

# Study on the Urban Heat Island(UHI) using Remote Sensing data

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**Abstract:** Analysis of UHI in Busan region using Landsat TM data. Between 1987 and 1997 surface temperature increased clearly. Land usage of Busan is construed that instigate UHI changing into industry and commerce area. Also, intensity of UHI in surface temperature appeared strongly in industrial area and business area. On the contrary, residential area, mountain area, suburb area did not appear strongly.

**Keywords:** Landsat, Urban Heat Island, surface temperature.

## 1. Introduction

UHI(Urban Heat Island) formed by temperature

change of city by industry development since 19th century. Because temperature invincible tendency rises, urban areas is diagnostic than suburb area is specific high temperature climate formed. UHI phenomenon confirmed by Luke Howard (1833), many researches had that used remote sensing data among them. City scale and UHI phenomenon by growth of cities took by first by research of Roth *et al.*(1989).

Use satellite data, thereafter and many studies that analyze UHI had consisted. That examine about UHI using remote sensing data in our country, Lee(1990) is basis case study about Seoul region, Park(2001) is research that analyze taking advantage of various kinds data with

Landsat TM surface temperature in Seoul area. But it is insufficient UHI case study in our country up to now. Therefore, this research is going to analyze UHI of Busan area effectively using remote sensing data.

## 2. Area Descriptions and Methodology

UHI analysis research area appeared to figure 1 in Busan region. Divided research area according to land usage. Chose to apartment congestion residential area (Haeundae new town), industrial area (Sasang1, Sasang2, Jangrim), commercial area (Semen, Nampodong), mountain area (Jangsan Mt., Hwangryeong Mt.), Kimhae Airport, 5 areas 8 points. Landsat image scene date is November 21 1984, May 6 1987, October 31 1988, May 17 1997. Surface temperature is extracted by Landsat TM band 6, Software that use for processing data used ERDAS IMAGINE 8.4, ENVI 3.4, ArcView Image Analysis. Research achievement method is, first relation of surface temperature and average air temperature, next intensity of UHI and annual change characteristic.



Fig. 1 Study Area (Busan)

## 3. Results

Figure 2 is isothermal line of 1997. Orange color expresses area that is more than 18°C and red color expresses area that is more than 20°C. Center of figure 2, commercial area and industrial area temperature is high temperature residential area and Kimhae airport are some high temperature. Table 1 displays surface temperature in each research areas different imagery Landsat TM 4 scenes. October, 1984 and November, 1988 to compare because difference that is season time interval. But, because May, 1987 and May, 1997 are data of same month, comparison is available. Industrial area and commercial area, both surface temperature is high more than 4°C, and rose more than 7°C in Jangrim industrial area for 10 years. This is due to formation and development of industrial district. Also, surface temperature rise by building increase in Kimhae airport. Other research area did temperature rise few than 2°C. Calculate UHI intensity with research area and suburb area and appeared to figure 4. Standard by 4°C, industrial area and commercial area had more strong UHI intensity, residential area, airport, mountain district show UHI intensity that is less few (figure 4 (a)). Figure 4 (b) is because seasonal difference of the fall and the winter, so intensity value are negative relation. But commercial area shows value between 2°C - 4°C that UHI phenomenon appears strongly in the winter season. Figure 5 displays 1980 - 2000 year's annual change of Busan area mean air temperature. Mean air temperature is tendency that rise for 20 years.

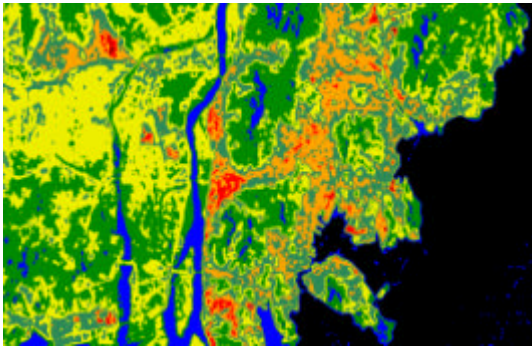


Fig. 2 Isothermal line in Busan

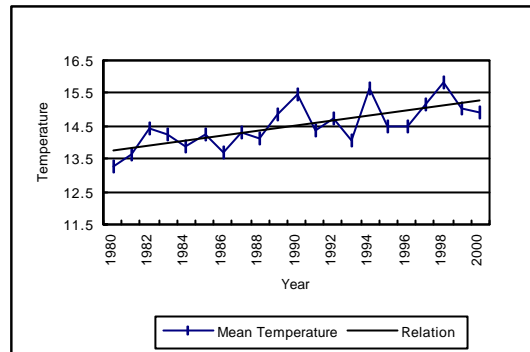


Fig. 4 Annual change of mean temperature

Table 1. Surface Temperature in study Areas

Time & Date	Industrial Area			Commercial Area	
	Sasang1	Sasang 2	Jangrim	Semen	Hwanggyung
21 Nov 1984	-3.4	-0.7	-2.2	1.6	1.7
06 May 1987	15.1	15.7	14.8	18.6	17.3
31 Oct 1988	4.9	4.2	5.1	5.4	5.8
17 May 1997	19	19.2	21.7	22	19.9

Time & Date	Mountain Area		Airport	Resident Area	Suburb Area
	Jung	Hwanggyung	Kimhae	Hwanggyung	Daejeon
21 Nov 1984	-2	-0.6	0.9	2.6	-0.6
06 May 1987	12.7	13	12.8	14.2	10.9
31 Oct 1988	3.9	4.6	5.3	5.5	5
17 May 1997	14.1	12.2	18.1	18.5	18.9

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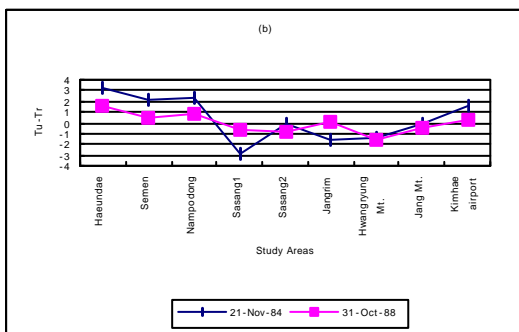
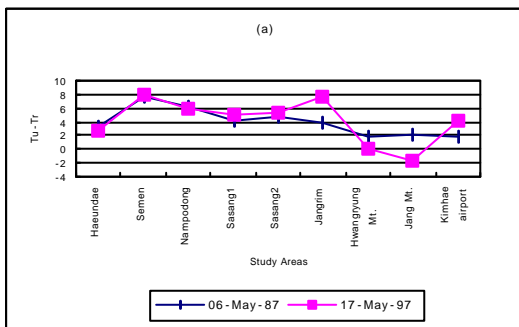


Fig. 3 Intensity of UHI in each study points.