APPLICATION OF ALOS DATA FOR LAND USE CHANGE IN GREEN AREA OF BANG KA CHAO, SAMUT PRAKAN PROVINCE

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Abstract

Bang Ka Chao is the largest greenery area near Bangkok metropolis. The area is ecologically important, and becomes a major source of oxygen, which can reduce air pollution in rapidly expanded city. Bangkok's rapid development has greatly affected Bang Ka Chao area. The area is conveniently accessible by waterways and located near Bangkok's Khlong Toey Port. The Port is located adjacent to a community area, and could not expand any further. Bang Ka Chao which is in the opposite river bank of Khlong Toey Port, has been partially transformed into a warehouse area. The warehouse has become a source of employment. Migration of workers into the area however has caused overpopulation in Bang Ka Chao. Their residential area has tendency to expand and affect the greenery area. New construction is prohibited in Bang Ka Chao and its policy is to keep as green area.

The objectives of this research are to study the potential of ALOS data in classification of landuse identification of and physical characteristics of the area and land use changes from 1996 to 2006 (approximately 10 years). Multi-sensor data such as Landsat, IRS, SPOT and ALOS images were analyzed for land use changes in 1996, 2002 and 2006. The results of the classification of these images were evaluated by field checks and local knowledges of the people in the area. The result provides a satisfactory accuracy of land use classification. The research demonstrates a complete approach of combining multi-sensor satellite images with GIS data to find out information required for regional planners.

In addition, the land use maps were brought to overlay one another, in order to study the land use changes. Physical characteristics and land use maps in 1996, 2002 and 2006 were obtained. These land use maps showed that most of land use in Bang Ka Chao were agricultural area, with mixed orchards. The results showed that residential area has increased and expanded from the main road to the mixed orchard area. As a result, the mixed orchard area was decreased, and the green area was affected. Ten years ago, a project aiming at creating parks in the city was initiated. Suan Sri Nakhon Khuan Khan public park has been created as a recreational space for the general public. The project has become one of the eco-touristic initiatives, which has increased the income of local people. The local people might be interested in tourism, instead of other industries which may affect the green area, as it has become their main source of income.

Keywords: ALOS, Land Use, Bang Ka Chao

1. Introduction

Bangkok Metropolitan is one of a mega city in the Southeast Asian region. With very high density in number of population, due to the fact that this metro serves as the centre of the country, for example socio-economic, politic

and cultural as well. Bangkok rapidly expands within the last decade. This explanation, mostly in habitat and transportation, invades the existing plantation. Furthermore, the consequences from the expansion causes social disorder, pollution including stress and health related deceases. To remedy the adversely affected, the new plantation for green area will ease this. In addition, green area also helps better scenic environment, pollution, transportation, socio-economic and aesthetic as well.

Bang Ka Chao is the largest orchard region located adjacent to Bangkok and industrial estate. The authority then has a plan to utilize this area to boost the air quality for metro population. Under the cabinet resolution on 14 September 1977, there has been a promulgation on the "green area" conservation of Bang Ka Chao area in amphoe Phra Pradaeng, Samut Prakan province. Later, another resolution on 25 June 1991, there has been a project "metro central park" of area 14.44 square kilometers. Although the designated area has been protected for more the three decades, but the rapidly growth for the metro has some negative impacts, particularly from this region located closes to the metro and easy to access by waterway. The opposite side of the area is the Bangkok port or KlongToey, later the community in the port area invades to the other side of the waterway. A number of stock or silo have been established, along with the community with a notification expansion rate, which opposes the cabinet resolution in 1997.

In order to conserve the area along with the development of the existing community, it is necessary to study the trend of land use in this area , from past to the future. The result of this study will enable the authority to plan and to control the community expansion in the future.

2. Objective

To study the potential of ALOS satellite, mostly on land use and the physical of the area from the past to present

3. STUDY AREA

Bang Ka Chao located in amphoe Phra Pradaeng, Samut Prakan province which composed of 6 sub district, they are Song Khanong, Bang Yo, Bang Kachao, Bang Krasop, Bang Namphueng and Bang Ko Bua district with some 21.10 square kilometers. The surrounding is Chaopraya River with total length of 17 kilometer. The narrow of the area is 570 meter in length with the pig-stomach shape as shown in fig.1

Figure 1 Location Map of the Study Area

4. METERIALS

Satellite Data
For this research, LANDSAT-5 IRS and ALOS imagery acquired in 1996, 2001 and 2006 were used with the details as follows:

Imagery	Date	Resolution (meter)
LANDSAT-5 + IRS	1996	5.8
LANDSAT-5 + IRS	2001	5.8
ALOS	2006	2.5

Other related Information (Ancillary data)

- Topographic map produced scale 1 : 50,000 by the Royal Thai Survey Department

- Field survey information and related document were obtained to support the results from the satellite image interpretation.

5. METHODOLOGY

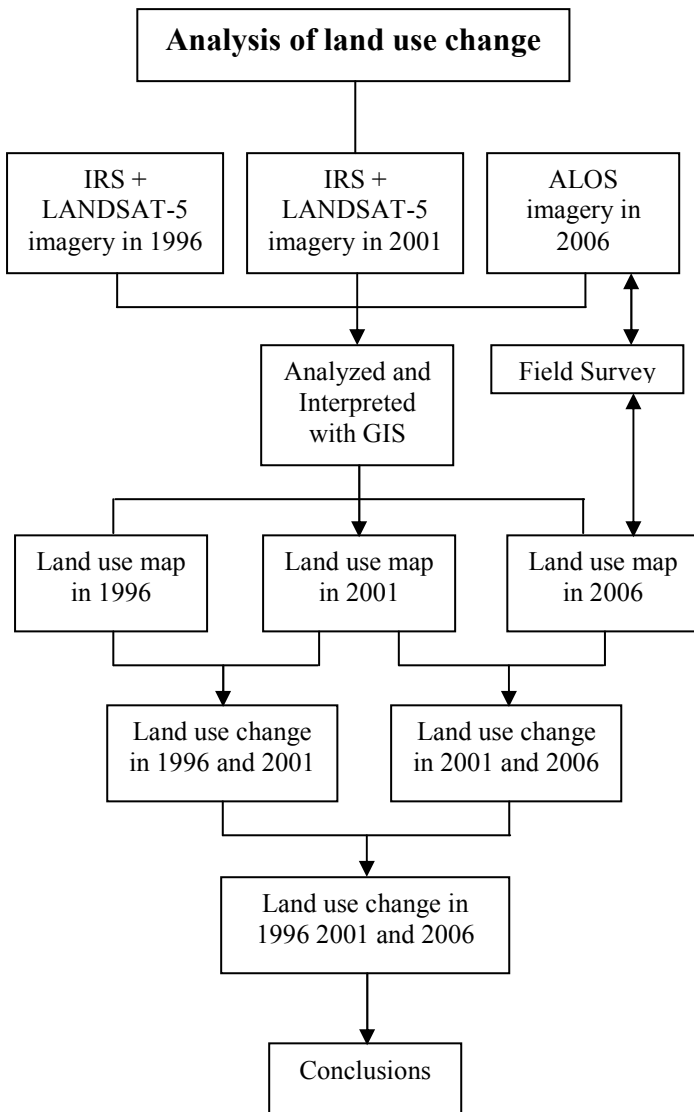The methodology of this research can be described by following flow diagram. (Fig 2)

Figure 2 Flow diagram of methodology

6. Results

By interpretating satellite imagery, the land use classification of Bang Ka Chao is shown as follow:

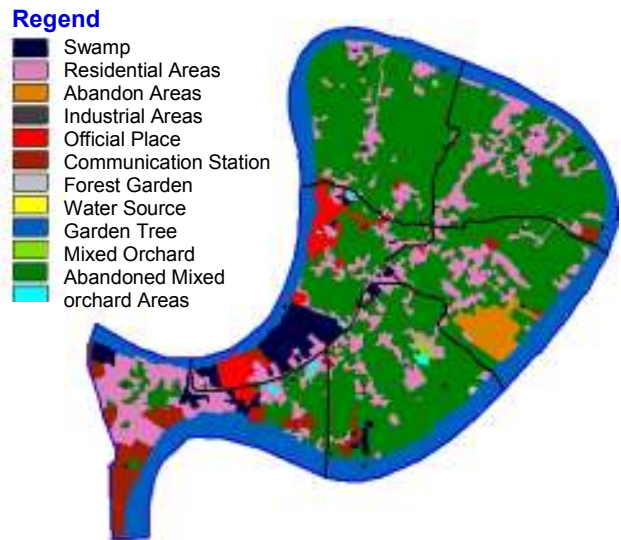**6.1 The land use change in 1996 :** The satellite image map of 1996 by as follow in Fig 3

Table 1 Land use in 1996

Land use	Area (sq.km.)	Percentage (%)
Mixed Orchard	10.63	50.39
Water Source	3.93	18.62
Residential Areas	3.78	17.90
Official Place	0.87	4.10
Swamp	0.86	4.07
Industrial Areas	0.52	2.47
Abandon Areas	0.39	1.85
Another	0.30	0.60
Total	**21.10**	**100**

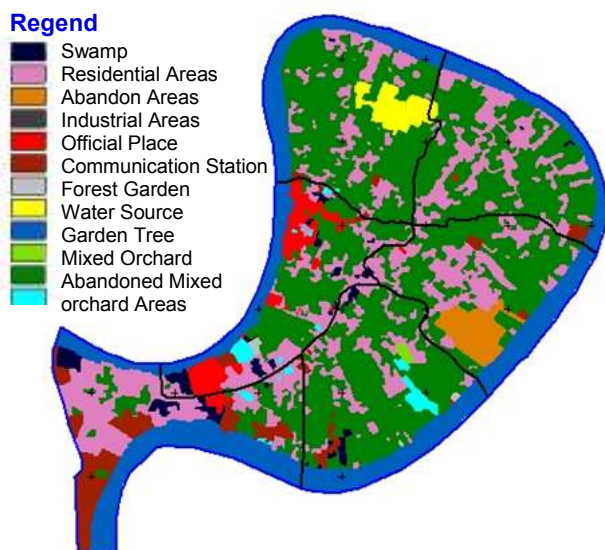**6.2 The land use change in 2001 :** The satellite image map of 2001 by as follow in Fig 4

6.3 The land use change in 2006 : The satellite image map of 2006 by as follow in Fig 5

Table 2 Land use in 2001

Land use	Area (sq.km.)	Percentage (%)
Mixed Orchard	9.48	44.95
Residential Areas	4.81	22.78
Water Source	3.93	18.63
Official Place	0.90	4.24
Industrial Areas	0.55	2.61
Abandon Areas	0.41	1.93
Swamp	0.40	1.90
Park Area	0.34	1.61
Another	0.28	1.35
Total	**21.10**	**100**
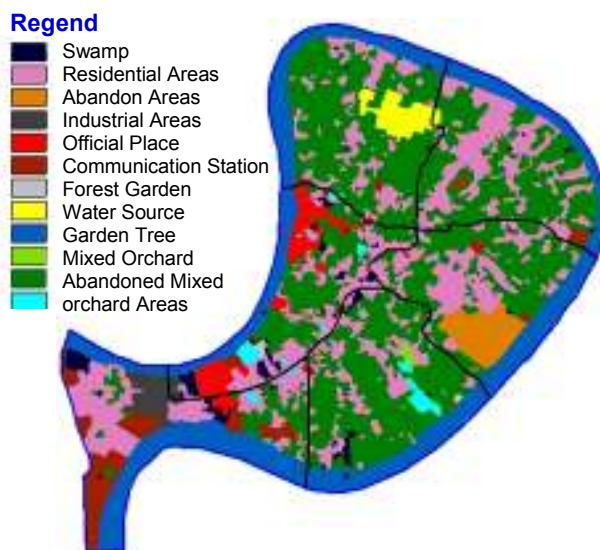
Table 3 Land use in 2006

Land use	Area (sq.km.)	(%)
Mixed Orchard	8.88	42.08
Residential Areas	5.19	24.60
Water Source	3.86	18.32
Official Place	0.84	3.97
Industrial Areas	0.56	2.65
Abandoned Areas	0.48	2.27
Swamp	0.36	1.73
Park Area	0.34	1.61
Constructing Areas	0.30	1.41
Abandoned Mixed Orchard Areas	0.22	1.06
Another	0.07	0.30
Total	**21.10**	**100**

6.4 Land use changes during 1996-2001 : From the existing data of land use in the area in 1996 and 2001 to overlay in order to find the land use during the said period (Table 4)

Table 4 Land use changes during 1966-2001

Land use	Area (sq.km.)		Change (sq.km.)	(%)
	1996	2001		
Mixed Orchard	10.63	9.48	-1.15	-10.82
Water Source	3.93	3.93	0	0
Residential Areas	3.78	4.81	+1.03	+27.25
Official Place	0.87	0.90	+0.03	+3.45
Swamp	0.86	0.40	-0.46	-53.49
Industrial Areas	0.52	0.55	+0.03	+5.77
Abandon Areas	0.39	0.41	+0.02	+5.13
Another	0.30	0.28	-0.02	-6.66
Total	21.10	21.10		

The change of land use during 1996-2001 had been mostly from mixed orchard to residential areas, around 1.04 square kilometer or 4.92 percent of the total area. The second change had been from mixed orchard to public area, around .33 square kilometer or 1.54 percent of the total area.

6.5 Land use changes during 2001-2006 :
From the existing data of land use in the area in 2001 and 2006 to overlay in order to find the land use during the said period (Table 5)

Table 5 Land use changes during 2001-2006

Land use	Area (sq.km.)		Change (sq.km.)	(%)
	2001	2006		
Mixed Orchard	9.48	8.88	-0.6	-6.33
Water Source	3.93	3.86	-0.07	-1.78
Residential Areas	4.81	5.19	+0.38	+7.90
Official Place	0.90	0.84	-0.06	-6.66
Swamp	0.40	0.36	-0.04	-10.00
Industrial Areas	0.55	0.56	+0.01	+1.82
Abandon Areas	0.41	0.22	-0.19	-46.34
Another	0.28	0.07	-0.21	-75.00
Total	21.10	21.10		

The change of land use during 2001-2006 had been mostly from mixed orchard to residential areas, around 0.52 square kilometer or 2.45 percent of the total area. The second change had been from residential area to Constructing Areas, around 0.21 square kilometer or 0.98 percent of the total area.

6.6 Land use changes during 1996-2006 :
It was noted that, during 1996-2006, we found that the change in land use during 1996-2006 had been mostly from mixed orchard to residential areas, around 1.50 square kilometer or 7.11 percent. Then the change had been from mixed orchard to public park area, around 0.33 kilometer or 1.54 percent of the total area (Fig 6)

Table 6 Land use changes during 1996-2006

Land use	Area (sq.km.)		Change (sq.km.)	(%)
	1996	2001		
Mixed Orchard	10.63	9.48	-1.15	-10.82
Water Source	3.93	3.93	0	0
Residential Areas	3.78	4.81	+1.03	+27.25
Official Place	0.87	0.90	+0.03	+3.45
Swamp	0.86	0.40	-0.46	-53.49
Industrial Areas	0.52	0.55	+0.03	+5.77
Abandon Areas	0.39	0.41	+0.02	+5.13
Another	0.30	0.28	-0.02	-6.66
Total	21.10	21.10		

7. Conclusion

During the change in land use in the past decade, most from mixed orchard to residential areas. However, during first 5-year period, from 1996-2001, changed from mixed orchard to public park and second 5-year period, the land use changed from residential areas to construction.

8. Recommended

The study in each period of time consorts with the change of socio-economic in this area. In short, the more rapid grown in socio-economic, the more change in land use. Hence, the study should include the socio-economic factor for a good result.

9. Referance

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