CHAPTER 1

INTRODUCTION

1.1 Statement of the Problem

Canals were clean and played an important role in Bangkok. About three decades ago, there were many canals, both natural and man-made in Bangkok. Bangkokians depended much on canals. Communities along the canal banks used the water for bathing, swimming, washing clothes, and drinking, as well as for travel and commerce.

Canals are now recertors of waste water from both households and industries. At present, the waste is disposed of in two ways. Excreta or toilet wastes are discharged into privies or flushed with water into cesspools or septic tanks. Waste water from sinks, laundries, baths and kitchens is collected separately from toilet wastes and discharged to the nearest storm-water drain, drainage ditch, or water course. So, one function of canals is as part of a drainage system. During the three decades the population and industries increased rapidly. This increases the volume of waste-water, while the provision of waste-water treatment facilities is only just beginning.

Apart from its function as a drainage system, canals are also a recepticles for garbage from some households along the canals. Both functions contribute to the deterioration of canal water. Presently, most canals in Bangkok are severely polluted, e.g., the water is black and produces a bad odor. Figure 1.1 and 1.2 show DO[1] and BOD[2] concentration as indicators of canal water quality,. Figure 1.1 indicates that most canals in Bangkok have a DO level of less than 2 mg/l, and figure 1.2 indicates

[1] DO denotes dissolved oxygen: the amount of oxygen in water, waste water , or other liquids. The measurement unit is milligram per liter.

[2] BOD denotes biochemical oxygen demand: the amount of dissolved oxygen required to meet the metabolic need of microorganisms in a water environment rich in organic matter, such as sewage.

that most of them have a BOD level of greater than 4 mg/l. Table 1.1 shows the quality standard for surface water. The information from table 1.1 and figure 1.1-1.2 shows that most canal water is classified as Class 5, as shown in Table 1.2 and that it is not suitable for any purpose except navigation.

Some severely polluted canals such as San Sab, Mahanag and Lad Prao are used for transportation purposes. However, the characteristics of the polluted water, such as bad odor, black color, and garbage, reduce it's usefulness for passenger travel. Many passengers try to protect themselves from the dirty water by paper or handkerchief.

The improvement of canal water poses no problem from the technological perspective, but is a financial problem because it requires a large budget. In general, people feel that it should be the responsibility of the government to handle this task. But the government has a limited budget to allocate among many projects. The result of this study will provide information about how the money can be collected for financing the clean canal project.

1.2 Objective of the Study

The purpose of this thesis is to study how much the boat passengers value the canals clean-up project, and to examine the factors that determine the level of willingness to pay for water quality improvement. Policy recommendations will be drown from the results of the study.

1.3 Scope of Study

The selected canals for the case study are Mahanag and San Sab Canals. The reason for selecting these two canals is that they are severely polluted, and there is a large number of passengers using them because they pass through business areas such as Rajadumnern, Rajaprasong, and Bang Kapi.

Improving the conditions of polluted canals will provide benefits to a large number of the population. The first group to benefit will be the people living along the canals. They will enjoy a better environment around their houses and be able to use the canal water. The second group will be the passengers using the canal. They will have a better environment through which to travel. The third group to benefit will be the rest of the population in Bangkok. The clean canal project will help upgrade the environment in Bangkok. Though some groups of people do not gain directly from the canals, they can feel pleased with Bangkok's improved environment. In addition, the existence of clean canals may provide new recreation areas.

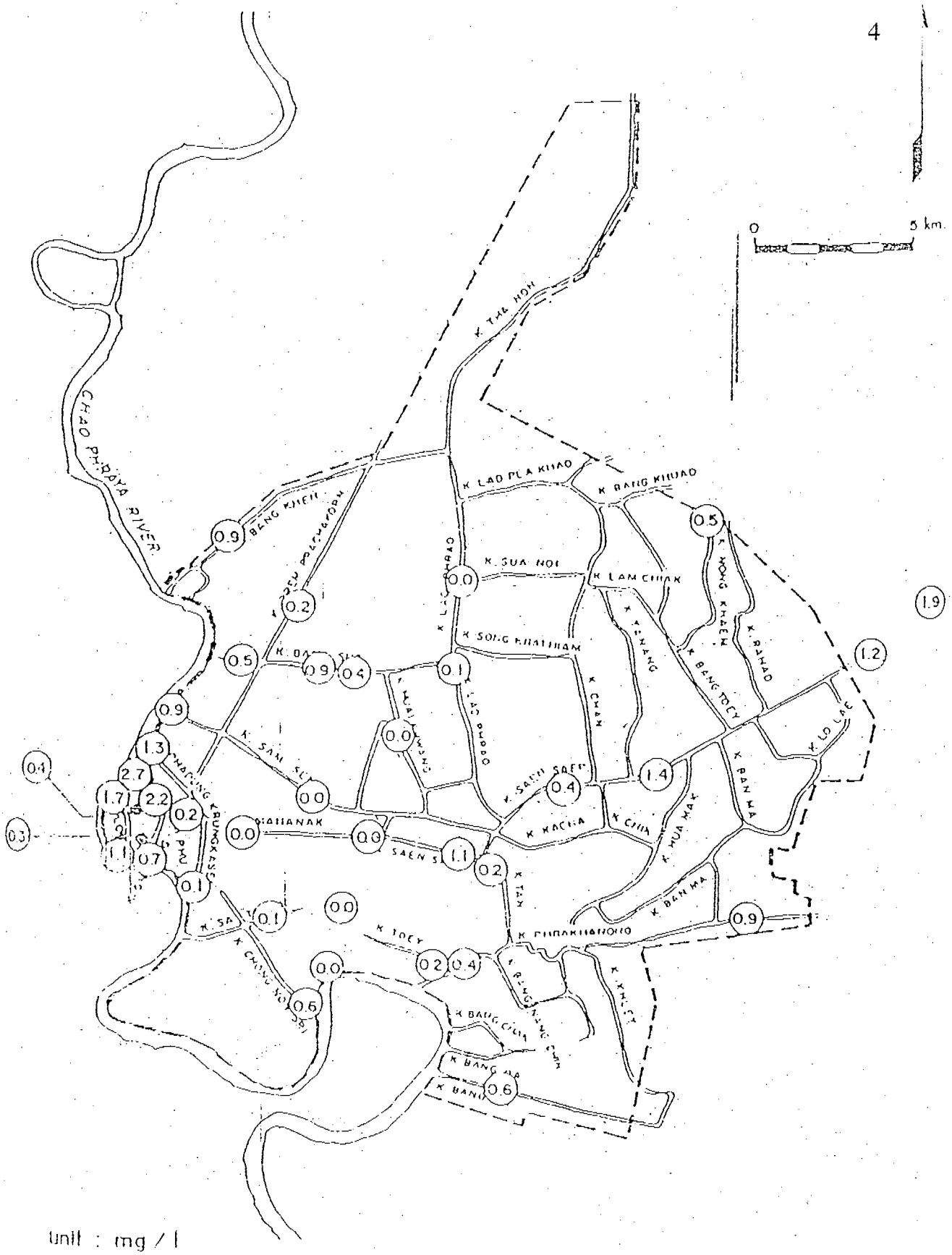

Figure 1.1
Level of Dissolved Oxygen of Canals in Bangkok

Source: The Department of Pollution Control

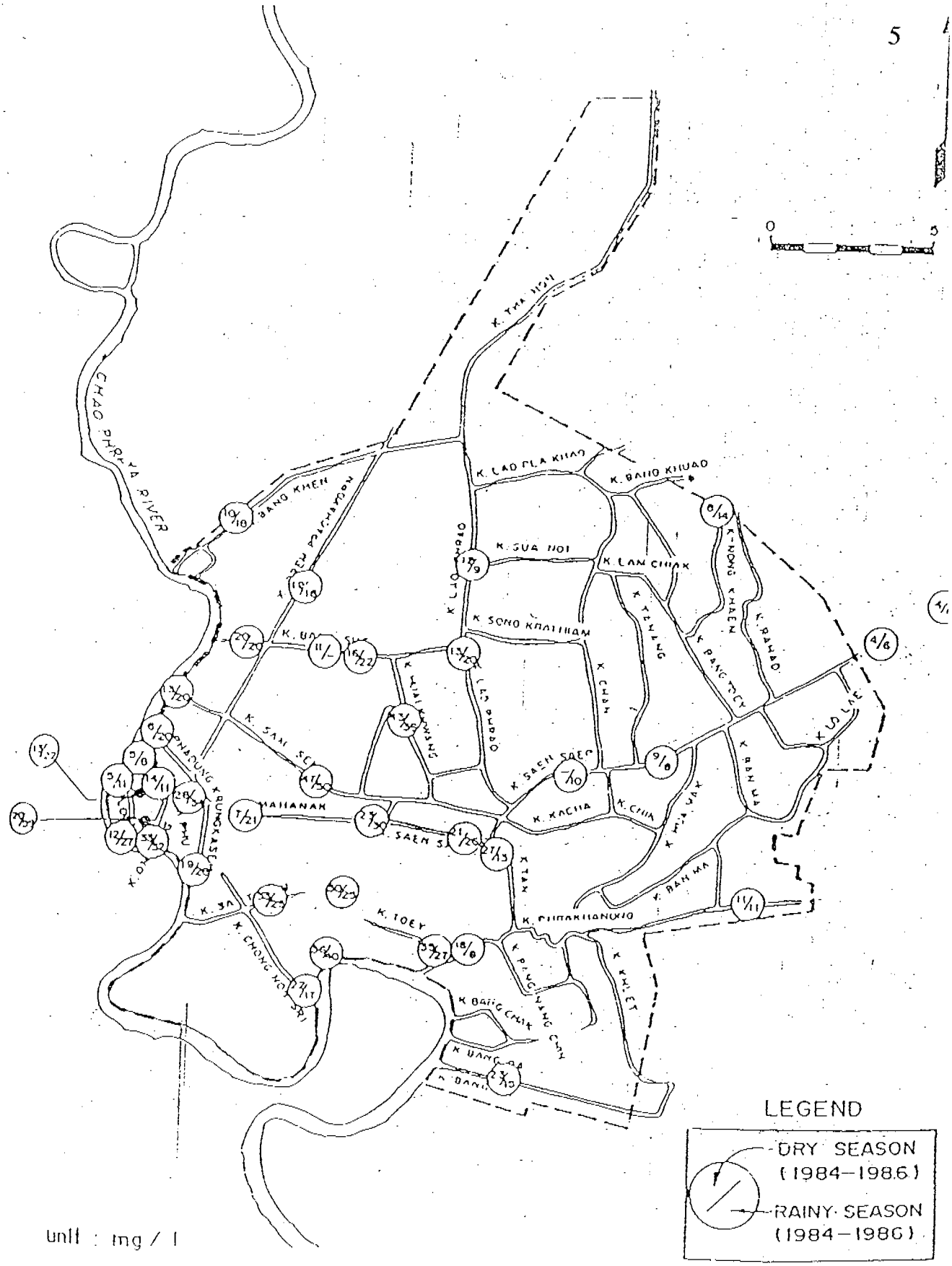

Figure 1.2
Level of Biochemical Oxygen Demand of Canals in Bangkok

Source: The Department of Pollution Control

Table 1.1

Thailand Fresh Water Quality Standard

Quality Index	Statistic Unit	Water Quality Level				
		Class I	Class II	Class III	Class IV	Class V
Color, Odor, and Taste	-	N	N	N	N	N
Water Temperature	°C	N	N'	N'	N'	N
pH	-	N	5.0-9.0	5.0-9.0	5.0-9.0	-
DO p20	mg/l	N	< 6.0	< 4.0	< 2.0	-
BOD p80	mg/l	N	> 1.5	> 2.0	> 4.0	-
Coliform - Total Coliform - Faecal Coliform	MPN/100 ml MPN/100ml		> 5,000 > 1,000	> 20,000 > 4,000	- -	- -
NO3-N	mg/l	N	Maximum 5.0			-
NH3-N	mg/l	N	Maximum 0.5			-
Phenols	mg/l	N	Maximum 0.005			-
Copper	mg/l	N	Maximum 0.1			-
Nickel	mg/l	N	Maximum 0.1			-
Manganese	mg/l	N	Maximum 1.0			-
Zinc	mg/l	N	Maximum 1.0			-
Total Mercury	mg/l	N	Maximum 0.002			-
Cadmium	mg/l	N	Maximum 0.005		0.05	-
Cromium	mg/l	N	Maximum 0.05			-
Lead	mg/l	N	Maximum 0.05			-
Stignin	mg/l	N	Maximum 0.01			-
Cyanide	mg/l	N	Maximum 0.005			-
Radioactivity - Alpha - Beta	 Bequerel/l Bequerel/l	 N N	 Maximum 0.1 Maximum 1.0			 - -
Total Pesticides	mg/l	N	Maximum 0.05			-
- DDT	g/l	N	Maximum 1.0			-
- Alpha-BHC	g/l	N	Maximum 0.02			-
- Dieldrin	g/l	N	Maximum 0.1			-
- Aldrin	g/l	N	Maximum 0.1			-
- Heptachor & Feptacjlor epocixide	g/l	N	Maximum 0.2			-
- Endrin	g/l	N	Not be found			-

Source: Royal Government Gazette, Vol. 103, part 60, dated April 15, B.E. 2529 (1986).

Note: Symbol Description for Table 1.1

N	=	natural
N'	=	natural but the change not greater than 3 ^{0} C
-	=	not defined
^{0} C	=	degree Centigrade
P 20	=	percentile 20 Th. from collected water sample
P 80	=	percentile 80 Th. from collected water sample
mg/l	=	milligram per liter
ml	=	milliliter
MPN	=	Most Probable Number
<	=	not less than
>	=	not greater than

Table 1.2

Classification of Surface Water Resource

Classifications	Objectives/ Condition & Beneficial Usage
Class 1	Extra clean fresh surface water resources which can be used for: (1) conservation, not necessary to pass through water treatment processes, require only ordinary process for pathogenic destruction (2) ecosystem conservation in which basic living organisms can breed naturally.
Class 2	Very clean fresh surface water resources which can be used for: (1) consumption which requires ordinary water treatment process before usage (2) aquatic organism conservation for living and assisting for fishery (3) fishery (4) recreation
Class 3	Medium clean fresh surface water resources which can be used for: (1) consumption but have to pass through an ordinary treatment process before usage (2) agriculture
Class 4	Fairly clean fresh surface water resources which can be used for: (1) consumption but require water treatment process before usage (2) industry (3) other activities
Class 5	The resources which are not classified in class 1-4 and can be used for: (1) navigation

Source: Royal Government Gazette, Vol.103, Part 60, dated April 15, B.E.2529(1986).

Table 1.3

The Relationship between the Characteristics of Canal Water and Water Quality in Term of BOD.

I. Color	BOD concentration
1. green or brown	< 15 mg/l
2. black or gray	> 20 mg/l
II. Odor	
1. odorless or non-disgusting	< 15 mg/l
2. bad odor or disgusting	> 20 mg/l

Source: Thongchai and other (1987).