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The Changed Coastline in Loi Island, Chonburi Province during 1997 to 2004

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ABSTRACT

Loi Island is connected with Sri Racha, Chonburi Province by a bridge. The fishermen and tourists use this island in many purposes. This research was investigated during September 2004-June 2005. Many kinds of data resource were used in this study such as geoinformatic system data and seawater current. From the final result showed that coastline is dynamics changed in every years and sensitive for protecting. The unique image in year of 2001 depicted a new bridge. Abandon of suspended solid was distribution around the coast. From human activity, size of Loi Island nowadays bigger than in year 1997 about 1.4 times, this was easy to interpret by remote sensing data. Although shape of new bridge was changed but seawater movement still having the same direction and speed have a little bit changed less than 10 % since under the bridge was still shallow. The seawater could not move in easy way.

Key words: remote sensing, coastline, seawater current

INTRODUCTION

Loi Island is connected with Sri Racha, Chonburi Province by a bridge. It is located at the east part of Thailand coast. The UTM location of study area were 1454725N-1456850N and 708250E-710375E. East part of the area looked like linear coastline, west part was upper gulf of Thailand. Tidal current effect the seawater movement, with averaged depth was about 6-8 meters and coastal main elements were sand and grit.

The fishermen and tourists use Loi Island in many purposes such as oyster and green mussels floating type farming, sea grass cultivation, and small scale fishing activities, with density of community. Since District Administration Organization have improved coastal environment into eco-tourism area and also provided some necessary infrastructures.

The seawater movement in this area was very slow or unmovable in some time. Until 2001, a new bridge in different shape was constructed to replace an old one. The seawater can flow through under the new bridge in both sides. Thus the water current along the coastline was conformed into new conditions. Previous time, this area had the coastal erosion as well as the water pollution problems.

The research had focused in changing of coastline and surround area by using satellite images data for accomplishment. Surveying and collected seawater velocities were used for observing seawater movement.

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MATERIAL AND METHODS

This research was investigated during September 2004 to June 2005. The location covered Sri Racha coastal zone(1454725N-1456850N, 708250E-710375E), Chonburi province, east coast of Thailand. The study area was presented in Figure 1.

Many kinds of data resources were used in this study. First, Geographic Informatic system vector data was analysed for creating the layout of coastal area and Loi Island. Second, remotely sensed data that acquired from Geo-Informatics and Space Technology Development Agency (GISTDA) had the details as Table1. Third, seawater current from collected during 20 May - 10 June 2005 by SD6000W and Anongponyoskun, 1998, seawater velocity data at 708500 E and 1455700 N were used. The water height was collected by Global water WL 15 water level logger at 708212 E and 1458517 N during 20 May -10 June 2005.

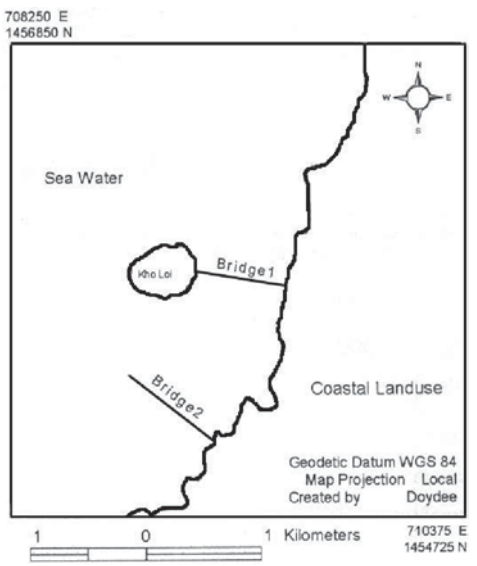

Figure 1 Study area : Loi Island, Chonburi Province, Thailand.

LANDSAT TM data from year of 1997 to year of 2004 were in digital image format. Change detection procedures should be involved acquired data as the same sensor and be recorded using the same spatial resolution, viewing geometry, spectral bands, and time of day. (Lillesand and Kiefer, 1979). Cropping an interested area need to save time for performing image analysis. Geocoding technique set entire images to Geodetic Datum (WGS 84) and Map Projection (LOCAL) with spatial resolutions 25 meters.

Around this area, water current is depended on mixed tide, which has period about 12 hours 25 minutes. SD 6000 was used to record every 10 minutes of seawater velocity at 708500 E and 1455700 N with depth 1 m below sea surface during 20 May -10 June 2005. This data of seawater velocity would be compared to data in 1997(Anongponyoskun, 1998). At the same time, seawater height was collected by used Global water WL 15 water level logger every hour along the experiments.

RESULTS AND DISCUSSION

After succeeded color surface technique (ER Mapper, 1998), features of coastline could be shown as Figure 2. During 1997-2000, the figures displayed almost the same phenomena, which is an old bridge there. In 2001, a new bridge started building so that the image displayed the suspended solids from soil and also task from bridge construction. A new bridge finished building in 2002. The image in year 2004 showed the size of

Table 1 Information of remotely sensed data during 1997-2004.

Image data information				
Satellite	Sensor	Geodetic datum	Map projection	Cell size (m)
LANDSAT	TM	WGS84	LOCAL	(25×25)

Loi Island as well as the coastline became bigger than in year 1997 about 1.4 times since District Administration Organization developed environment by increasing the area for eco-tourism purpose and pier as well. From field survey in this year, coastal water quality along Loi Island was in normal situation and water column was mixed in both sides.

Figures 3 showed grid surface of Loi Island image in 1997 and 2004. They appeared that area of Loi Island and Coastline was changed. The enlarge area at Loi Island and coastline near the bridge could see from this figure. District Administration Organization had been multiply infrastructures, park, port and breaker water around the Island and the coastline.

Current velocity distribution diagrams and stick diagram were plotted by using software SD6000W version 4.1.7.21 as shown in Figure 4 and Figure 5, respectively. Flow direction in year 1997 and 2004 were nearly the same pattern. Direction of flood tide was about 15-40 degree from north and ebb tide was about 190-200 degree from north. Velocity speed was about 0.6-1.0 m/sec. Velocity distribution diagrams showed that velocity in 1997 and 2004 were nearly the same

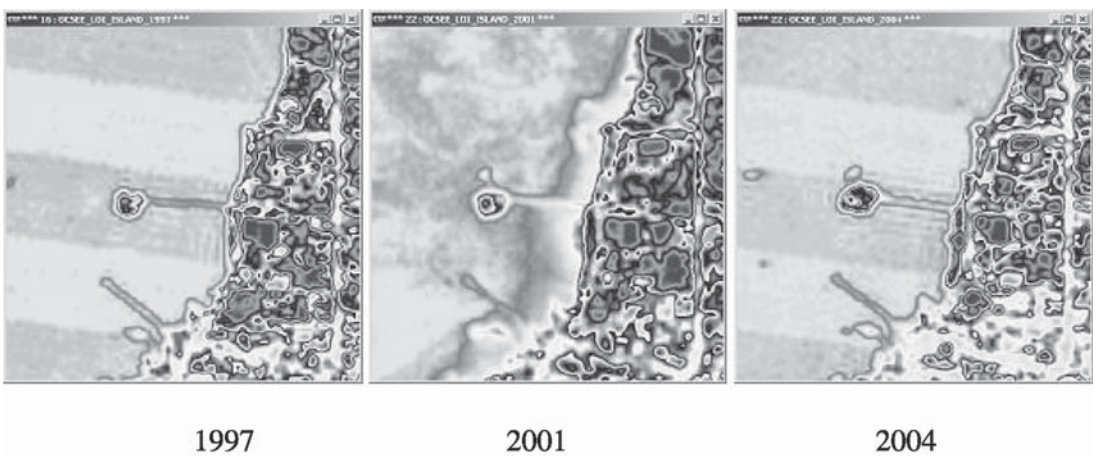

Figure 2 Color surface of Loi Island Image in year 1997, 2001 and 2004

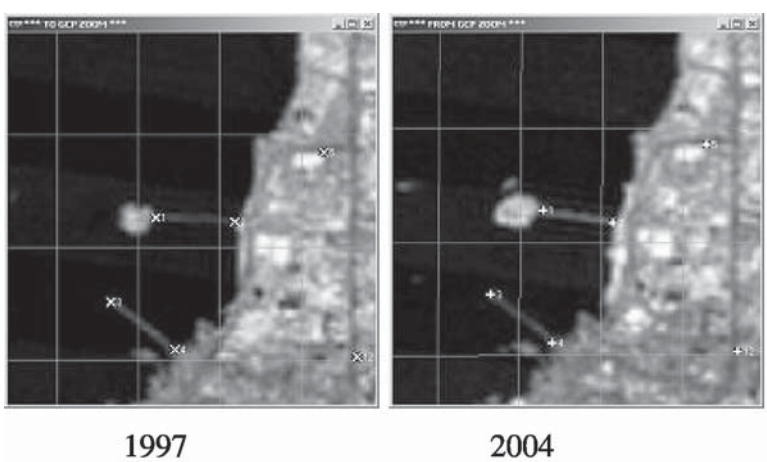

Figure 3 Grid surface of Loi Island Image in year 1997 and 2004.

component. Anongponyoskun and Bundismith (1998) reported that in this area during flood tide, highest velocity was about 1.1 m/s and current moved to northeast (approximately 30 degree with north). During ebb tide, highest velocity was about 1.0 m/s and current moved to southwest (approximately 200 degree with north).

The Figure 5 showed that tide and tidal current had period about 12 hours 25 minutes. Direction of tidal current was controlled by topography of the area. Flood tide, direction of flow is toward northeast and ebb tide direction of flow is toward southwest. The range of tide was about 3.5 m. According to Anongponyoskun, 1998, buoys tracking pattern were showed as Figure 6. The direction of flow looked as same as Figure 4-5. The almost of seawater moved around the head of Loi Island on the west part. It flowed toward northern part during flood and flowed toward southern part during ebb.

In year of 2004, new shape bridge was finished constructing. Pattern of flow was stilled having the same pattern as year 1998. There was only a few seawater flowed through under the new bridge, because of shallow depth under the new bridge and seawater could not move through during low tide. During flow rate was slow, it would have sedimentation phenomena along the shoreline. In other hand, because of shallow water area near the shoreline, wind wave would be affected to the coastal erosion. So water breakers were added in the coastline and Island by District Administration Organization' projects. But dynamic changed of natural resources, marine and coastal environmental which had done by human activity, would be effected to surround area.(Doydee, 2005)

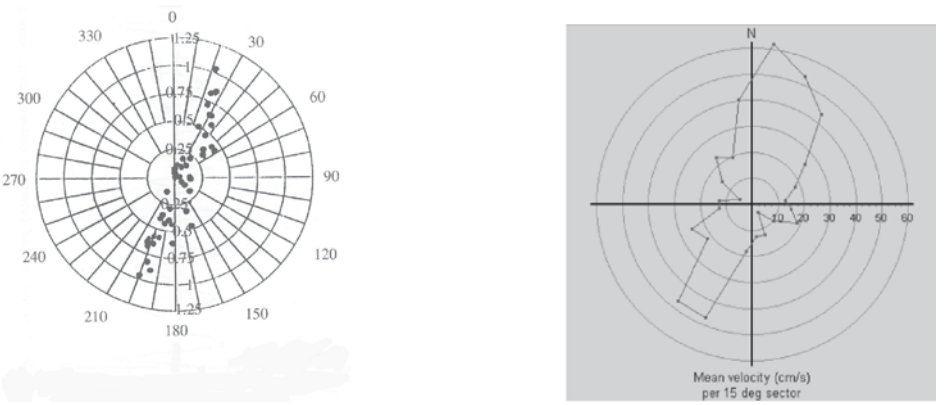

Figure 4 Current velocity distribution diagrams in year 1997 and 2005. (From Anongponyoskun, 1998)

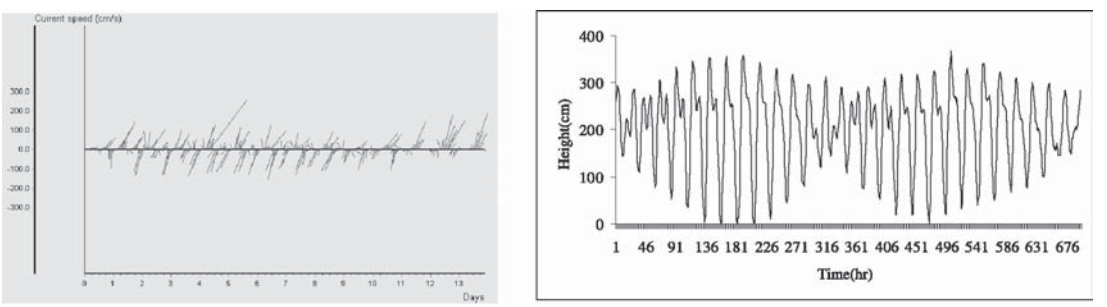

Figure 5 The stick diagram of tidal current and variation of tide during 20 May –10 June 2005.

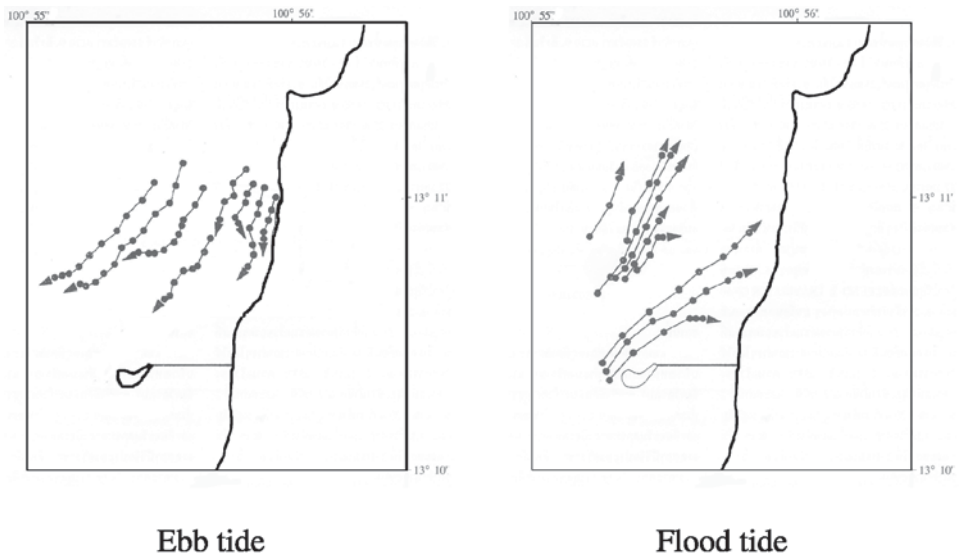

Figure 6 Maps of buoy tracking at Sri Racha during ebb tide and flood tide. (Anongponyoskun, 1998)

CONCLUSIONS

The study was focused on remote sensing technique for observing the changed of coastline and on pattern of seawater circulation in Loi Island. From final result showed that coastline is dynamics changed in every year and sensitive for protecting. The unique image in year of 2001 depicted that a new bridge was created by abandon of suspended solid was distribution around the coast. From human activity, size of Loi Island nowadays is bigger than in year 1997 about 1.4 times, which was easy to interpret by remote sensing images. Although shape of the new bridge was changed but seawater movement still having the same direction and the speed have a little bit changed less than 10% since under the bridge was still shallow. The seawater could not move in easy way.

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