CHAPTER 1

INTRODUCTION

1.1 Background Information

Urbanization has a dynamic relationship with the physical environment. While urban growth affects the physical environment, urban environment changes also affects the qualities of life in these areas. It transforms the landscape into a complex environment characterized by forms, materials, and activities, which are extensively different from those in the rural landscape. As a result, the climate condition near the ground changes (Goulding, Lewis and Steemers, 1992).

Urban heat island is a phenomenon of microclimate changes induced by urbanization, which the temperature within an urban area tends to be much warmer than its rural counterpart (Kim, 1992). This phenomenon was discovered in the mid of the 19th century in Europe and consequently in North America, and Asia particularly in Japan has been found urban warming in the early of this century.(Kubo, 1996). The geographic extent and intensity of urban heat island varies with city size and with local weather conditions. In general, large cities under calm, sunny weather produce the strongest heat islands (Marsh, 1991). Thereby, large cities in temperate and tropical zones often experience to occur urban warming (Kim, 1992), which get worse in summer season.

Bangkok Metropolis, which is the one of uncontrolled growth cities, is the capital of Thailand that located in tropical zone. The city began to change rapidly in the second half of the 20th century indirectly response to the policy of modernization and westernization. It has been developed as the dominant center for national administration, economic activities, industrialization, telecommunications, social services and public welfare. Table 1 shows the change of population and number of district in Bangkok Metropolis between 1980- 1997.

Table 1: The change of population and number of district in Bangkok Metropolis between 1980-1997 (Department of Policy and Planing, Bangkok Metropolitan Administration, cited in Chulalongkorn University, 1996; National statistical office, 1998)

Year	Population (Million)	Amphoe/Khet
1980	5.15	24 Khet
1993	5.57	38 Khet
1997	5.60	40 Khet

The built-up areas of Bangkok increased more than 122 times in the last two hundred years (Savanamas, 1982, cited in Anuchat Poungsomlee and Rose, 1992), as a result, the city extended and encroached the agricultural area in suburban (Anuchat Poungsomlee and Rose, 1992). Table 2 shows land use change in Bangkok Metropolis in 1986 and 1989, and Table 3 shows the change of green area in Bangkok Metropolis between 1986-1995.

Table 2: Land use change in Bangkok Metropolis in 1986 and 1989 (Department of Policy and Planing, Bangkok Metropolitan Administration, cited in Chulalongkorn University, 1996)

Land use category	Area (sq.km.)		Area changing
	1986	1989	(1986-1989)
Residential	181.0	357.1	+176.1
Commercial	17.84	22.0	+4.16
Industrial and cargo	28.43	27.3	-1.13
Monastery / Public utilities	66.89	47.1	-19.79
Recreation area	4.0	10.4	+6.4
Vacant area and others	1,270.6	1,104.86	-165.75
Total	1,568.76	1,568.76	

Table 3: The change of green area in Bangkok Metropolis between 1986-1995 (Chulalongkorn University, 1996)

Year	Area (sq.km.)
1986	1190.781
1995	1007.088
Area decreasing	183.6936
% Decreasing	15.43 %

The removal of vegetation and placement of a built-up surface on the landscape of Bangkok gives rise to radiative, thermal, moisture and aerodynamic modification of the surrounding environment (Oke, 1989). Therefore, Bangkok is facing higher risk on urban heat island effect. A detailed knowledge of the temperature variation base upon land use / land cover type is the great importance for further urban planning and design to minimize or even to avoid urban warming and also to effectively control energy consumption.

The capability of satellite-based sensors to provide sun-synchronous, high spatial resolution imagery is potentially very attractive and valuable to the study of urban climatology (Roth and Oke, 1989). Surface radiant temperature and vegetation indicies, which derived from satellite data can be used as the factors to indicate urban-rural temperature differences or urban heat island phenomenon (Roth and Oke, 1989; Smith and Choudhury, 1990; Nichloe, 1994).

Settlements in urban area are continually expanding, and by the year 2000 it is estimated that 60% of the world's people will live in towns with 5000 or more inhabitants (Oke, 1987). This makes the study of urban climates more important, to ensure that the urban dwellers have the good healthy environment.

1.2 Objective

To apply remote sensing data for determining the relationship between the vegetation index, surface radiant temperature and land use / land cover in Bangkok Metropolis in 1988 and 1997

1.3 Scope of the study

1.3.1 The study areas covered Bangkok Metropolis and some parts of Samut Prakan, Samut Sakhon, Pathum Thani and Nonthaburi province. The area were represented both of urban and rural land cover type. This area is bounded by a rectangle with the upper left corner at 640000E, 1565000N and the lower right corner at 713000E, 1480000N, covers an area of 6,205 square kilometers. Plate 1 shows the study area and political boundary.

1.3.2 Surface radiant temperature, transformed vegetation index, and land use / land cover derived from Landsat-5 Thematic Mapper satellite.

1.3.3. PCI software was used for satellite image processing and data analysis. ARC/INFO software were used for spatial information preparation. Adobe Photoshop was used for data presentation.

1.4 Anticipated Benefits

1.4.1The data obtained can be applied to predict the trend of urban heat island in other large cities.

1.4.2 The results of this study can be used as the supporting data for urban planning and management in the future to minimize or avoid urban warming.

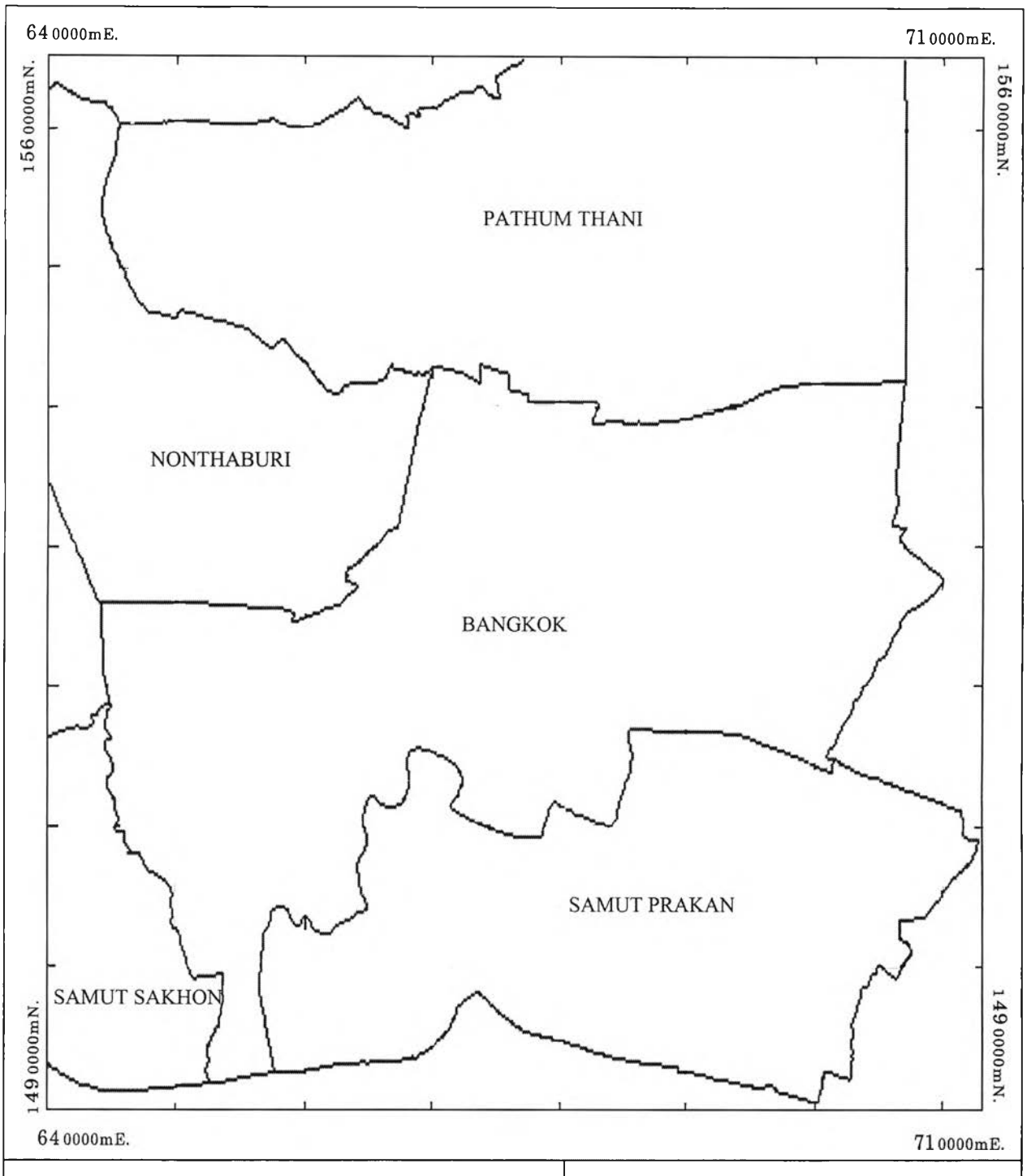

PLATE 1 : STUDY AREA AND POLITICAL BOUNDARY	THE EFFECTS OF LAND COVER ON URBAN HEAT ISLANS IN BANGKOK METROPOLIS
SOURCE : THE POLLUTION CONTROL DEPARTMENT	10 0 10 20 KM N