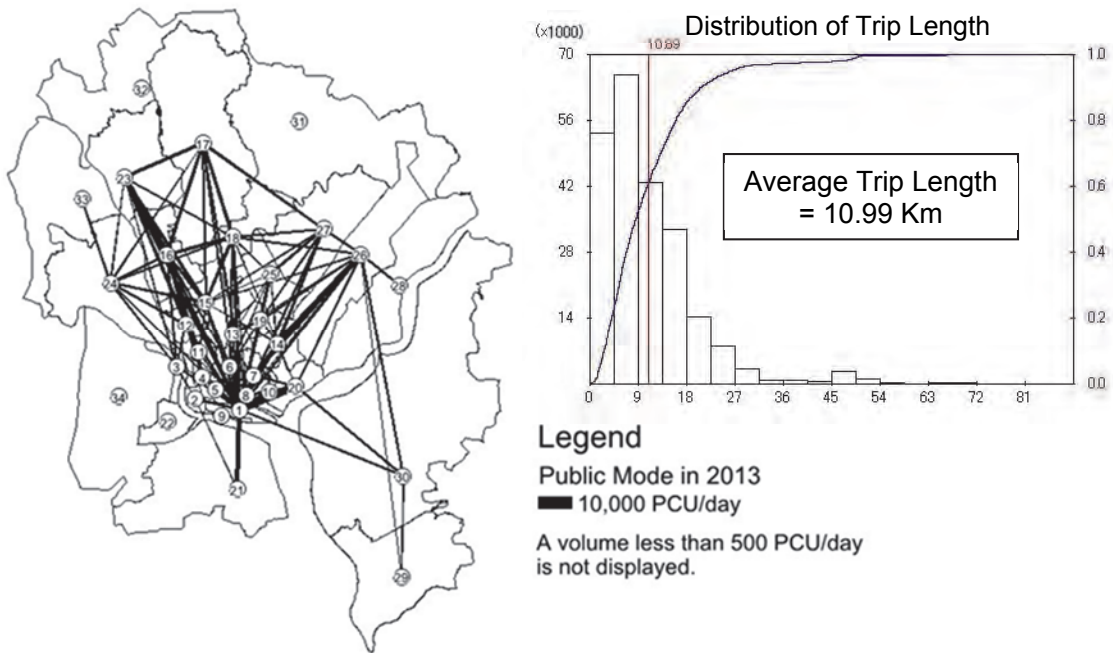
Legend

Passenger Car in 2013
 ■ 10,000 PCU/day
 A volume less than 500 PCU/day is not displayed.

Source: YUTRA Person-trip Survey

Figure 2.3.8.3 Trip Length and Distribution of Passenger Car

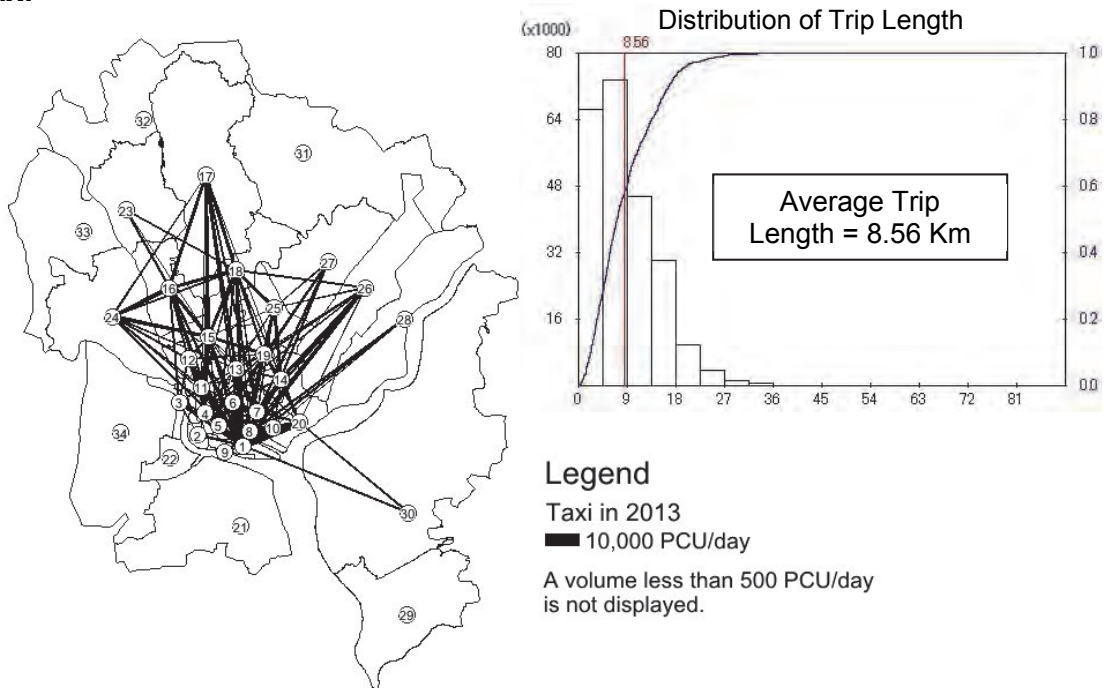
Public Mode including Bus



Source: YUTRA Person-trip Survey

Figure 2.3.8.4 Trip Length and Distribution of Public Mode including Bus

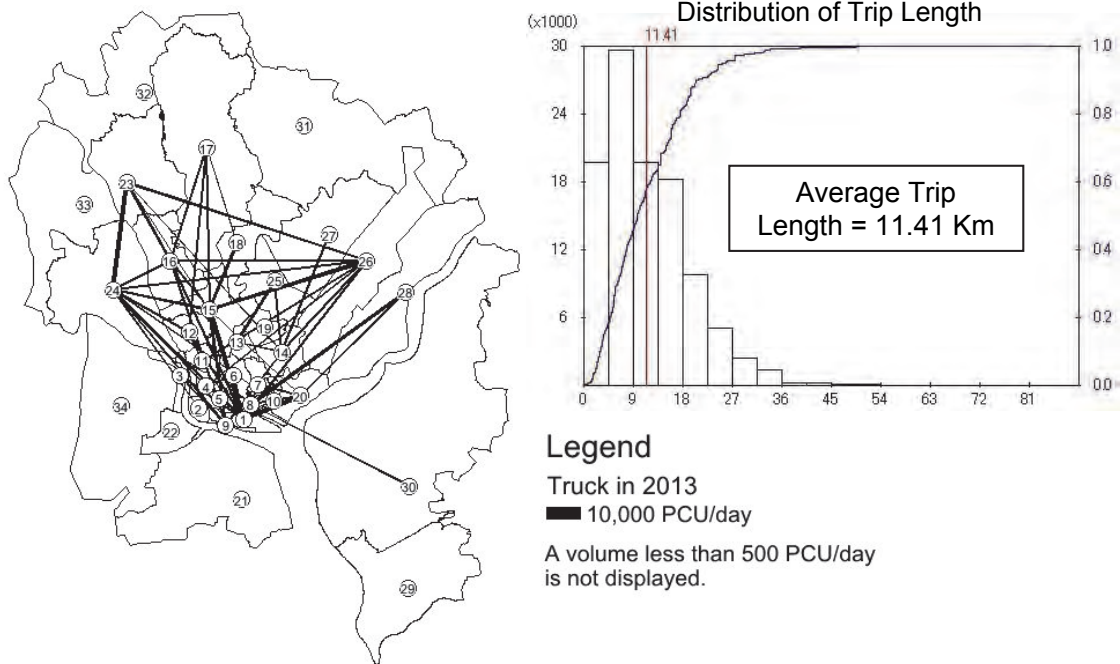
Taxi



Source: YUTRA Person-trip Survey

Figure 2.3.8.5 Trip Length and Distribution of Taxi

Truck



Source: YUTRA Person-trip Survey

Figure 2.3.8.6 Trip Length and Distribution of Truck

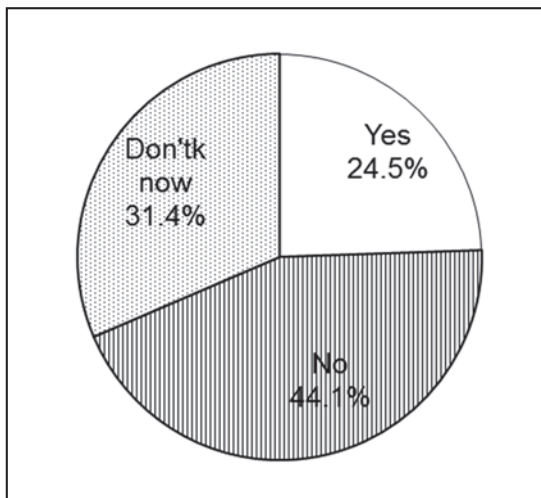
2.3.9 Trip Maker's Opinion

In YUTRA Person Trip Survey, 2 questions were asked to interviewees of their opinion regarding two policy issues of Yangon urban transport.

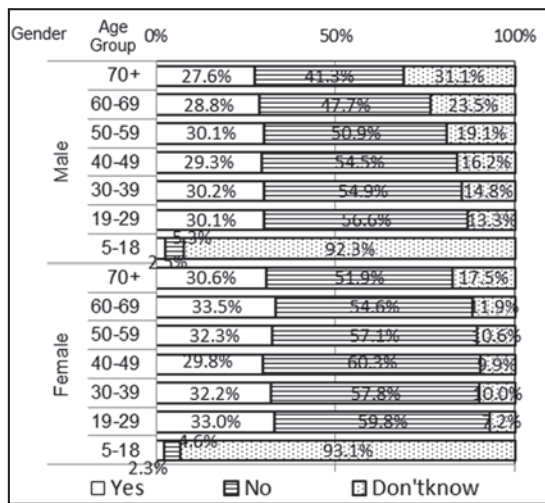
Question A: Do you think the current limitation on the import of used vehicles should be continued? (Yes/ No/ Don't know)

Figure 2.3.8.1 to Figure 2.3.8.4 depict the opinion about the limitation on the import of used vehicles. More than 30% of people didn't know (or didn't answer) about this issue (see Figure 2.3.8.1). Especially, samples at school age didn't express yes/no (see Figure 2.3.8.2).

Do you think the current limitation on the import of used vehicles should be continued?



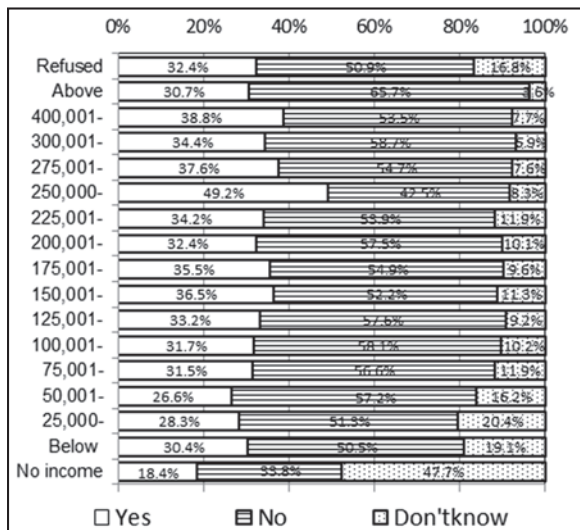
Source: YUTRA Person Trip Survey



Source: YUTRA Person Trip Survey

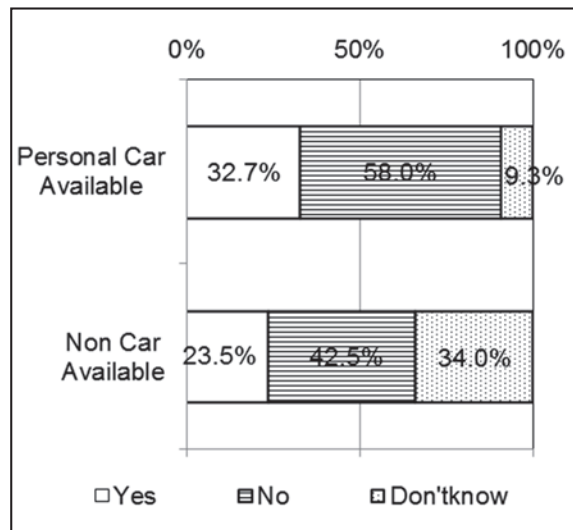
Figure 2.3.9.1 Opinion on Used Car Import, 2013

Figure 2.3.9.2 Opinion on Used Car Import by Gender & Age Group, 2013



Source: YUTRA Person Trip Survey

Figure 2.3.9.3 Opinion on Used Car Import by Personal Income Level (Kyat/month), 2013



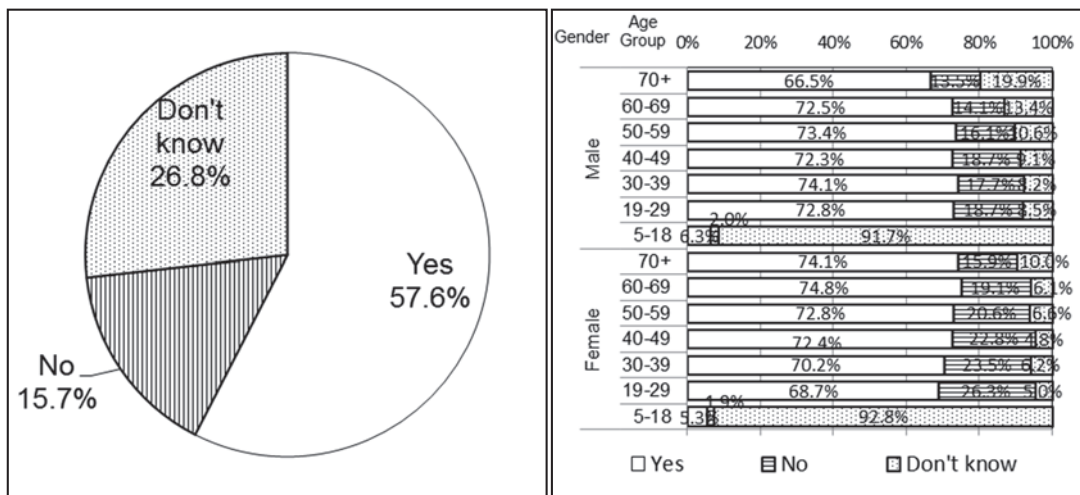
Source: YUTRA Person Trip Survey

Figure 2.3.9.4 Opinion on Used Car Import by Car Availability, 2013

Question B: Do you think the current limitation on the use of motorcycle in Yangon should be continued?

Figure 2.3.9.5 to Figure 2.3.9.7 show the opinion about the limitation of the use of motorcycle. More than half of samples agreed with the limitation of motorcycle use.

Do you think the current limitation on the use of motorcycle in Yangon should be continued?

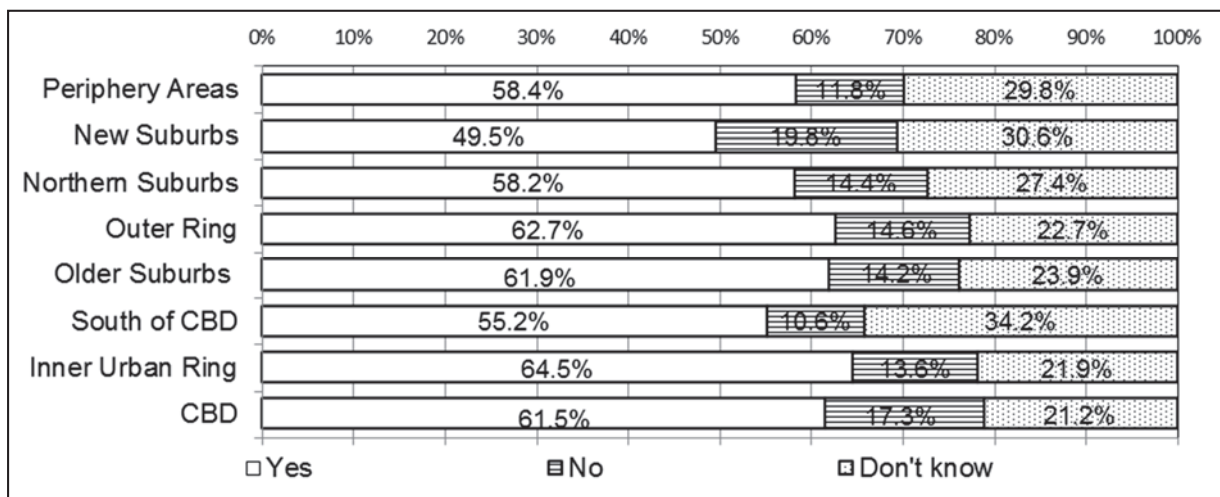


Source: YUTRA Person Trip Survey

Source: YUTRA Person Trip Survey

Figure 2.3.9.5 Opinion of Motorcycle Limitation, 2013

Figure 2.3.9.6 Opinion of Motorcycle Limitation by Car Availability, 2013



Source: YUTRA Person Trip Survey

Figure 2.3.9.7 Opinion of Motorcycle Limitation by House Location, 2013

2.4 Environmental Conditions and Issues

2.4.1 Policy, Legislative and Institutional Framework

1) Legislation related to Environmental and Social Considerations

The National Environment Policy of Myanmar was proclaimed on 5 December 1994. Then the drafting of 'Myanmar Agenda 21' followed the Policy in 1997.

However, since then the progress in development of environmental policy has passed with rather slow step. In addition, the legal framework for environment protection has been indebted to sectorial laws and these laws do not possess holistic vision on environmental protection.

In order to solve the above situation the Environmental Conservation Law was established and enacted by the Union Hluttaw on 30th March 2012.

The law consists of the objectives, formation of the environmental conservation committee, environmental conservation functions and powers of the Ministry of Environment Conservation and Forestry (MOECAF), environmental emergency, and so on.

It is noteworthy that Myanmar laws do not contain any descriptions related to the system of environmental impact assessment (EIA) for development projects as well as to SEA at present. Moreover, the systems of public involvement in the decision-making process are not also prescribed in the law. This is considered as a significant gap between the Myanmar laws and JICA Guidelines.

In addition, compared with national level legislation, Yangon City does not have particular provisions or ordinances for environmental conservation.

2) Regulations for Environmental Impact Assessment (EIA)

Existing Situation of EIA Approval in Myanmar

At present, in the case of official development scheme by the foreign public sector including foreign donors, the approval for the project implementation is attained after several processes as follows:

- (i) At first, the project proponent shall submit project proposal documents together with a feasibility study report including the results of Environmental Impact Assessment (EIA)/Social Impact Assessment (SIA) to the Foreign Economic Relations Department (FERD) of Ministry of National Planning and Economic Development (MNPED).
- (ii) After examining all the required documents by FERD, the documents are forwarded to the Planning Department of MNPED.
- (iii) The Planning Department consults with the Social Advisory Council and other relevant organizations as well as MOECAF for examination in detail the documents. In this process MOECAF reviews and evaluates the results of EIA/SIA in terms of environmental and social considerations.
- (iv) After all the above organizations approved the submitted documents, the Planning Department forwards the documents together with the results of the above examination and evaluation to the Planning Commission (or the President's Office).
- (v) After the approved of the documents, the Planning Commission will endorse them together with its recommendation to the Parliament.

- (vi) In the Parliament, after acceptance of the project approval, the project will be registered into the national annual project list without which no project is able to be conducted in the target year.

Environmental Approval according to Environmental Impact Assessment Procedures (draft)

Article 7 of the Environmental Conservation Law stipulates that the Ministry of Environment, Conservation and Forestry (MOECAF) has responsibility for laying down and carrying out of a system of Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) as to whether or not a project or activity to be undertaken by any governmental department, organization or person may cause a significant impact on the environment. The above law, however, does not stipulate the detail procedures to be taken for conducting environmental impact assessment. With regard to this, MOECAF has been working for the drafting of the “Environmental Conservation Rules” in which “Environmental Impact Assessment Procedures (EIA Procedures)” shall be stipulated.

As of November 2013 the drafted EIA Procedures are waiting for official enactment through discussion in the Inter-Ministry Committee.

Based on the EIA Procedures, infrastructure projects which are required of IEE/EIA and processes of environmental approval are described below.

Lists of projects, which are required of IEE/EIA are provided in Schedule I and II of the EIA Procedures.

- Schedule I projects - All projects that are likely to have some adverse environmental impacts, but of lesser degree and/or significance than those of Schedule II projects, an Initial Environmental Examination (IEE) is required to determine whether or not significant environmental impacts warranting an EIA (full EIA) are likely. If the EIA is not needed, the report of the IEE is regarded as the final environmental assessment report.
- Schedule II projects - All projects that are likely to have potential for significant adverse environmental impacts, an EIA (full) is required to address such significant impacts.

Lists of IEE/EIA required projects in infrastructure development are shown in Table 2.4.1.1. Schematic processes of Environmental approval in the EIA Procedures are shown in Figure 2.4.1.1.

Gaps of Environmental and Social Considerations between Myanmar legislation and JICA Guidelines

Regarding policies for environmental and social considerations, those of JICA guidelines are basically same as those of World Bank and ADB.

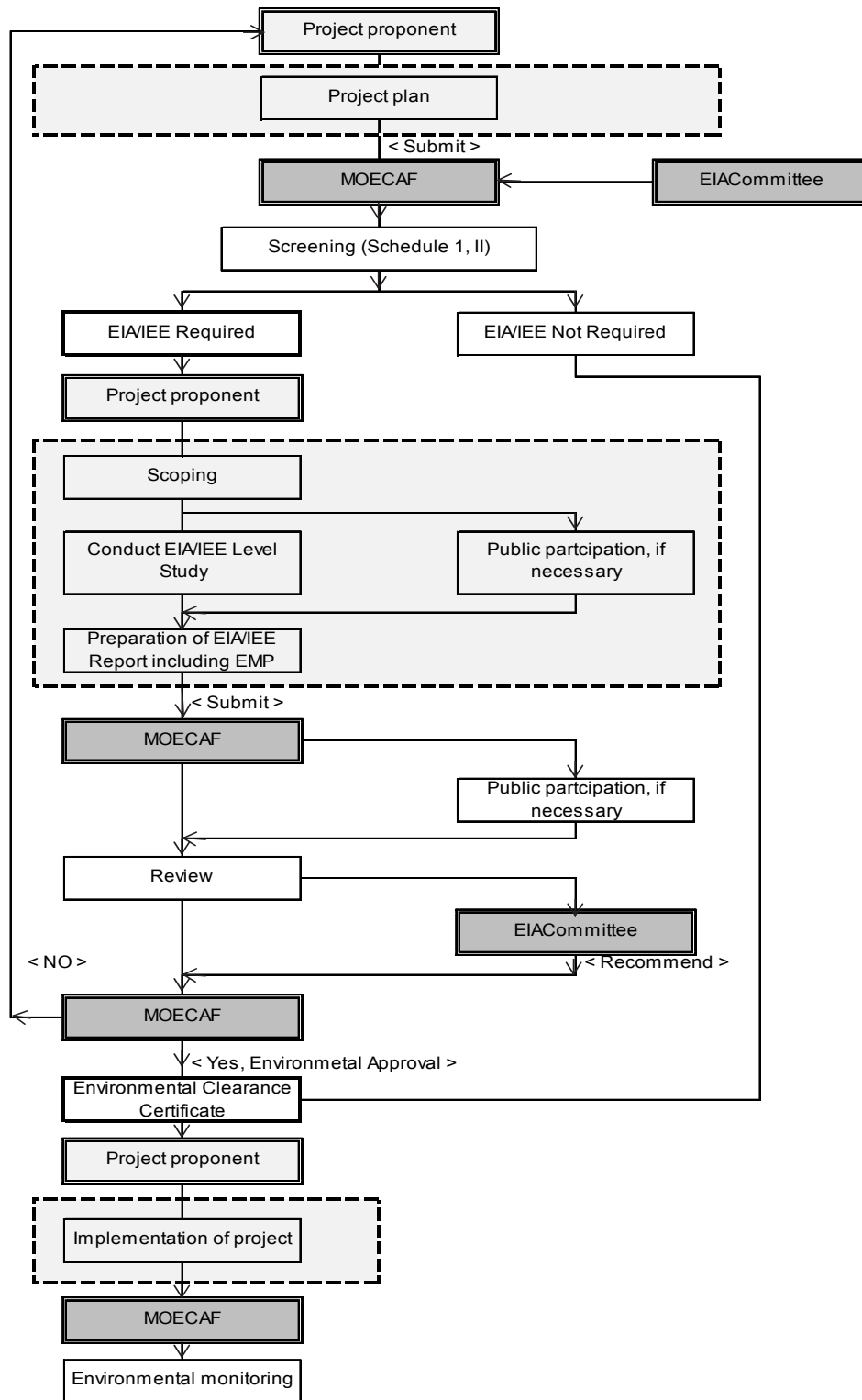
Results of comparison between the policies of Myanmar legislations including the EIA Procedures and those of JICA Guidelines indicate there are still considerable gaps between Myanmar legislations and JICA Guidelines.

Table 2.4.1.1 List of IEE/EIA required project of infrastructure development

| Specific types of project | Project feature (size, etc.) |
|---|--|
| (I) IEE required project (Schedule I) | |
| 1. Water supply schemes | for a population of more than 20000 and less than 50,000 |
| 2. Housing development scheme | More than 250 acres (100 ha) and less than 500 acres (200 ha) |
| 3. River Training Works | All projects |
| 4. Municipal solid Waste and municipal sewerage management system | for a population of 10,000 or more |
| 5. Construction of Bridges | more than 50 feet and less than 200 feet |
| 6. Port Development | All projects |
| (II) EIA (full EIA) required project (Schedule II) | |
| 1. Construction of Highways and fly-over | all projects if recommended by IEE |
| 2. Ports Development | all projects if recommended by IEE |
| 3. Construction of subways | all projects if recommended by IEE |
| 4. Construction of Bridges | more than 200 feet |
| 5. Construction of Shipyards | dead weight tonnages greater than 5,000 tons |
| 6. Construction of Airports | airstrips of 8,200 feet (2,500 meters) or longer |
| 7. Construction of Railways including Construction of new routes | all projects if recommended by IEE |
| 8. Solid waste and sewerage management system | |
| a) Garbage disposal using incineration | 2,000 acres (800 ha) and above |
| b) Garbage disposal using controlled landfill or sanitary landfill system | 2,000 acres (800 ha) and above |
| c) Garbage disposal using open dumping systems | 32 tons/ acre or 80 tons/ ha and above |
| d) Municipal sewerage management | |
| (i) Construction of wastewater treatment facilities in urban areas | 125 acres (50 ha) and above |
| (ii) Construction of sewerage systems | service area 6,250 acres (200 ha) and above |
| 9. Public housing and settlement construction | more than 500 acres (200 ha) |
| 10. Construction of multi-stories and apartment building | height more than 65 yards (60 meters) |
| 11. Construction of multi-purpose reservoirs | |
| a) Construction of medium dams | height between 50 feet (15 m) to 100 feet (30 m) covering an irrigable area of 100,000 acres or more |
| b) Construction of high dams | height of 100 feet (30 m) or more together with hydropower generation of town water supply of any size |
| 12. Groundwater development for industrial, agricultural and water supply | more than 160,000 cubic feet (4,500 cubic) meters |
| 13. Water supply schemes | for population of 50,000 or more |

Note: Project activities other than new construction such as rehabilitation, extension and/or improvement are not clearly stipulated.

Source: Compiled from Environmental Impact Assessment Procedures (Draft, 2013)



Note: MOECAF - Ministry of Environmental Conservation and Forests
 Source: Environmental Impact Assessment Procedures (Draft, 2013)

Figure 2.4.1.1 Schematic Processes of Environmental Approval

3) Environmental Quality Standards

In Article 10 of the Environmental Conservation Law, 2012, MOECAF may stipulate the environmental quality standards for items such as surface water quality, underground water quality, air quality, noise and vibration etc., although the standards have yet been established until October 2013.

4) Land Acquisition and Resettlement

Legislation Related to Land Acquisition

The Land Acquisition Act 1894 promulgated in the British Colonial Era is even now the core law for land acquisition and resettlement in Myanmar.

Type and Classes of Land

From an administrative point of view, land can be classified into the following eleven categories: (i) Freehold Land, (ii) Grant Land, (iii) Agricultural Land, (iv) Garden Land, (v) Grazing Land, (vi) Cultivable Land, Fallow Land, and Waste Land, (vii) Forest Land, (viii) Town Land, (ix) Village Land, (x) Cantonments, and (x) Monastery Land.

Land Acquisition Process

The results of comparison between the JICA Guidelines and Myanmar legislation on land acquisition and involuntary resettlement, there are found several gaps between them. For example, neither the avoidance and minimization of involuntary resettlement and loss of livelihood nor the requirement of preparation of Resettlement Action Plan is stated in any law. For the compensation only market value of the land is considered. No law is identified on the participation of project Affected Persons (PAPs) in public consultation in the land acquisition and resettlement procedures.

5) Institutional Framework

Institutional Framework for Environmental Conservation

The Ministry of Forest was re-named as the Ministry of Environmental Conservation and Forestry (MOECAF) on September 6th 2011 in order to undertake both environmental and forest conservation and management more effectively. It is after about 90 years from 1923, when the Ministry of the same name was firstly formed.

Institutional Framework for Land Acquisition and Resettlement

Agencies responsible for land acquisition differ from those of management of land acquisition as shown in Table 2.4.1.2.

Table 2.4.1.2 Responsible Agencies for Land Acquisition

| | Land | City Development Committee (CDC) | MOAI | MOECAF (Forest Dept.) | GAD (Ministry of Home Affairs) |
|---|--|----------------------------------|------|-----------------------|--------------------------------|
| 1 | Yangon, Nay Pyi Taw and Mandalay Cities | X | | | X |
| 2 | Farmland, vacant, fallow and virgin land | | X | | X |
| 3 | Forest lands | | | X | |
| 4 | Other town and village lands | | | | X |

Source: YUTRA Project Team

2.4.2 Existing Conditions: Social Environment

1) Population

The Yangon Region had a population of 6,944,000 at the end of 2010-2011. It represented approximately 12% of the national population. As for the economic scale, the net production value of the Yangon Region was MMK 8,818,345 million in 2010-2011, accounting for approximately 22% of the country's gross domestic product (GDP). For this reason, Yangon is referred to as "the Economic Center of Myanmar".

There are a total of 33 townships in Yangon City, and there are seven township groups, e.g., the Central Business District (CBD), Inner Urban Ring, South of CBD, Older Suburbs Zone, Outer Ring Zone, Northern Suburbs, and New Suburbs Zone.

The annual average growth rate in Yangon City was 2.58% from 1998 to 2011.

The population scale of the Periphery Area is less than 10% of Yangon City, which has 5.14 million populations.

2) Land Use

In 2002, Greater Yangon has an urbanized area which expands with an area of approximately 505 km². The urbanized area was originally developed around Shwe Dagon Pagoda and along the Yangon River areas which still perform as the city center of Yangon today, namely the Central Business District (CBD) with high density of houses and shops. Urban central functions including administration, banking, business and commerce are located in the CBD and it is likely that this current status does and will cause serious urban issues such as traffic jams, despite some urban facilities, especially shopping centers, tend to be transferred from CBD to outwards the city area.

Urbanization tends to have expanded northwards and eastwards rather than southwards and westwards.

Regarding land use type (2012), the dominant land use type is agricultural area, which occupies about 51% of total area, followed by urbanized area, which consists of 22% of the built-up area and 9% of under-developing area.

3) Industrial Structure

The industrial structure in Myanmar comprised the agriculture, livestock, fishery, and forestry sectors (36%); trade sector (20%); process and manufacturing sector (20%); and services sector (18%).

Contrast with the above, the industrial structure in Yangon Region composed of the processing and manufacturing sector (37%); trade sector (25%); and services sector (24%). The agriculture, livestock, fishery, and forestry sector accounted only 8% of the total production value.

Yangon heavily leans towards manufacturing industries. It is thus reasonable to refer Yangon as the "Commercial and Industrial City" rather than a "Commercial City", judging from the present industrial structure.

4) Social Services

Water Supply System

The service coverage of YCDC water supply system was approximately 42% in 2010 and

the remaining 58 % of population depends on either private well/pond or rainwater.

In addition, access to safe drinking water is not secured, except for those who can use deep wells, although there is no data on the water quality of private wells.

Sanitary Condition

Existing sewerage system covers only a small part of the CBD area. The sewerage system was constructed in 1888 and the service area was expanded in 1929. Construction of the first wastewater treatment plant (WWTP) was completed in 2005.

People living outside the sewerage service area employ on-site disposal systems such as septic tank. The degradation of water quality is high concern as human waste sewage often flows into the drainage directly without appropriate treatment.

Health Services

From 2005 to 2010, only five new hospitals were added in the health facilities. In addition, there are 11 townships in Greater Yangon where there are no hospitals at all (with more than 25 beds). In terms of bed occupancy, eight out of twelve specialist hospitals have bed occupancy of less than 50%. There is no station hospitals which achieve 50% and above bed occupancy rate.

Urban Poor Community

The poverty line was defined as an earning of US\$3 per day (6.3% of total population). Households below poverty line are located in periphery areas (Kyauktan, Thanlyin, Hlegu, Hmawbi, Htantabin, Twantay) and south of the CBD (Dala, Seikgyikanaungto) with limited access to urban services. Accordingly, the housing conditions in these areas are poor. Majority of houses have a living space below 200 sq.ft. and their construction type is either stable wooden frame with leaf roof house or temporary house.

Gender

There is gender gap in the labor market and in employment opportunities. Also, there is an increase in female's vulnerability to trafficking. Community awareness and understanding of the needs of women is still low.

5) Disaster/Hazard

Floods

Flooding is one of the major hazards in Myanmar accounting for 11% of all losses by disasters. Flood in Myanmar usually occur during two distinct periods, i.e. from June to August and from late September to October. Floods in Greater Yangon can be classified into three types; (i) River floods, (ii) Localized flood inundations in urban areas with a combination of cloudburst, poor infiltration rate, poor drainage condition and in rural areas due to decrepit dams, dykes and levees, (iii) Floods due to cyclone and storm surge.

Cyclones

Cyclones that originate in the Bay of Bengal generally move westward heading for India and then turn towards Bangladesh and Myanmar. Severe cyclones tend to occur either during the pre-monsoon season from April to May or post-monsoon season from October to November. Cyclones have three destructive forces, namely: i) storm surge, ii) heavy rainfall and iii) strong winds.

2.4.3 Existing Conditions: Natural Environment

1) Topographic Conditions

Myanmar, with the total area of 678,500 km², generally slopes downward from the north to south. Mt. Hkakabo Razi, located in Kachin State is the highest mountain in Myanmar with an elevation of 5,881 m.

The Ayeyarwaddy River, which originates from Mt. Hkakabo Razi and flows southward to Andaman Sea, is the longest river in Myanmar with the total length of approximately 2,170 km. The river has an approximately 255,081 km² of river basin.

The Greater Yangon lies along the Yangon River between around 17 06' and 16 35'N latitude and between 95 58' and 96 24' longitude, east of the Ayeyarwaddy River delta. Yangon City is located 34 km upstream from the river mouth of Yangon River. Yangon City has low hills which are a long and narrow spur of Pegu Yomas hill range in the central area running in a N-S direction with an average height of 30 m and degenerates gradually into delta plains in eastwards and westwards.

2) Water Body in Greater Yangon

The largest water body is the Yangon River, which accounts for 27.80 % of the total area, and is managed by the Myanmar Port Authority (MPA). The Second largest water body is the Bago River in Thanlyin Township with some 13 % of total area. Both of the water bodies have saline water. In regard to inland waters, the Mingaladon Township, comprising Hlaw Ga Lake (the major source of water supply for the Greater Yangon), accounts for 8% of the total area. Botahtaung, Dagon and Pazundaung Townships have 1.0 to 2.0 ha of water body within each Township. Botahtaung and Pazundaung Townships are suffering from rainwater congestion problem.

3) Geological Features

Tectonics

There is the Andaman Trench in Bengal Bay, west of Myanmar, in which the Indian Plate is moving northward and subducting underneath the Burma Plate from west to east. Sagaing Fault, boundary between Burma Plate and Sunda Plate, is located eastern of Myanmar which tends to cause large scale earthquakes in Greater Yangon.

Geomorphological and Soil Conditions

Most of Greater Yangon area consists of fluvial flood plain which is associated with the area lies in the delta of the Ayeyarwaddy River and along Yangon, Hlaing and Bago rivers and Nga Moeyeik Creek. The rivers transfer and deposit sediments, and form soils.

4) Climate

Greater Yangon is located in tropical monsoon climate, characterized by three distinct seasons, namely, summer (March to middle of May), rainy (Middle of May to middle of October), and cool (Middle of October to February) seasons.

Generally, temperature in April is high, the maximum monthly temperature recorded in April 2001 was 39.1 °C. Minimum monthly temperature recorded in December 2004 was 13.8 °C. The difference between the monthly maximum and monthly minimum temperature is more than 20 °C from December to February and around 10 °C from June to August, which is the peak season of monsoon rainfall.

5) Hydrology

Rainfall

At Kaba-aye Meteorological Station, mean annual rainfall is 2,749 mm and maximum mean monthly rainfall is 591 mm in August and minimum mean monthly rainfall is 3 mm in January and February. Maximum annual rainfall was recorded as 3,592 mm in 2007. Maximum monthly rainfall was 868 mm in August 1968 and minimum monthly rainfall was zero in the past several months. Mean annual rainfall in Bago is 3305 mm while that in Tharrawaddy is 2,220 mm.

River Flow Discharge

River flow discharge is measured far upstream from Greater Yangon to avoid tidal effects. Tidal phenomenon makes it difficult to carry out precise discharge observations. The Hlaing River flow discharge in Khamonseik is 1,851 m³/s in August and 17 m³/s in March with a difference of about hundred times. The Bago River flow discharge in Zaungtu is 242 m³/s in August and 2 m³/s in January and February with a large difference. The maximum daily flow discharges in Khamonseik and in Zaungtu were recorded as 2752 m³/s in October 1997 and 1,237 m³/s in July 1994, respectively.

Tidal Conditions

Based on past observation records at Yangon Port and the river mouth of Yangon River, the highest high water level (HHWL) is +6.74 m and mean water level (MWL) is +3.121 m and ground elevation is normally indicated from MWL. Hence, it can be said that HHWL around Yangon Port is approximately +3.619 m on ground elevation basis.

6) Plants, Animals and Ecosystem

Endangered Species

Greater Yangon is recorded to have three threatened animal species and two threatened plant species. All these threatened species are also protected by the Forest Law in Myanmar.

Protected Areas and Public Parks

(i) Protected Areas

There are at present 40 protected areas in Myanmar including wildlife and bird sanctuaries, national parks, and nature reserves. Myanmar is also a Party to the Convention on International Trade in Endangered Species of Wild Fauna and Flora, and Ramsar Convention.

Among them The Hlawga Park (No.15 in Table 2.4.12) in Greater Yangon has an area of 2,342 ha which is managed strictly as Watershed Protection Forest. Not everyone can enter the park without permission. Teaks and other trees are planted in the Hlawage Park every year.

(ii) Public Parks

In the low hills, several lakes and marshes remain in the urbanized area. Of those, Kan Daw Gyi Lake and Inya Lake are protected as public parks. Other lakes and marshes should also be given more attention in terms of conservation, because these water areas are very important and needed for flood control and mitigation of environmental pollution.

2.4.4 Existing Conditions: Environmental Pollution

1) Situation of Water Pollution

Existing sewerage system covers only a small part of the CBD area and people living outside the sewerage service area lack of proper sewage treating systems. Thus, human waste sewage often flows into the drainage directly without appropriate treatment.

In addition, habitual flooding by tidal backwater occurs in lowland areas without any flood protection. Flooding causes accumulation of floating debris in the drainage. Waste water without proper treatment results to poor water quality and offensive odor. Consequently, this waste water may flow directly to the Yangon River resulting in degradation of the river water quality.

Further, solid waste disposal in Greater Yangon is being operated in an open dump site. Therefore, there is a concern that untreated leachate might cause deterioration of water quality including ground water.

2) Situation of Air Pollution and Noise

More than 25,000 vehicles have been reportedly added to the number of vehicles plying on the city roads in the first half of the year after the government approved the import permit in 2012. Therefore, air pollution and noise are major concerns due to the increasing number of vehicles as well as the traffic congestion.

The polluted level is unknown because no monitoring data on air pollution and noise is available, but there is a high possibility of serious environmental issues caused by air pollution and noise with rapid economic growth in the future.

3) Situation of Solid Waste Problem

Solid waste in Yangon City comes from waste generators such as residents, business owners, and retailers. It is then transported to seven final disposal sites operating as open dump sites.

However, waste transportation is not always done immediately after the secondary collection, leaving the fully-loaded garbage trucks parked along the street even at the day-time. Wastes kept in trucks emit bad smell in the area.

2.4.5 Strategic Environmental Assessment in Comprehensive Urban Transport Plan of the Greater Yangon

The Strategic Environmental Assessment (SEA) has been developed as a system of incorporating "strategic" environmental and social considerations into policies, plans and programs of national, regional or sector level, providing necessary alternatives or decisions at upper level of policy making.

1) Components of SEA

In general the chief components of SEA are listed below:

- (i) Complementary evaluation to the project level EIA.
- (ii) Impact assessment to help the decision-making at the upper level of policy development;

- (iii) Comprehensive assessment with integrated evaluation by environmental and social considerations as well as economic, financial and technical feasibility or political integrity factors at policy, plan and program level;
- (iv) Consideration of alternatives;
- (v) Public participation and information disclosure at the earlier stages;
- (vi) Assessment of accumulated impacts beyond one project, if sub-projects are involved;
- (vii) Rough evaluation of environmental impact and the countermeasures to relieve it to reflect to the EIA of individual project.

2) Role of SEA at Administrative Decision Level

As mentioned above, SEA is applied to formulation of policies, plans and programs at a higher administrative level of national, regional, sector and sub-sector. Necessary environmental and social considerations in relation to policies and plans are shown in Table 2.4.5.1.

Table 2.4.5.1 Development Plan and SEA/EIA

| Development Plan | | SEA/EIA | Environmental and Social Considerations (Transport Sector) |
|------------------|--|----------|--|
| Level | Policy, Plan, Program, Project etc. | | |
| 1 | National Level | SEA | National Transport Policy, National Environmental Policy etc. |
| 2 | Regional Level | SEA | Regional level SEA -Regional environmental management policy, plan |
| 3 | Sector level | SEA | Sector level SEA -Evaluation of policy, plan and/or program for nationwide and/or urban transport master plan |
| 4 | Selection of prioritized plan or project | SEA/EIA* | SEA/EIA* of plan and/or project alternatives - Evaluation of development plans/projects for road, railway, inland waterway, bridge, etc. |
| 5 | Implementation of project | EIA* | EIA* of projects for development for road, railway, bridge, etc. |

Note: * EIA – including IEE level study.

Source: YUTRA Project Team

3) Methodology of SEA in Master Plan Studies

A SEA will be applied as a systematic process for comprehensively evaluation, at earlier stage in the planning process, several alternative options for the overall development projects, thereby ensuring a full integration of the relevant environmental and social considerations as well as economic, engineering and financial aspects of the proposed Master Plan.

- (i) Collection of baseline data and information: Baseline data and information should be collected for both anticipated activities due to plans and/or projects, and environmental and social considerations of targeted areas.
- (ii) Identification of evaluation factors
- (iii) Setting the criteria for each evaluation factor
- (iv) Rating and weighting of the criteria

- (v) Calculation of total evaluation score: To reflect the significance of the evaluations, the total evaluation score will be calculated taking both rating and weights into account.
- (vi) Comparison of total score and ranking: Ranking alternative plans/projects by comparing total score. Then prioritized plan/project will be selected referring to total score and/or ranking.
- (vii) Qualitative evaluation will be added if necessary instead of the comparison of total score and ranking.

2.5 Public Sector Planning and Budgeting Systems

2.5.1 Recent Developments

The Constitution of the Republic of the Union of Myanmar was ratified and promulgated through the National Referendum in 2008, which declared Myanmar as upholding market economy in its development path. With a new Parliament voted into office after the national elections in November 2010 and by-elections in April 2012, the current leadership of the Union Government has launched a reform program that effectively transferred strategic development decision-making to the executive and legislative branches of the government from the once powerful 11-member National Defense and Security Council (NDSC).

In February and March 2012, there were parliamentary debates for the first time on the country's national plan and annual budget, respectively. In January 2013, during the 1st Myanmar Development Cooperation Forum, President Thein Sein unveiled the Framework for Economic and Social Reforms (FESR), which outlines the policy priorities for the government in the next three years while identifying key parameters of the reform process that will allow Myanmar to become a modern, developed and democratic nation by 2030. The FESR was first drafted by the National Economic and Social Advisory Council, a private sector group of experts and advisers, and later approved by the Cabinet-level Planning Commission, headed by the President. The FESR consists of a 10-point basic framework for economic and social reforms, more specifically:

- (i) Finance and taxation reforms;
- (ii) Monetary sector reforms;
- (iii) Relaxation of regulations on trade and investments;
- (iv) Undertakings for private sector development;
- (v) Health and education sectors reforms;
- (vi) Plan for food sufficiency and agricultural sectors development
- (vii) Plan for governing system and transparency;
- (viii) Plan for upgrading of mobile communication service and internet system;
- (ix) Infrastructural development programme; and
- (x) Programme for emergence of effective and efficient governing system.

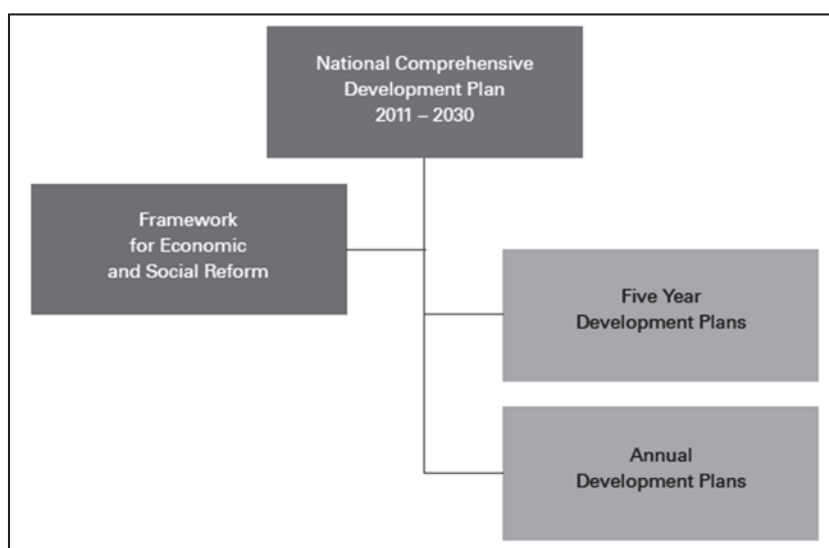
To demonstrate Myanmar's commitment to actively engage donor countries and organizations in constructive dialogue for inclusive growth and development, the Nay Pyi Taw Accord for Effective Development Cooperation was approved by acclamation on 20 January 2013 between the Union Government and international donors and NGOs. The Accord, which is aligned to the principles under the Paris Declaration among OECD member countries and the Busan Partnership for Effective Development Cooperation.

As earlier drafted and endorsed by the Planning Commission, the successor five-year National Plan from Fiscal Year 2011-2012 to 2015-2016 is expected to be approved by the National Parliament in its seventh session. The multi-year national plan envisaged:

- (i) 7.7% annual average GDP growth based on FY2010/11 market prices;
- (ii) Decrease of agricultural sector ratio in GDP from 36.4% to 29.2%;
- (iii) Increase of industrial sector ratio in GDP from 26% to 32.1% and of services sector ratio from 37.6% to 38.7%, respectively; and
- (iv) 1.7-fold rise in per capita GDP when compared with the base year.

In keeping with the FESR guidelines in preparing the long-term National Comprehensive Development Plan, the Union Government has initiated the convening of consultation meetings with the participation of the Development Partners to develop the major component plans, notably: rural development and poverty alleviation plan; human resources development plan; investment plan - trade sector development plan; industrial development plan; financial and currency sector development plan; regional/state plans; and sector plans.

Figure 2.5.1.1 illustrates the National Planning Framework in Myanmar following the drafting of the Framework for Economic and Social Reforms, five-year National Plan from Fiscal Year 2011-2012 to 2015-2016, and envisaged long-term National Comprehensive Development Plan.



Source: Infrastructure in Myanmar, KPMG, 2013

Figure 2.5.1.1 Myanmar National Planning Framework

2.5.2 Key Myanmar Institutions for National Planning and Budgeting

1) National Parliament

The legislative branch of the Myanmar government is established in its bicameral Parliament (Pyidaungsu Hluttaw), which is comprised of the 224-member National Assembly (Amyotha Hluttaw) or the upper house, and the 440-member People's Assembly (Pyithu Hluttaw) or lower house. The powers of Pyidaungsu Hluttaw to appropriate government funds are specified in the 2008 Constitution (Chapter IV, Section 103) as follows:

- (a) *The President or the person assigned by him, on behalf of the Union Government, shall submit the Union Budget Bill to the Pyidaungsu Hluttaw.*
- (b) *The following matters included in the Union Budget Bill shall be discussed at the Pyidaungsu Hluttaw but not refused or curtailed:*
 - (i) *salary and allowance of Heads and Members of the Union level organizations formed under the Constitution and expenditures of those organizations;*
 - (ii) *debts for which the Union is liable and expenses relating to the debts, and other expenses relating to the loans taken out by the Union;*
 - (iii) *expenditures required to satisfy judgment, order, decree of any Court or Tribunal;*

- (iv) other expenditures, which are to be charged by any existing law or any international treaty.
- (c) Approval, refusal and curtailing of other expenditures except the expenditures specified in Sub-Section (b) shall be passed by the majority consent of the Pyidaungsu Hluttaw.
- (d) The Union Government shall perform as necessary in accord with the Union Budget Law enacted by the Pyidaungsu Hluttaw.”
- (e) If in respect of the relevant financial year a need has arisen to authorize the estimated receipts and authorized expenditures in the Union Budget Law enacted by the Pyidaungsu Hluttaw and in addition to estimate receipts and to authorize expenditures, the Supplementary Appropriation law shall be enacted in the above manner.
- (f) The Union Government shall perform as necessary in accord with the Supplementary Appropriation Law enacted by the Pyidaungsu Hluttaw.

Besides the legislative action on the Union Budget, Pyidaungsu Hluttaw exercises law-making powers related to: the Union Fund, capital and money markets, duties and taxes, services of the Union, domestic and foreign loans, foreign aid and financial assistance, disbursement of loans from the Union Funds, among others in the Union Legislative List (Schedule 1 of the 2008 Constitution).

Records of parliamentary sessions indicated that key legislations on national plans and Union budgets were passed by Pyidaungsu Hluttaw after the first and second waves of the economic reforms since 2011. These laws are shown in Table 2.5.2.1.

Table 2.5.2.1 Laws on National Plans and Union Budgets

| No. | Parliament Approval Date | Name of the Law | Session Approved |
|-----|--------------------------|---|------------------|
| 1. | 23-02-2012 | 2012 Union Supplementary Budget Allocation Law | Third Session |
| 2. | 16-03-2012 | National Planning Law for FY2012-2013 | Third Session |
| 3. | 22-03-2012 | Union Budget Law 2012 | Third Session |
| 4. | 21-11-2012 | Supplementary 2012-2013 Union Budget Law | Fifth Session |
| 5. | 1-03-2013 | National Planning Law for FY2013-2014 | Sixth Session |
| 6. | 8-02-2013 | US\$704.28-million-loan from the Japan International Cooperation Agency | Sixth Session |
| 7. | 21-03-2013 | 2013 Union Budget Law | Sixth Session |

Source: MRTV 3 website: Daily News and Brief (<http://www.mrtv3.net.mm>)

For effective vetting of the proposed national plan and budget bills, the National Parliament established the Joint Bills Committee and Joint Public Accounts Committee (chaired by the Deputy Speaker and comprised of seven members each from the Amyotha Hluttaw and Pyithu Hluttaw. The Joint Bills Committee is tasked with the evaluation of proposed legislative measures submitted to the Parliament, while the Joint Public Accounts Committee takes responsibility in scrutinizing the government budget and reports of the Auditor-General on fund utilization).

2) Financial Commission (Constitutional Body)

Under the 2008 Constitution (Chapter V, Section 229), the Union Government has convened the Financial Commission and undertaken significant decentralization and

transparency of decisions in the national planning and budgeting functions. While government structures and authorities are mainly top-down, there is a policy pronouncement on the shift towards more bottom-up planning and budgeting. The Myanmar Financial Commission, headed by the President with key Cabinet officials and chief ministers of the regions and states (Table 2.5.2.2), is tasked to consolidate, review, and revise the annual Union budgets of Union-level organizations and region/state governments. The socio-economic targets in the National Plans, policy priorities for FY2012-2015 under the Framework for Economic and Social Reforms, and directives from the National Parliament (Pyidaungsu Hluttaw) guide the work of the Financial Commission.

Table 2.5.2.2 Composition of the Financial Commission

| # | Position | Cabinet Title |
|-----|----------------------|------------------------------------|
| 1. | Chairman | President |
| 2. | Vice-Chairman | Vice-President (1) |
| 3. | Vice-Chairman | Vice-President (2) |
| 4. | Commission Secretary | Minister of Finance |
| 5. | Member | Attorney General |
| 6. | Member | Auditor General |
| 7. | Member | Nay Pyi Taw Council Chairperson |
| 8. | Member | Kachin State Chief Minister |
| 9. | Member | Karenni State Chief Minister |
| 10. | Member | Karen State Chief Minister |
| 11. | Member | Chin State Chief Minister |
| 12. | Member | Mon State Chief Minister |
| 13. | Member | Arakan State Chief Minister |
| 14. | Member | Shan State Chief Minister |
| 15. | Member | Sagaing Division Chief Minister |
| 16. | Member | Magwe Division Chief Minister |
| 17. | Member | Mandalay Division Chief Minister |
| 18. | Member | Pegu Division Chief Minister |
| 19. | Member | Tenasserim Division Chief Minister |
| 20. | Member | Rangoon Division Chief Minister |
| 21. | Member | Irrawaddy Division Chief Minister |

Source: Constitution of the Republic of the Union of Myanmar (2008)

Pursuant to Chapter V, Section 230 of the 2008 Constitution, the Financial Commission evaluates the budgets of the Union-level organizations as well as the budgets of each of the Regions or States. The Financial Commission submits its recommendation to the Pyidaungsu Hluttaw on the Union Budget, which includes the expenditure of the Union territory, a supplementary finance as suitable to the Regions or States from the Union Fund, grants as a special matter, and authority to enter into loan agreements.

3) Planning Commission

The Planning Commission, which was established under the authority of the President, is chaired by the President and composed of the two Vice Presidents, union ministers, the attorney-general, the auditor-general, the Civil Services Board Chairman, chief ministers of regions and states, deputy ministers, chairpersons of self-administered regions, and departmental heads.

4) National Economic and Social Advisory Council

In June 2012, the Union Government announced the formation of a National Economic and Social Advisory Council, which included prominent personalities from the private sector, to recommend to the President policies, strategies and programs covering economic, educational, healthcare and agricultural matters. The advisory council is composed of a patron, a chairman, a secretary and 14 members from the academe and business sector.

5) Ministry of Finance

Renamed from then Ministry of Finance and Revenue in July 2013, the Ministry of Finance performs the following functions:

- (i) Collection, management and allocation of public funds from various sources;
- (ii) Increasing tax revenues to fund government expenditures;
- (iii) Control inflation and stabilizing general prices; and
- (iv) Mobilizing the domestic and foreign resources for development programs of the Union Government.

Key financial institutions under the Ministry of Finance include: the Central Bank of Myanmar, the Myanmar Economic Bank (MEB), the Myanmar Foreign Trade Bank (MFTB), the Myanmar Investment and Commercial Bank, the Myanmar Small Loans Enterprise and the Myanmar Insurance. For Union budget disbursements and revenue collections, the MEB and MFTB play vital functions as MEB handles state funds accounts, while MFTB maintains foreign currencies' accounts for Union-level ministries and state-owned enterprises relative to ODA loan proceeds and share of revenues in joint ventures.

In collaboration with the Export-Import Banks of neighboring countries, MFTB has set-up financial facilities to implement important projects in the areas of infrastructure, agriculture, industrial and telecommunication sectors such as: the Machinery Rehabilitation Project, Earthmoving Equipment Project of Ministry of Industry, Yangon-Mandalay Trunk Line Railway Project of Ministry of Rail Transportation, telecommunication projects of Ministry of Telecommunication, and hydropower projects of Ministry of Electric Power.

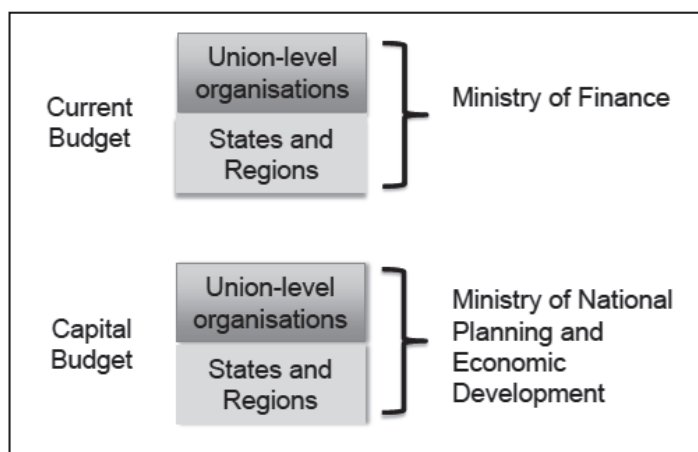
6) Ministry of National Planning and Economic Development

The Ministry of National Planning and Economic Development is mandated to: (i) formulate and submit long term, medium term and annual plan in accordance with the national economic policies; (ii) to study and analyze production, services, trade and investment activities in line with the market economic system for socio-economic development of the nation and the people; (iii) to study the situation of human resource development and employment opportunities crucial for enhancing economy; (iv) to archive socio-economic information and data of the departments and private organizations, analyze and submit to the higher authority; (v) to serve as a coordinating ministry for cooperating with UN agencies, international organizations, international NGOs and regional organizations based on the national interest for the development of the nation; (vi) to evaluate, review, report and submit the progress of ministries and private organizations to the state; and (vii) to coordinate among departments, private entrepreneurs and investors for comprehensive development of business enterprises as well as economy being promoted in the era of modernization.

2.5.3 Union Budgeting Process

1) Recurrent and Capital Expenditures

The preparation of the consolidated fiscal year budget proposal is vested in two ministries as shown in Figure 2.5.3.1. The current operating budget for staff salaries, office capital expenditures, and operation and maintenance expenses is consolidated and analyzed by the Ministry of Finance through its Budget Department, which formulates and implements the annual Union budget within the adopted macro-economic framework under the guidance of the Ministry of Finance for the given fiscal year period. On the other hand, the Ministry of National Planning and Economic Development develops the capital expenditure program on the basis of the five-year national plan as approved by the Union Government.

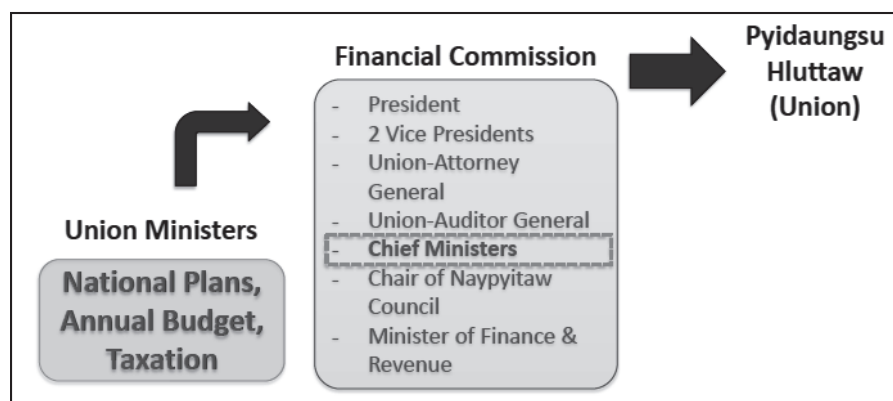


Source: Soe Nandar Linn, Myanmar Development Research Institute, presentation on Sub-National Budgeting in Myanmar, 26 September 2012

Figure 2.5.3.1 Union Budget Preparation Agencies

2) Budget Bill Process

From submissions of Union-level organizations and endorsement from the Ministry of Finance and Ministry of National Planning and Economic Development, the proposed Union budget for the next fiscal year is vetted by the Financial Commission for submission to Pyidaungsu Hluttaw for approval/passage of the Union Budget Law. Figure 2.5.3.2 shows the budget bill work flows.



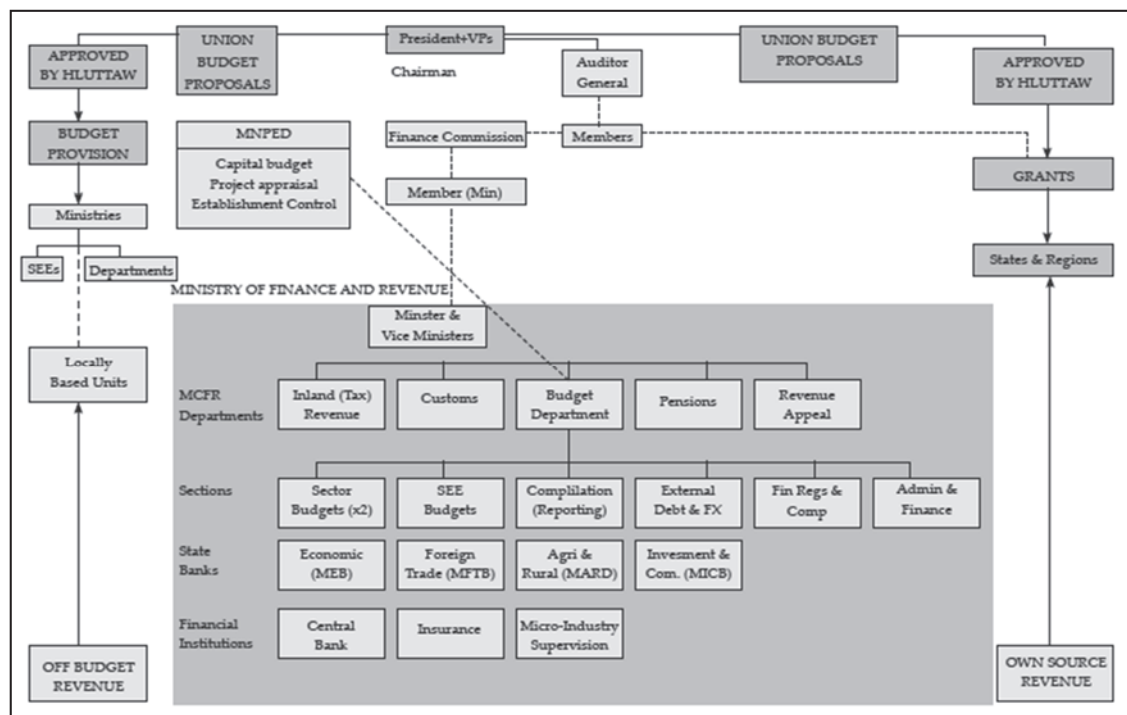
Source: Soe Nandar Linn, Myanmar Development Research Institute, presentation on Sub-National Budgeting in Myanmar, 26 September 2012

Figure 2.5.3.2 Union Budget Bill Process

3) Detailed Institutional Arrangements for Public Financial Management

Figure 2.5.3.3 presents the institutional set-up for the public financial resources. The key features are:

- (i) The Auditor General, while a constitutional body, reports to the Hluttaw through the President rather than directly.
- (ii) Budget preparation is shared between the Ministry of Finance and Ministry of National Planning and Economic Development with the latter preparing both strategic plans (and economic targets) and developing the budget for capital expenditure.
- (iii) There are considerable off-budget flows with regard to areas such as the fees and charges of service providing bodies. However, this off-budget activity is at least reported in summary form in the financial statements.
- (iv) The payment system is centralized, with payments made by the MEB for Union-level organization budget disbursements and MFTB for foreign currency payments such as loan and grant disbursements. Exceptions include civil service salary payments, which are handled by township level ministry officials) and payments from Other Accounts.



Source: Public Financial Management Performance Report, World Bank, 2013

Figure 2.5.3.3 Institutional Arrangements for Management of Public Finances

2.5.4 Performance Review of Public Financial Management

1) Fiscal Performance before the Economic Reforms

In May 2013, the World Bank issued the Public Financial Management Performance Report: Republic of the Union of Myanmar. The World Bank noted that there were two major catalysts for reforms since 2011, namely:

- (i) Convening of the Parliament and establishment of oversight joint committees have resulted in enhanced external scrutiny of the budget by the Parliament; and

- (ii) Constitutional requirement for separation of regional/state budgets from the Union fund accounts has required rapid decentralization of budgeting and planning functions to support bottom-up planning and budgeting processes in states and regions.

It further recognized the convening of the Financial Commission and establishment of the National Planning Commission as positive steps to coordinate and integrate state/region budgets with the Union budget.

Table 2.5.4.1 presents the main fiscal indicators of performance from FY2008/09 to FY2011/12. The World Bank cited the significant increase in budget deficit from FY2010/11 to FY2011/12. The consolidated fiscal deficit was -5.2% of GDP in 2009/10. Despite the increase in revenues by 1.2 percentage points of GDP in 2011/12, expenditures rise by 1.5 percentage points of GDP, adding to the overall deficit that year by about 0.4 percentage points of GDP.

The World Bank further noted the adoption of a managed float exchange rate system at the start of FY2012/13 is expected to have a favorable impact on the overall fiscal balance resulting in overall balance to improve by approximately 0.7 percentage points of GDP to -5.3% of GDP.

Table 2.5.4.1 Consolidated Government Fiscal Outcomes¹

(Unit: Percent of GDP, 2009-2012)

| | FY2008-09 | FY2009-10 | FY2010-11 | FY2011-12 |
|---|-----------|-----------|-----------|-----------|
| Revenues and Grants ² | 13.0 | 11.7 | 13.0 | 13.0 |
| A. Revenues | 13.0 | 11.7 | 13.0 | 13.0 |
| 1. General government ³ | 4.4 | 3.8 | 4.8 | 4.4 |
| 2. State economic enterprises | 8.6 | 7.9 | 8.2 | 8.6 |
| B. Grants | 0.0 | 0.0 | 0.0 | 0.0 |
| Expenditures ² | 15.5 | 16.9 | 18.4 | 19.0 |
| A. Recurrent Expenses | 9.6 | 9.4 | 9.7 | 11.3 |
| 1. General government | 3.3 | 3.6 | 4.2 | 5.2 |
| a. Non-interest expenditure | 2.6 | 2.8 | 3.3 | 4.1 |
| b. Interest expenditure | 0.6 | 0.8 | 1.0 | 1.2 |
| 2. State Owned Enterprises ³ | 6.4 | 5.8 | 5.4 | 6.1 |
| B. Capital Expenses | 5.8 | 7.5 | 8.8 | 7.7 |
| 1. General government | 4.6 | 6.2 | 7.8 | 6.6 |
| 2. State economic enterprises | 1.2 | 1.3 | 1.0 | 1.0 |
| Overall Balance | -2.4 | -5.2 | -5.4 | -6.0 |
| Primary Balance | -1.8 | -4.4 | -4.5 | -4.8 |
| Net Financing | 2.4 | 5.2 | 5.4 | 6.0 |
| A. Domestic | 2.4 | 5.2 | 5.4 | 6.0 |
| B. Foreign ² | 0.0 | 0.0 | 0.0 | 0.0 |

Source: Public Financial Management Performance Report, World Bank, 2013

¹ Budgets of the regional/state governments and state economic enterprises were all subsumed into the Union budget.

² All foreign exchange transactions through 2011/12 were valued at the official, fixed exchange rate rather than the market rate

³ Net of transfers from state economic enterprises to Union government.

The review of actual budgetary outlays by sector from FY2008/09 to FY2011/12 (Table 2.5.4.2) revealed the significant reduction in defense spending and increasing trend in budgetary support to health and education. Notable growths in percentage of total Union budget are demonstrated for in production and infrastructure sectors (Fuel, Energy,

Mining, Manufacturing, Construction, Transport and Communications) from 36% of total budget in FY2010/11 to 43.2% of total in FY2011/12.

Table 2.5.4.2 Actual Government Budget Outlays by Sector

(Unit: Percent of Total, 2009-2012)

| | FY2008-09 | FY2009-10 | FY2010-11 | FY2011-12 |
|---|-----------|-----------|-----------|-----------|
| General Public Services | 22.2 | 28.6 | 29.4 | 26.0 |
| Defense Affairs | 8.8 | 10.5 | 17.3 | 14.1 |
| Public Order and Safety | 1.6 | 2.2 | 2.2 | 2.2 |
| Education | 3.3 | 3.3 | 3.6 | 3.7 |
| Health Services | 0.9 | 0.9 | 1.0 | 1.1 |
| Social security and welfare | 1.0 | 0.3 | 0.3 | 0.3 |
| Housing, Water, Community Dev't, Environment | 2.4 | 2.5 | 2.1 | 2.0 |
| Transport and Communication | 6.2 | 5.8 | 5.2 | 6.6 |
| Fuel, Energy, Mining, Manufacturing, Construction | 44.3 | 37.3 | 30.8 | 35.7 |
| Religious affairs, Culture, Recreation Media | 0.5 | 0.5 | 0.5 | 0.5 |
| Others | 8.8 | 8.0 | 7.6 | 7.8 |
| Total Expenditures (excl. debt service) | 100.0 | 100.0 | 100.0 | 100.0 |

Source: Public Financial Management Performance Report, World Bank, 2013

2) Fiscal Performance with the Economic Reforms

Table 2.5.4.3 shows the detailed budget allocation by sector based on the Union Budget Laws as originally enacted. As earlier noted and shown in Table 2.5.1, supplemental budgets were approved in March and November 2012 to significantly reduce defense spending and increase funding for education and health sectors.

Table 2.5.4.3 Union Budget Law Allocation by Sector

| Sector/Ministry | FY2010-11 | | FY2011-12 | | FY2012-13 | |
|---|-----------------------|------------|-----------------------|------------|-----------------------|------------|
| | Allocation (MMK mil.) | % of Total | Allocation (MMK mil.) | % of Total | Allocation (MMK mil.) | % of Total |
| Foreign Affairs | 2,272 | 0.09 | 2,280 | 0.04 | 40,998 | 0.64 |
| Defense | 1,323,066 | 51.00 | 1,318,578 | 21.13 | 1,977,412 | 31.05 |
| Border Affairs | 25,701 | 0.99 | 25,519 | 0.41 | 77,601 | 1.22 |
| Home Affairs | 112,209 | 4.33 | 50,083 | 0.80 | 150,798 | 2.37 |
| Immigration | 7,199 | 0.28 | 2,462 | 0.04 | 10,964 | 0.17 |
| Religious Affairs | 3,985 | 0.15 | 5,145 | 0.08 | 6,400 | 0.10 |
| Social Welfare, Relief and Resettlement | 16,733 | 0.65 | 14,397 | 0.23 | 60,128 | 0.94 |
| Information | 14,162 | 0.55 | 26,849 | 0.43 | 32,924 | 0.52 |
| Culture | 5,179 | 0.20 | 5,754 | 0.09 | 6,135 | 0.10 |
| Education | 266,906 | 10.29 | 310,020 | 4.97 | 752,067 | 11.81 |
| Health | 78,387 | 3.02 | 90,819 | 1.46 | 392,197 | 6.16 |
| Sports | 6,537 | 0.25 | 6,993 | 0.11 | 313,362 | 4.92 |
| Labor, Employment and Social Security | 1,672 | 0.06 | 6,764 | 0.11 | 2,659 | 0.04 |
| Environmental Conservation and Forestry | 21,387 | 0.82 | 142,465 | 2.28 | 12,554 | 0.20 |
| Agriculture and Irrigation | 199,444 | 7.69 | 310,217 | 4.97 | 374,644 | 5.88 |
| Livestock and Fisheries | 8,362 | 0.32 | 50,628 | 0.81 | 4,842 | 0.08 |
| Mines | 2,182 | 0.08 | 39,855 | 0.64 | 2,864 | 0.04 |

| Sector/Ministry | FY2010-11 | | FY2011-12 | | FY2012-13 | |
|--|-----------------------|---------------|-----------------------|---------------|-----------------------|---------------|
| | Allocation (MMK mil.) | % of Total | Allocation (MMK mil.) | % of Total | Allocation (MMK mil.) | % of Total |
| Industry | 2,810 | 0.11 | 419,860 | 6.73 | 5,426 | 0.09 |
| Science & Technology | 42,452 | 1.64 | 42,564 | 0.68 | 21,881 | 0.34 |
| Energy | 232 | 0.01 | 1,008,640 | 16.16 | 310 | 0.00 |
| Electric Power | 78,233 | 3.02 | 668,520 | 10.71 | 278,501 | 4.37 |
| Construction | 295,963 | 11.41 | 578,024 | 9.26 | 360,361 | 5.66 |
| Transport | 36,880 | 1.42 | 83,337 | 1.34 | 29,110 | 0.46 |
| Rail Transportation | 4,487 | 0.17 | 208,186 | 3.34 | 5,002 | 0.08 |
| Communications and IT | 200 | 0.01 | 320,930 | 5.14 | 728 | 0.01 |
| Commerce | 2,413 | 0.09 | 5,547 | 0.09 | 4,631 | 0.07 |
| Hotels & Tourism | 300 | 0.01 | 4,495 | 0.07 | 530 | 0.01 |
| Co-operatives | 6,414 | 0.25 | 1,347 | 0.02 | 3,222 | 0.05 |
| National Planning and Economic Development | 13,778 | 0.53 | 12,041 | 0.19 | 36,282 | 0.57 |
| Finance | 14,683 | 0.57 | 479,229 | 7.68 | 709,492 | 11.14 |
| Others ¹ | 0 | 0.00 | 0 | 0.00 | 695,341 | 10.92 |
| TOTAL | 2,594,228 | 100.00 | 6,241,548 | 100.00 | 6,369,364 | 100.00 |

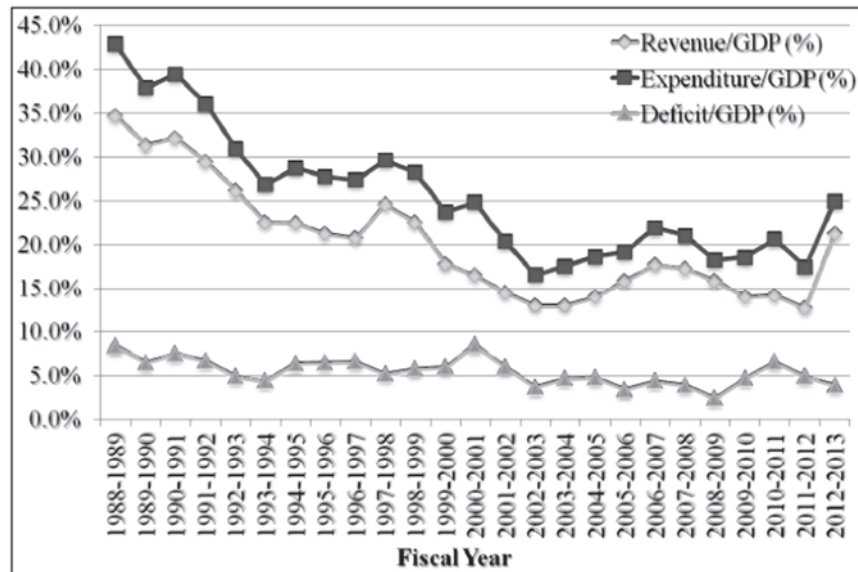
Source: Ministry of Finance, Official Gazette for Union Budget Law FY2012-2013

¹ For FY2012-13, budget subsidies (grants) and loans to regions/states have been indicated as separate line items. Includes also salary increase and special fund of Ks.100 billion.

Statements from the Office of the President and from the Speaker of Pyidaungsu Hluttaw indicated further balancing of sector allocation for FY2012/13 as follows:

- (i) Defense allocation reduced to 14.94% of total budget from 23.6% in FY2011/12; and
- (ii) Education and health funding levels increased to 4.91% of total (4.13% in FY2011/12) and 2.93% of total (1.3% in FY2011/12), respectively.

Figure 2.5.4.1 presents the revenue and expenditure levels as a factor of GDP from FY1988/89 to FY2012/13. Under the revised Union Budget for FY2012/13, the Myanmar Government targets the budget deficit at 3.7% of GDP on account of higher tax revenues. In FY2013/14, the government's total revenue is expected to account for 23.4% of GDP, while its expenses represent 28.4% of GDP, or a budget gap of 5% of GDP, as a result of increased public spending on infrastructure, health, and education.



Source: Maung Maung Win, Director General, Budget Department, Ministry of Finance and Revenue, presentation during the 1st Myanmar Development Cooperation Forum, 19-20 January 2013, Nay Pyi Taw

Figure 2.5.4.1 Myanmar Fiscal Indicators to GDP, FY1988/89 to FY2012/13

2.5.5 Financing of Transport Projects

1) Transport Sector Capital Investments

(1) Recent Comparative Studies

Recent studies on Myanmar concluded that there are significant gaps in the country's infrastructure development, particularly in the transport sector. KPMG (2013)² noted Myanmar was ranked 133 out of 155 in the 2012 Logistics Performance Index published by the World Bank. The Logistics Performance Index overall score reflects perceptions of a country's logistics systems based on the efficiency of customs clearance process, quality of trade- and transport-related infrastructure, ease of arranging competitively priced shipments, quality of logistics services, ability to track and trace consignments, and frequency with which shipments reach the consignee within the scheduled time.

The Global Competitiveness Report (2013)³ ranked Myanmar at 139th among 148 economies, right behind Timor-Leste (138th). The Report highlighted "the country's performance in the Global Competitiveness Index (GCI) confirms that it is starting from a very low base and that the road toward prosperity will be long and dauntingly arduous". Myanmar needs to focus on the basic determinants of its competitiveness, namely the institutional framework (141st), transport, energy, and communications infrastructure (141st), health and primary education (111th), and the banking sector. Table 2.5.5.1 indicates Myanmar's GCI ranking among ASEAN member countries.

² Infrastructure in Myanmar, KPMG, 2013.

³ The Global Competitiveness Report 2013–2014, World Economic Forum, 2013.

Table 2.5.5.1 ASEAN Countries' Global Competitiveness Ranking, 2013

| ASEAN | GDP/Capita Ranking | Competitiveness Ranking | |
|-------------|--------------------|-------------------------|----------------|
| | | Overall | Infrastructure |
| Singapore | 10 | 2 | 2 |
| Brunei | 20 | - | - |
| Malaysia | 62 | 24 | 29 |
| Thailand | 82 | 37 | 47 |
| Indonesia | 98 | 38 | 67 |
| Philippines | 107 | 59 | 96 |
| Vietnam | 114 | 86 | 82 |
| Lao PDR | 117 | 81 | 84 |
| Cambodia | 128 | 88 | 101 |
| Myanmar | 129 | 139 | 141 |

Source: The Global Competitiveness Report 2013–2014, World Economic Forum, 2013

(2) Transport Investment Trends

Table 2.5.5.2 indicates the recent changes in financing indicators, including Gross Fixed Capital Formation (GFCF) in the transport sector (Column 5), proportion to the total national GFCF (Column 6). The double-digit ratios of Transport GFCF to total GFCF for FY2004/05 to FY2005/06 reflected the major construction works for the transfer of the capital to Nay Pyi Taw with ratios reaching 12.8% and 14.4% for these fiscal years, respectively. Thereafter, the ratio of Transport GFCF to Total GFCF averaged about 5.6% until FY2010-11. Preliminary estimates based on the budget allocation under Union Budget Law FY2012-13 indicated that the ratio of Transport GFCF to Total GFCF could be between 8 to 10%, depending on the utilization of the capital.

Table 2.5.5.2 Proportion of GFCF in the Transport Sector to Total

(Unit: MMK Billion)

| Fiscal Year (0) | Nominal GDP (1) | Total Fixed Capital Formation (2) | Gov't Expenditure (3) | Gov't Capital Expenditure (4) | Fixed Capital Formation in the Transport Sector (5) | Transport to Total GFCF (5)/(2) (%) |
|-----------------|-----------------|-----------------------------------|-----------------------|-------------------------------|---|-------------------------------------|
| 2004-05 | 9,078.9 | 1,207.5 | 1,693.0 | 733.5 | 154.3 | 12.8 |
| 2005-06 | 12,286.8 | 1,867.6 | 2,353.9 | 906.5 | 269.3 | 14.4 |
| 2006-07 | 16,852.8 | 2,359.4 | 3,693.5 | 1,274.0 | 177.7 | 7.5 |
| 2007-08 | 23,336.1 | 3,710.4 | 4,901.5 | 1,890.0 | 255.9 | 6.9 |
| 2008-09 | 29,233.3 | 5,057.4 | 5,314.9 | 2,033.6 | 244.3 | 4.8 |
| 2009-10 | 33,894.0 | 7,151.6 | 6,260.6 | 2,840.8 | 381.7 | 5.3 |
| 2010-11 | 39,846.7 | 10,081.2 | 7,506.9 | 3,575.3 | 352.3 | 3.5 |

Source: Myanmar Statistical Yearbooks 2010 and 2011, Central Statistical Organization

Average investment levels on infrastructures and the transport sector in Myanmar were about 8% of GDP and 1% of GDP, respectively. This low investment ratio to GDP is comparable to the spending trends on road, railway and inland transport in advanced OECD⁴ countries at 0.85% of GDP, where transport capital assets had been well established for decades (Figure 2.5.5.1).

⁴ Organisation for Economic Co-operation and Development countries, comprising of 40 countries that account for 80% of world trade and investment.

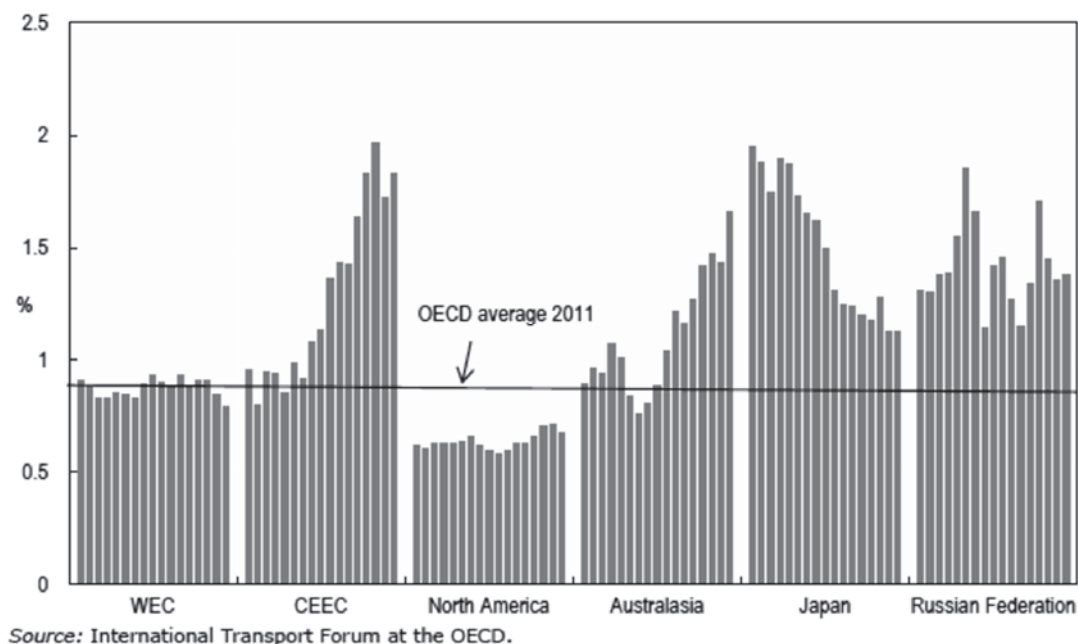


Figure 2.5.5.1 OECD Inland Transport Investment, 2011

An independent country review undertaken by McKinsey Global Institute (“Myanmar’s Moments: Unique Opportunities, Major Challenges”, June 2013) estimated that about US\$650 billion in investment would be required to support Myanmar’s potential growth until 2030, of which US\$320 billion are required in infrastructure, particularly to improve connectivity to neighboring countries for efficient flow of people, goods and services.

2) Financing Options for Major Transport Projects

(1) Central Government Revenues

The main sources of Union Government income are derived from taxes, state incomes and contributions from State Economic Enterprises (SEEs) as shown in Table 2.5.5.3. The Internal Revenue Department of the Ministry of Finance and Revenue collects taxes on production and consumption (taxes on commodities/services/commercial tax, state lottery and stamp duties), and income taxes. Public sector revenues increased from 10.7% of GDP in FY2009/10 to 23% of GDP in FY2012/13. For FY2013/14, total government income is projected at 23.4% of GDP.

Table 2.5.5.3 Union Government Revenues

(Unit: MMK Billion)

| Revenue Source | FY2009/10 | FY2010/11 | FY2011/12 | FY2012/13 |
|--|-----------|-----------|-----------|-----------|
| Tax revenue | 1,077 | 1,318 | 3,058 | 3,509 |
| SEE receipts, including government transfers | 2,499 | 2,805 | 7,476 | 8,560 |
| Other non-tax revenues | 163 | 427 | 329 | 361 |
| Grants | 0.46 | 0.36 | 24 | 89 |
| Total | 3,739 | 4,550 | 10,887 | 12,519 |

Source: Staff Report for the 2013 Article IV Consultation and First Review under the Staff-Monitored Program, IMF, June 2013

The joint Memorandum of Economic and Financial Policies as attached to the Letter of Intent to IMF, dated June 12, 2013, committed to further broaden the tax base and improving collection efficiency to raise resources for development spending and to reduce reliance on natural resources.

(2) Official Development Assistance

Funding capacity within the public sector of Myanmar is limited, particularly when set before an ambitious economic and social reform agenda. While encouraging foreign direct investments for infrastructure facilities and services, concessional financing from donor institutions and countries remain the major source of project finance for the transport sector.

The early gains of the reform package implemented by the Union Government, has encouraged development partners, both multilateral institutions like the ADB and the World Bank and traditional bilateral partners of Myanmar to re-channel very concessional financing for development projects. Table 2.5.5.4 presents the prevailing concessional terms and conditions for program and project financing available to Myanmar in pursuing accelerated infrastructure development in the years to come.

Figure 2.5.5.2 illustrates the ODA negotiation process. The principal Union institutions involved in aid management are:

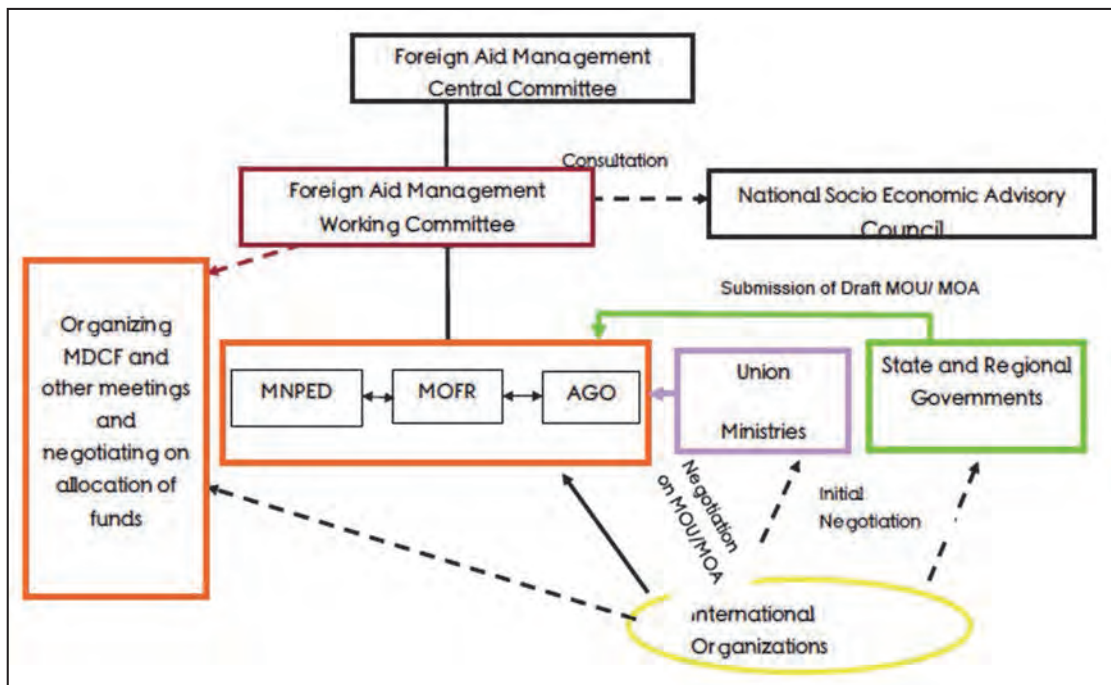
- (i) National leadership through Foreign Aid Management Central Committee and its Working Committee, supported by National Economic and Social Advisory Council;
- (ii) Foreign Economic Relations Department of the Ministry of National Planning and Economic Development serving as the focal agency for ODA coordination, with links to all Union ministries and departments; and
- (iii) Each level of sub-national government has a Plan and Implementation Committee with sub-committee on Foreign Aid Management.

The Union Government is currently updating the current policies, procedures and regulations for the management of ODA and will consult with Development Partners before finalization and publication later in 2013.

Table 2.5.5.4 Current ODA Loan Terms for Myanmar Projects

| ODA Source | Interest Rate Per Annum | Term and Grace Period | New/Proposed Loan Project |
|---------------------------|----------------------------|---|---|
| ADB | 1% 1.5% | During 8 years grace period Thereafter up to Year 24 | Support for Myanmar's Reforms for Inclusive Growth Program (Policy Loan) |
| World Bank | 0.75% | 40 years repayment, including 10 years grace period | Reengagement and Reform Support Credit Program (Policy Loan) |
| JICA | 0.01% | 40 years repayment, including 10 years grace period | Regional Development Project for Poverty Reduction, Phase I; Urgent Rehabilitation and Upgrade Project Phase I; Infrastructure Development Project in Thilawa Area, Phase I |
| China | Interest-free | 20 years maturity | Proposed GSM Project, Metro Optical Fiber Network in Yangon, Mandalay and Nay Pyi Taw; New highway from Yangon to Mandalay; Expansion of Hsedawgyi Dam; and Upgrade of Beeluchaung Hydropower Project |
| India (Eximbank of India) | LIBOR+ or Fixed Rate of 2% | 8 to 12 years maturity | Proposed Upgrading of Irrigation and Drainage Systems and Upgrading of Railway Routes and Purchase of New Trains |
| Korea | 0.01% | 40 years repayment, including maximum of 15 years grace period | Proposed Friendship Bridge and Industrial Park |

Source: ADB, World Bank loan agreements, JICA, China Exim, India Exim and Korea EDCF



Source: Presentation by Director General of Foreign Economic Relations Department, First Myanmar Development Cooperation Forum, 20 January 2013

Figure 2.5.5.2 ODA Processing Procedures

With the expected resolution of Myanmar's arrears and the re-engagement of the international community, Myanmar is expected to gradually regain access to concessional resources. As donors re-engage with Myanmar, and gradually identify suitable projects, the share of non-concessional financing is expected to decline. The Myanmar authorities aim to use non-concessional external borrowing only to finance economically viable projects in priority sectors such as energy and infrastructure, at levels consistent with maintaining low external risk and debt sustainability.

(3) Build-Operate-Transfer Arrangement

During the period when development assistance have been stopped, except for humanitarian activities and cross-border arrangements with neighboring countries, major infrastructure development in Myanmar have taken place through Build-Operate-Transfer (BOT) arrangements, either through tender or direct negotiation with the concerned Union ministry or department. Through such arrangements, the government grants the right to occupy and develop land to an entity and may also participate as an equity holder in the entity, which has been granted land use rights. In such a case, the said entity may acquire a specific status under the Special Companies Law.

While Myanmar does not have a specific legal framework for BOT undertaking, a combination of existing and recent laws and regulations may form the basis of the arrangement. BOT approach is preferred in Myanmar taking into account the restrictions on land ownership (allowing instead the right to lease or use land for at least 50 years) and the restricted or prohibited industries where the private sector can participate as identified in the amended Foreign Investment Law.

Table 2.5.5.5 presents a list of selected transport projects implemented as BOT arrangement. The Ministry of Construction successfully awarded the toll road projects, while the new Yangon airport is under tender award stage by Department of Civil Aviation.

Table 2.5.5.5 Selected Transport BOT Projects

| Sub-sector | Project Title | Private Concessionaire |
|------------|--|--|
| Road | Mandalay-Lashio-Muse National Road (Lashio-Muse Section) | Asia World Group |
| | Mandalay-Lashio-Muse National Road (Nawngkio-Lashio Section) | Asia World Group |
| | Mandalay-Lashio-Muse National Road (Nawngcho-Lashio Section) | Asia World Group |
| | Hseni-Kunlong-Chinshwehaw Road | Asia World Group |
| | Mandalay-Lashio-Muse National Road | Asia World Group |
| | Meiktila-Taunggyi-Kengtong-Tachileik Road (Kengtong-Tachileik Section) | Homg Pan Construction Co.,Ltd. |
| | Mandalay-Lashio-Muse National Road (Mandalay-Pyinoolwin-Wetwun-Nawngcho Section) | Asia World Group |
| Airport | New Hanthawaddy International Airport | On-going tender with 11 firms shortlisted and four firms submitted technical and financial proposals |

Source: Ministry of Construction and Department of Civil Aviation

Unless clear legal basis and procurement guidelines for BOT projects are drawn by the Union Government, transport projects tendered under BOT arrangement would likely be transformed into joint venture projects with any of the transport-related ministries or

authorities.

(4) Joint Venture Arrangement

Most of the transport-related joint venture-structured projects are components of Special Economic Zone development, which gain much ground in preparation and construction with the passage of the Special Economic Zone Law (SEZ Law) and Dawei Special Economic Zone Law (DSEZ Law) in January 2011.

To this date, there are 18 private-operated industrial zones across the country, contributing about 20% of Myanmar's GDP. The government has actively promoted greater public and private sector investments into the industrial zones to generate jobs and technological development. Myanmar expects to overcome infrastructure bottlenecks and promote foreign direct investment to the Special Economic Zones.

Three key SEZ projects being developed with private funds are:

- (i) Dawei Special Economic Zone in the southern Taninthayi region, with investors from Thailand;
- (ii) Kyauk Phyu Economic and Technology Zone in the western Rakhine state, with investment from China; and
- (iii) Thilawa Special Economic Zone near Yangon, with the support from Japanese industries.

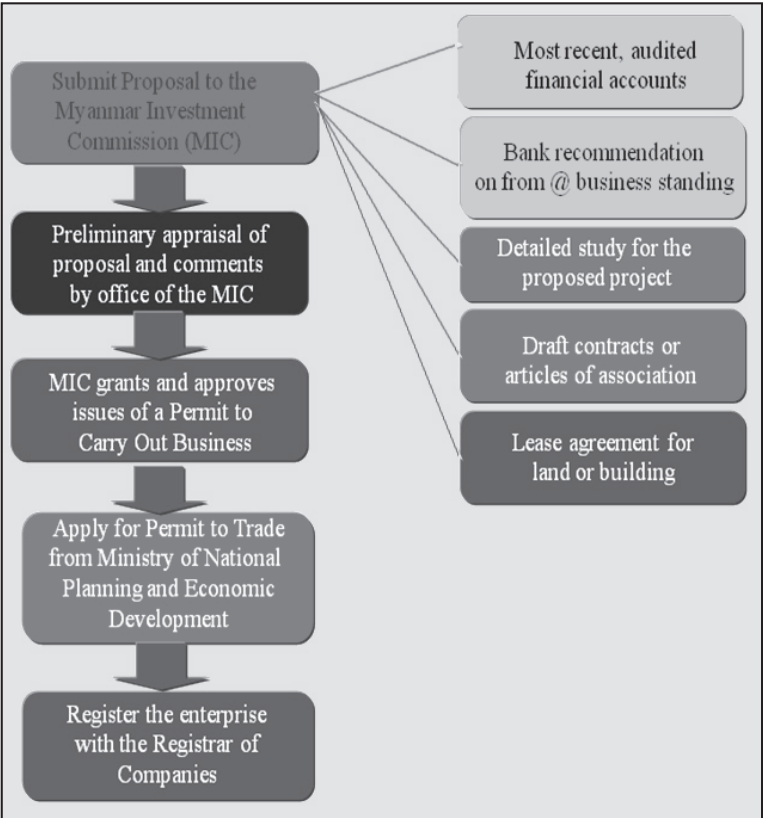
The associated transport projects for each SEZ are listed in Table 2.5.5.6.

Table 2.5.5.6 Transport Projects in SEZs under Joint Venture Arrangement

| SEZ | Project Name | JV Partners |
|------------|--|---|
| Dawei | Proposed Dawei Deep Sea Port; roads connecting the Dawei project to border province of Kanchanaburi (Thailand) | Dawei Development Co. Ltd. (majority owned by Italian-Thai Development Public Co. Ltd.) |
| Kyauk Phyu | Muse-Kyauk Phyu Railway Project | CITIC (China) |
| | Proposed oil wharf, airport, highway bus terminal (general invitation for investors) | |
| Thilawa | Myanmar International Terminals Thilawa | Hutchinson Port Holdings |
| | Botataung No.1 Inland Container Depot | Allied Container Services Singapore |
| | Nos. 1-4 Alone Wharves | Asia World Port Terminal |
| | Thilawa Plot. 4 | Myanmar Integrated Port Limited |

Source: Myanmar Investment Commission; Myanma Ports Authority

The typical procedure for structuring joint venture investment in Myanmar is shown below.



Source: Ministry of Tourism website

Figure 2.5.5.3 Joint Venture Arrangement Procedures

(5) Privatization of State Economic Enterprises

The state owned economic enterprises of Myanmar face various problems in operations and financing, notably: operating losses that translate into added deficits in the Union budget; scarcity of funds for capital expansion and operational improvements, heavy debts; and inability to realize their full production capacity. For these reasons, the Union Government recognized the imperative to transfer most of the state owned enterprises to the private sector.

There are about 33 State Economic Enterprises under the government ministries, while there are 652 industry enterprises owned by government agencies in 2010, operating in food and beverages, clothing, construction materials, personal goods, household goods, printing and publishing, industrial raw materials, mineral and petroleum products, agricultural equipment, machinery and equipment, transport vehicles, workshops and dockyards, etc. Out of 33 Sate Economic Enterprises, four enterprises are under the Ministry of Transport, including the Inland Water Transport, Myanmar Port Authority, Shipyards, and Airways, which are to be privatized within the next three years.

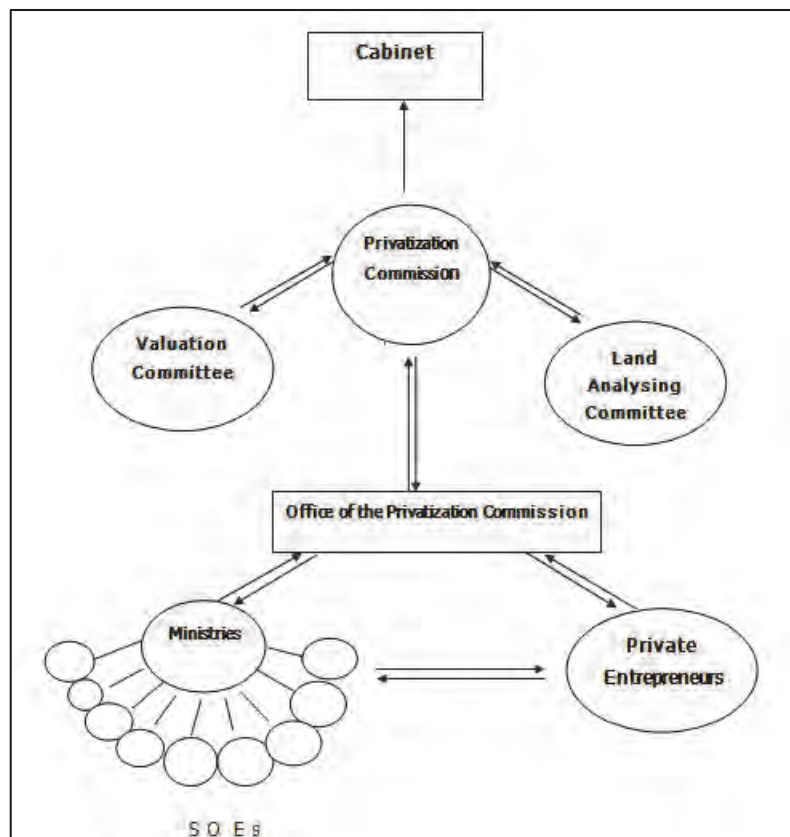
The government’s privatization policy aims to: (i) increase the efficiency of enterprises through competition; (ii) harness the financial, technological and management strengths of the private sector and increase the their role in the development of the state economy; (iii) to facilitate the market oriented economic system being introduced by the state.

Privatization programs are implemented through Privatization Commission for State Economic Enterprises. The Project Appraisal and Progress Reporting Department under

the Ministry of National Planning and Economic Development carries out the office work of the Privatization Commission for State Economic Enterprises. Figure 2.5.5.4 shows the privatization approval process.

Myanmar introduced the privatization plan in 1995, which has been implemented through auctioning and leasing or establishing joint ventures with local and foreign investors. More than 90 state-owned businesses were privatized in 2008, more than 300 in 2009, more than 100 in 2010, and 76 privatized in 2011. The liberalization in the ports subsector in Myanmar allowed Hutchison Port Holding (HPH) to develop the Port of Thilawa (Myanmar International Terminals Thilawa).

For transport project finance, the privatization approach could be explored in combination with ODA loan financing (e.g., privatization of operation and maintenance of the transport facility/system completed with ODA support).



Source: Ministry of National Planning and Economic Development website

Figure 2.5.5.4 Approval Procedure for Privatization of State Economic Enterprises

3) Innovating Funding Sources

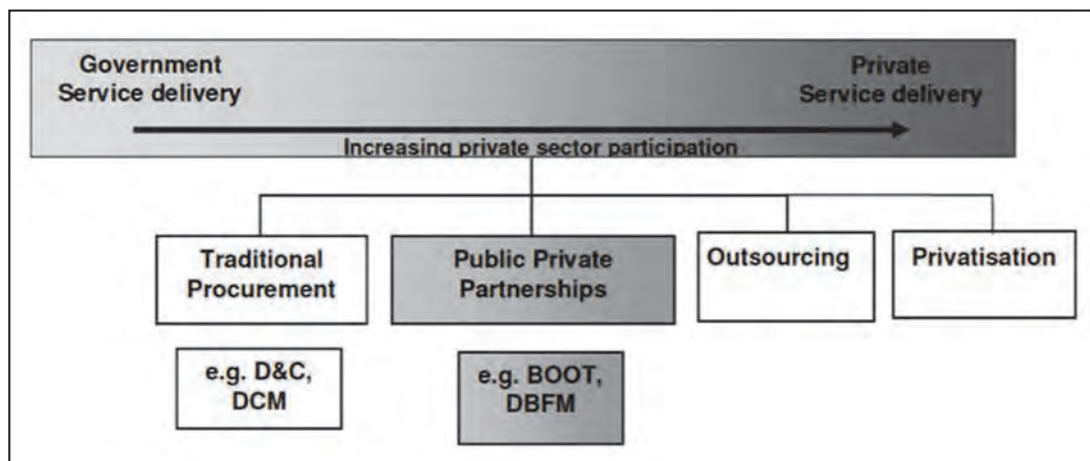
(1) Public Private Partnership (PPP) and ODA Financing

In the 10 years, PPP as the preferred financing scheme for infrastructure projects has been increased significantly in developing countries. The main purpose of PPP is to achieve value for money and to deliver better quality of services for the same amount spent by the public sector. A second but equally important reason is the need to provide increased infrastructure provision and services within imposed budgetary constraints by utilizing private sources of finance via off balance sheet structures, and to accelerate

delivery of projects which might otherwise have to be delayed.

PPP projects are part of a broader spectrum of contracted relationships between the public and private sectors to produce an asset or deliver a service (Figure 2.5.5.5). The key benefits of PPP implementation are:

- (i) Potentially deliver significant benefits in design, the quality of services, and the cost of infrastructure; and
- (ii) Draw upon the best available skills, knowledge, technology, and resources in the private sector.



Source: National Public Private Partnership Guidelines, Infrastructure Australia, December 2008

Figure 2.5.5.5 Public and Private Delivery Systems

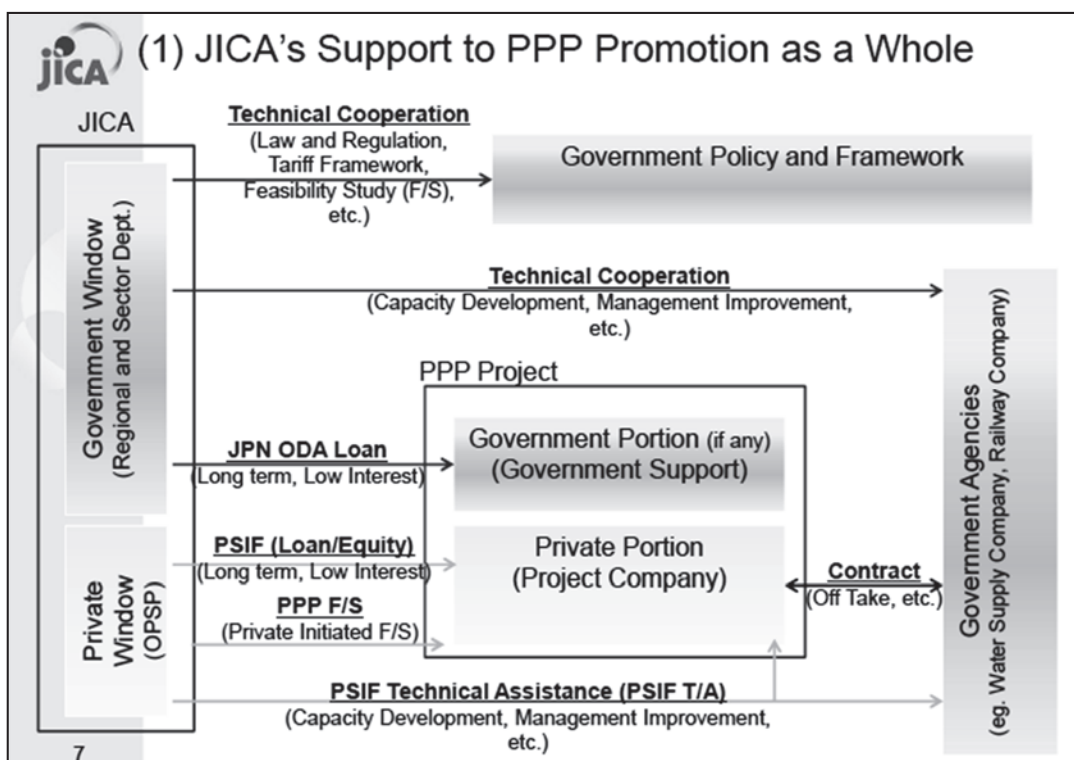
In Myanmar, the potentials for private sector financing transport projects as drawn from KPMG's infrastructure review are summarized as follows:

- (i) Roads - Under the Framework for Economic and Social Reform (FESR), the Union government has indicated that immediate priority will be given to infrastructure projects to improve land connectivity and transportation links with regional economies to boost economic integration and fulfil the country's commitments under the Master Plan on ASEAN Connectivity. To meet the goals of equitable development between the various regions in the country, the government will also prioritize development of rural-city connectivity and the maintenance and upgrading of existing road infrastructure.
- (ii) Railways - Under the FESR, the Myanmar government has committed to improve the quality of railway sections that connect important economic centers in the country, namely the Yangon-Mandalay-Myitkyitna section and the Bago-Mawlamyine section. Develop will focus on core links and services that complement the existing strategy of development rail system that connect various regions of the country to the main economic centers to promote regional equity.
- (iii) Ports - With long coastline and growth in volume of imports and exports following an increase in demand for agricultural products, minerals and natural resources, present significant opportunities in the development of port infrastructure in Myanmar.
- (iv) Airports - In February 2012, the Myanmar government announced plans to add two new international airports to meet future air traffic demand in the country. The two airports are Hanthawaddy International Airport in central Bago region and Dawei International Airport in the Dawei special economic zone. A new civil aviation master

plan will be formulated to establish the air transport needs and develop investment plans.

To date, development partners have created special PPP offices and programs to assist developing countries strengthen capability and widen financing mechanisms. Under its Strategy 2020, ADB has expanded work with the private sector to generate greater economic growth in the region. Public-private partnership (PPP) is seen as an important modality to achieve this objective, and Strategy 2020 emphasizes the promotion of PPPs in all of ADB's core operations. On the other hand, the World Bank/IFC provides advice on designing and implementing public-private partnership PPP transactions to national and city governments to improve infrastructure and access to basic services such as water, power, health and education.

While JICA has created the Office of Private Sector Partnership in 2008, it is only recently that JICA is aggressively pursuing this PPP financing scheme. JICA's efforts that promote PPPs are focused primarily on cooperation aimed at improving the business environment and the support infrastructure development in developing countries and improvement of public services through PPP in which the government and private sector share responsibilities. The general framework in JICA's assistance to PPP projects is shown in Figure 2.5.5.6.



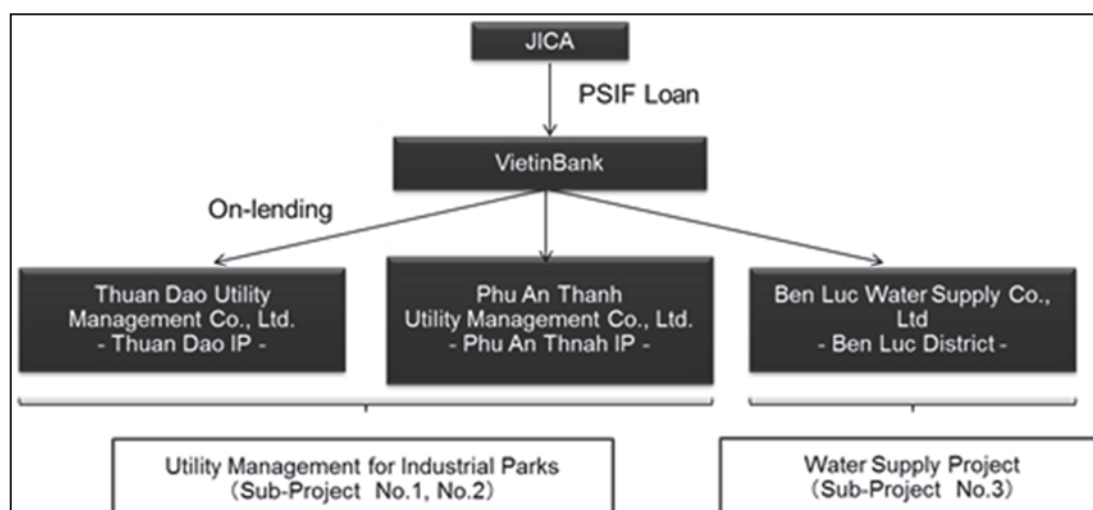
Source: Takehiro Yasui, JICA's Private Sector Partnership Activities, presentation of the Private Sector Partnership and Finance Department, JICA, April 24, 2013

Figure 2.5.5.6 JICA Assistance Scheme for PPP Projects

In January 2013, the JICA signed a loan agreement with the Vietnam Joint Stock Commercial Bank for Industry and Trade (below "VietinBank"), one of the largest commercial banks in Vietnam, for the "Utility Management for Industrial Parks and Water Supply Project." This is the first infrastructure project to use Private Sector Investment

Finance (PSIF) since it was fully resumed in October 16, 2013 based on a decision was made at a Ministerial Meeting on the Overseas Deployment of Integrated Infrastructure Systems.

Using PSIF, JICA will provide loans for facility construction to a total of three Special Purpose Companies ("SPC") (Thuan Dao Utility Management Company Limited, Phu An Thanh Utility Management Company Limited, and Ben Luc Water Supply Company Limited) that provide utility services, such as waste water treatment and electricity supply, to environmentally friendly industrial parks in Vietnam, and construct, operate and maintain a water treatment plant and related facilities that use surface water. The SPCs for implementing the project have been established with joint investments by Kobelco Eco-Solutions Co., Ltd. and Shinsho Corporation, along with local enterprises, and the water supply project will be implemented with continued assistance from Kobe City (Japan). For the assistance, JICA will provide loans to VietinBank, which will then make on-lendings to the SPCs (Figure 2.5.5.7).



Source: JICA website (http://www.jica.go.jp/english/news/press/2012/130130_01.html)

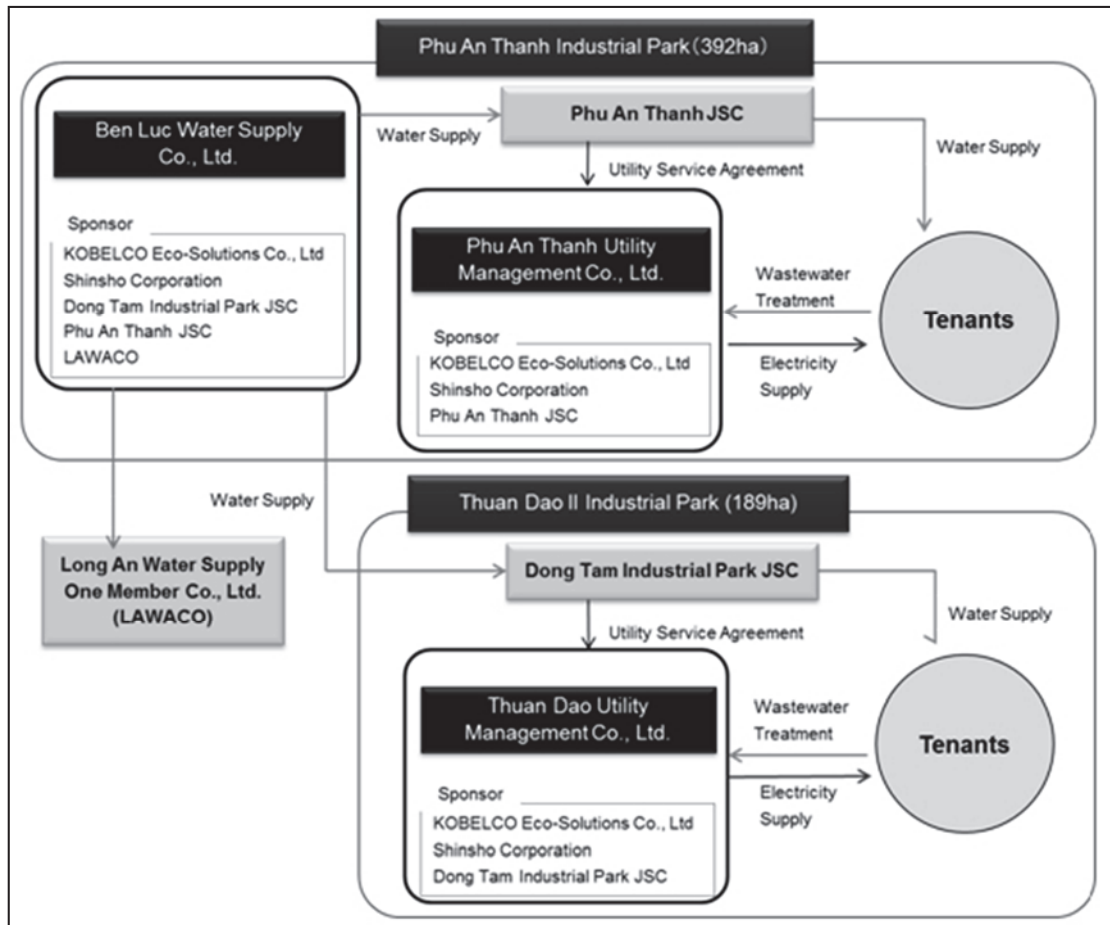
Figure 2.5.5.7 Example of Private Sector Investment Finance Scheme (Vietnam)

In this Project, JICA will provide a PSIF loan to those private infrastructure projects in Long An Province (Vietnam) to support the province's policy of development with environmental consideration. JICA expects that this project will become a successful business model for contributing to sustainable development in Vietnam, which is undergoing industrialization, and will serve as a model case for future infrastructure PPPs.

Figure 2.5.5.8 presents the Project Implementation Structure showing the responsibilities of Special Purpose Companies and other stakeholders such as the tenants and facility users.

In the water supply project, Kobe City (home to Kobelco Eco-Solutions Co., Ltd. and Shinsho Corporation) will join in by making an equity investment in the SPC through the Kobe Housing & Urban Development Corporation and the Kobe Water Services Corporation, which fall under the control of the city, and participate in facility construction, operation and maintenance of the project. This is the first initiative in Japan in which a local Japanese government is participating in a water infrastructure project with ties to private companies, and it is expected that this project will pioneer a path for infrastructure

exports in the style of Japanese PPP packages.



Source: JICA website (http://www.jica.go.jp/english/news/press/2012/130130_01.html)

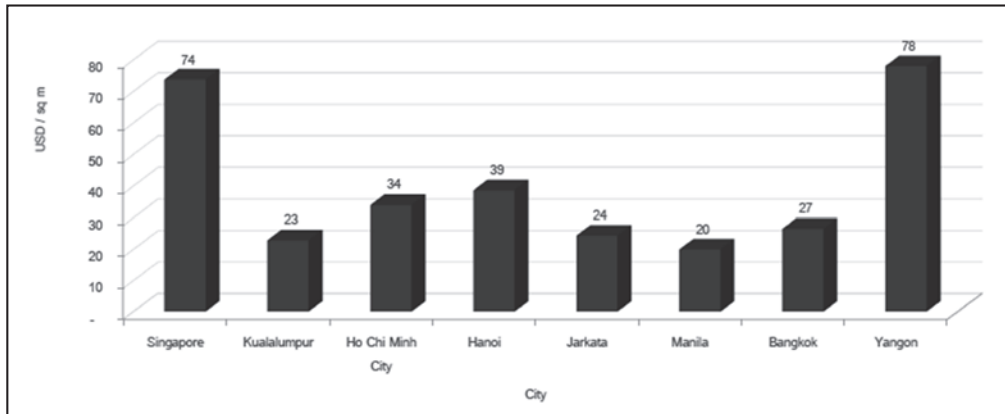
Figure 2.5.5.8 Example of Project Implementation Structure (Vietnam)

(2) Land Development in Support of Transport Projects

Myanmar's major economic center, Yangon Region, is witnessing the effects of the country's rapid transition into a new frontier market for commercial development. Hotels, serviced apartments and office space in good location are in significant demand from companies exploring investment opportunities together with tourists planning to visit a country. With demand for commercial space rising, new supply is expected to take some time to catch up and land prices and rental rates in all property sectors have risen as a result.

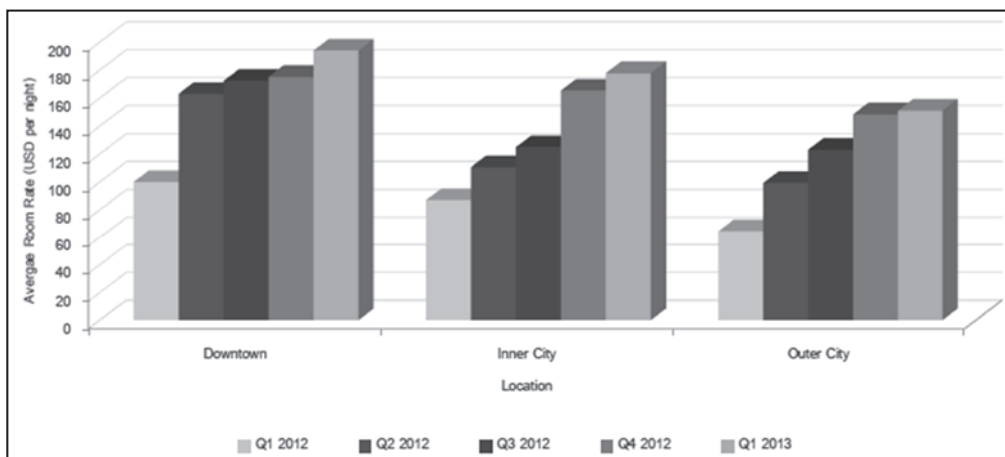
Land prices within Yangon and its outskirts have risen as much as 30% since the beginning of 2013, resulting in an increase of more than 100% over last year in some locations, especially those adjacent to industrial zones and new housing projects. On the other hand, Collier International (2013) noted the increase in space rentals, hotel room charges and lease rate of industrial sites accompanying this scarcity in real estate facilities. Figure 2.5.5.9 shows a comparison of prevailing Yangon office rental rates and those in capital cities in ASEAN. Current rent ranges from US\$1,800 to \$3,500 a month for an office, while a desk in an open area costs \$30 a day, \$150 a week or \$450 a month. Conference rooms are booked for \$40 an hour.

The prevailing room charges for hotels from 2012-2013 are presented in Figure 2.5.5.10, while Figure 2.5.5.11 indicates average industrial land lease rates. Myanmar is stepping up tenders of land plots in prime locations in Yangon for hotel development, particularly geared to: the country's hosting SEA Games 2013 and ASEAN Summit 2014 and the 44% rise in tourist arrival during the first quarter of 2013.



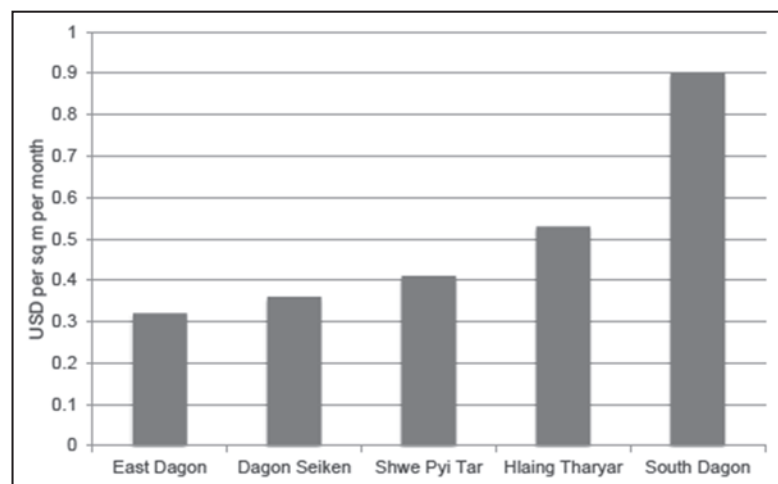
Source: Real Estate Review for Yangon, Collier International Myanmar, August 2013

Figure 2.5.5.9 Average Monthly Rental Rates for Grade A Office Space, as of Q1 2013



Source: Real Estate Review for Yangon, Collier International Myanmar, August 2013

Figure 2.5.5.10 Average Daily Rates for Hotel Rooms in Yangon



Source: Real Estate Review for Yangon, Collier International Myanmar, August 2013

Figure 2.5.5.11 Average Lease Rates for Industrial Land in Yangon

To avert the looming socio-political upheaval resulting from Yangon residents being priced out of the market by surging real estate prices and to control speculative activities, the Myanmar Government put into effect as well as plans to establish a strong regulatory framework. Recently, land valuation of the government has been updated as part of the tax reform. A draft condominium law includes provisions that will restrict foreigners to owning 40% of the units in each building. Other regulatory efforts include the development of a national building code. Table 2.5.5.7 presents the new Yangon land prices on a per square foot basis by township as used by the Myanmar Inland Revenue Department for the purpose of calculating applicable property tax.

Table 2.5.5.7 Assessed Land Values, as of October 2013

| No. | Township | Road/Street Name | 1 sq ft Rate (MMK) |
|-----|------------|--|--------------------|
| 1 | Lanmadaw | Mahabandoola Road Ahnawrahta Road, Strand Road, Merchant Road, Bogyoke Road. | 240,000.00 |
| | | Lanmadaw St, Kaingdann St, Shwe Taung Tan St, Lannthit St, Wardan St, | 200,000.00 |
| | | Inside Streets | 140,000.00 |
| 2 | Pabedan | Mahabandoola Road Ahnawrahta Road, Strand Road, Merchant Road, Bogyoke Road. | 240,000.00 |
| | | Shwe Bon Thar St, Kon Zay Dan St, Shwe Dagon Pagoda Road, Bo Soon Pat St, | 200,000.00 |
| | | Inside Streets By No. | 140,000.00 |
| 3 | Latha | Mahabandoola Road Ahnawrahta Road, Strand Road, Merchant Road, Bogyoke Road. | 240,000.00 |
| | | Bo Ywe St, Sint Oh Dan St, Latha St, Lanmadaw St, | 200,000.00 |
| | | Inside St, No. St | 140,000.00 |
| 4 | Botahtaung | Mahabandoola Road Ahnawrahta Road, Strand Road, Merchant Road, Bogyoke Road. | 240,000.00 |
| | | Botahtaung Pagoda Road, Botahtaung Market Road, Yarza Dirit St, Bo Aung Kyaw Road, Thein Phyu Road, Bo Myat Tun Road | 185,000.00 |
| | | Inside st, No. st | 120,000.00 |
| 5 | Pazundaung | Bogyoke Aung San Rd, Ahnawrahta Road, Maharbandoola Road | 240,000.00 |
| | | Botahtaung Pagoda Road, Botahtaung Market Road, Thein Phyu Road, Bo Myat Tun Road, Lower Pazundaung Road. | 185,000.00 |
| | | Wut Kyaung St, Eingyin St, Yae Kyaw St, | 90,000.00 |
| | | No. Inside streets | 70,000.00 |
| | | Nyaung Tan Housing – Inside lane | 45,000.00 |
| 6 | Kyauktada | Mahabandoola Road Ahnawrahta Road, Strand Road, Merchant Road, Bogyoke Road. | 240,000.00 |
| | | Seikkan Thar St, Pansodan St, Sule Pagoda Rd, Bo Aung Kyaw Rd | 200,000.00 |
| | | No. Inside Streets | 140,000.00 |
| 7 | Dagon | Yawmingyi St, Nawaday St, Boyar Nyunt St, | 275,000.00 |
| | | Pyi Htaung Su Yeik Thar St, Manaw Hari St | 275,000.00 |
| | | Pyay Road | 325,000.00 |
| | | Min Kyaung St, Other St, (Own Lane) | 175,000.00 |
| 8 | Bahan | Kabar Aye Pagoda Rd, Ko Min Ko Chin Rd, Bahan Rd | 325,000.00 |
| | | Inya Myaing Rd, Shwe Taung Kyar St, Than Lwin St, Kan Baw Za Yeik Thar St, University Avenue Rd, Shwe Gon Daing Rd | 275,000.00 |
| | | U Chit Maung Rd, Nat Mauk St, Sayar San Rd | 135,000.00 |
| | | San Yae Twin St, Wingabar St, Garden St, Nat Mauk Yeik Thar St, | 90,000.00 |
| 9 | Mayangone | Pyay Road | 275,000.00 |
| | | Kyaik Wine Pagoda Rd | 135,000.00 |
| | | Parami Rd, Bayint Naung Rd | 135,000.00 |

| No. | Township | Road/Street Name | 1 sq ft Rate (MMK) |
|-----|----------------------|---|--------------------|
| | | Kabar Aye Villa | 90,000.00 |
| | | Bayint Naung Holesale Market, Thiri Mon Plaza | 75,000.00 |
| | | May Kha St, Mali Kha St, | 135,000.00 |
| | | Inya Yeik Thar St, Kan Yeik Thar St, | 175,000.00 |
| | | Myaing Hay Wun Housing, Thiri Mon Housing | 60,000.00 |
| | | (4,5,6,7) Ward, Inside Streets | 55,000.00 |
| | | (4,5,6,7) Ward, Inside Streets (Inside Lane) | 45,000.00 |
| | | (8,9) Ward, Inside Streets | 45,000.00 |
| | | (1,2,3) Ward, Inside Streets | 35,000.00 |
| 10 | Sanchaung | Pyay Road | 275,000.00 |
| | | U Wisara Rd | 235,000.00 |
| | | Shin Saw Pu Rd, Dhamazedi Rd, Bagayar Rd | 130,000.00 |
| | | Home St, Kyun Taw Rd, Mahar Myaing St, Bargayar Rd, Shan Kone St, | 65,000.00 |
| | | Pan Hlaing Housing, Ma Po St, Ma Kyee Kyee St, | 60,000.00 |
| | | Baho Rd | 110,000.00 |
| | | Pathein St, Myaung Mya St, Phyar Pone St, Mau Pin St, Nyaung Tone St, Pan Chan St, Inside Streets | 45,000.00 |
| 11 | Hlaing | Pyay Road | 275,000.00 |
| | | Yangon-Insein Road | 135,000.00 |
| | | University Housing, Bayint Naung Rd | 110,000.00 |
| | | Shwe Hinthar St (Near Pyay Road), Parami Housing | 90,000.00 |
| | | Shwe Hinthar St (Inside) | 60,000.00 |
| | | Mya Kan Thar Housing, Hlaing Yadanar Housing, Aye Yeik Mon Housing, Yadanar Mon Housing, Parami Housing | 60,000.00 |
| | | Inside Streets | 35,000.00 |
| 12 | Kamayut | Junction Square | 275,000.00 |
| | | Than Lwin St, Inn Yar Rd, University Avenue Rd, Thiri MIndalar St, TCC Avenue St | 172,000.00 |
| | | Yangon-Insein Rd | 135,000.00 |
| | | Ward's inside Sts | 35,000.00 |
| | | Khaing Shwe War St | 90,000.00 |
| | | Shwe tha ya phi yeik mon, Aung Myay Thar Si Villa, Mya Kan Thar Villa, Han Thar Yeik Mon Villa | 60,000.00 |
| 13 | Tarmwe | East Horse Race Course Rd, West Horse Race Course Rd, U Pho Sein Lane, Thamain Bayun Rd | 110,000.00 |
| | | Pyar Yoe Gone St, Aung Mingalar St, Banyar Dala Rd, Kyaik Ka San St, 152-166 St | 60,000.00 |
| | | Ward's inside steets/branch lines | 45,000.00 |
| | | Ward's feeder lines | 35,000.00 |
| 14 | South Okkalapa | Wai Zayandar Rd | 110,000.00 |
| | | Thitsar Rd, Parami Rd | 75,000.00 |
| | | Yadana Rd, Thu Mingalar Rd, Myittar Rd, Mingalar Rd, Byamaso Rd, Than Thu Mar Rd | 65,000.00 |
| | | Mya Thitar Housing Estate, Zizawar Garden Housing Estate, Ngwe Kyar Yan | 60,000.00 |
| | | Inside St (3)ward, (8) ward | 45,000.00 |
| | | Inside Sts (4, 5, 6, 7, 9, 10, 13, 14, 15) | 35,000.00 |
| 15 | Mingalar Taung Nyunt | (87,99,122)Sts | 110,000.00 |
| | | Upper Pazundaung Rd | 110,000.00 |
| | | Pansodan St, Myanma Gon Yi St | 175,000.00 |

| No. | Township | Road/Street Name | 1 sq ft Rate (MMK) |
|-----|-----------------|---|--------------------|
| | | Mya Yar Gone St, Thitsar St | 55,000.00 |
| | | Maha Thukha St | 45,000.00 |
| | | Mingalar Gardan Housing Estate | 60,000.00 |
| | | (1,2,3 St, Pathein Nyunt) | 35,000.00 |
| 16 | Yankin | Pyi Thayar St, Lower Station St, Moe Kaung Rd, Parami Rd, Sayar San Rd, Yankin St | 110,000.00 |
| | | Dhamar Yon St, Shwe Thitsar St, Malar Myaing St, Myaing Malar St, Pyi Thayar Housing Estate, Tharyar Shwe Pyi St, Awaiyar St, Ani Gar St | 90,000.00 |
| 17 | Kyeemyint Daing | Strand Rd | 135,000.00 |
| | | Upper Kyeemyint Daing Rd, Lower Kyeemyint Daing Rd, Bargayar Rd | 70,000.00 |
| | | Thein Gyeemyint St, Htar Na St, Salin St, Ohn Pin St, U Kywe Hoe St, Pwe Sar Tan St, Nat Sin Rd, Thida St, Panpingyi St | 45,000.00 |
| | | Inside Sts | 35,000.00 |
| 18 | Ahlone | Strand Rd | 135,000.00 |
| | | Riverview Garden | 60,000.00 |
| | | Bargayar Rd | 70,000.00 |
| | | Ahlone Rd | 175,000.00 |
| | | Min Ye Kyaw Swar Rd | 110,000.00 |
| | | Htarna St, Ngu War St, First Thiri Yeik Thar St | 45,000.00 |
| | | Sin Yae Kan St, Tharaphi St, Inside Sts | 35,000.00 |
| 19 | Thingangyun | Wai Zayandar Rd | 110,000.00 |
| | | Wai Zayandar Housing Estate, Thu Mingalar Housing Estate, Myakya-Mallkha Housing Estate, Thiri Yadanar Housing Estate, Thiri Gone Housing Estate, Hnin Garden Housing Estate, Yadanar St, (23/Thu Wana) | 60,000.00 |
| | | Aung Yadanar Housing Estate, Thiri Nanda Housing Estate | 60,000.00 |
| | | Mya Yamone Kan Tharyar Housing Estate | 60,000.00 |
| | | Lay Daungkan St, Thanthumar Rd, Thu Mingalar Rd | 75,000.00 |
| | | Inside Sts (Big Ward) | 35,000.00 |
| | | Inside Sts (Small Ward) | 25,000.00 |
| 20 | Insein | Air Port Avenue St | 110,000.00 |
| | | Bayint Naung Rd | 90,000.00 |
| | | Insein-Yangon Rd | 110,000.00 |
| | | Station Rd | 60,000.00 |
| | | Lower Mingalardon Rd | 45,000.00 |
| | | Lan Thit Rd | 60,000.00 |

Noting wide international experience where public transport facilities are developed in tandem with their urban surroundings, commercialization of government lands as part of transport development has gain acceptance as a funding mechanism. **Transit-oriented development (TOD)**, a mixed-use residential and commercial area designed to maximize access to public transport and incorporating features to encourage transit ridership, has proven successful in both developed and developing countries when TODs were organized as public-private joint ventures in which the parties involved assume various roles in covering the costs of public transport. In a number of Asian cities, for example, the government encourage private companies to build railway lines by offering them the necessary land virtually free of charge, but gain some share in land development revenues. More importantly, the transit project is implemented with reduced contribution from the central government. In Japan, Hong Kong and Singapore, the focus of property

development with transit development is on extremely high-density housing, large-scale amusement parks, shopping malls and business centers. In United States, TODs has emerged as a powerful tool for creating livable communities near good public transit through the development of dense housing, work places, retail and other community amenities.

The U.S. Environmental Protection Agency (2013)⁵ has issued a report that details funding mechanisms and development strategies that communities can use to provide innovative financing options for transit-oriented development. The report identified innovative financing mechanisms such as:

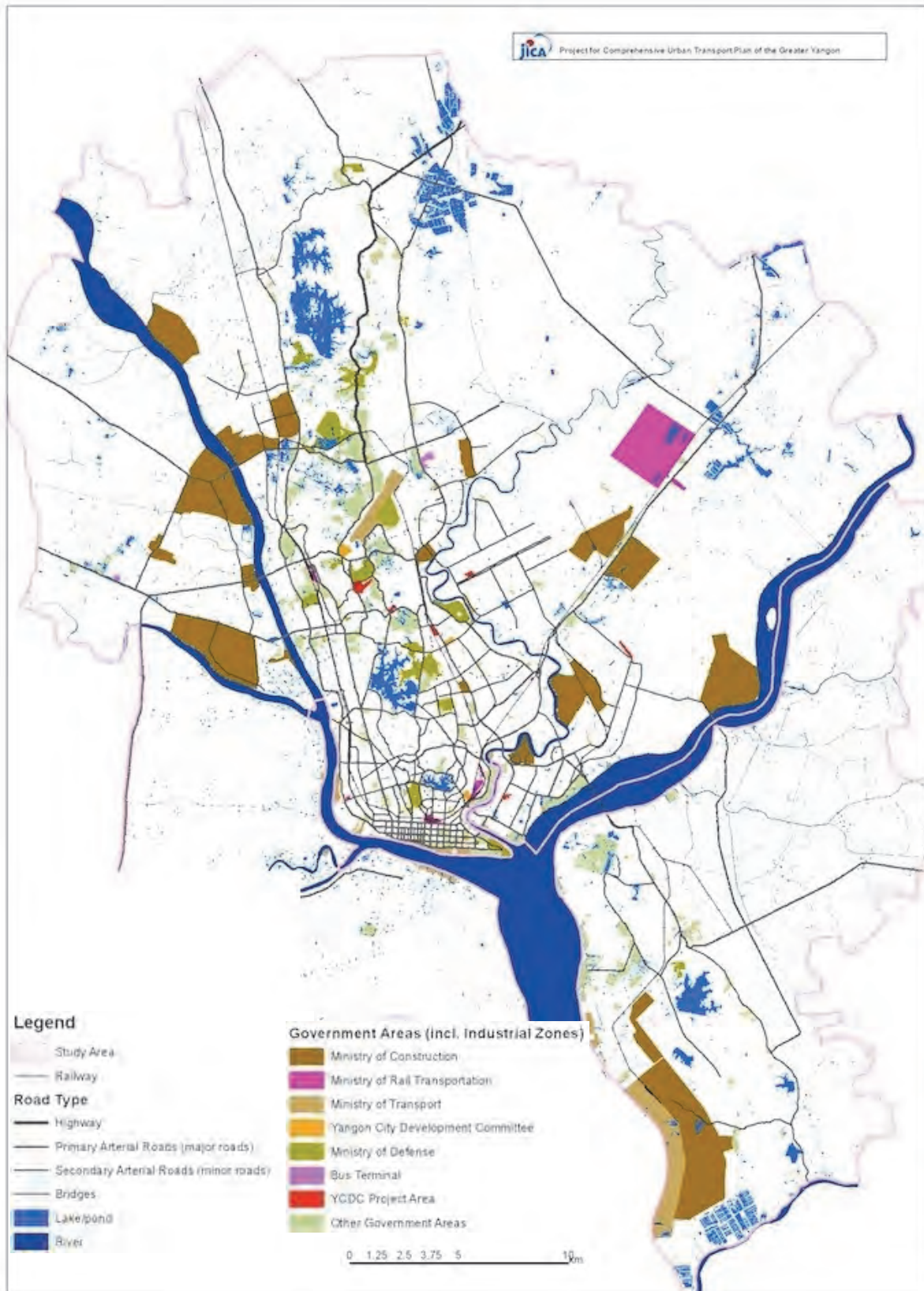
- (i) Direct fees: user or utility fees and congestion pricing;
- (ii) Debt tools: private debt, bond financing and federal and state infrastructure debt mechanisms;
- (iii) Credit assistance: state and federal credit assistance tools;
- (iv) Equity: public-private partnerships and infrastructure investment funds;
- (v) Value capture: developer fees and exactions, special district and tax increment financing and joint development;
- (vi) Grants: federal transportation and community and economic development grants and foundation grants and investments; and
- (vii) Emerging tools: structured funds, land banks, redfields to greenfields, and a national infrastructure bank.

Equity tools allow private entities to invest in infrastructure in expectation of a reasonable return. Unless the public sector is willing to directly pay the private partner for constructing, financing, operating, and/or maintaining a facility, equity sources are typically available only for infrastructure that generates a significant return, such as parking facilities, utilities, railways, toll roads, or airports. The availability of equity is not typically tied to the strength of the local real estate market, except insofar as the potential source of revenue is tied to real estate values.

Myanmar's potential to utilize land development as a means to supplement transport finance is enhanced by the substantial land holdings of the government, particularly within Yangon Region. Figure 2.5.5.12 shows the extent of land owned by Myanmar Union ministries and agencies, including the Yangon City Development Committee.

In October 2013, the Ministry of Rail Transportation announced that it has received proposals from foreign firms to upgrade the Yangon Railway Station, considered a major site for comprehensive station redevelopment. The ministry plans to invite tenders for TOD-type development of this station after permissions from the national government have been granted.

⁵ Infrastructure Financing for Transit-Oriented Development, U.S. Environmental Protection Agency, 2013, Washington DC.



Source: YUTRA Project Team

Figure 2.5.5.12 Government Lands in Yangon Region

2.6 Transport Sector Institutions and Administration

2.6.1 Overall

This section aims to introduce the government institutions involved in Road transport sector, Railway transport sector, and Water transport sector. In light of the inauguration of the new Government in March 2011, institutional structure and administrative system in both central and regional governments have undertaken gradual reforms. Therefore, roles and responsibilities as well as coordination mechanism among the relevant agencies in the transport sector has not been clearly defined yet. Figure 2.6.1.1 shows the organizations involved in the transport sector in Yangon Region.

Currently, transport related responsibilities are shared between various ministries at union level as well as city development committees, and state-owned transport enterprises at regional level. Administrative organizations under the regional transport minister are not the organizations owned by the regional Government. They are acting as regional offices of the relevant union ministries. In fact, they are under double control, i.e. they have to get order from their own vertical administrative system, meanwhile, they have to report to the regional minister.

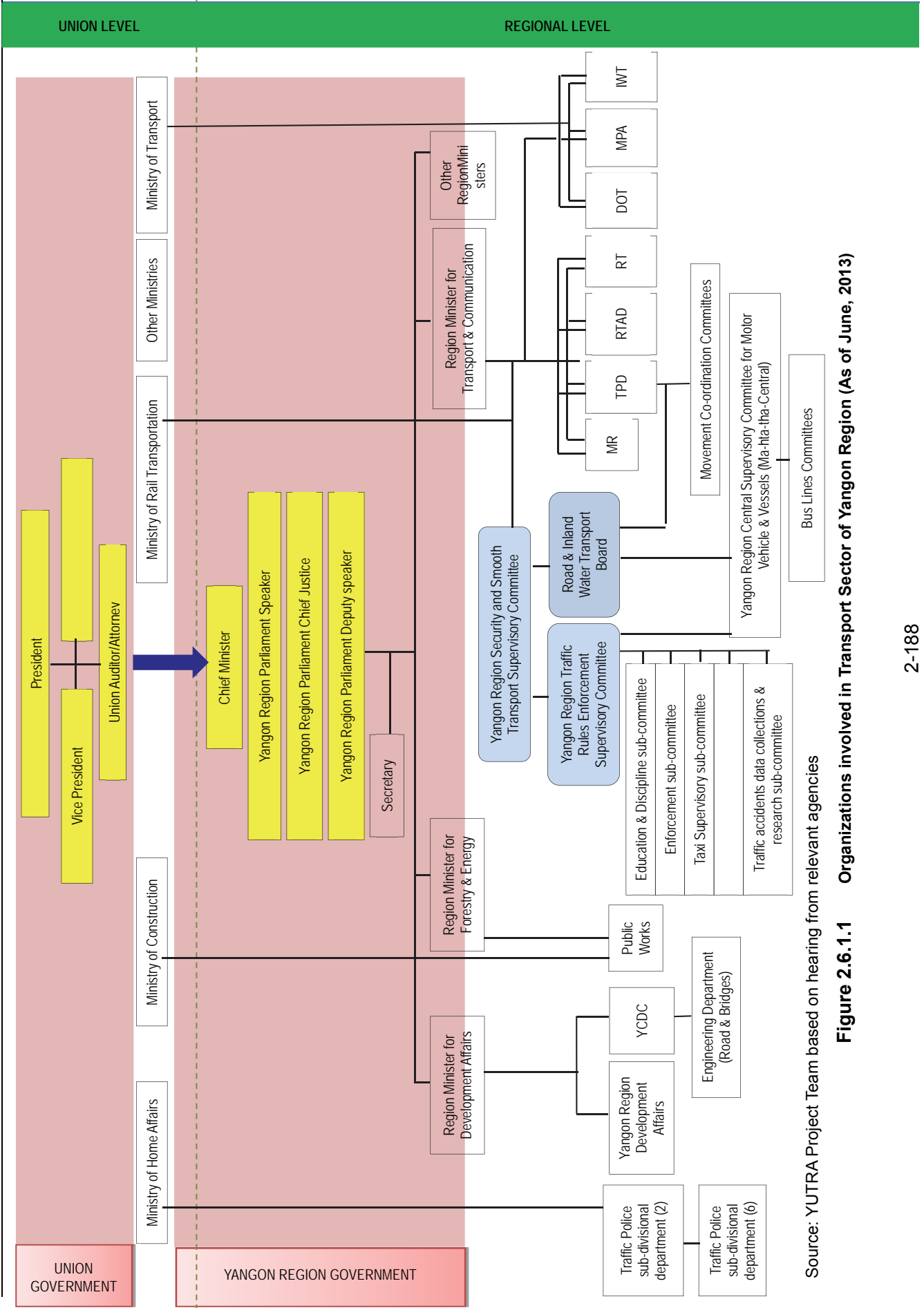
Among the government agencies overseeing the transport sector, Ministry of Rail Transportation (MORT), Ministry of Transport (MOT), and Ministry of Construction (MOC) play pivotal roles. Main responsibilities of each department are summarized in the following table.

Table 2.6.1.1 Responsibilities of each Government Agency

| Organization | Concerned Ministry | Main Responsibilities |
|---|---|--|
| (a) Road Transport Sector | | |
| Transport Planning Department (TPD) | Ministry of Rail Transportation (MORT) | <ul style="list-style-type: none"> ▪ Scrutinizing and coordinating plans, budget, and financial matters for the Ministry and its agencies ▪ Issuing licenses to commercial vehicle operators for carrying passengers and freight ▪ Managing passenger and freight logistics to ensure sufficient supply to meet demand ▪ Coordinating international and regional relations related to land transport |
| Road Transport Administration Department (RTAD) | Ministry of Rail Transportation (MORT) | <ul style="list-style-type: none"> ▪ Motor vehicle inspection and registration ▪ Drivers' license testing and issuing ▪ Preparation of road safety regulation ▪ Compiling road transport statistics ▪ Vehicle-related taxes |
| Road transport (RT) | Ministry of Rail Transportation (MORT) | <ul style="list-style-type: none"> ▪ State-owned provider of road transport services for passengers and freight |
| Public Works (PW) | Ministry of Construction (MOC) | <ul style="list-style-type: none"> ▪ Design, construction and maintenance of main and secondary roads, and bridges |
| Yangon City Development Committee (YCDC) | Region minister for Development Affairs | <ul style="list-style-type: none"> ▪ Construction and maintenance of roads and bridges within YCDC (33 townships) ▪ Traffic signal operation and maintenance ▪ Parking policy ▪ Regulation and licensing of non-motorized vehicles |
| Yangon Region Development Committee (YRDC) | Region minister for Development Affairs | <ul style="list-style-type: none"> ▪ Roads and bridges construction and maintenance outside YCDC |

| Organization | Concerned Ministry | Main Responsibilities |
|--|--|---|
| Traffic Police | Ministry of Home Affairs (MOHA) | <ul style="list-style-type: none"> Enforcement of road traffic and safety regulations |
| Yangon Region Security and Smooth Transport Supervisory Committee | - | <ul style="list-style-type: none"> Responsible in the examination of transport policies for the Yangon Region and report to the Chief Minister of Yangon Region Government |
| Yangon Region Traffic Rules Enforcement Supervisory Committee | - | <ul style="list-style-type: none"> Traffic legislation, enforcement and education |
| Yangon Region Central Supervisory Committee for Motor Vehicles & Vessels (Ma-hta-itha-Central) | - | <ul style="list-style-type: none"> Coordinating and overseeing urban bus transportation |
| (b) Railway Transport Sector | | |
| Myanma Railway | Ministry of Rail Transportation (MORT) | <ul style="list-style-type: none"> Rail transport operation and maintenance |
| (c) Water Transport Sector | | |
| Department of Transport (DOT) | Ministry of Transport (MOT) | <ul style="list-style-type: none"> Putting up higher authorities the report on implementing the objectives of long and short term plans perform by the Departments and Enterprises under the Ministry Monitoring the G.D.P growth rate of the Ministry which estimated by the states Scrutinize projects which carried out by foreign loans and focused on foreign exchange income of concerned Departments and Enterprises To consult general administration and records of Departments, Enterprises, University and Institute under MOT Taking responsibility in relation with the international and regional organization to co-operate all the action plans under air and maritime transport |
| Inland Water Transport (IWT) | Ministry of Transport (MOT) | <ul style="list-style-type: none"> Providing river transport services |
| Myanma Port Authority (MPA) | Ministry of Transport (MOT) | <ul style="list-style-type: none"> Administer all coastal ports of Myanmar |

Source: YUTRA Project Team based on hearing from relevant agencies as well as some ministries' official websites



Source: YUTRA Project Team based on hearing from relevant agencies

Figure 2.6.1.1 Organizations involved in Transport Sector of Yangon Region (As of June, 2013)

2.6.2 Ministry of Rail Transportation (MORT)

When Myanmar gained Independence, Ministry of Waterways and Civil Aviation, and Ministry of Transport, Posts and Telecommunications were formed. In 1961, the above-mentioned two ministries were merged and reconstituted as the Ministry of Transport and Communications with 11 organizations. In 1972, it was again restructured as the Ministry of Transport and Communications with 17 organizations. In 1992, it was reformed into three ministries, namely Ministry of Transport, Ministry of Rail Transportation, and Ministry of Communications, Posts and Telegraphs.

Currently, there are 5 departments under MORT.

- (i) Transport Planning Department (TPD)
- (ii) Road Transport Administration Department (RTAD)
- (iii) Road Transport (RT)
- (iv) Myanma Railways (MR)
- (v) Central Institute of Transport and Communications

MORT has overall responsibility concerning users of road infrastructure. Within the MORT, TPD and RTAD are the core service agencies.

1) Transport Planning Department (TPD)

The Central Transport and Communications Corporation were formed under the Ministry of Transport and Communications on March 16, 1972 to co-ordinate, supervise and control the transport of goods. On August 1, 1974, the Central Transport and Communications Corporations, the Directorate of Inspection, the Directorate of Training and Research, and the Directorate of Records and Statistics were merged together into one department called "Transport and Communications Planning and Operation Department".

On September 1, 1992, the Transport and Communications Planning and Operation Department were recognized into two departments and one department by the name of "Transport Planning Department" was put under the Ministry of Rail Transportation and the other "Department of Transport" was put under the Ministry of Transport.

Transport Planning Department is formed in Central and States/Regions levels. There are four divisions under TPD such as Operation Division, Planning and Budget Division, Administration Division, and Inspection, Training and Records Division. On behalf of the Minister's Office, TPD is undertaking the tasks as follows:

- (i) To issue commercial license to private/co-operative owned vehicles and vessels according to the 1963 Road and Inland Water Transport Law at various level
- (ii) To scrutinize plans, budgets and financials affairs of the organizations under MORT and to compile and prepare the summary for the Ministry
- (iii) To coordinate transportation of cargo in accordance with the 1980 Procedures of Movement Coordination Committee at various levels
- (iv) To inspect operational accounts and social welfare works of department and organizations occasionally under the guidance of the Ministry
- (v) To act as the focal point implementing the tasks for ASEAN, Greater Mekong Sub Region (GMS), BIMST-EC related land transport activities such as ASEAN Framework Agreement on the facilitation of goods in transit, agreement on inter-state transport and GMS cross-border agreement

The practicing laws and regulations are

- (vi) Road and Inland Water Transport Law (1963)
- (vii) Road and Inland Water Transport Rules (1964)
- (viii) Road and Inland Water Transport Regulation (1965)

Under the Road and Inland Water Transport Law (1963), all motor vehicles and motor vessels undertaking transportation on commercial scale, need to apply commercial license to the TPD.

TPD has being involved in two coordinating bodies namely Road and Inland Water Transport Board and Movement Coordination Committee.

(a) Road and Inland Water Transport Board

The role of Road and Inland Water Transport Board are:

- (i) To systemically mobilize road, inland water and coastal transport to ensure convenient movement at minimum cost on resources
- (ii) To provide safe and secure travel experience for the people
- (iii) To ensure harmony in transporting goods and passengers and to fix fares and tariffs to bring down commodity prices
- (iv) To issue commercial license to privately-owned road vehicles and river vessels and collect revenues

(b) Movement Co-ordination Committee

Movement co-ordination committee is formed in central and states/regions level. At the central level, the Minister acts as Chairman and the Director General of TPD as secretary. The main activities of Movement Co-ordination Committee are

- (i) Co-ordinations of State-, Cooperative- and Privately-owned vehicles for transporting State-, Cooperative-owned goods
- (ii) Co-ordinations for ensuring smooth flow of passenger transport with permission of authorities concerned
- (iii) Systematically supervises the privately-owned commercial vehicles

2) Road Transport Administration Department (RTAD)

After 1962, Revolutionary Council of Myanmar had taken the responsibility of the State. The meeting of the cabinet of Revolutionary Government of Union of Myanmar which was held on April 10, 1962, decided to make National Transportation Plan for developing systematic transportation in Myanmar. According to the decision made by the Cabinet, on September 1, 1963, "Road and Inland Water Transport Authority" was established and that authority had been cooperating in road and inland water transportation and giving guidance where necessary.

The function of motor vehicle registration and issuing driving license was handed over from Myanmar Police Force to Road and Inland Water Transport Authority on December 7, 1964. In 1972, Road and Inland Water Transport Authority was renamed as "Road Transport Administration Department" and was included one of the department under Ministry of Transport and Communication.

On September 18, 1988, State Law and Order Restoration Council reformed governmental

institutions aiming at further development in the future. In January 1992, Ministry of Transport and Communication was reformed into three Ministries, namely, Ministry of Communication, Posts and Telegraph, Ministry of Transport, and Ministry of Rail Transportation. RTAD became one of the departments under MORT.

The main objective of RTAD is for road safety. The four main responsibilities of RTAD are as follows:

- (i) Motor vehicle inspection for road worthiness and registration in accordance with the laws and regulations
- (ii) Administers drivers' license testing and issuance in accordance with the laws and regulations
- (iii) Formulates traffic regulation, road signs and signals for road safety measures and road users, analysis of traffic accident statistics
- (iv) Administer levying of taxes and collection of revenues for the State in accordance with the laws and regulations

It administers the provisions of the Motor Vehicles Act of 1964, the Motor Vehicles Rule of 1989, and other standing orders.

3) Road Transport (RT)

Road transport is one of the state-owned enterprises under MORT. RT was originally established by the Defense Services Institute in 1959 as the City Transport Company. In 1961, the City Transport Company was placed under the Burma Economic Development Corporation. In 1963, it was brought under public ownership and renamed as Road Transport Board. In 1972, Road Transport Board was reconstituted as Road Transport Corporation. In 1989, the word "Corporation" was dropped and the organization was called Road Transport according to the marked oriented system.

It provides transport services for both passengers and freight. The passenger service is organized with a fleet of 480 units of buses in 6 branches in Yangon City to operate urban and intercity transportation. It also extends service in two other major cities such as Mandalay and Mawlamyine. The road freight services are organized with the fleet of 1,398 units of trucks. Regarding contribution to development of the State, RT is now providing services to develop the projects and works, logistics from Defence, troops deployment, relief and rehabilitation works, border areas development projects, State-sponsored ceremonies and festivals, rail road construction etc. Moreover, it is also involved in transportation of cement and sugar cane for state-run projects (Source: Transport Sector Development Issues and Strategies, Myanmar).

The objectives of RT are:

- (i) Ensuring free competition and preventing the development of monopoly situations and adequate safety
- (ii) Providing transport services dutifully for the safeguard of the sovereignty of the state, border areas development, state-run development projects, state-sponsored ceremonies and other transport services required by the state
- (iii) Participation on domestic production of motor vehicles, spare parts and major-repair of our own-fleet

4) Myanma Railway (MR)

Myanma railways is one of the state economic enterprise under MORT and sole operator of the rail system in Myanmar. Its administration and organization is explained earlier in Section 2.2.2.

The objectives and responsibilities of MR are:

- (i) Convenience and fulfillment for passengers and product suppliers
- (ii) Reduction and disappearance of accidents
- (iii) Punctuality of train
- (iv) Railway track stiffness
- (v) Increasing of income and decreasing of expenditures
- (vi) Revolving the factories and workshops with fully energizing
- (vii) Reducing deficiency of locomotive and coach
- (viii) Developing and innovating machine apparatus and spared parts
- (ix) Continuous observing staff rights and welfare
- (x) Dispelling fraud and malpractice

2.6.3 Ministry of Transport (MOT)

Ministry of Transport (MOT) is responsible for air and maritime transportation. When MOT was first formed, it has 4 departments, 5 enterprises and one training institute, totaling 10 organizations. The Meteorology and Hydrology Department was added to the MOT on August 20, 1999. Myanmar Maritime University was inaugurated on 1st August, 2002. Currently, there are 5 departments, 5 enterprises, one university, and one training institute totaling 12 organizations under MOT.

MOT laid down the following transport policies to fully support the economic development of the nation.

- (i) To develop and fully utilize transport capacities to contribute towards the realization of an economically strong, modern and developed nation
- (ii) To fulfill transport requirements, and to extend and maintain the transport infrastructure to be able to fully support increased production from other economic sectors and meet growing public and social demands
- (iii) To ensure smooth and secure domestic and international transport systems as well as contribute towards the development of border areas and national races and the development of tourism
- (iv) To enable all-weather river transportation by maintenance and preservation of natural resources
- (v) To develop air and maritime transport infrastructures in line with international standards for environmental protection
- (vi) To enhance the transport sector through human resources development and upgrade expertise in management and advancing modern technology
- (vii) To abide by international conventions, acts, laws, rules and regulations with respect to the transport sector
- (viii) To develop domestic and international transportation and actively take a key role in the implementation of a national multi-modal transport system

- (ix) To plan for implementation of implement national, sub-regional and international transport networks

1) Department of Transport (DOT)

Department of Transport was established under MOT with the decision of the State Law and Order Restoration Council's meeting No. (36/92) in September 1992.

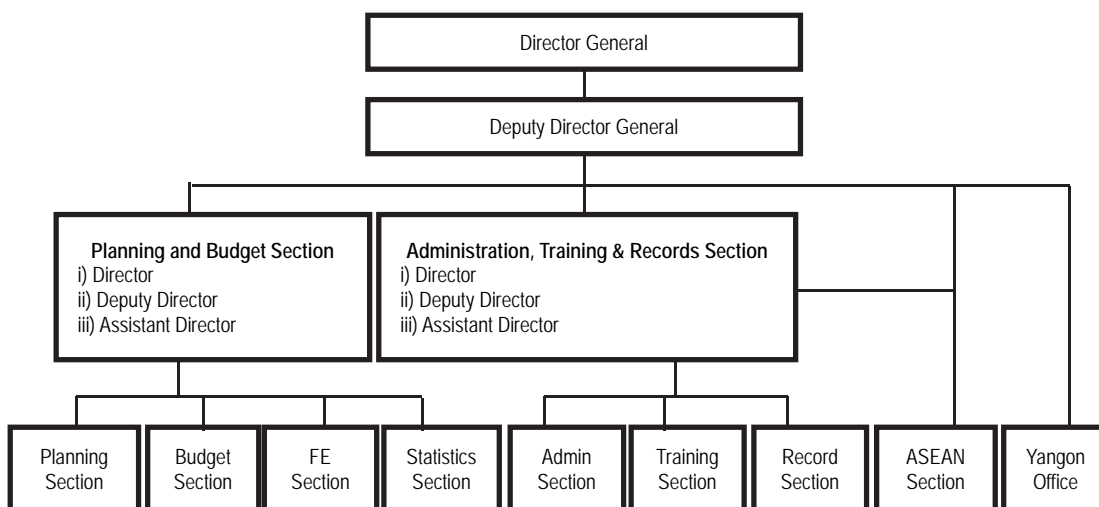
Department has organized into two sections: one is Planning and Budget Section and another is Administration, Training and Records Section. The organization chart of DOT is described in Figure 2.6.3.1.

The objectives of DOT are:

- (i) To formulate transport policies and monitor the impacts of policy initiatives
- (ii) To ensure that agreed transport policies are reflected in the laws and regulations governing the sector
- (iii) To monitor transport costs, prices and the efficiency of the transport system
- (iv) To co-operate the action plans of the international and regional organizations (eg. ASEAN, BIMSTEC, ACMECS, GMS)
- (v) To have efficient promote for human resources development relate of the transport sector

The duties and responsibilities of DOT are:

- (i) Putting up higher authorities the report on implementing the objectives of long and short term plans perform by the Departments and Enterprises under the Ministry
- (ii) Monitoring the G.D.P growth rate of the Ministry which estimated by the states
- (iii) Scrutinize projects which carried out by foreign loans and focused on foreign exchange income of concerned Departments and Enterprises
- (iv) To consult general administration and records of Departments, Enterprises, University and Institute under MOT
- (v) Taking responsibility in relation with the international and regional organization to co-operate all the action plans under the transport sectors



Source: Ministry of Transport

Figure 2.6.3.1 Department of Transport's Organization Chart

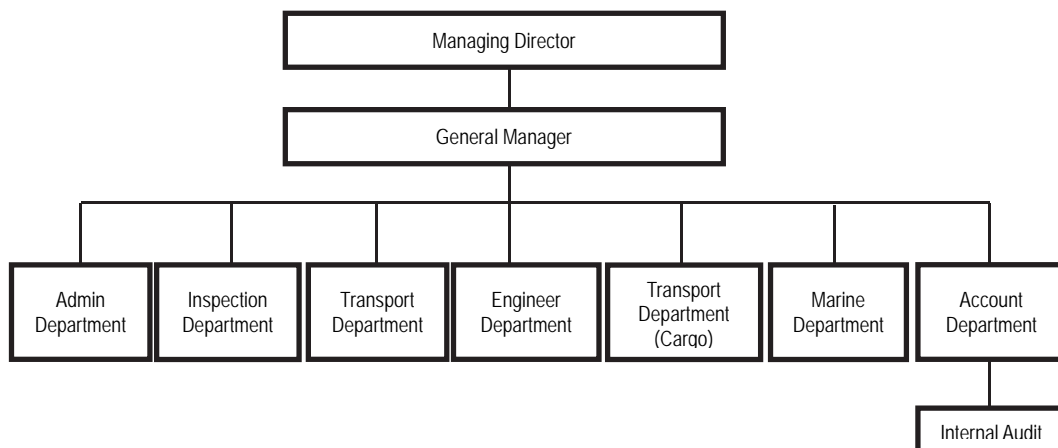
2) Inland Water Transport (IWT)

The present IWT's forerunner was setup in 1865. At that time, the organization functioned as a private enterprise under the name of Irrawaddy Flotilla Company Limited (IFCL). The IFCL was nationalized on June 1, 1948 after gaining independence from the British Colonial Rule. Under the plan to practice new administrative order, "Inland Water Transport Board" was renamed as "Inland Water Transport Corporation" on March 1, 1972. The present name of "Inland Water Transport (IWT)" has been used on April 1, 1989. The organization chart of IWT is shown in Figure 2.6.3.2.

As the state-owned enterprise for transportation, the main function of IWT is to provide river transport services in Myanmar, utilizing its facilities to optimize transport performance while meeting public requirements.

The duties and responsibilities IWT are

- (i) To carry out the transportation of passengers and freight along the navigable waterways in Myanmar
- (ii) To operate ferry services for the convenience of passengers and vehicles



Source: Ministry of Transport

Figure 2.6.3.2 Inland Water Transport's Organization Chart

3) Myanma Port Authority (MPA)

All coastal ports of Myanmar are administered by single organization Myanma Port Authority under the management of MOT (Figure 2.6.3.3). The historical background of MPA is as below.

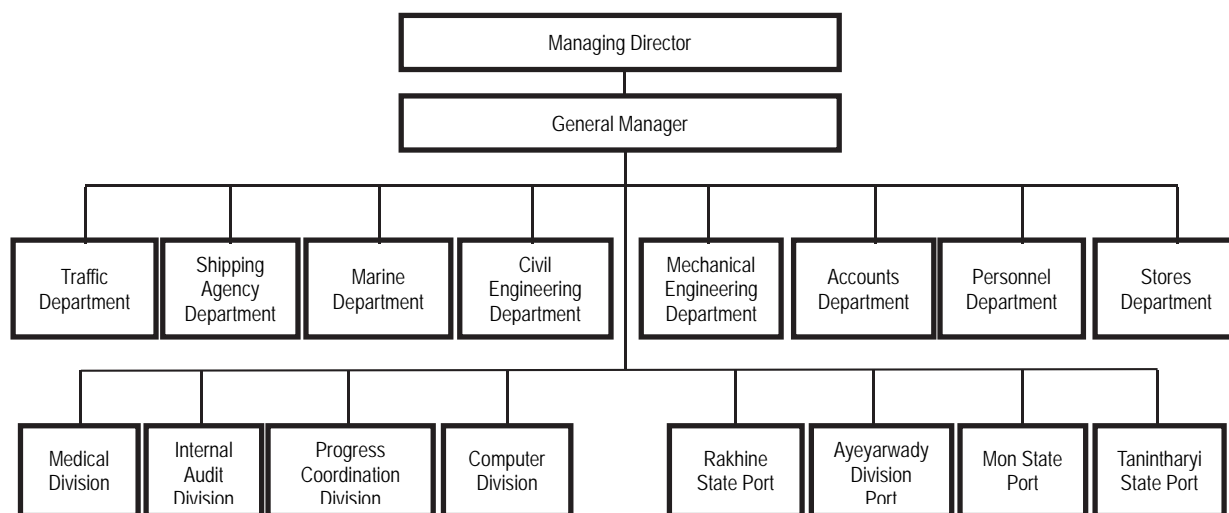
- (i) 1880 – Commissioners for the Port of Rangoon
- (ii) 1954 – Board of Management for the Port of Rangoon
- (iii) 1972 – Burma Ports Corporation
- (iv) 1989 – Myanma Port Authority

As an international relationship, MPA became as a member of International Association of Ports & Harbours (IAPH) since 1957. MPA joined ASEAN Port Association as a member in May 25, 2005.

The objective of MPA is to provide required services (loading, discharging, storage of cargoes, receipt and delivery of transit cargoes etc.) for vessels calling to the all ports of

Myanmar within the minimum ship turn round time. MPA has to handle virtually all sea borne imports and exports of Myanmar i.e. about 90% of the country's imports and exports. It carried out plans in accord with transport policies for the infrastructure development and reforms for proper evolution of the market oriented economic system in keeping with the changing economic situation. The duties and responsibilities of MPA are:

- (i) Pilotage
- (ii) Container and general cargo handling and storage
- (iii) Diving service
- (iv) Tug service
- (v) Shipping agency service
- (vi) Fire fighting
- (vii) Port security
- (viii) Fresh water supply
- (ix) Ship repairs



Source: Ministry of Transport

Figure 2.6.3.3 Myanmar Port Authority's Organization Chart

Traffic Department: The main responsibility of this department is accepting imported goods from vessels docking at the piers owned by the department, delivering goods and loading the ship. It is also responsible for leasing out building shops and plots of land within the port.

Shipping Agency Department: The main responsibility of this department is to carry out the operations of loading/unloading of sea-going vessels for convenience as the agent.

Marine Department: This department is responsible for carrying out the pilot service and providing services with regard to marine so that entering or leaving of pilot station is accessible from within the port area.

Civil Engineering Department: This department is responsible for giving technical advice, and occasionally accept prepaid outside works.

Mechanical Engineering Department: This department is responsible for inspection, maintenance and repair of MPA vessels and official vessels with or without mounted

engines.

Accounts Department: The mission of the Accounts Department is to provide accounting services and financial support to MPA.

Personnel Department: This department is responsible for taking care of MPA's blue and white collar staff starting from the time of their appointment to that of their resignation or retirement from services.

Stores Department: This department is responsible for making procurement, preservation the goods and auction.

4) Department of Water Resources and Improvement of River System (DWIR)

Waterways Department (WD) was organized and founded in 1972 by combining the Dredging and River Conservancy sections of Department of Marine Administration, Ministry of Transport and Communication and parts of Hydrographic Surveying section of Port Corporation, Ministry of Transport and Communications. In 1999, WD was reorganized and DWIR (Figure 2.6.3.4) was established.

Main objectives of DWIR are:

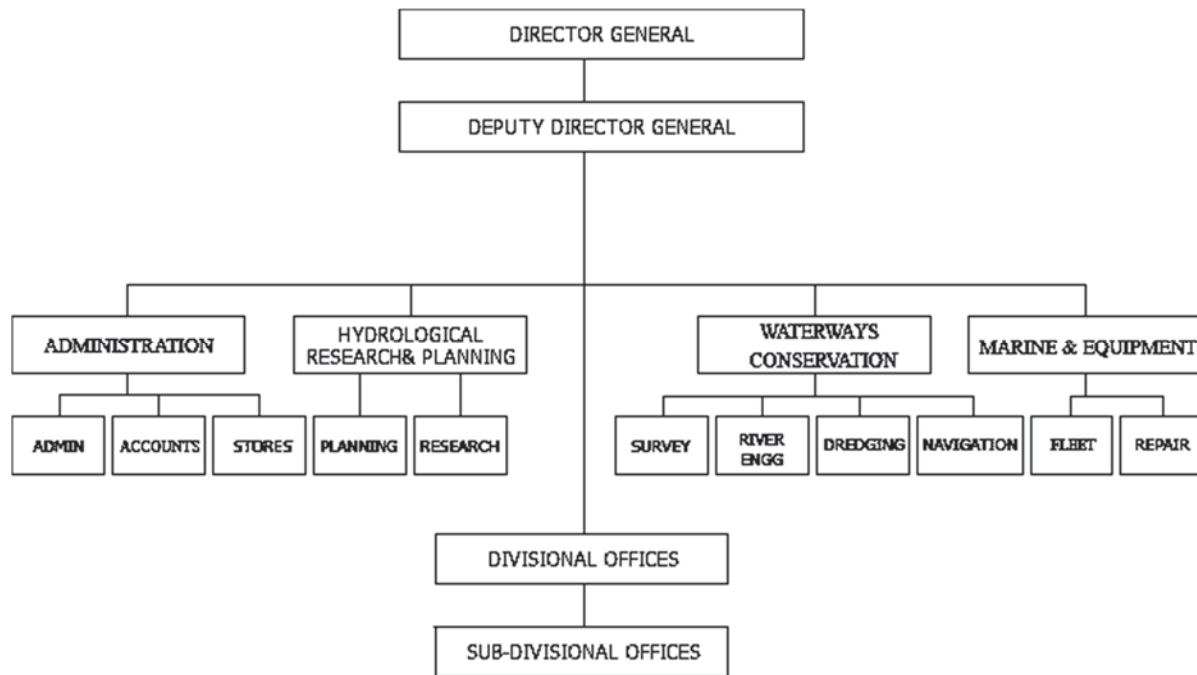
- (i) To improve the navigation channel and to stabilize the inland river ports,
- (ii) To protect the river bank erosion,
- (iii) To cooperate with other organizations in demarcation of danger water level,
- (iv) To utilize the river water for domestic and agriculture all the year round,
- (v) To protect bank erosion of border rivers,
- (vi) To observe the long term existence of the cross river bridges by river engineering points of views,
- (vii) To manage the prevention of the river water pollution and
- (viii) To achieve adequate depth for maximum loading capacity of the vessels.

DWIR maintains 6,650 km length of river as shown in the following table.

Table 2.6.3.1 Navigable Waterway Route Managed by DWIR

| No. | Route | Length (Km) |
|---------|------------------------------|-------------|
| 1 | Ayeyawady | 1,534 |
| 2 | Chindwin | 730 |
| 3 | Thanlwin and Mon State River | 380 |
| 4 | Ayeyawady Delta | 2,404 |
| 5 | Rakhine State Rivers | 1,602 |
| (Total) | | 6,650 |

Source: DWIR



Source: IWT

Figure 2.6.3.4 DWIR's Organization Chart

2.6.4 Ministry of Construction (MOC)

MOC is organized with one enterprise and one department as follows:

- (i) Public Works (Enterprise)
- (ii) Department of Human Settlement and Housing Development (DHSHD)

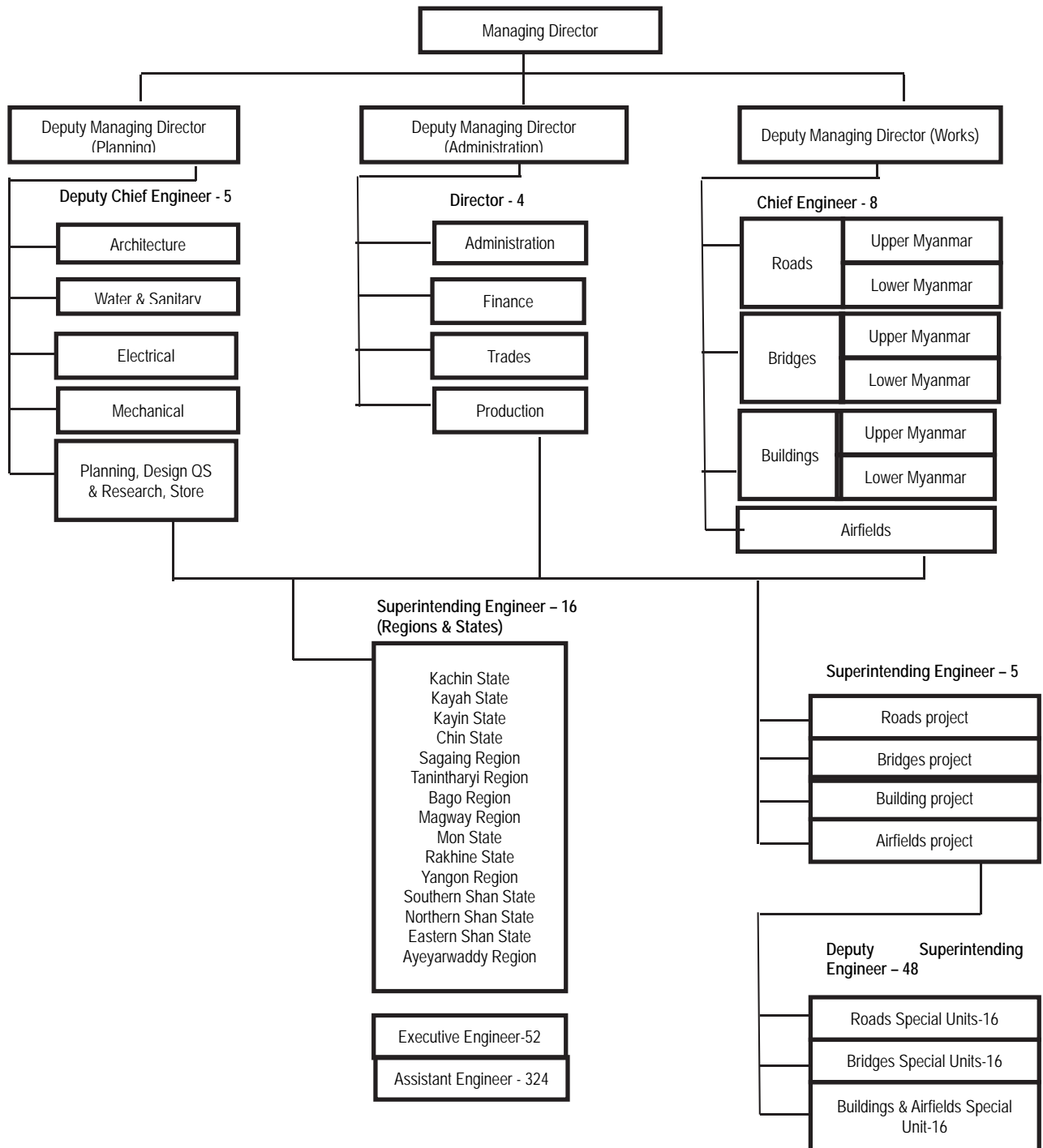
MOC's principal function related to road transport sector include:

- (i) Preparing policies for development of roads
- (ii) Preparing plans for construction of roads
- (iii) Repair and maintenance of roads
- (iv) Arranging and overseeing joint ventures with other agencies for construction and maintenance of roads
- (v) Undertaking land acquisition and clearance for construction of roads
- (vi) Importing equipment for constructing and maintaining roads
- (vii) Undertaking research related to construction and maintenance of roads
- (viii) Overseeing the Public Works Department, which provides the resources to undertake these tasks and has separate divisions responsible for roads, bridges, public buildings, and airfields

Public Works (PW): Public Works (PW) in Myanmar is found under MOC since 1965. It is the major undertakes the construction, maintenance and renovation works of government buildings and establishments assigned by the various departments and organizations concerned. PW has the responsibility for planning, construction and maintenance of most of the union highways, regional/state roads in Myanmar.

PW is managed by a management board presided over by a Managing Director in collaboration with three Deputy Managing Directors. There are eight chief Engineers and

five Deputy Chief Engineers to operate the divisions at headquarter level. There are also four supporting divisions headed by four directors, who are non-technical senior administrative officers. (Figure 2.6.4.1)



Source: Public Works

Figure 2.6.4.1 Public Work's Organization Chart

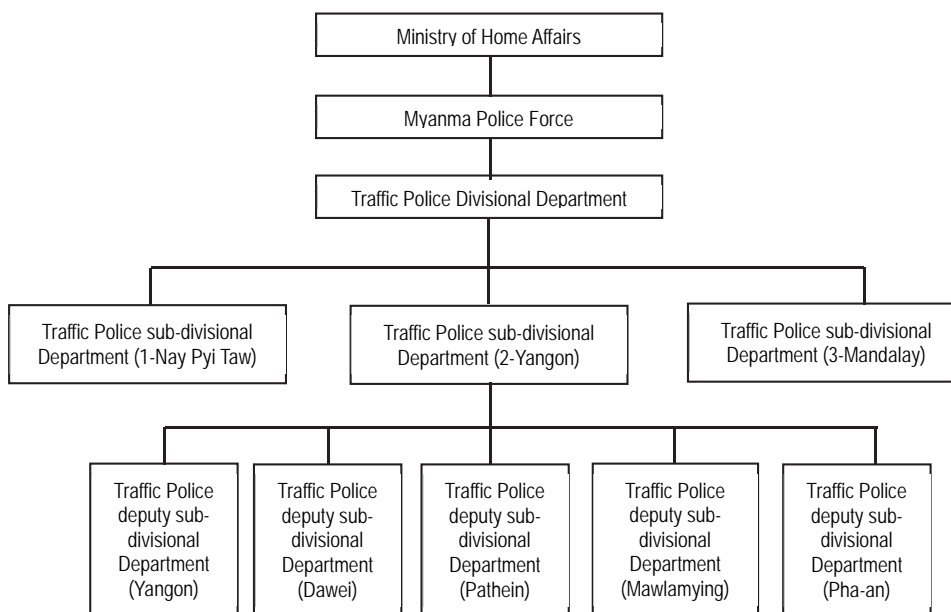
2.6.5 Ministry of Home Affairs (MOHA)

The Ministry of Home Affairs is the focal ministry of state stability, community peace and tranquillity, and law and order prevalence. There is networking among departments under the ministry, including the General Administrative Department, Myanmar Police Force, Prison Department, and Special Investigation Department.

Myanmar Police Force plays a vital role for the restoration of law and order. It has its network in all states and regions, districts, townships, towns, quarters and village groups. Traffic police divisional department under Myanmar Police Force enforce road traffic and transport and announce safety regulations. The main responsibilities are as below.

- (x) To mitigate traffic congestions and accidents
- (xi) To enforce road and traffic rules and regulations
- (xii) To give road safety awareness to public and protect from injury
- (xiii) To investigate and prosecute the traffic accident
- (xiv) To take care of road safety for VIP track, Guest track, and official ceremony of the State

The organization chart for departments involved in road traffic related activities is shown in Figure 2.6.5.1.



Source: Traffic Police Deputy Sub-Divisional Department (Yangon)

Figure 2.6.5.1 Organizations/Departments Involved in Road-Traffic related Activities

Traffic Police Department: Traffic Police Department belongs to Ministry of Home Affairs and the Yangon Region Traffic Police is responsible for the following tasks in the region.

- To reduce the accident and control the traffic congestion
- To control and supervise road and vehicles disciplines
- To give the road safety awareness to public for safety and protection from injury
- To investigate and take preventive countermeasures for the accident
- To guide and keep security for VIP traffic and official ceremony

Table 2.6.5.1 is an equipment list of Traffic Police Department (Yangon Office). According to the officer, most of the equipment, especially walkie-talkies, become aged and considered to be renewed.

Table 2.6.5.1 Equipment of Traffic Police (Sub-Office Yangon)

| ID | Type of Equipment | Number of Equipment | ID | Type of Equipment | Number of Equipment |
|----|-------------------|---------------------|----|-------------------|---------------------|
| 1 | Gun | 15 | 7 | Telephone | 8 |
| 2 | Vehicles | 15 | 8 | Camera | 8 |
| 3 | Forwarding Cycle | 12 | 9 | Reflected Coat | 54 |
| 4 | Cycle (Admin) | 10 | 10 | Reflected Light | 52 |
| 5 | VHF | 2 | 11 | Alcohol Tester | 6 |
| 6 | Walkie-talkie | 54 | 12 | Speed Meter | 6 |

Source: YRDC, 2013

2.6.6 Committees under Yangon Region Government

1) Yangon City Development Committee (YCDC)

Yangon City Development Committee (YCDC) was founded by order No. 38/85 of the Council of State dated on March 12, 1985. It was previously known as Yangon Municipal Development Board.

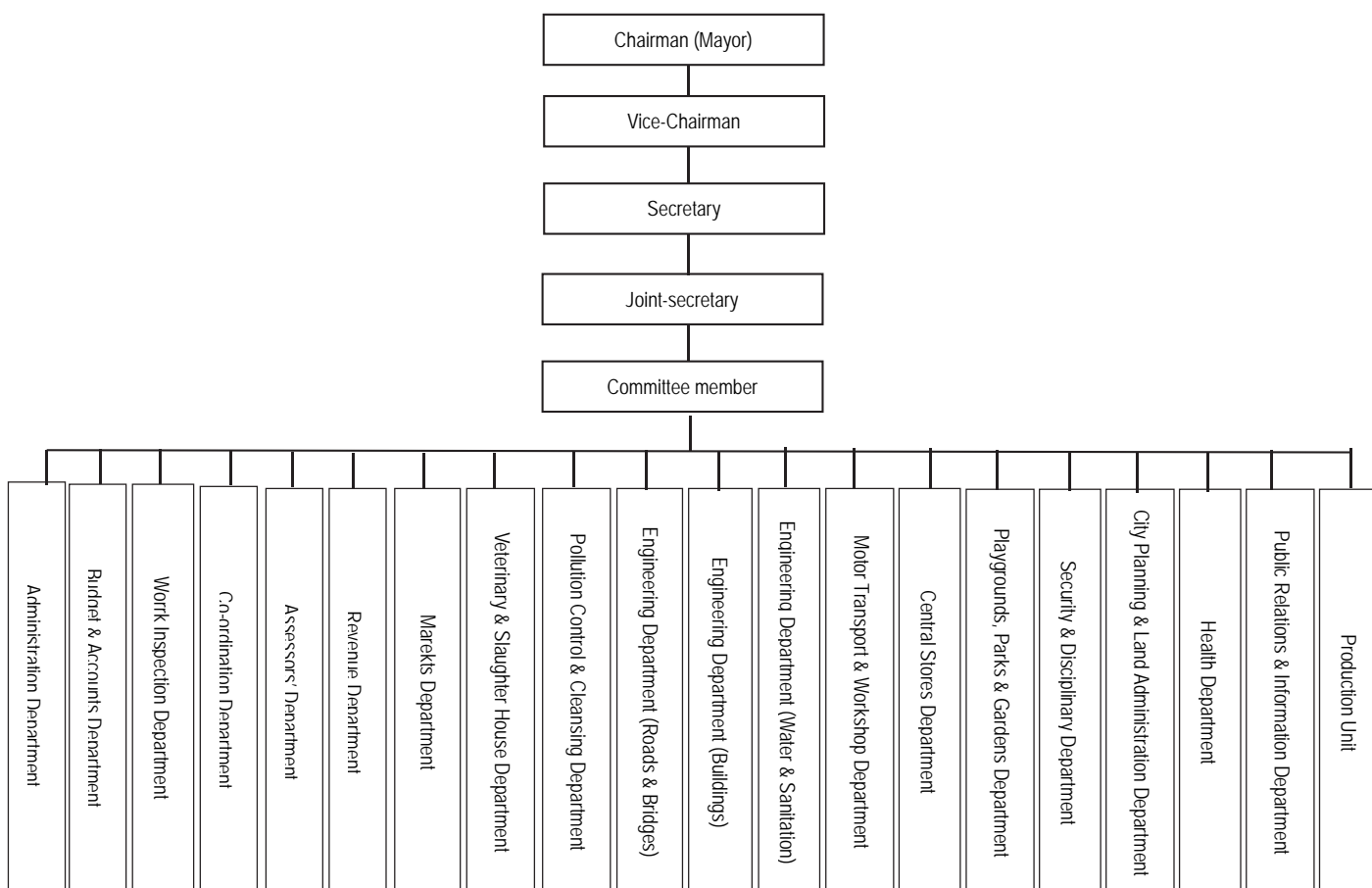
In May 14, 1990, the Yangon City Development Law formally established the present incarnation of YCDC, delegating wide responsibilities to this body, including city planning, land administration, tax collection, and development. However, YCDC is also responsible for duties stipulated in the 1922 Rangoon Municipal Act.

It consists of 20 departments, with headquarters in the Yangon City Hall. The Chairman of committee is the Mayor of Yangon and the Joint-Secretary is the Head of Service Personnel. The organization chart of YCDC is described in Figure 2.6.6.1.

The Committee shall, in respect of the following duties and responsibilities, lay down the policy, give guidance, supervise or implement:

- (i) Preparation of civil projects and establishment of new towns within the limits of the City of Yangon Municipality
- (ii) Administration of lands within the limits of the City of Yangon Municipality
- (iii) Determining only the population which should be allowed to settle properly in the City of Yangon
- (iv) Construction, repairing, and demolition of buildings, squatter buildings and squatter wards
- (v) Demolition and re-settlement of squatter huts, squatter buildings and squatter wards
- (vi) Construction of roads, bridges, and maintenance thereof
- (vii) Stipulation of conditions for traffic and parking of vehicles and slow moving vehicles
- (viii) Construction of gardens, parks, playgrounds, and recreation centres and maintenance thereof
- (ix) Carrying out works for lighting of roads
- (x) Carrying out works for water supply
- (xi) Construction of reservoirs and pipelines and maintenance thereof

- (xii) Carrying out works for sanitation
- (xiii) Carrying out works for public health
- (xiv) Construction, maintenance and administration of markets
- (xv) Stipulation of conditions in respect of roadside stalls
- (xvi) Carrying out precautionary measures against fire



Source: YCDC

Figure 2.6.6.1 YCDC's Organization Chart

Engineering Department (Roads & Bridges): Engineering Department (Roads & Bridges) under YCDC takes responsibility for maintenance of bridges and roads, including the union highways in Yangon City with Yangon Municipality area (33 townships). The duties and responsibilities of this department are:

- (i) Maintenance of roads and bridges within Yangon Municipality area
- (ii) Construction of new roads and extension of roads
- (iii) Extending and maintenance of sidewalks, excrement lanes and drainages
- (iv) Installation and maintenance of traffic signals at intersection
- (v) Setting direction sign, road signs to obey rules and regulations
- (vi) Painting pavement/lane marking
- (vii) Providing bus routes and bus stops

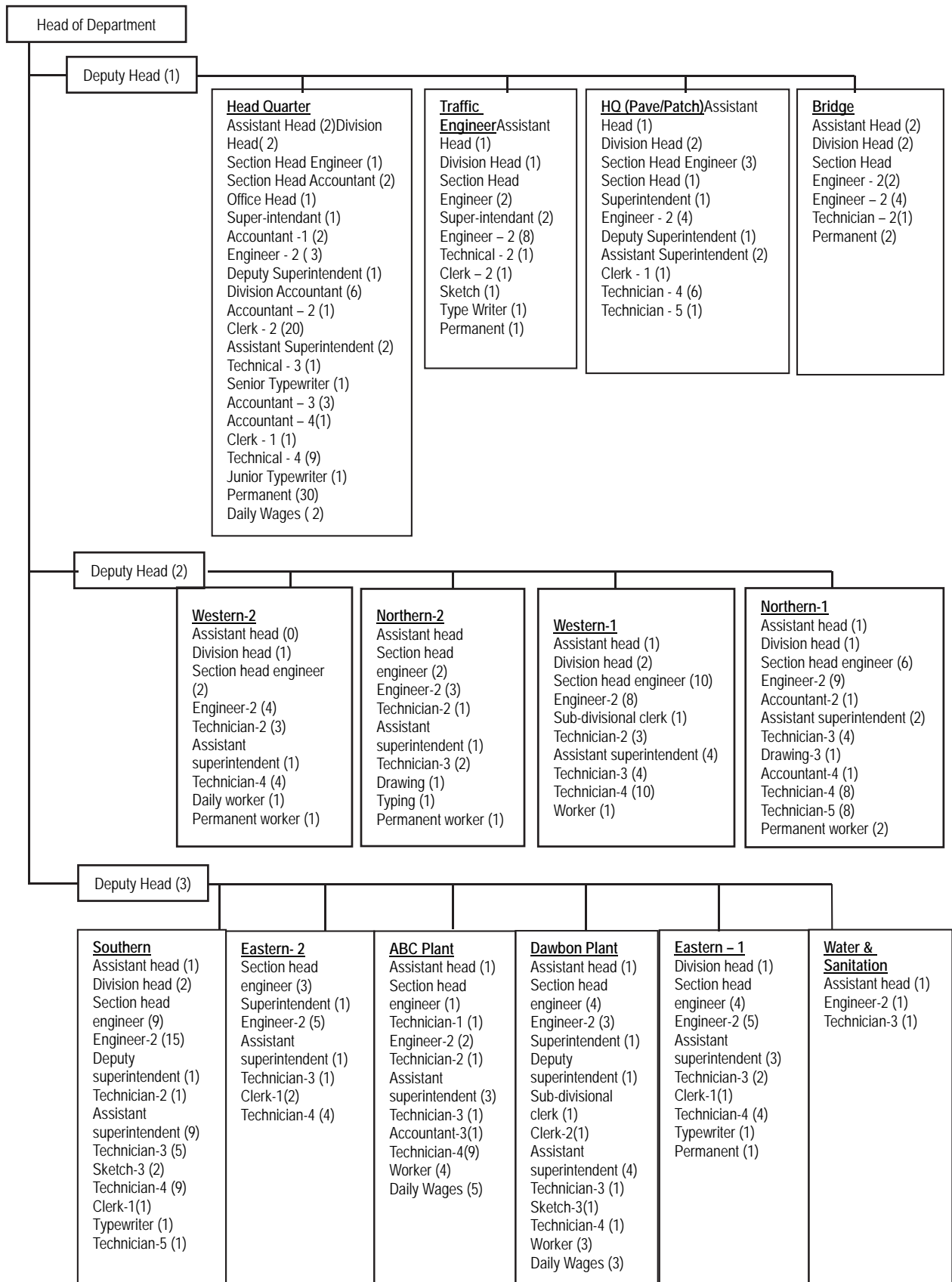
- (viii) Setting one way road and street if necessary
- (ix) Setting no-entry areas and terminal for truck and highway bus
- (x) Setting street lighting if necessary to reduce accidents
- (xi) Setting the location to build over-bridge for pedestrians and vehicles
- (xii) Controlling non-motorized vehicles to avoid traffic congestion in city center
- (xiii) Importing, filling and storage of fixed assets from domestic and foreign suppliers
- (xiv) Production of coal tar concrete and breaking of several type of stones
- (xv) Making the tiles, blocks and maintaining the concrete mixers, large grinders, heavy machines, factories and hand tools
- (xvi) Budgeting, requesting, and spending for the expense of Roads & Bridges Department
- (xvii) Construction and maintenance of the flyovers and bridges over the drainage
- (xviii) Cooperation with relevant agencies to install organization's telephones and switches
- (xix) Street lamps and renewal the bulbs
- (xx) Supervision of executive level and other ranks staff of Roads & Bridges Department

The number of staff is shown in Table 2.6.6.1. The organization chart of Roads & Bridges Department is shown in Figure 2.6.6.2.

Table 2.6.6.1 No. of Staff in Engineering Department (Road & Bridge)

| Department | No. of Staff |
|-----------------------------|--------------|
| Head of Department | 1 |
| Deputy Head | 3 |
| Eastern-1 | 22 |
| Eastern-2 | 17 |
| Western-1 | 41 |
| Western-2 | 17 |
| Southern | 57 |
| Northern-1 | 44 |
| Northern-2 | 13 |
| Headquarter | 93 |
| Traffic Engineer Division | 37 |
| Headquarter(Pave/Patch) | 23 |
| Bridge Division | 13 |
| ABC Plant | 29 |
| Dawbon Plant | 25 |
| Water & Sanitation Division | 3 |
| Total | 438 |

Source: Engineering Department (Roads & Bridges), YCDC



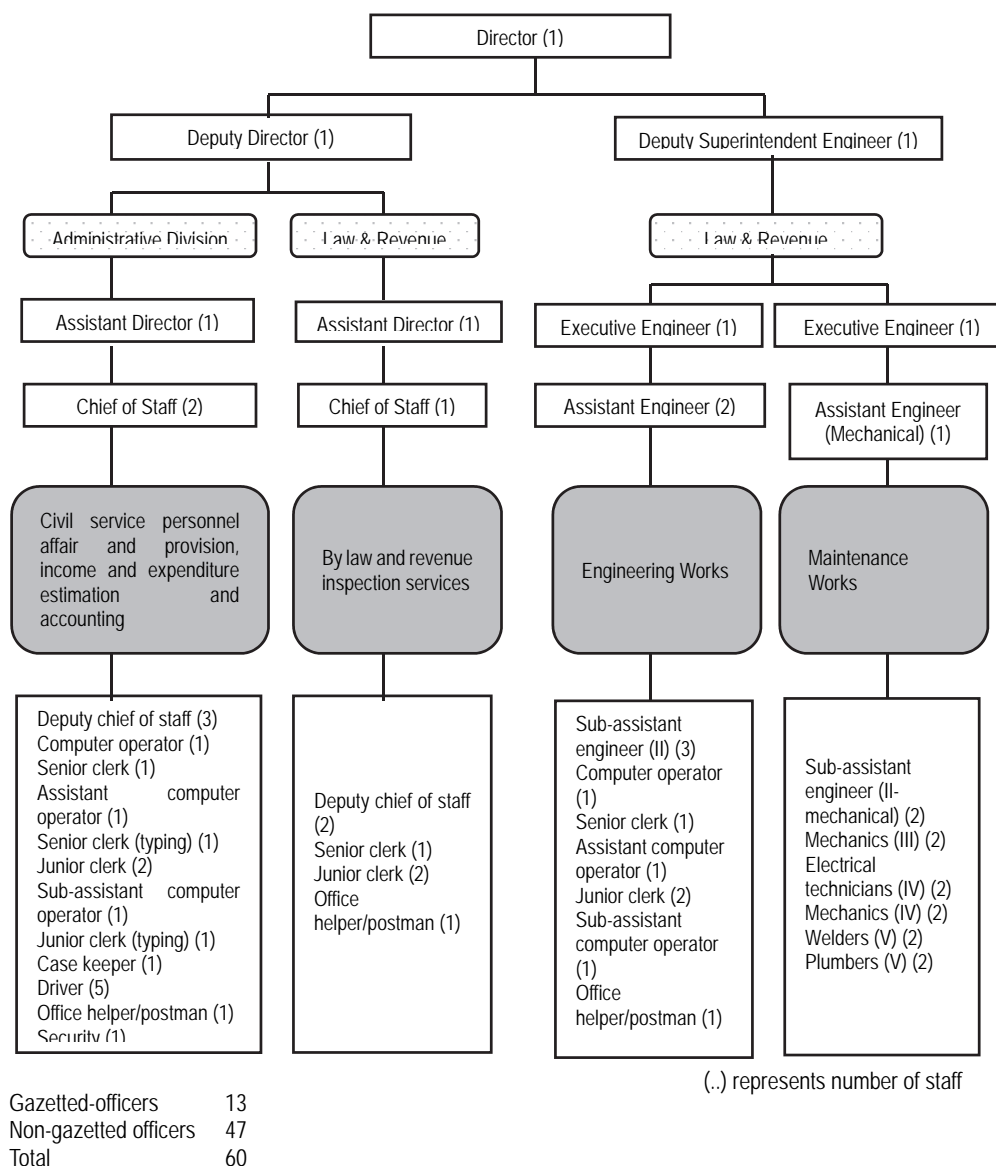
(..) represents number of staff

Source: Engineering Department (Roads & Bridges), As of December 31, 2012

Figure 2.6.6.2 Engineering Department (Roads & Bridges) Organization Chart

2) Yangon Region Development Committee (YRDC)

Local roads-most of which are within towns or villages outside of YCDC area- are the responsibility of the Yangon Region Development Committee under the supervision of Yangon Region Minister for Development Affairs. Moreover, YRDC takes responsibilities for construction, inspection, and maintenance of bridges, drainages, platforms, water tanks, water supply, lighting road lamp, gardens and playgrounds etc. YRDC is self-supporting bodies that have authority to levy local taxes and charges, subject to ministerial approval of rates. The organization chart of YRDC is shown in Figure 2.6.6.3.



Source: Yangon Region Development Committee

Figure 2.6.6.3 Yangon Region Development Committee's Organization Chart

3) Yangon Region Secure & Smooth Transport Supervisory Committee

The committee is chaired by Yangon Region Transport Minister and is responsible in the examination of transport policies for the Yangon Region and to report to the Chief Minister

of Yangon Region Government. Secretariat for the committee is from Yangon Region Transport Planning Department.

4) Yangon Region Traffic Rules Enforcement Supervisory Committee

TRESC has been established since 1989 to improve road safety measures and to reduce road traffic accidents. The committee is headed by Yangon Region Minister for Transport and Communication and organized with concerned governmental agencies of Yangon Region Government. Those organizations are as follows.

- (i) Yangon City Development Committee
- (ii) Yangon City Electricity Supply
- (iii) Supreme Court
- (iv) Yangon Region Transport Planning Department
- (v) Yangon Region Road Transport Administration Department
- (vi) Myanmar Railway
- (vii) Department of Marine Administration
- (viii) Myanmar Radio & Television
- (ix) Myanmar Motion Picture Enterprise
- (x) Myanmar Police Force
- (xi) Traffic Police Divisional Department
- (xii) Yangon Region Central Supervisory Committee for Motor Vehicles and Vessels

This committee takes the authority to handle all road traffic issues in Yangon Region and currently manage the road safety problems by holding a meeting on monthly basis, but the area covered is only in the traffic legislation, enforcement and education.

Under this committee, there are four sub-committees, namely

- (i) Education & Discipline Sub-Committee
- (ii) Enforcement Sub-Committee
- (iii) Taxi Supervisory Sub-Committee
- (iv) Non-Motorized Transport Sub-Committee
- (v) Traffic Accidents Data Collections & Research Sub-Committee

5) Yangon Region Central Supervisory Committee for Motor Vehicles and Vessels (Ma-hta-tha-Central)

Yangon Region Central Supervisory Committee for Motor Vehicles and Vessels, known locally as Ma-hta-tha (central), was established on December 2, 2009 with the aim of reducing the number of accidents in Yangon Region through coordinating and overseeing bus transport. The main responsibilities of this committee are:

- (i) To review the performance of bus operations and gives guidelines whenever necessary
- (ii) To check whether it is necessary to operate new bus route, or to extend/shorten existing bus route, or to allow for route changing which are proposed by bus lines association or private bus companies
- (iii) To know the difficulties/necessity of bus operators, drivers/conductors,
- (iv) To report immediately to the relevant organizations if any special case occur

(v) To monitor bus fare

In order to carry out above mentioned responsibilities, this committee occasionally held the meeting (hereinafter referred to as Committee Meeting). Most of the important decision is made by this committee meeting. Committee members include Yangon Region Transport Minister, Transport Planning Department, Road Transport Administration Department, Myanmar Oil & Gas Enterprise, Traffic Police Divisional Department, Ma-Hta-Tha-Central, and bus lines committees representatives.

There are total 18 bus supervisory committees, bus line committees, private companies under the oversight of this committee.

- (i) Yangon Region Bus Supervisory Committee for intra-city (Ma-hta-tha-Intra-city)
- (ii) Yangon Region Bus Supervisory Committee for highway (Ma-hta-tha-highway)
- (iii) Bus Supervisory Committee (Eastern district)
- (iv) Bus Supervisory Committee (Western district)
- (v) Bus Supervisory Committee (Southern district)
- (vi) Bus Supervisory Committee (Northern district)
- (vii) Than Myan Thu Bus Line Committee
- (viii) ShweInnwa Bus Line Committee
- (ix) YCDC bus Line Committee
- (x) MyanmaTharkaung Bus Line Committee
- (xi) Kandalawaddy Bus Line Committee
- (xii) Yangon War Veteran Organization (Inner YCDC)
- (xiii) Yangon War Veteran Organization (Outer YCDC)
- (xiv) Shwe Yangon Bus Line Committee
- (xv) ShweMyinPyan Bus Line Committee
- (xvi) GEC Bus Line Committee
- (xvii) Bandoola Transportation Co. Ltd.
- (xviii) Myanmar Golden City Link Co. Ltd.

Income to fund committee's expense is based on 0.1% and 5% of total daily revenue of private bus companies and bus line committees respectively.

Furthermore, this committee is also responsible for enforcing traffic rules that bus drivers and conductors must abide by. These include not driving under the influence of alcohol, stopping at traffic lights and being polite to passengers. Passengers can also complain to the committee if they find the behavior or language of drivers and conductors offensive.

The organizational structure of Ma-Hta-Tha-Central is shown in Figure 2.6.6.4.

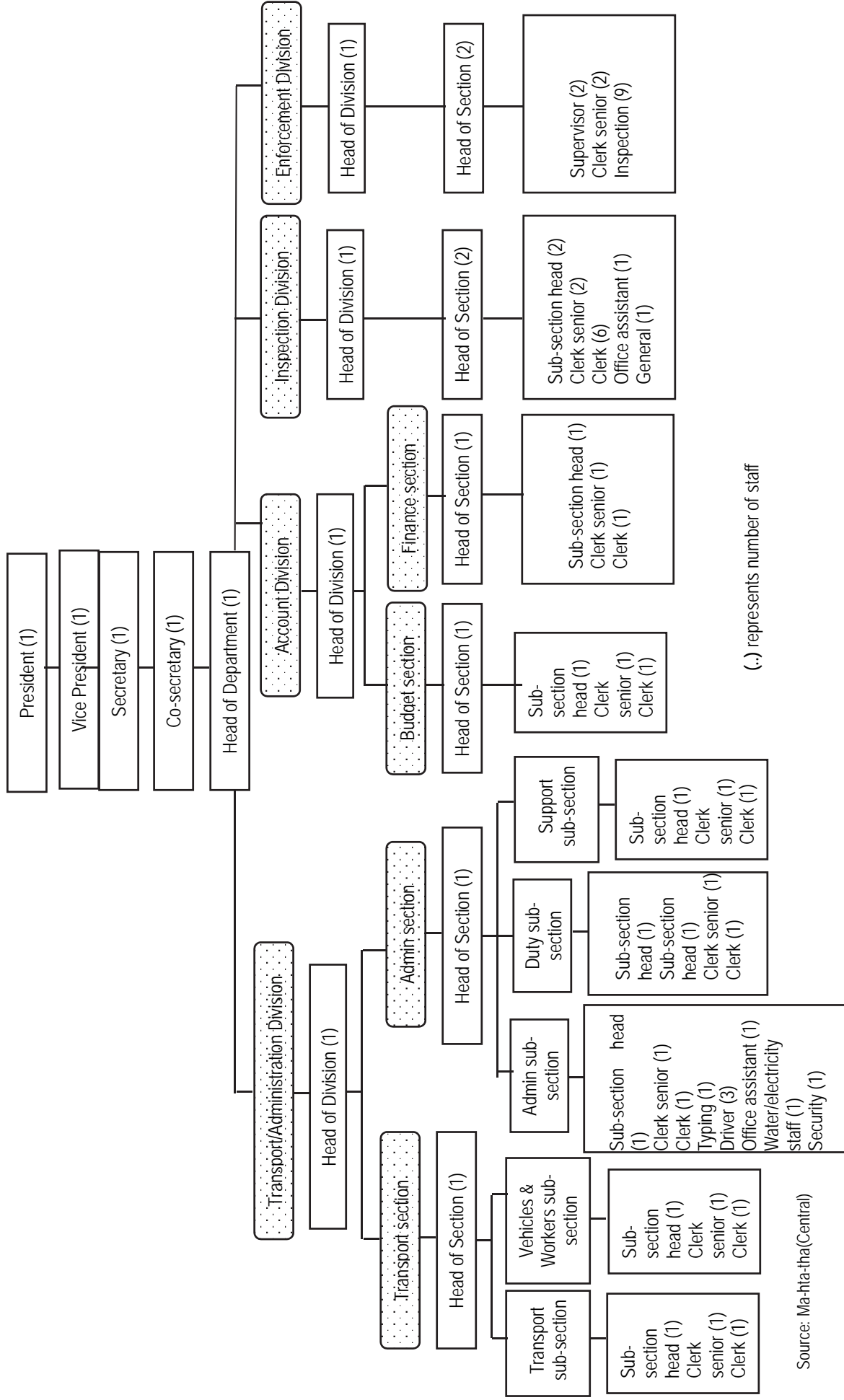


Figure 2.6.6.4 Organization Structure of Ma-hta-tha-Central (As of September 2012)

2.7 Current Transport Problems and Issues

2.7.1 Road Network and Traffic

Based on the site reconnaissance and the results of traffic surveys, the key findings and main issues to be addressed for the road network are summarized below.

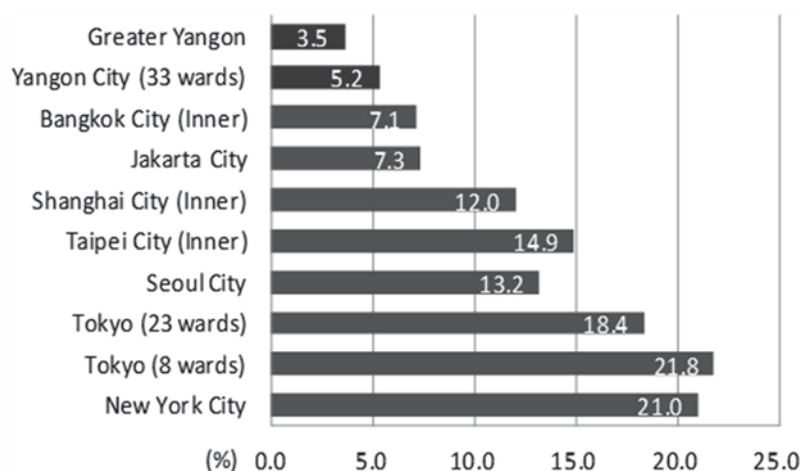
1) Lack of Hierarchy within Unclear Classification of Road

As mentioned in the previous section in this Chapter, Ministry of Construction classifies the roads into six (6) types, such as 1) Expressways, 2) Major Roads, 3) Secondary Roads, 4) Collector Roads, 5) Local Streets, 6) Cul-de-sac, and the old design standard published in 1969 is still used which covers only up to 4 lanes road. Also YCDC classifies the roads into three (3) types such as 1) Main Roads, 2) Collector Roads 3) Minor Roads.

The classifications of MOC and YCDC have not been well unified yet and the well-organized inventory list of roads by each classification does not exist even in YCDC which is responsible authority for the maintenance of roads in the city.

2) Lack of Road Network

Figure 2.7.1.1 shows the road area (per city area) of metropolitan cities comparing with Yangon City. It is obviously found that the road network of Yangon City is quite insufficient. The immediate development of the road network will be quite essential for the estimated population of 11 million in Greater Yangon toward 2040.



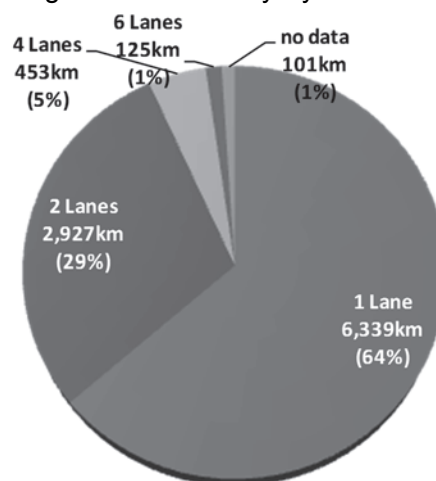
| Metropolitan Cities | Data Year | Area (km ²) | Pop. Density (pop/ha) | Road Area | |
|------------------------|-----------|-------------------------|-----------------------|--------------------|------|
| | | | | (km ²) | (%) |
| New York City | 2010 | 789 | 112 | 166 | 21.0 |
| Tokyo (8 wards) | 2010 | 110 | 121 | 24 | 21.8 |
| Tokyo (23 wards) | 2010 | 621 | 131 | 114 | 18.4 |
| Seoul City | 2009 | 605 | 168 | 80 | 13.2 |
| Taipei City (Inner) | 2007 | 134 | 197 | 20 | 14.9 |
| Shanghai City (Inner) | 2008 | 108 | 378 | 13 | 12.0 |
| Jakarta City | 2007 | 656 | 133 | 48 | 7.3 |
| Bangkok City (Inner) | 2006 | 225 | 96 | 16 | 7.1 |
| Yangon City (33 wards) | 2012 | 829 | 62 | 43 | 5.2 |
| Greater Yangon | 2012 | 1535 | 36 | 54 | 3.5 |

Source: 1) Transport Development in Asian Mega Cities, 2013, 2) GIS Data by YUTRA Project Team

Figure 2.7.1.1 Road Area of Metropolitan Cities

Figure 2.7.1.2 shows the total road length of the existing roads in the city by number of lanes. It is found that majority of the roads has only one lane width. Accordingly, the Department of Public Works, MOC has the road construction policies with the target number of lanes as listed below.

- (i) Four lanes road width for Union Highways
- (ii) Four lanes or Two lanes roads width for connected roads among Regions and States
- (iii) Two lanes roads width for connected roads among Districts
- (iv) Two lanes roads width for connected roads among Townships
- (v) Single lane road for connecting village



Source: GIS Data by YUTRA Project Team

Figure 2.7.1.2 Composition of Number of Lanes

However, the implementation of the above mentioned policies is still backward against the recent rapid increase of the traffic volume especially in the large cities such as Yangon.

In terms of the road administrative issues also, it is still transition period between the Union Ministries and the Regional authorities during the democratization process, and the task demarcation and financial resources transfer regarding the road improvement and construction is sought to be concretely established.

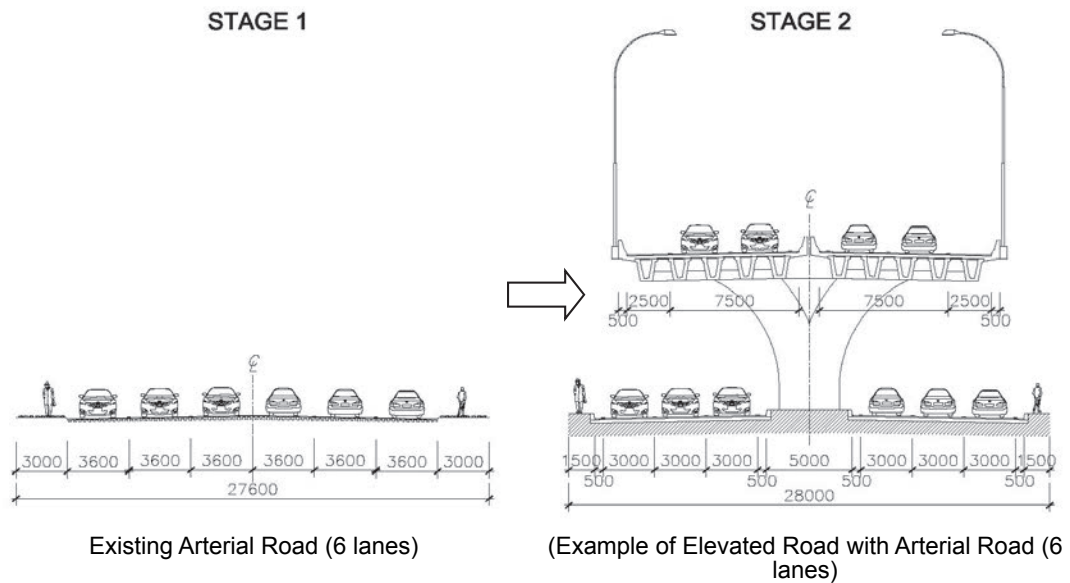
Due to lack of road network as mentioned above and recent rapid increase of the traffic volume, the capacity of the roads is getting toward the saturation. As shown in the section 2.1.2, the rapid increase of the vehicle is recorded since 2011 due to recent deregulation of car imports.

The followings are possible measures to enlarge the capacity of the road network.

- Widening of existing roads
- Construction of new roads
- Utilization of upper space on the existing roads by flyovers and/or viaducts structure
- Utilization of underground space (i.e. tunnels)

Generally, it will take a long time for the widening of existing roads and the construction of new roads in the dense build-up area due to land acquisition and resettlement issues. Therefore it is considered to utilize the upper space on the existing roads or underground space minimizing the land acquisition and resettlement. However the construction cost of road tunnels is quite expensive and it might be comparatively practical to implement the elevated urban road network as proposed in “The Project for the Strategic Urban Development Plan of the Greater Yangon”, as well as other metropolitan cities in the world.

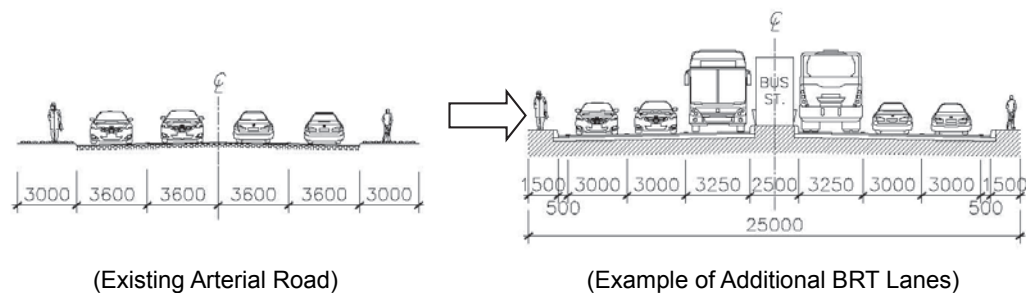
The further study/proposal of the elevated urban road (i.e. route alignment, location of interchanges, etc.) will be conducted later for the middle-/long- term development plan based on a traffic demand analysis.



Source: The Project for the Strategic Urban Development Plan of the Greater Yangon

Figure 2.7.1.3 Proposed Typical Cross Section for Elevated Inner Road

Due to land constraint and existing build-up area along the existing road network, the capacity increase by the elevated roads mentioned above will not be a fundamental solution to solve the traffic congestion and the implementation of the public transportation system such as BRT, LRT, UMRT will be requisite in parallel with the improvement by the road sector. Figure 2.7.1.4 indicates the BRT system along the existing road network minimizing the land acquisition by reducing the width of the each carriageway.

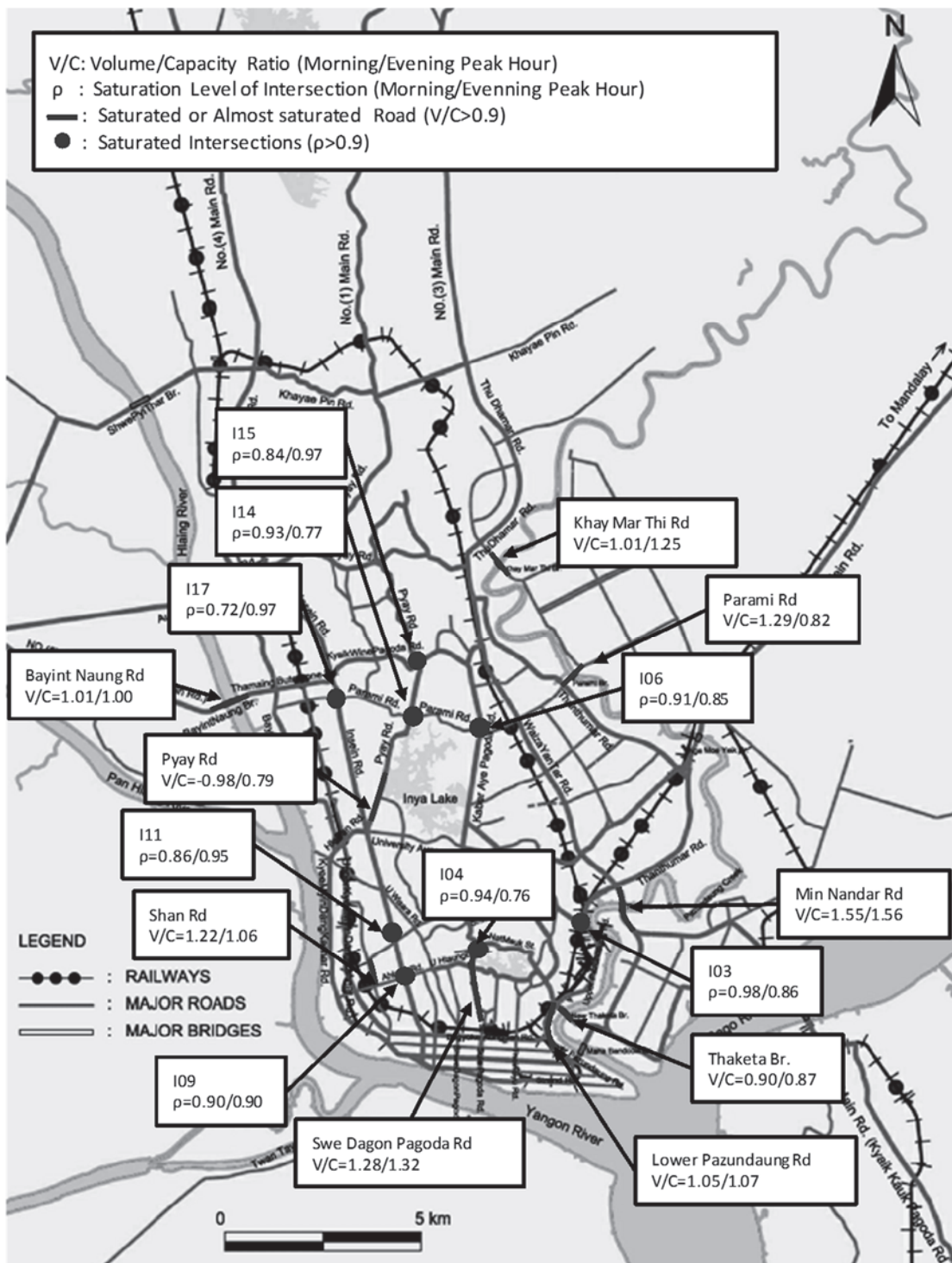


Source: The Project for the Strategic Urban Development Plan of the Greater Yangon

Figure 2.7.1.4 Proposed Typical Cross Section for BRT

3) Current Bottleneck Sections

Figure 2.7.1.5 has been prepared based on the traffic survey results in 2013 showing the bottleneck sections of the road network.



Source: YUTRA Project Team

Figure 2.7.1.5 Current Bottleneck Sections

Only single CBD is located at the south side of the city along the Yangon River and Yangon Port. As a result, a large number of vehicles are oriented to/from CBD through the 4 major north-south roads (Insein Road, Pyay Road, Kabar Aye Pagodda Road, No.2 Road).

As seen in Figure 2.7.1.5, the results of the traffic survey have recorded serious traffic jam at many intersections especially in peak hours along the 4 major north-south roads. The

existing traffic control system at the intersections such as traffic signals is conventional type with “fixed” cycle-time and is not synchronized each other. Traffic police officers are manually changing the cycle-time at the site against daily/hourly fluctuations of the traffic volume.

On the other hand, the sections between the intersections along the 4 major north-south roads have not been saturated yet even in the peak hours.

It is essential to facilitate the traffic congestion at these intersections for short-term development plan.

4) Lack of Parking Space

Parking issues have now become one of the most serious urban transport issues in Yangon reducing the capacity of the road network. Parking on the roads is restricted in designated main roads in CBD at present. However, no strict enforcement is taken. In addition, both roadsides of narrow streets in CBD have actually been occupied by parked vehicles. As the parking space is absolutely in shortage, a comprehensive parking management policy should be developed such as restriction of vehicle inflow and establishment of public parking spaces, etc. On the other hand, YCDC has plans to prepare public parking spaces at 6 selected roads.

It is noted that these proposed new parking spaces are still “on-road” parking facilities by improving a part of sidewalks for parking space and removing vender shops on sidewalks.

In addition to the above new parking space plan, the following policies are recommended:

- Enforcement of on-street parking prohibition in the selected main roads where traffic volume is high and being in dangerous condition of traffic accidents.
- Adjustments/raising of parking charges to encourage public transport usage (with explanations that collected revenues are to be used for the preparation of other public parking spaces and improvement of public transport, etc.)
- Development of public parking spaces not “on-road”

5) Traffic Safety

It is observed that driver’s manners are comparatively good in case of passenger cars. However, problem is bus operations which occupy one lane to pick up passengers and occasionally standby long time until the bus is full. The traffic accident rate of buses per 10,000 vehicles is extremely high. The reasons of high accident rate of buses are due to their operation system to pick up/ drop passengers on road side, higher driving speed, and overloading of passengers.

It is pointed out also that the pedestrian priority rule is not strictly kept and crossing roads is in dangerous situation for pedestrians. In order to reduce the number accidents, measures such as construction of pedestrian crossing bridges in order to separate vehicles and pedestrians movements and establishment of bus bays are also necessary measures together with the traffic safety education.

2.7.2 Railway Network and Services

The modal share of railway in Greater Yangon is merely 1.1% only. It is because of poor railway network, poor passenger service, poor access to station, poor feeder at station, many accidents, dirtiness at stations and in trains, and so on. Followings are major issues

for current railway system in Greater Yangon.

1) Poor Railway Network

The number of railway lines is absolutely insufficient judging from the present population (6.5 million) of Yangon, rapid economic growth and the urban structure (Decentralized Urban Pattern) proposed in this study. It is recommended to introduce new mass transit, such as UMRT, LRT, Monorail, AGT, and BRT in order to solve traffic congestion and improve passenger's convenience.

2) Ineffective Budget Allocation System in MR

Myanma Railways regional administration/division in charge of Yangon area (Division 7 in Lower Myanmar Administration) has no budget of its own which they can control because the authority for budget allocation is given to Myanma Railways headquarters only, and it causes an obstruction in establishing Division 7's own development/maintenance plan. It is recommended that the following actions be conducted as countermeasures;

- To prepare a special budget frame for railway infrastructure development for Greater Yangon region;
- To establish new organization in YCDC or YRG for developing urban railways including UMRT, monorail, LRT, etc. for Greater Yangon region.

3) Deteriorated Infrastructures

Track condition is quite poor because: i) relatively light, 37 kg/m rail, which is normally used only for low density lines, is used and in addition the railhead is thoroughly worn out due to long duration of service, ii) the ballast thickness under the sleeper is not enough and it causes accelerated roadbed deterioration, and iii) due to the poor drainage condition, water stays on the tracks during rain and it causes damage to roadbed and contaminates the ballast. Regarding the signaling system, frequent trouble and malfunctions happen due to the age of the system and shortcut circuits caused by water staying on the tracks. Telecommunications system is also old-fashioned such as walkie-talkie, telephone, etc. Regarding rolling stock, all diesel locomotives and coaches are aging and deteriorated due to the poor maintenance. Especially, acceleration/deceleration performance is quite poor due to locomotive traction type and it has a detrimental effect to the train operation frequency. It is recommended that the following actions be conducted as countermeasures:

- To reconstruct roadbed;
- To install proper drainage system;
- To spread ballast by proper thickness;
- To replace with heavier Head Harden rail;
- To replace with new signaling system;
- To install proper drainage system on tracks and structure;
- To replace new telecommunications system;
- To replace with diesel railcar which has high acceleration/deceleration performance.

4) Mismatching between railway user's needs and current railway service

Currently MR is operating large number of trains which is more than 200 trains in Yangon

Circular Railway and the Suburban Lines. It means MR is already providing moderate transport capacity as a whole. However, railway's modal share is quite low. It seems that the one of the reasons is mismatching between railway user's needs and current railway service. For example, MR is providing "circular railway" for users who want to move circularly in Yangon city. However, such needs may be quite rare and almost users may want to move radially from CBD. In order to improve the situation, it is recommended to take following considerations.

- To recognize Yangon Circular Railway as "two North-South urban railway lines spreading from CBD radially, not as circular railway.

5) Poor passenger service and insufficient feeder service at stations

The stations are not functional as key traffic connecting areas, due to poor condition of station plaza and poor ticketing system. It takes time for boarding and alighting to/from train because of low height platform. In addition, poor access to station and no feeder service discourage commuter against using railway. It is recommended that the following actions be conducted as countermeasures;

- To introduce Automatic Fare Collection System and Smart Card System;
- To introduce high platform;
- To clean stations, trains and rail corridors;
- To provide amenities at station, such as train information, WiFi, advertisement, powder room;
- To study privatization of station operation to improve passenger service and get additional income;
- To improve connectivity and accessibility at stations between railways and other transport modes such as bus, taxi, etc.

6) Many Level Crossings in Yangon Circular Railway

Yangon Circular Railway has 25 level crossings and it induces traffic jam. In addition, level crossing operation for manually opening/closing a barrier takes a long time, and it impairs the shortening of train operation interval. It is recommended that the following actions be conducted as countermeasures;

- To install automatic operating level crossing system in order to minimize barrier closing time;
- To replace level crossings with flyovers (ROB). The height of ROB shall consider the future electrification requirements.

7) Ineffective train diagram and bottleneck due to mixing long-distance trains with Yangon Circular trains

There is a bottleneck caused by inappropriate track layout between Yangon R.S. and Puzundung R.S. In the section, two tracks for Yangon Circular Railway and long distance Yangon-Mandalay Line are grade crossing, and the number of tracks in this section is reduced. In addition, the section between Yangon R.S. and Danyingone R.S. is used for both Yangon circular trains and long distance trains, and it causes a delay in Yangon circular trains and restrict shortening of train operation interval. It is recommended that the following

actions be conducted as countermeasures;

- To increase new tracks along the bottleneck section;
- To improve track layout at Yangon station and change the role of each platform for long distance train and Yangon circular train in order to avoid grade crossing of trains;
- To make Danyingone R.S. a terminal for long distance trains to/from Pyay or to introduce another double track for section between Yangon R.S. and Danyingone R.S.

8) Privatization of Yangon Circular Railway and the Suburban Lines

Myanmar Railways has a plan of privatization of Yangon Circular Railway and the Suburban Lines. The procedure and schedule are not clear at this moment. Proper PPP scheme should be studied for prompt and proper railway development. Some PPP railway projects in Asian countries faced big problems such as delay, cancellation, dispute, poor service, etc.

2.7.3 Bus Transport and Services

Even though bus transport has a predominant share in people's travel, levels of service are not sufficient enough in terms of reliability of operation, comfort and safety. And bus transport related facilities such as bus stop shelter, and seating facilities are also in poor conditions. Nearly half of the commuters stated long waiting time and on-board crowding (HIS, 2012).

In general, problems may arise from the manner in which bus services are planned. Typically, bus network in Yangon has evolved incrementally in response to changes in demand, or requests from the operators regardless of systematic bus route planning based on adequate information of operational data and passenger demand. A poorly planned system can result in bus route overlapping; add to traffic congestion as well as on-road competition among the operators.

More importantly, bus fare level is strictly regulated by the Yangon Region Government. The present bus fare in Yangon is at lower levels for benefit of people, in particular, the urban poor without compensation by the government in the form of subsidy. However, bus operators must follow this government policy in providing cheap fares for lower income groups. Consequently, in order to maximize revenue from bus operation, operators usually offer share of fare revenue salary system to bus crews in which drivers' earning depends on the number of passengers. On the other hand, this salary system links the monetary benefits of bus crew to the number of passengers a bus can have and in the absence of proper law enforcement and service monitoring system, antisocial drivers' behavior like over speeding, aggressive driving behavior etc. becomes as a part of driving practices in Yangon public bus transportation system resulting uncomfortable, unreliable and unsafe travel.

Additionally, closer examination of the current situation of Yangon public bus system shows that the supply of buses cannot keep up with demand which leads to overcrowded on buses because of poor management of the fleets, lower maintenance standard, vehicle wear out due to poor road condition, lack of supply of spare parts and inadequate funds are available for fleet replacement.

In view of above discussion, a comprehensive structure representation problems related to service level of bus operation is illustrated in Figure 2.7.3.1.

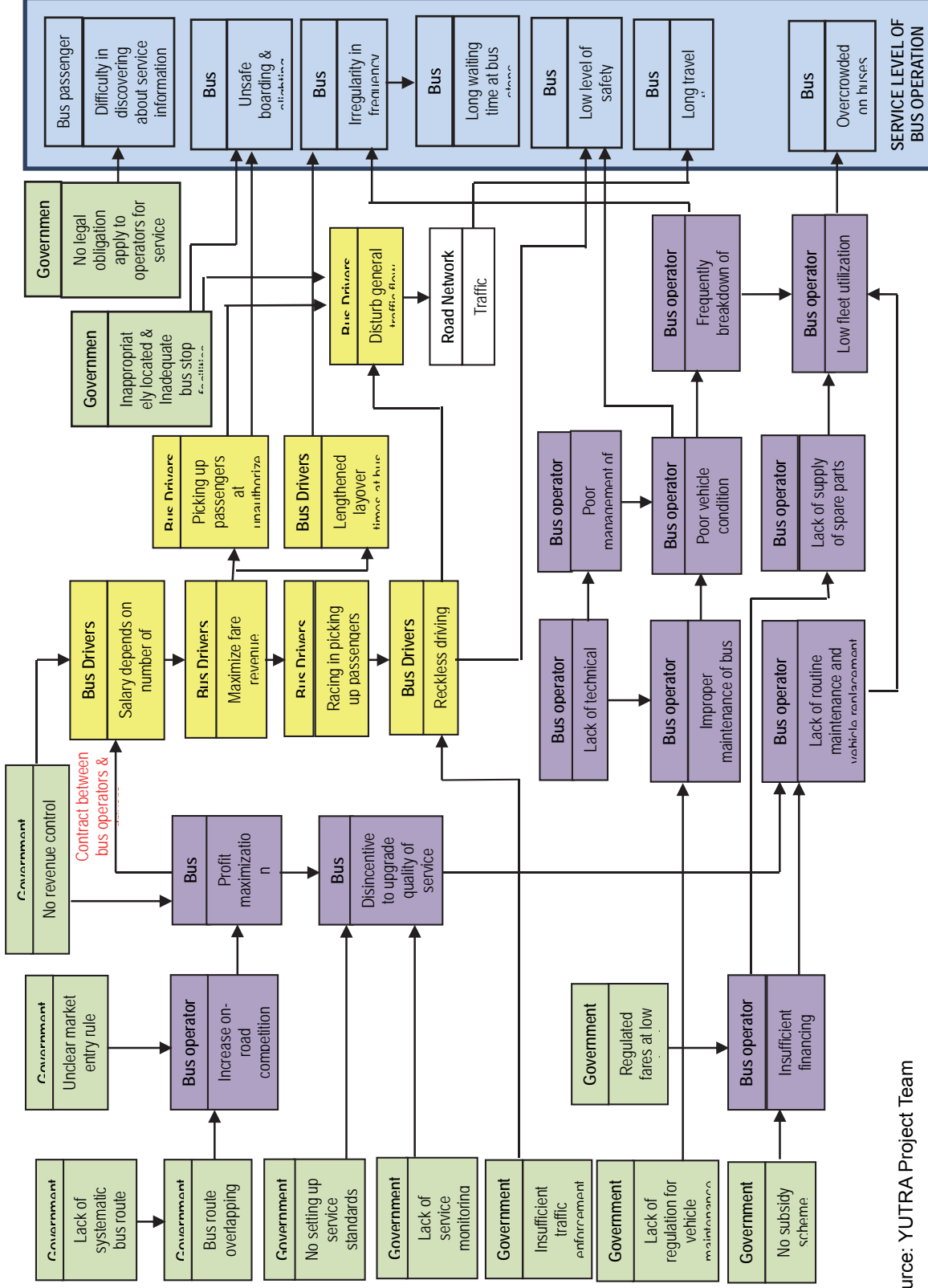


Figure 2.7.3.1 Problems related to Service Level of Bus Operation

Source: YUTRA Project Team

2.7.4 Water Transport and Services

(1) Condition of Passenger and Cargo Vessels

More than five thousands vessels have plied inland waterways, however about half of them are more than 40-year age. Ship conditions are generally inferior, and shortage of power, inadequate safety equipment and improper hull form are main issues.

In consideration of these situations, Japan has supported to rehabilitate the ship docks to maintain vessels, or plans to provide vessels. As mentioned in previous phase, three ferry boats, which have an accommodating capacity of 1,000 is schedule to be procured by Japanese gratis fund, and will launch at the end of 2014.

(2) Condition of Navigation Channel

Entrance into and Leave from Ports at night-time is not performed due to inadequate navigational facilities such as leading lights and navigation buoys. In order to maintain safety navigation and ship calling schedule, improvement and installation of navigation aids are required as well as maintenance dredging.

(3) Condition of Passenger Jetty

Jetty is decrepit due to inadequate maintenance, and mooring facilities and equipment are damaged, for example, it is often observed that mooring rope is worn-out. Regular maintenance is fundamental to keep public facilities good condition. Establishment and introduction of maintenance system are required, and budget for implementation should be reserved.

(4) Role of Inland Waterways in the Future

Inland waterways have been utilized extensively in northern Europe because it could reduce environmental impact and road congestion. In Antwerp and Rotterdam, diversification of destination has been advanced, and measure to increase river transportation share has been urged. While in Yangon Region, river transport system will have following performance after river-crossing bridge is well-arranged in the future.

- (i) Shuttle boat which connects waterfront areas. Along with waterfront development, resident area, commercial area and public spaces will be arranged along the river.
- (ii) Container transport in the Ayeyarwady River System, taking advantage of existing well-developed waterway network.

2.7.5 Goods Transport

1) Preliminary Traffic Impact Assessment of Major Freight Generators

Based on the currently available information, a preliminary traffic assessment of the existing goods related facilities is made in Table 2.7.5.1.

Table 2.7.5.1 Preliminary Traffic Assessment

| Activity Type | Assessment |
|---|--|
| Industrial zones | Major cargo movement is observed between AWP and the Hlaing Tharyar industrial area. The traffic volume between the two areas may not be so significant according to the statistics from Myanmar Port Authority. |
| Commercial centres | The number of large-scale commercial centres is very limited as of today. Some areas such as New Junction Square and Dagon Centre area (Myaynigone intersection) are congested by various traffic including buses, private cars, pedestrians, etc. A special traffic study is recommended for such particular congestion areas. There are several large-scale urban regeneration project proposals. It is recommended to conduct a comprehensive traffic impact assessment study on such proposals. |
| Traditional markets | The number of traditional market is rather large, but their impacts in terms of traffic have not been identified as yet. It is recommended to carry out a traffic generation survey on some selected (sampled) traditional markets to understand their service coverage and access modes of transport. |
| Container to/from ports / ICD in Yangon | About 380 thousand TUE of containers was handled at the ports in Yangon in 2011. Assuming all the container cargo are 20ft and carried by one container trailer, this figure is roughly translated into an average of 1,000 container truck traffic per day. Actually this figure is not so significant in terms of traffic volume, but the existing number of container truck heads might be not enough for efficient cargo movement in Yangon. Actually the number of containers carried by Container Trucks Association is less than 400 units per day in average. |
| YCDC Truck terminal | About 1,000 truck long-distance traffic (general cargo) is generated to/from the YCDC truck terminal near Bayint Naung bridge. This amount of traffic is not so significant in terms of traffic impact to the surrounding roads. However, the roads to the terminal (Bayint Naung road and bridge) look congested. One of the reasons could be "aged truck vehicles" of which performance is very low (low speed, etc.). Another reason might be "mixed traffic" of various types of vehicles including trucks, truck trailers, pick-up trucks, buses, cars, and non-motorised modes of transport. |
| Freight rail stations | The largest cargo handling station is Sat San station which handles about 700t of general cargo per day. Assuming all of this cargo is transported by medium truck (5t), the number of truck traffic is estimated 140 trips per day. This figure is quite small in terms of traffic impact to the surrounding roads. |

Source: YUTRA Project Team

In summary, impacts of these traffic generators may not be so significant in terms of traffic volume, however, it is understood that not small number of people have an idea that these are one of the major causes of traffic congestion in Yangon.

With regard to the Byaint Naung road in particular, one of the major causes to explain the traffic congestion phenomena is a mixture of vehicles of different dimension and performance, that is, old trucks of low speeds, old buses making frequent stops, old cars, non-motorised modes and jay-walkers.

Presumably physical segregation of those traffic by adopting a traffic engineering / design solution will contribute to alleviation of traffic congestion of this road.

2) Urban Regeneration

There is a proposal to relocate the existing ports in Yangon to the Thilawa area in order to create an environment-friendly, modern and sophisticated river front space in the Yangon downtown area. This was suggested in the Strategic Urban Development Plan of the Greater Yangon (JICA, 2013). Probably ports in the prime area of the Yangon downtown such as Sule Pagoda Wharves (handling general cargo) and Bo Aung Gyaw Wharves (handling container cargo) are the candidate regeneration areas. Such an idea is also preferred from the traffic management point of view, that is, segregation of cargo movement

(heavy vehicles) and passenger movement in the highly urbanized (river front) area. By doing this, traffic congestion along the Strand road and other roads in the river front areas can be alleviated to a certain extent.

However, it should be noted that this kind of idea cannot be implemented in the short-term because some port capacity expansion works are currently on-going (and actually necessary) as reported above in order to meet the sharply increasing cargo demand. It also should be noted that impact of changing cargo movement pattern (relationship) between the ports and inland destinations should be carefully considered in planning such relocation / regeneration plan.

3) Strand Road, heritage buildings, landscape

Strand Road crosses the downtown area in a west-east direction and runs parallel to the Yangon River. There are many commercial and residential buildings along Strand Road including designated heritage buildings such as Strand Hotel, the British embassy, Myanmar Economic Bank.

A truck access road paralleling Strand Road (about 9km from Botahtaung Township to Kyeemyindaing Townships) was recently developed by Asia World Group to increase the capacity between Ahlone Wharves (AWP) and ICD.

Accessibility to the river front is limited (worsened) by this road and views towards the Yangon River are also blocked by this truck access road and a wall of stacked containers.

2.7.6 Implication with National Transport

There are already several national level project proposed to meet the increasing demand as discussed in previous sections. Those projects include, circular rail system improvement, Yangon station area re-development, expansion of the existing Yangon ports, Thilawa development, and Hanthawady International Airport. Corresponding planning issues are summarized below.

Table 2.7.6.1 Preliminary Planning Thoughts

| Issues | Preliminary consideration |
|--|---|
| Increased handling capacity of the existing Yangon Ports | The existing container cargo handling volume at the existing Yangon ports is about 400,000 TEU per year, which will be increased slightly by the on-going port expansion projects. Accordingly container cargo traffic will increase, but its traffic impact may not be so significant in comparison with the current situation. However, it can be said that accessibility between from Hlaing Thayar industrial area and the ports needs to be improved as far as the ports exists as they are. |
| Regeneration of the existing ports | Sule Pagoda Wharves (SPW) in located at the one of the prime area of Yangon in terms of future regeneration. Relocation of the Sule Pagoda Wharves can be considered for more sophisticated use of the riverfront area. |
| Traffic generation to / from new ports (plots) in Thilawa area | Future movement pattern of cargo generated at the Thilawa area is unknown yet, however, through-traffic by heavy vehicles generated from the Thilawa area in downtown Yangon should be avoided by proper traffic management and provision of road facilities of higher standard with such heavy vehicles. More effective use of Dagon bridge and corresponding road improvement should be considered (see Figure 2.2.1.5). |
| Regeneration of Yangon International Airport | Use of the existing Yangon International Airport area after completion of the Hanthawady International Airport is unknown. In a long-term perspective, several scenarios with regard to the regeneration of the YIA area and corresponding urban transport facilities needs to be considered. |
| Access to/from Hanthawaddy International Airport | There are no concrete project proposals with regard to the access development to the Hanthawaddy International Airport (HIA). A rail access between Yangon and HIA and a spur line from the expressway can be considered to serve the new international airport (See Figure 2.2.7.1). |
| Regeneration of Yangon station area | Investors will be invited to propose ideas of regeneration of the Yangon station area shortly according to Myanmar Railway(MR), aiming at maximum utilization of the existing asset of MR. No concrete information about requirements of this project is available as of July 2013 (the JICA study team has not been informed). Regeneration of the Yangon station area requires high level planning work before actual design work, including improvement of MR main line, Circular rail line, track layout of the station, station building, accessibility to the station (from south), utilities, etc. It is highly recommended to make a comprehensive planning study about the regeneration of the station area. |
| Extension of the Expressway | Accessibility between downtown Yangon and the expressway needs to be improved. And extension of the expressway to Thilawa area can be considered to encourage investment in SEZ . (see |

Source: YUTRA Project Team

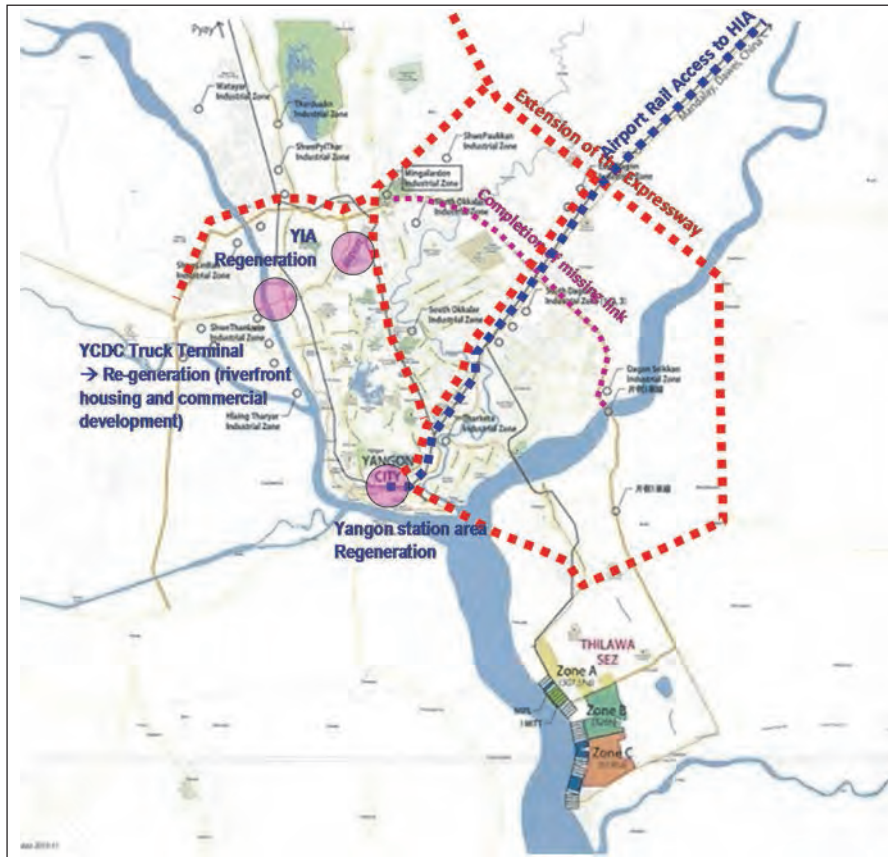


Figure 2.7.6.1 Preliminary Ideas (expansion of the expressway, etc)

2.7.7 Institutional Setup

Recognizing that transport sector is under the responsibilities of several ministries and agencies of both central government and regional government, there is no single agency with clear oversight of the sector. Despite this multiplicity of agencies, the unclear and illogical division of responsibilities among them. The most essential points to note from institution and administrative system are as follows:

- (i) Lack of clarity in defining roles and responsibilities for each ministry and other government agencies
- (ii) Lack of transparency and coordination among agencies in transport sector development and service delivery
- (iii) No clear lines of responsibility, for example, how do supervisory and reporting procedures take place between the government agencies
- (iv) No clear budgeting mechanisms
- (v) Yangon Region Security and Smooth Transport Supervisory Committee and Yangon Region Traffic Rules Enforcement Supervisory Committee have been established. Nevertheless, it is not clear at what level this committee operates, or whether it meets regularly.
- (vi) Monopolistic control in some transport services, for example railway transportation
- (vii) Shortage of trained personnel able to fulfill the demands of government administration and operating the transport services due to Myanmar's long period of isolation since the 1980s and lack of international expertise, experience, and investment