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JAPAN INTERNATIONAL COOPERATION AGENCY
YANGON CITY DEVELOPMENT COMMITTEE

THE STUDY
ON
IMPROVEMENT OF WATER SUPPLY
SYSTEM
IN
YANGON CITY
IN THE UNION OF MYANMAR

FINAL REPORT
VOLUME II: MAIN REPORT

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SEPTEMBER 2002

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PREFACE

In response to a request from the Government of Union of Myanmar, the Government of Japan decided to conduct The Study on Improvement of Water Supply System in Yangon City in the Union of Myanmar and entrusted the study to the Japan International Cooperation Agency (JICA).

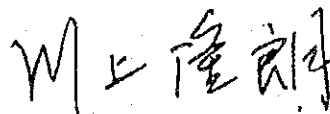
JICA selected and dispatched a study team to Yangon three times between May 2001 and May 2002. The study team is headed by Mr. Kazufumi Momose of Tokyo Engineering Consultants Co., Ltd. and associated with NJS Consultants Co., Ltd.

The team held discussions with the officials concerned of the Government of Myanmar and conducted field surveys at the study area. Based on the field surveys, the Study Team conducted further studies and prepared the final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Myanmar for their close cooperation extended to the Team.

September, 2002



Takao KAWAKAMI

President

Japan International Cooperation Agency

Mr. Takao Kawakami
President
Japan International Cooperation Agency

September, 2002

LETTER OF TRANSMITTAL

Dear Sir,

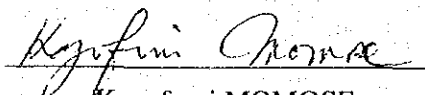
We are pleased to submit you the final report entitled "THE STUDY ON IMPROVEMENT OF WATER SUPPLY SYSTEM IN YANGON CITY IN THE UNION OF MYANMAR". This report has been prepared by the Study Team in accordance with the contracts signed on 21 March 2001, between Japan International Cooperation Agency and Tokyo Engineering Consultants Co., Ltd. and NJS Consultants Co., Ltd.

The report examines the existing conditions concerning water supply system in Yangon City, and presents pre-feasibility study on a priority project selected from the master plan.

The report consists of the Summary Report, Main Report, Appendix and Drawings. The Summary Report summarize the results of all studies. The Main Report presents the results of whole study including background conditions, formulation of the master plan, selection of the priority project and the pre-feasibility study on the priority project. The Appendix describes in detail of the contents of the Main Report.

All the members of the Study Team wish to acknowledge gratefully to the personnel of your Agency, Advisory Committee, Ministry of Foreign Affairs, Embassy of Japan in the Union of Myanmar, and also to the officials and individuals of the Government of Myanmar for their assistance extended to the improvement of water supply system in Yangon City in the Union of Myanmar.

Yours faithfully,



Kazufumi MOMOSE

Team Leader

**THE STUDY
ON
IMPROVEMENT OF WATER SUPPLY SYSTEM
IN
YANGON CITY
IN THE UNION OF MYANMAR**

**FINAL REPORT
CONSTITUENT VOLUMES**

VOLUME I	SUMMARY REPORT
VOLUME II	MAIN REPORT
VOLUME III	APPENDIX
VOLUME IV	DRAWINGS

PART 1
MASTER PLAN

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LIST OF ABBREVIATIONS

ACE	Assistant Chief Engineer
AE	Assistant Engineer
CAPEX	Capital Expenditure
CBD	Central Business District
CE	Chief Engineer
CI	Cast Iron
DEO	District Executive Officer (of YCDC)
DHSHD	Department of Human Settlement and Housing Development
DPDC	Divisional Peace and Development Council
DYCE	Deputy Chief Engineer
EE	Executive Engineer
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EO	Executive Officer of township
FIRR	Financial Internal Rate of Return
GA	General Account
GAD	General Administration Department
GDP	Gross Domestic Product
GI	Galvanized Iron (Pipe)
GOJ	Government of Japan
GOM	Government of Myanmar
GW	Groundwater
IEE	Initial Environmental Examination
JICA	Japan International Cooperation Agency
Ks.	Kyats
MC	Municipal Committee
MCM	Million Cubic Meter per Year
MGD	Million Gallon per Day
MS	Mild Steel (Pipe)
MST	Myanmar Standard Time
NCEA	National Commission of Environmental Affairs
NGOs	Non Governmental Organizations
NIHL	National Health Laboratory
NPL	Non Physical Losses
NPV	Net Present Value
NTU	Nephelometric Turbidity Unit
O&M	Operations & Maintenance
OPEX	Operating Expenditure
P/S	Pumping Station

PDC	Peace and Development Council
PL	Physical Losses
PLC	Passive Leakage Control
PVC	Unplasticized Polyvynyl Chloride (Pipe)
RC	Reinforced Concrete (Pipe)
RCDC	Rangoon City Development Committee
RMC	Rangoon Municipal Corporation
SAE	Sub Assistant Engineer
SLORC	State Law and Order Restoration Council
SP	Steel Pipe
SPDC	State Peace and Development Council
SW	Surface Water
TCU	True Colour Unit
T/S	Township
TE	Township Engineer for Water Supply & Sanitation
TPDC	Township Peace and Development Council
UFW	Unaccounted for Water
US \$	United States Dollar
WA	Works Authority
WHO	World Health Organization
WIS	Water into Supply
WSS	Water Supply & Sanitation (Engineering) Department
WTP	Water Treatment Plant
YCDC	Yangon City Development Committee
YMC	Yangon Municipal Corporation
μ S/cm	Micro Siemens per Centi Meter

Note) Abbreviations are listed in alphabetical order.

CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Yangon city, a highly urbanized independent city is the capital of Myanmar as well as the designated economical center.

The Union of Myanmar has approximate land area of 677,000 km² and is administratively divided into 7 Divisions and 7 States (see Figure 1.1). The country is sharing its borders with Bangladesh, India, Thailand, Laos and China. On the southwest, it has a long coastline of 2,832 km in total length with Bay of Bengal and Andaman Sea. The population was estimated at 44 million in 1998. The GDP growth rate between 1990-98 was estimated at 6.3%. Agriculture is major product followed by service sector.

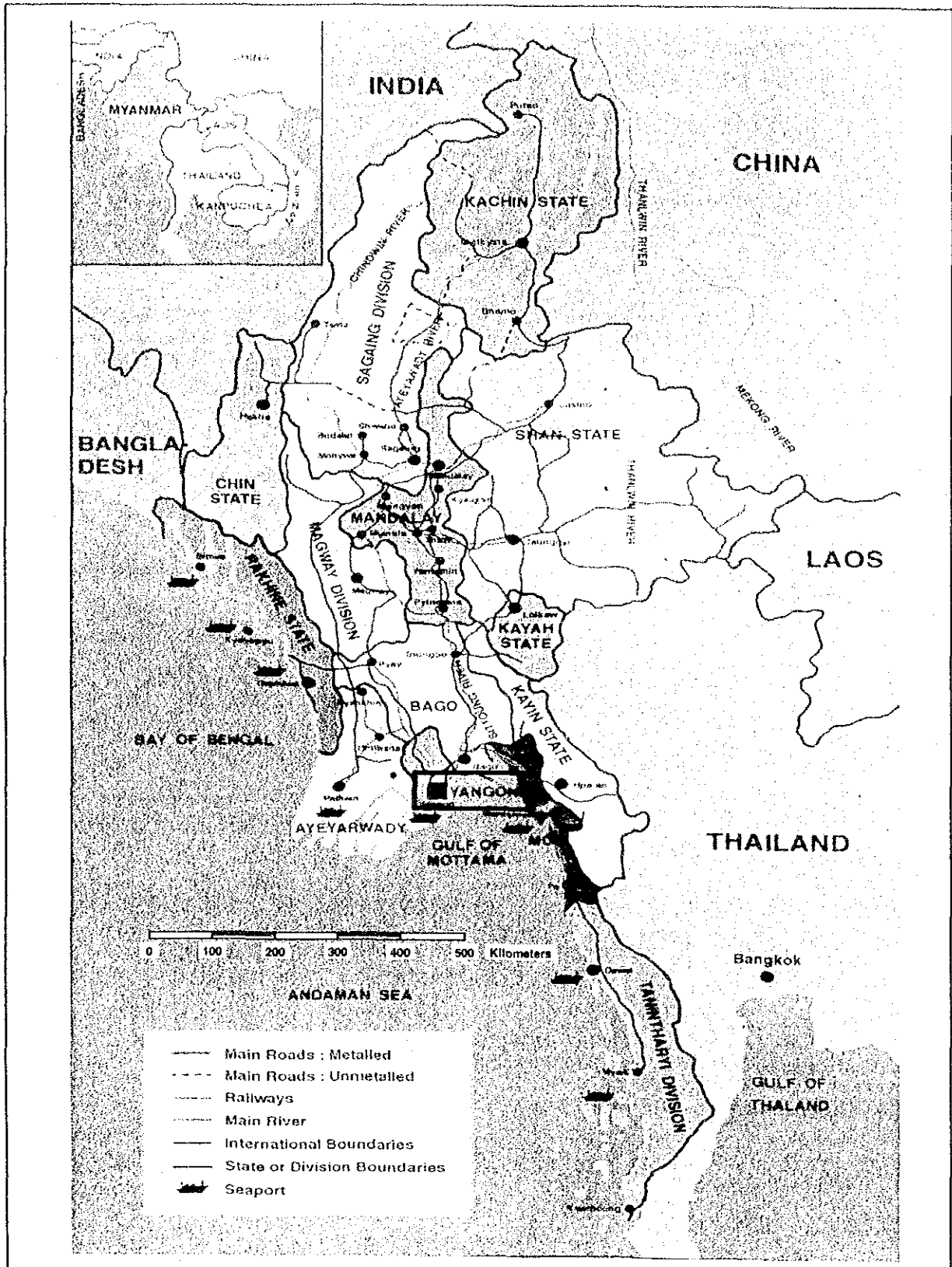
Yangon City is a part of Yangon Division. The central City is located 34 km (21 miles) inland from the mouth of Yangon River. The City is physically divided into five (5) blocks by the rivers, namely ; (a) Pazundaung Creek, (b) Hlaing River (c) Pan Hlaing River and (d) Thunday Canal. The city is the nation's center of administration, business and communication.

Water supply system in Yangon City has become old (started since 1842), overloaded and inadequate to meet the increasing water demand of the city. The water supply system in Yangon City needs to solve the various problems and constraints currently encountering. The city also needs to expand its water supply capacity so that it will be able to meet increasing water demand of the city in the future.

In August 2000, a project formulation mission from the Government of Japan (GOJ) visited Yangon City to identify and confirm necessity and urgency of Japan's cooperation in water supply sector of the city. As a result, the Government of the Union of Myanmar (hereinafter referred to as "GOM") requested the GOJ to conduct the Study on Improvement of Water Supply System in Yangon City in the Union of Myanmar (hereinafter referred to as "the Study").

In response to the request from the GOM, Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the GOJ dispatched the Preparatory Study Team. After discussions with GOM, JICA agreed on the Scope of Work and Minutes of Meetings for the Study on November 17, 2000.

Accordingly, JICA decided to undertake the Study in close cooperation with the authorities concerned of GOM. Tokyo Engineering Consultants Co., Ltd. in association with NJS Consultants Co., Ltd. was selected in March, 2001 by JICA to conduct the Study.



	<p align="center">THE STUDY ON IMPROVEMENT OF WATER SUPPLY SYSTEM IN YANGON CITY IN THE UNION OF MYANMAR</p>	
<p align="center">States and Divisions in The Union of Myanmar</p>		<p align="right">FIG 1.1</p>

1.2 OBJECTIVES OF THE STUDY

The Objectives of the Study are:

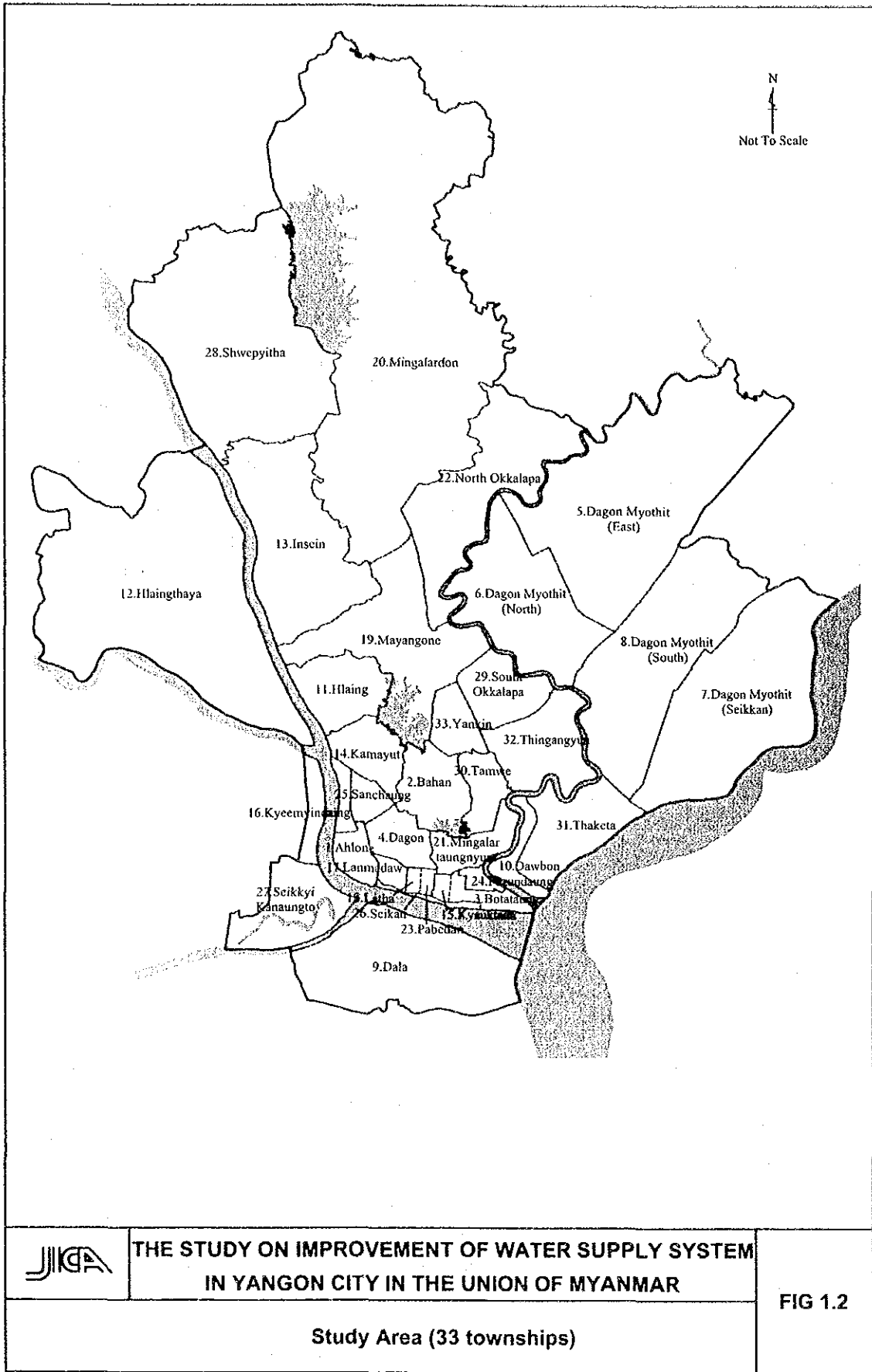
- To formulate a Master Plan for improvement of water supply system in Yangon City for the Target year 2020.
- To conduct a Pre-Feasibility Study on the priority project(s) identified in the Master Plan.
- To pursue technology transfer to counterpart personnel in the course of the Study.

1.3 STUDY AREA

The Study Area covers the administrative area of Yangon City Development Committee (YCDC) (610 km²), which consists of 33 townships. In this Report, 33 townships are numbered in alphabetical order as follows. The short history of township is described in 2.4.2. The Study Area map with 33 townships' name is shown in Fig. 1.2.

1. Ahlone
2. Bahan
3. Botataung
4. Dagon
5. Dagon Myothit (East): developed as Satellite Town
6. Dagon Myothit (North): developed as Satellite Town
7. Dagon Myothit (Seikkan): developed as Satellite Town
8. Dagon Myothit (South): developed as Satellite town
9. Dala
10. Dawbon
11. Hlaing
12. Hlaingthaya: developed as Satellite Town
13. Insein
14. Kamayut
15. Kyauktada
16. Kycemyindaing
17. Lanmadaw
18. Latha
19. Mayangone
20. Mingalardon
21. Mingalartaungnyunt
22. North Okkalapa: developed as Satellite Town
23. Pabedan
24. Pazundaung
25. Sanchaung
26. Seikan

27. Seikkyi Kanaungto
28. Schwepyitha: developed as Satellite Town
29. South Okkalap: developed as Satellite Town
30. Tamwe
31. Thaketa
32. Thingangyun
33. Yankin



1.4 ORGANIZATION OF THE STUDY

The Study was carried out by the JICA Study Team, which comprised members of the Tokyo Engineering Consultants (TEC) and NJS Consultants (NJS), under the guidance of JICA Advisory Committee and in cooperation with the Myanmar counterparts (YCDC). The organization for the Study is shown in Fig.1.3.

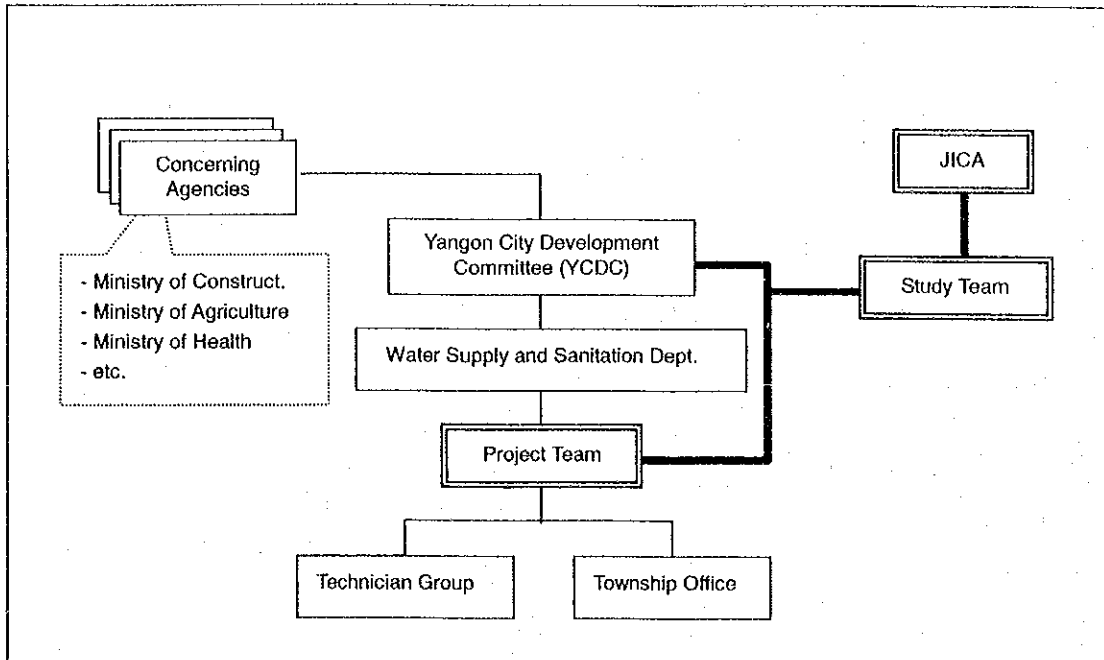


Figure 1.3 Study Organization

The Study was carried out by the Study Team composed of the following members.

- | | |
|----------------------------|---|
| 1. Mr. Kazufumi MOMOSE: | Team Leader |
| 2. Mr. Osamu NAKAGOME: | Sub Team Leader /Water Supply Planning |
| 3. Mr. Takashi WATANABE: | Facility Planning |
| 4. Mr. Hirotaka SATO: | Distribution Network Planning |
| 5. Mr. Nobuyuki OKABE: | Hydrology, Hydraulics and Water Resources Evaluation |
| 6. Mr. Nobukatsu SAKIYAMA: | Groundwater Management |
| 7. Mr. Katsuji KAJINO: | Water Treatment and Water Quality Improvement Planning |
| 8. Mr. Paul Naylor: | Unaccounted-for Water Control Planning |
| 9. Mr. Naoto KOIKE: | Water Leakage Survey |
| 10. Mr. Hirotaka SATO: | Consumer Survey |
| 11. Mr. Hidetoshi HAGA: | Organization, Institution, Operation & Maintenance Planning |
| 12. Mr. Yoshiaki ISHIZUKA: | Economic and Financial Analysis |

- 13. Mr. Taketoshi ISHIHARA: Environmental Considerations
- 14. Mr. Atsushi KOJIMA: City Planning
- 15. Mr. Takuro NUKAZAWA: Administration

CHAPTER 2

DESCRIPTION OF STUDY AREA

CHAPTER 2 DESCRIPTION OF STUDY AREA

As already mentioned in Chapter One, the Study Area is the Yangon City Development Committee (YCDC) area. This Chapter presents information pertaining to the Study Area.

2.1 POLITICAL ATMOSPHERE AND THE GOVERNMENT

After gaining independence in 1948, the Union of Myanmar saw two types of government. A parliamentary system of government along the British style was formed in 1948. Following the elections held in 1962 a socialist government administered the Union until 1988. After the civil troubles in 1988, the Myanmar Armed Forces assumed the political power of the Union. Since then, the State Law and Order Restoration Council (SLORC) governed the country until 1997. In November 1997, the SLORC was replaced by the State Peace and Development Council (SPDC). At present, the SPDC has assumed the governance of the Union in addition to the facilitation of the national Constitution to govern the country towards a multi-party democratic system with a market-oriented economy.

For the purpose of administration, the Union is divided into 7 Divisions and 7 States (Figure 1.1). Each Division/State has its own districts, townships, wards and villages/ village tracts. The townships are the smallest administrative units of which there are 595 wards and 30 villages in total.

The current structure of the government consists of two lines of command. The 32 Ministries, and the Departments functioning under them are charged with the administration of the Union including planning and implementation of development programmes. In the case of large cities such as Yangon and Mandalay, the administration of respective areas is vested in the Yangon and Mandalay City Development Committees respectively.

The political command radiates from the supreme body, the SPDC, to the Divisional PDCs, the District PDCs, the township PDCs and finally to the Ward Peace and Development Councils. It is to be highlighted that both the political as well as the administrative commands receive overall directions and leadership from the SPDC. The 7 Divisional and 7 State Peace and Development Councils under the command of the SPDC coordinate the functioning of the Divisions and the States. The PDCs have some responsibility for the maintenance of law and order throughout the country.

The current administrative structure of the Union is presented in Figure 2.1.

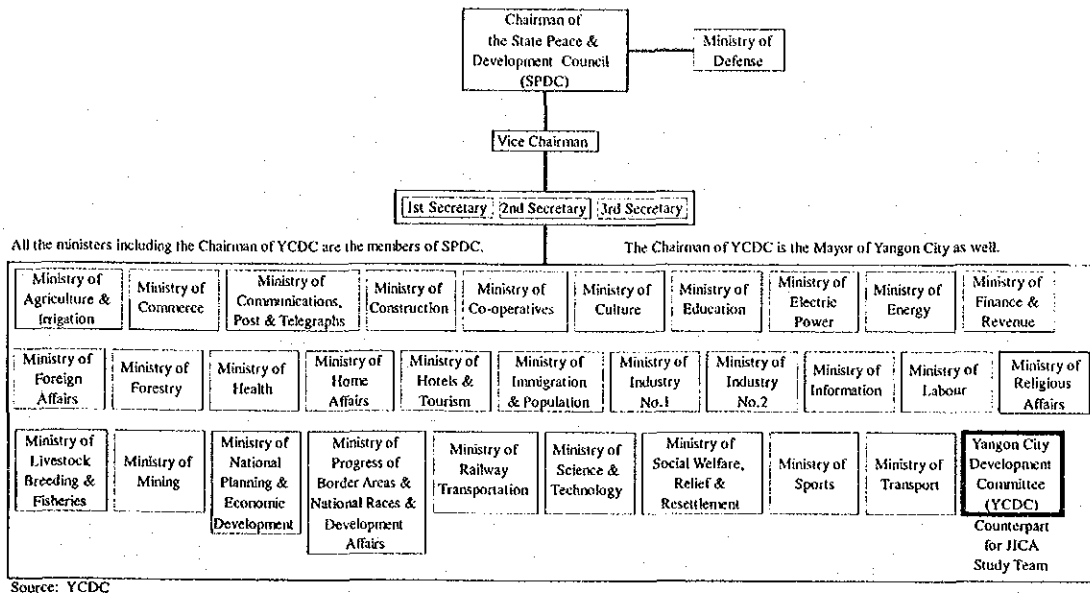


Figure 2.1 Government Organization Structure of the Union of Myanmar

In the study area, the coordination of all development efforts is undertaken by the Yangon Division Peace and Development Council, 43 TPDCs and several WPDCs. These Councils are accountable to the SPDC for the implementation of law and order and to provide leadership in all development activities while they are accountable to the General Administrative Department (GAD) of the Ministry of Home Affairs for the purpose of administration of the area under their charge.

The administration of the City is entrusted to the Yangon City Development Committee (YCDC). The social, economic, commercial, recreation, environmental and cultural activities within the study area is administered by the YCDC. For this purpose, the Committee has deployed staff at 33 townships spread through out the study area. The government ministries and departments of the Union within the study area have only a limited function having to undertake specific tasks related to the roles and responsibilities of the relevant Ministry.

As mentioned above, commercial, economic, social and domestic activities within the study area are administered by laws, bye-laws and regulations drawn under the original Rangoon Municipal Act of 1922. For example, the YCDC has the power to establish new townships, expand existing townships, and undertake other activities such as housing, water supply work, planning and implementation, execution of civil projects etc. within the study area. Water being the basic commodity for life and all other activities, it can be shown that the YCDC has a major influence on the lifestyle of the citizens in Yangon.

2.2 THE ECONOMY

The economy of the Union is based mainly on agriculture. Its contribution to the national Gross Domestic Product (GDP) is about 50%. The GDP attributable to the production of goods (of which agricultural goods are dominant) is about three times larger than the services. The per capita GDP was about Kyats (Ks.) 1800 in 2000 at 1999 constant prices. The mean annual rate of increase of the GDP during the past 10 years has been 3.83%. This is quite low compared to other developing countries in the region.

The main industries of the Union are cement, pharmaceutical products, alcohol and cigarettes.

The government finances of Myanmar have been growing from Ks.14,837 million (equivalent to US \$24.7 million) in 1990/91 to Ks.107,667 million (equivalent to US \$179.4 million) in 1999/00 with a mean annual rate of growth of 22% in revenue. The expenditure has grown from Ks.21,708 million (equivalent to US \$36.2 million) in 1990/91 to Ks.145,404 million (equivalent to US \$242.3 million) in 1999/00 with a mean annual rate of growth of 21%.

The above figures indicate that the expenditure has exceeded the revenue for the past 10 years.

The two main financial sources are the tax revenue contributing to 46% and the revenue from state enterprises making up 41% of the government revenue. Other sources make up the balance of 13%.

2.3 SOCIO-CULTURAL CHARACTERISTICS

People in Myanmar are friendly, hospitable and entertaining. The culture is characterized by diversity in races, food preparations and costumes, religion, and life styles which are different across the country. Ceremonies and festivals occupy an important place in the lifestyles of the people with several of them celebrated in the City.

2.3.1 Ethnicity

People in Myanmar belong to about 135 ethnic groups of which two races namely, Burmans making up 69.0% and indigenous races (25.7%) contribute to over 90% of the population. The others include Indian and Pakistan races (1.3%), Chinese (0.7%), and European and other races making up the remaining 3.3%. The Burman race in the country being the largest ethnic group made the British rulers to name the Union as Burma.

2.3.2 Religious Affiliations

According to the 1983 census, the population comprised of 5 main religions. A total of 89.4% of the population is made of Buddhists followed by Christians of 4.9%, and Muslims contributing to 3.9% of the population. The prominent religious group in Yangon is Buddhists. Accordingly, Pagodas and Buddhist temples occupy a significant position of the landscape in the study area.

The other important religious groups in Yangon are Christians, Hindus and Muslims.

The Buddhism and the lifestyles closely associated with the religion, have had a positive impact on the education of the people in the study area as well as throughout the Union. According to statistics (Household Income & Expenditure Survey of 1997) , 60.91% of household members have had their primary education from the monastery in the country as a whole. This percentage was 57.29% in the Yangon Division and came down to 47.76% in the City. Moreover, 41.83% of household heads in the study area (59.69% for the Union) have received their primary education from the monastery.

2.3.3 Education and Literacy

As outlined above, on account of the monastery-based style of people, the mean level of education is expected to be higher. As stated in the survey referred to above, approximately 86% of household members are educated in the Union as a whole. The relevant figure for Yangon Division was about 90% with a slightly higher figure of 94% for the study area.

The mean literacy rate as stated in the Statistical Yearbook 2000 was 66.5% literate.

2.3.4 Household Composition

Households are characterized by extended system of family living where several families closely-related to each other reside in the same house. The extended system of family living is common both in the country as well as in the study area.

The mean household size in the Union was 5.25 while this was 5.22 in Yangon Division. The relevant figure for the study area was 5.16 (Household Income & Expenditure Survey, 1997).

2.3.5 Status of Health

The mean life expectancy at birth in the country is low with only 60 years for men and 63.9 years for women in 1993. However, the life expectancy has grown to 61 years for men and 65.1 for women in 1999 (Statistical Yearbook, 2000). Other important health statistics are the crude birth rate at 24.3 per thousand (1000) in 1996 declining to 18.1 per in 1998. The death rates during the same period were 7.9 and 9.3 per thousand of population respectively.

Data on the incidence of water-borne diseases in the study area are presented in Table 2.1. The data (Table 2.1) indicate that the prevalence of water-borne diseases is high in the study area. This suggests the importance of water supply improvement in the City.

According to the latest urban statistics (Ibid, 2000), the main death factors in urban areas are intestinal infections contributing to 38.3 deaths per 100,000 population, Malaria with 29.5 deaths per 100,000 and Bronchitis making up 13 deaths per 100,000 population. The above death causing factors indicate the below average status of domestic water use and housing in urban areas in general.

Table 2.1 Incidence of Water-borne Diseases in Yangon City

Township	Diarrhoea			Dysentery			Viral Hepatitis			Typhoid Fever		
	1998	1999	2000	1998	1999	2000	1998	1999	2000	1998	1999	2000
Ahlon	16	41	6	1		10						
Bahan	113	34	19	47	1		2					
Botataung	71	38	44				1			10		
Dagon	91	4	3	16			1					
Dagon (North) & (Seikkan)	268	132	77	6		1	12			1		
Dagon (South)	714	94	61	2			2					
Dala	221	147	90	149	40	81	21					
Dawbon	440	158	56									
Hlaing	66	60	49									
Hlaingtharyar	1299	888	485	59	115		50			5		
Insein	628	562	370									
Kamayut	85	61	125	29	9		2					
Kyauktada	23	2	1	3			2					
Kyeemyindaing	120	61	42	22								
Lanmadw	125	9		21	7		6					
Latha	91	14	4	29	4		2					
Mayangon	183	36	2	52								
Mingalar Taungnyunt	116	66	19	42						20		
Mingalardon	778	201	137	274	43	38						
North Okkalapa	547	132	136									
Pabedan	38	22	5	27	2							
Pazundaung	13	3	27	2			2					
Sanchaung	45	31	39	27								
Seikkyi Kanaungto	89	98	40	52	32	49						
Shwepyithar	1239	367	303	569								
South Okkalapa	204	67	8	80								
Tarmway	114	78	12									
Thaketa	307	108	160									
Thingangyun	163	38	133									
Yankin	62	36	12		7		1					
Total	8269	3588	2465	1509	260	179	104			36		

Source: Health Department (YCDC)

2.3.6 Spread of Mass Media

According to the Statistical Yearbook (2000), only about 25% of urban household members of the age group 35-49 years read newspapers in the Union. On the other hand, the newspaper readership of household members of the age group 15-59 was 79% in the country. There was hardly a difference in newspaper readership between the Union and Yangon City. This suggests the relatively low level of newspaper readership in the study area. This characteristic has an important bearing on the education of water customers within the City.

2.3.7 Employment and Household Income

The mean employment rate for the Union was 2.38 employed persons per household. This came down to 1.90 persons per household in the City. The mean monthly income per household was Ks.16,660 in Yangon Division while the figure for Yangon City was Ks. 18,997 per household.

The above data were sourced from the Household Income and Expenditure Survey of 1997.

2.4 ADMINISTRATION OF THE STUDY AREA

The responsibility for administration of law and order in the study area is vested in the General Administration Department (GAD) of the Ministry of Home Affairs and the YCDC. The focus of the former is general administration such as law and order, resolution of social conflicts, registration of deaths, births and migration and the collection of other basic statistics. The activities of YCDC on the other hand, are the provision of social, economic and recreation facilities, utility services such as water, housing, markets, cleansing and discipline.

2.4.1 Administrative Unit

For the purpose of City administration, the YCDC area is carved out into 33 townships and 595 wards. Some townships have villages in addition to wards. Altogether there are 30 villages included within 33 townships. The service administration is centred on the township office where YCDC officials responsible for implementation of various tasks are based.

The geographical area under each township depends mainly on the size of the resident population, whether it includes any satellite towns or the year in which the township was established. The townships newly added to the YCDC area comprising the satellite townships for instance have relatively larger areas under their command. Most of the satellite townships are yet to be fully developed and populated. It is these areas where the exodus of inhabitants from the densely populated City would be settled in future.

2.4.2 Township History

As mentioned above, there are 33 townships in Yangon City at present. The number of townships have increased together with City expansion. To summarize how the townships' numbers increased, gives some idea of city growth. Since there is no official records on township history at YCDC, information on township history was collected from YCDC staff through interviews.

The oldest settlement is Dagon which is said to have established around 700 years ago, however Dagon became a Township in 1974.

In 1700's the following 5 areas are established (the number in the parenthesis is founded year of township).

- Ahlone (1972)
- Dawbon (1974)
- Lanmadaw (1974)
- Pazundaoung(1974)
- Seikgyikhanaungto(1974)

Those areas became townships in 1970's.

In 1800's,

- Latha (1974)
- Padedan (1974)
- Botatung (1974)
- Hlaing (1972)
- Kyauktada (1974)
- Kyeemyindaing (1974)

In 1900's, the other 21 areas are established, as follows (establish means people has started to live in the area),

Established Year	Township Name	Township founded year	
1903	Insein	1972	
1917	Sanchaung	1972	
1920	Kamaryut	1972	
1920	Thingahgyun	1970	
1922	Mingaladon	1960	
1924	Mayangone	1972	
1952	Bahan	1972	
1952	Mingalartaungnyunt	1959	
1952	Yankin	1972	
1959	Dala	1974	
1959	Thaketa	1959	Satellite Town
1959	North Okkalapa	1959	Satellite Town
1959	Seikkan (port)	1974	
1959	South Okkalapa	1959	Satellite Town
1959	Tamwe	1974	
1989	Hlaingthaya	1989	Satellite Town
1989	Shwepyihaya	1989	Satellite Town
1990	Dagon North	1990	Satellite Town
1990	Dagon South	1990	Satellite Town
1994	Dagon East	1994	Satellite Town
1994	Dagon Seikkan	1994	Satellite Town

The followings are summarized from the above information.

(1) By established year of the areas, it is divided into four groups,

Group1 :Old towns

12 townships which were established before 1900's.

Group2 :Second Old towns

6 townships which were established between 1900 to 1920's.

Group3: 1950's towns (9 townships)

The satellite towns were constructed from 1959. Three (Thaketa and North & South Okkalapa) satellite towns were constructed out of 9 townships in this time. It is reported that 300,000 people were resettled.

Group4: 1989 to 1994 towns (6 township)

This era is mainly the Satellite township development. 6 satellite towns were constructed.

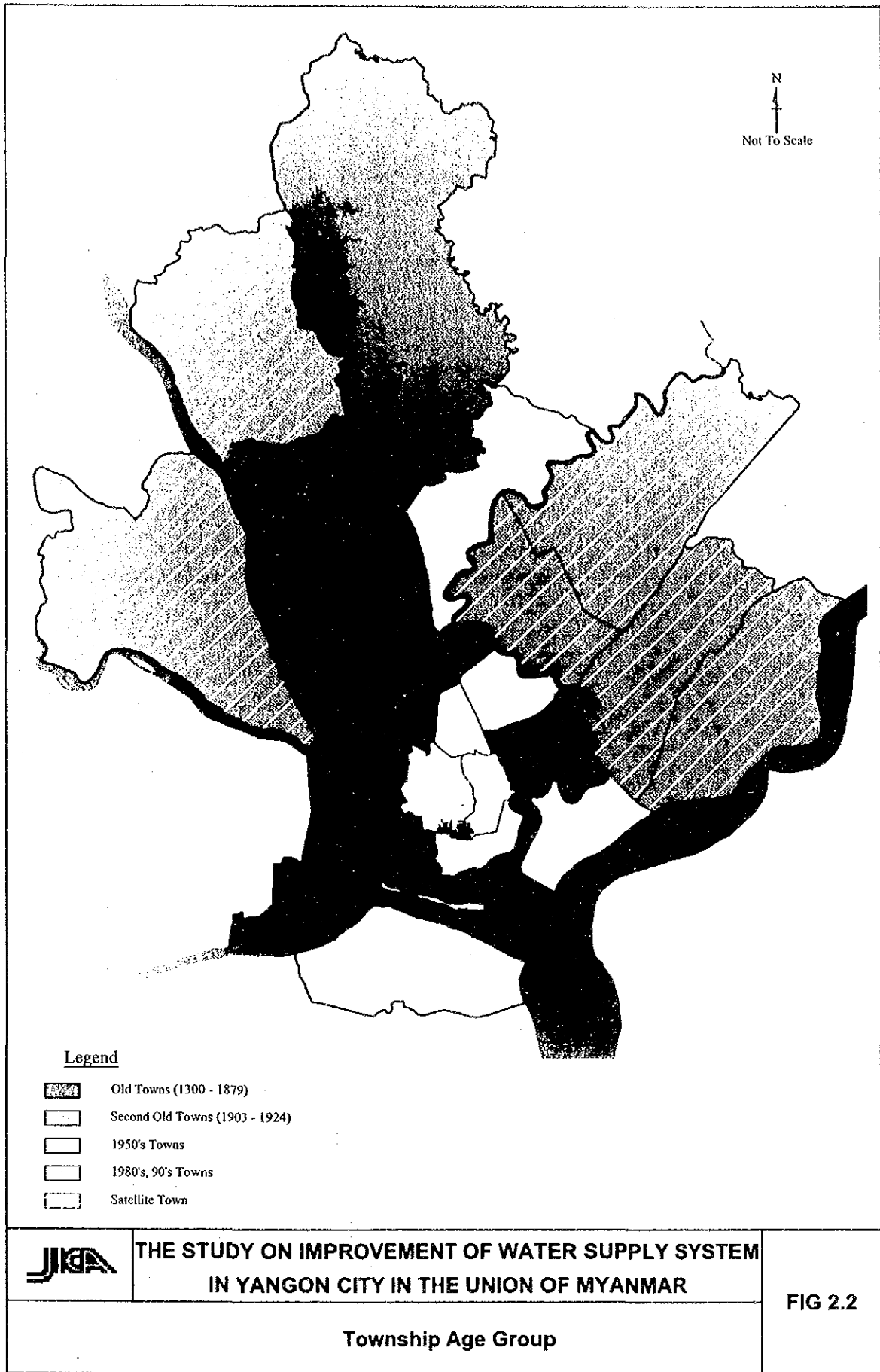
Fig. 2.3 shows those four groups in different colors, which gives a kind of city development direction.

(2) It seems that township system has started from 1959, same year as the first four satellite towns were founded in the then-suburbs in addition to the old Yangon City. The numbers of township established by year is as follows,

1959:	4 townships
1960:	1 township
1970:	1 township
1972:	8 townships
1974:	13 townships
1989:	2 townships (satellite town)
1990:	2 townships (satellite town)
1994:	2 townships (satellite town)

The majority of townships were founded in 1972, 1974 (21 townships in total), reorganizing the old Yangon City when additional suburbs were developed.

(3) In recent years (after 1989), township establishment is the history of satellite towns (6 satellite towns out of 8 satellite towns), which are located eastwards and westwards as can be seen in Figure 2.2. It is reported that about 75,000 squatter families and 60,000 government employees were resettled to 4 satellite towns in 1989 and 1990 (Hlaingthaya, Shwepyitha, Dagon South & North).



2.4.3 Identification of Townships

As mentioned earlier, YCDC area comprises of 33 townships which are the basic administrative units in the study area. Each township has a unique name and a defined area.

Wards and villages which make up townships are numbered, in general. The numbering of all wards and villages within a given township following certain principles would be an appropriate practice. However, a review of the method of numbering wards and villages indicates several inconsistencies.

The main method by which wards/villages is numbered is found to be that each unit is serially numbered starting from either "1" or letter "A" (in Myanmar alphabet). Whenever each ward/village has a specific name, it is also used in addition to the serial number of the unit. This appears to be the most common and accepted method of numbering.

However, there are several instances where the actual method of numbering wards and villages within the townships has deviated from what is stated above. These different methods are summarised in Table 2.2 below.

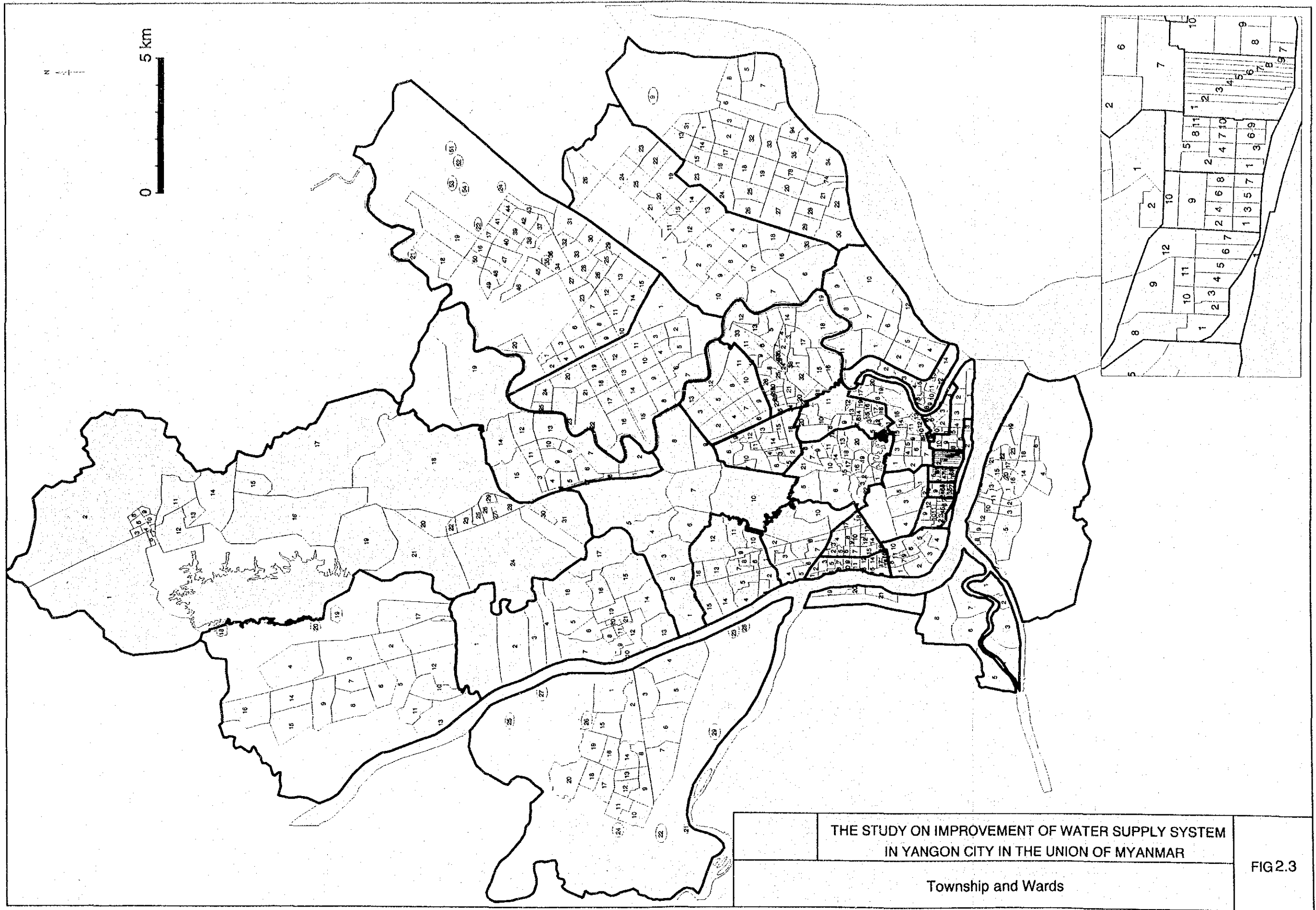
Table 2.2 Current Methods of Numbering Wards and Villages in Selected Townships

Method of Numbering Units	Township where method adopted
Each ward is either serial numbered or given a unique name	Ahlonge; Bahan; Botatung; Dagon; Dawbon; Hlaing; Insein; Kamayut; Kyauktada; Kyeemyindaing; Lanmadaw; Latha; Pabedan; Pazundaung; Seikkan (Port); Seikky Kanaungto Tamwe
Each ward is serial numbered but not villages	Shwepyitha; Yankin
Each ward and village is both serial numbered as well as given a unique name	Mingalartaungnyunt
Ward serial numbering does not start at "1" or "A"	South Okklapa has no ward # 1 & 2
Each ward is split into two with each part having a unique name and number; split is not considered in identifying wards	Thaketa
Each ward is numbered by a letter	Mayangone
Some wards numbered by a letter while others have no number but a unique name. Numbers are not in a serial order	Thinganchaung
Each ward has a unique name	Dala
Each ward has a number while each village has a unique name. Numbers not assigned in any serial order	Hlaingthayar; Dagon Myothit (Seikkan)
All wards numbered without any order. The first ward number is 16 and no wards from number 17-27	Dagon Myothit (North); Dagon Myothit(South); Dagon Myothit (East)
Some wards are serial numbered while others have a letter. Each village has a unique name	North Okklapa
Each ward has a unique name but 4 are also named by a letter	Mingalardon

Source: Interviews with Township Staff

The above table indicates that ward identification practised at present is confusing at least in some cases. Serial numbering of each ward within a township can be considered as an appropriate practice which facilitates proper keeping of records and administration of the ward.

Figure 2.3 shows township and wards.



THE STUDY ON IMPROVEMENT OF WATER SUPPLY SYSTEM
IN YANGON CITY IN THE UNION OF MYANMAR

Township and Wards

FIG 2.3

2.4.4 Township Boundaries

(1) Township

Many of the townships have proper boundaries. New townships such as Dagon (East) and Dagon (Seikkan) of which the exact boundaries are yet to be established. The township boundary is mainly along a natural path such as a river or creek; sometimes, man-made objects such as street, railway tract. Whenever the boundary runs along a street it usually follows the centre line of the street. So is the centre line of a river which forms the boundary of a township.

(2) Wards

Unlike township boundaries, wards do not have proper boundaries. In many cases the boundary of a ward does not exist. As a part of the present study the relevant officers were requested to draw ward and village boundaries in respect of each township (see Figure 2.4). The exercise was found to be a tedious operation. The boundary of many wards may still be not correct as the relevant staff does not have a good knowledge of the exact boundary.

Table 2.3 Inconsistencies Associated with Marking Wards

Township	Exclusions from Ward
Yankin	Ward No. 10 houses Ministries and departments which is not considered part of this township. Area where the ministries are does not belong to any ward
Shwepyitha	Ward No. 1 has a large area set apart for industrial zone. The latter is not considered as part of this ward. In contrary, the small area in ward No. 13 where industrial zone exists is considered a part of the ward
Dagon	Area occupied by Shwedagon Pagoda is not considered as part of ward No.5. On a similar case, ward No.3 where the People's Park is not considered part of ward No.5. Area where military and official buildings are located is excluded.
Halangthayar	Industrial zones 1,2,3, and 4 are not in ward areas. Industrial zone 5 is inside ward
Hlaing	Official and military area excluded from the ward
Botatung	Navy and official area are not included in the relevant ward area

Source: Township Staff

As shown in Table 2.3, Areas occupied by some institutions are not considered as part of the ward even though such areas are within the same ward area. In Dagon Seikkan, area set apart for future railway line is not considered within the ward area.

(3) Problems caused by present demarcations

The current method of identification of ward boundaries is inconsistent. This will affect maintaining of accurate records of customer names by type and thereby make maintaining of accurate water records for the ward an impossible task. It is imperative that all consumers in a given ward whether departmental or private are identified for the proper management of the water sector. The current practice of eliminating certain areas from being a part of the ward is not appropriate.