URBAN LAND USE STUDY WITH HIGH RESOLUTION SATELLITE IMAGERY

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ABSTRACT

Multi temporal data of LANDSAT and SPOT recorded in 1988 and 2002 and IRS recorded in 2001 were used for a study site of Bangkok Metropolitan and its vicinity. The Pan-sharpened image of LANDSAT and high resolution IRS data revealed many different urban land use categories based on color differences and could be used for land use change detection on an operational basis. The urban land use can be grouped into 5 main types as follows: agriculture, forest land, water body, urban and built up land and miscellaneous land. It was found that during the 15 year period (1988 – 2001) the urban and built up land increased 1,222 sq.km. or 115 % while the agriculture areas and forest land decreased 1,242 sq.km. or 20 % and 37 sq.km. or 32 % respectively.

1. INTRODUCTION

An operational earth observation, optical sensors have proven an efficient tool for many applications. Imagery acquired by them offer various wavelengths and reveal specific information about ground features. Applications of satellite remote sensing have been accomplished in several fields. The Geo-Informatics and Space Technology Development Agency has collaborated with Chiang Mai University in the use of satellite data in the project "Metropolitan transportation system construction collaboration project phase 7 (MTS VII)". The main objective of this study is to carry out the urban land use change detection of Bangkok Metropolitan and its vicinity during a period of 15 year (1988-2002) by using remote sensing technology. The obtained results will be integrated with the socio-economic data for effective planning of traffic and transportation system suitable for the development of a city.

2. REMOTELY SENSED DATA AND OTHER DATA

2.1 Satellite Data

SPOT –1	1988
LANDSAT-5/TM	1988
LANDSAT-7/ETM	2002
IRS-Panchromatic	2001

2.2 Other related Information

Topographic maps which were produced by the Royal Thai Survey Department and an existing land use map from Land Development Department at a scale 1:50,000 were used for supporting image interpretation.

3. METHODOLOGY

The simple image pre-processing was carried out including image enhancement, geometric correction, mosaicking and Pan-sharpening of IRS and LANDSAT-7/ETM(Figure 1and2). The visual interpretation of 1: 50,000 scale Pan-sharpened images was performed, and ground truth data were collected by using GPS tracking in mid 2002. Urban land use map of 1988 and 2002 were obtained, and then urban land use change detection was conducted by using GIS.

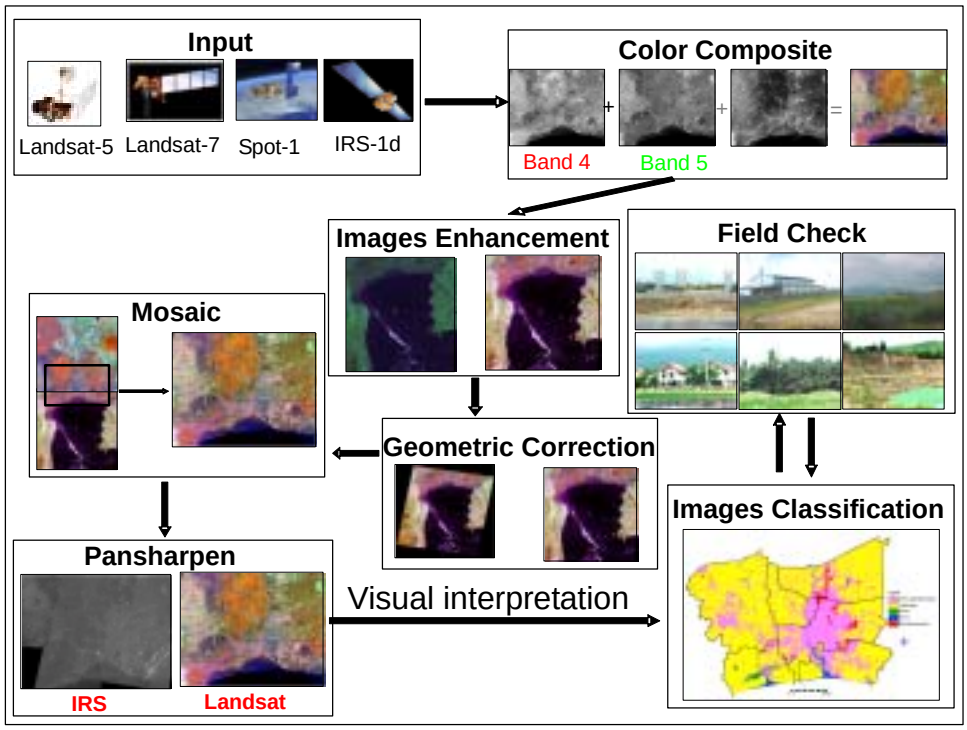

Figure 1: Flowchart of methodology

Figure 2: Pan- sharpened image of LANDSAT-7 ETM+ and IRS-Pan 5 m. resolution (2001 image) (Muang Thong Thani Complex and vicinity)

4. RESULTS

The pan-sharpened image as shown in Figure 2 provided a better inter-pretation capability for urban land use mapping. Land use categorieswere derived from visual interpretation . The image interpretation keysused to identify includes tone, texture, pattern, shape and association. The land use types were divided into 5 classes in Table 1.The land use of 1988 and 2002 as will as The land use change detection are shown inFigures 3-5 and table 2.

5. CONCLUSION

The best identification of urban land use type with pan-sharpened image of IRS Panchromatic and LANDSAT-7+ETM is achieved by visual interpreta-tion using reflectance in term of tone and color, texture, pattern, shape and association. In addition, understanding of local cultural practices, knowledge of topography and ground information are essential to make an accurate urban land use map.

REFERENCES

Lillesand, T.M., and Kiefer, R. W, 1979, Remote Sensing and Image Inter-pretation, 2 nd, John Wiley & Sons Ine., New York.

Office of Transport and Traffic Policy and Planning (OTP). 2003 FinalReport: Metropolitan Transportation System Construction Collaboration Project Phase 7 (MTS VII).

Table 1: Land use and land use change of Bangkok Metropolitan and its Vicinity during 1988 - 2002

LAND USE	Area (sq.km.)		Land use change	
	1988	2002	Sq.km.	%
Agriculture	6,352.94	5,110.97	-1,241.97	-19.55
Forest land	115.52	78.98	-36.54	-31.63
Water body	99.55	127.20	+27.65	+27.77
Urban& built up land	1,058.09	2,280.12	+1,222.03	+115.49
Miscellaneous land	94.95	123.74	+28.79	+30.32

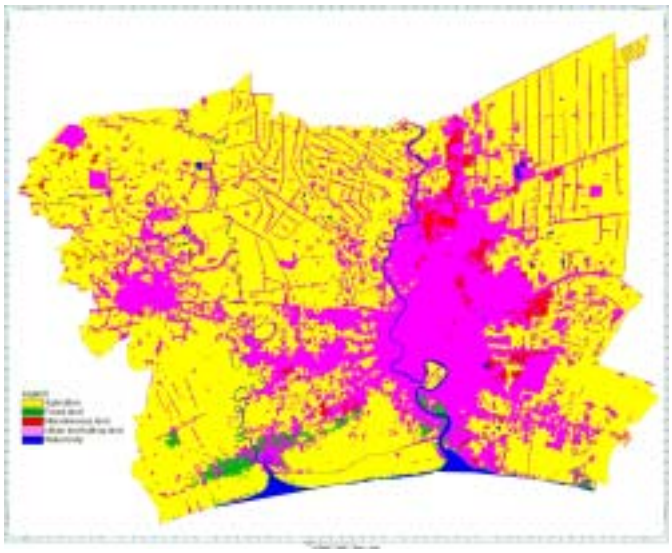

Figure 3: Land use map of Bangkok Metropolitan and its vicinity in 1988.

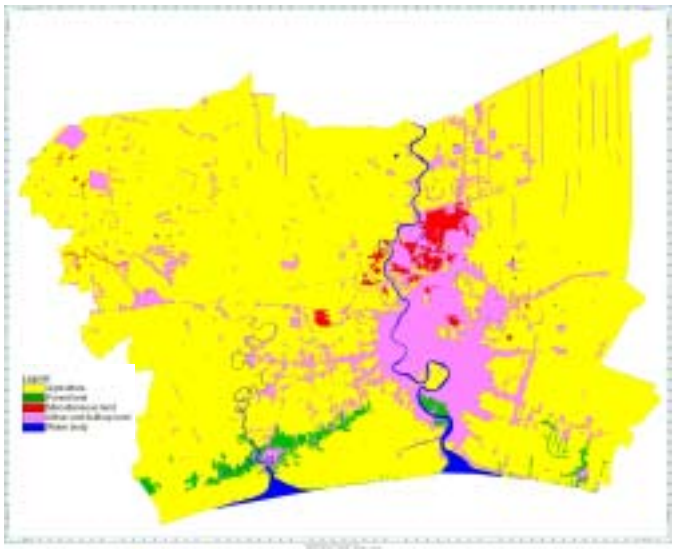

Figure 4: Land use map in 2002.

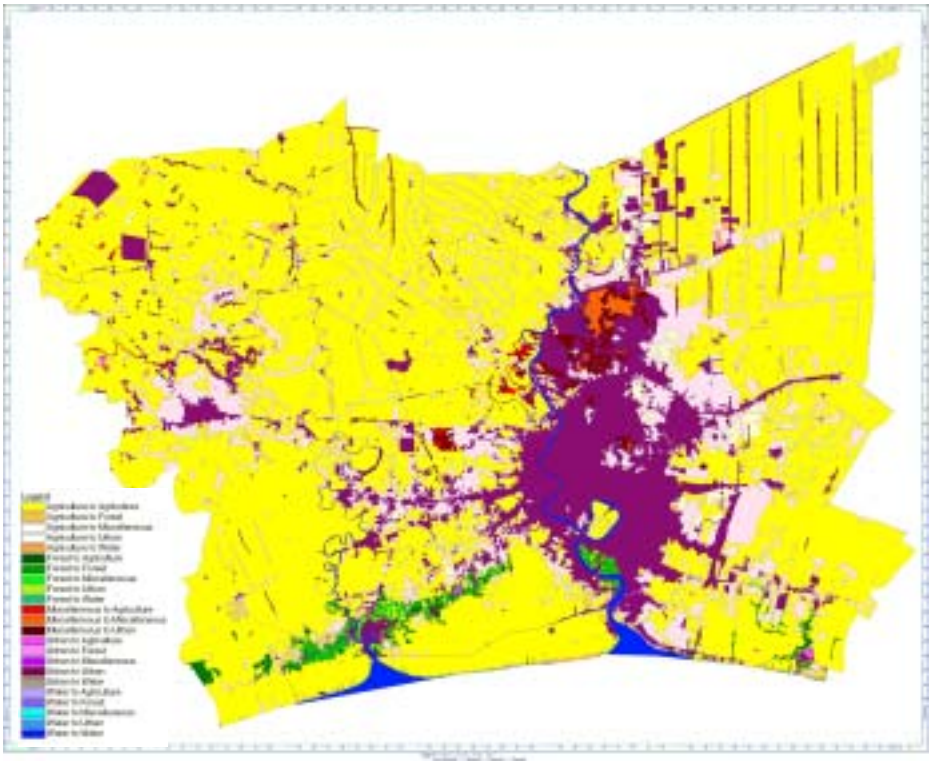

Figure 5: Land use change detection map of Bangkok Metropolitanand its vicinity during 1988 - 2002.

Table 2: Confusion matrix of Land use change detection, Bangkok Metropolitan and its Vicinity during 1988 - 2002

Land Use 2002	Land Use 1988						
		Agriculture	Forest	Misc.	Urban	Water	Total
	Agriculture	5045.2	43.35	11.62	7.43	3.18	5110.79
	Forest	34.45	41.97	0	1.53	1.03	78.98
	Misc.	96.48	0.18	26.33	0.22	0.53	123.74
	Urban	1141.49	26.56	56.96	1046.92	7.8	2279.72
	Water	35.02	3.45	0.04	1.74	86.95	127.2
	Total	6352.72	115.52	94.95	1058.09	99.49	7720.76