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## HISTORICAL SHORELINE CHANGE RATE IN HUALIEN CITY TAIWAN

Wen-Juinn Chen and Hon-Yi Kuo

Hualien coast is located in the eastern of Taiwan and its coastline length is about 124 km, most of them are rocky type, sandy coast is relatively rare and precious. The diversity of the coastal geomorphology formed many well-known tourist attractions and unique marine cultures, coastal sightseeing become one of the major economic development in Hualien. However, human's over-development and large waves and storm surge act in typhoon season, has caused the coast occurred serious erosion problem, especially in the sandy coast, such as Hualien city and Hsingchen town, many coastal highway were collapsed and re-lined to avoid this threaten. The government has started planning many protection works to mitigate coastal erosion, due to not to understood the historical shoreline change, resulting in many of the protection methods didn't effective to mitigate the erosion.

The main purpose of this paper is to understand the historical shoreline change in Hualien city; we used aerial photos, survey maps and satellite images etc. since 1978 to 2010 to calculate the rate of shoreline change. Firstly, we adopt four factors that presented by Ali (2003) to examine the linear metric characteristic of all the digitized shorelines, after the calibration; we use a GIS system and a P2P program to compute the shoreline change rate.

Table 1 shown as the historical shoreline change rate in Hualien coast, and the left illustration in Figure 1 shows the historical shoreline of each year, and the right illustration in that figure shows the shoreline change between two different years. In Table 1, it shows; shoreline in Hualien coast has an obviously change rate since 1978, a lot of beaches were eroded by wave action and the maximum retreated rate happened between 1978 and 1987 in Gian township.

Table 1 Shoreline change rate in Hualien coast.

Town	Shoreline change rate (m/year)				
	1978~1987	1987~1994	1994~2000	2000~2009	1978~2009
Shoelin	1.03	-3.90	-0.37	-0.18	-0.70
Hsinchen	-2.02	-0.39	-0.75	-2.18	-1.45
Hualien	-1.82	-0.77	-1.08	-2.21	-1.55
Gian	-3.68	-4.20	-5.68	2.03	-2.53
Sohon	0.03	-5.50	-0.07	-0.32	-1.34
Honbin	-0.28	-4.79	1.12	-0.17	-0.98

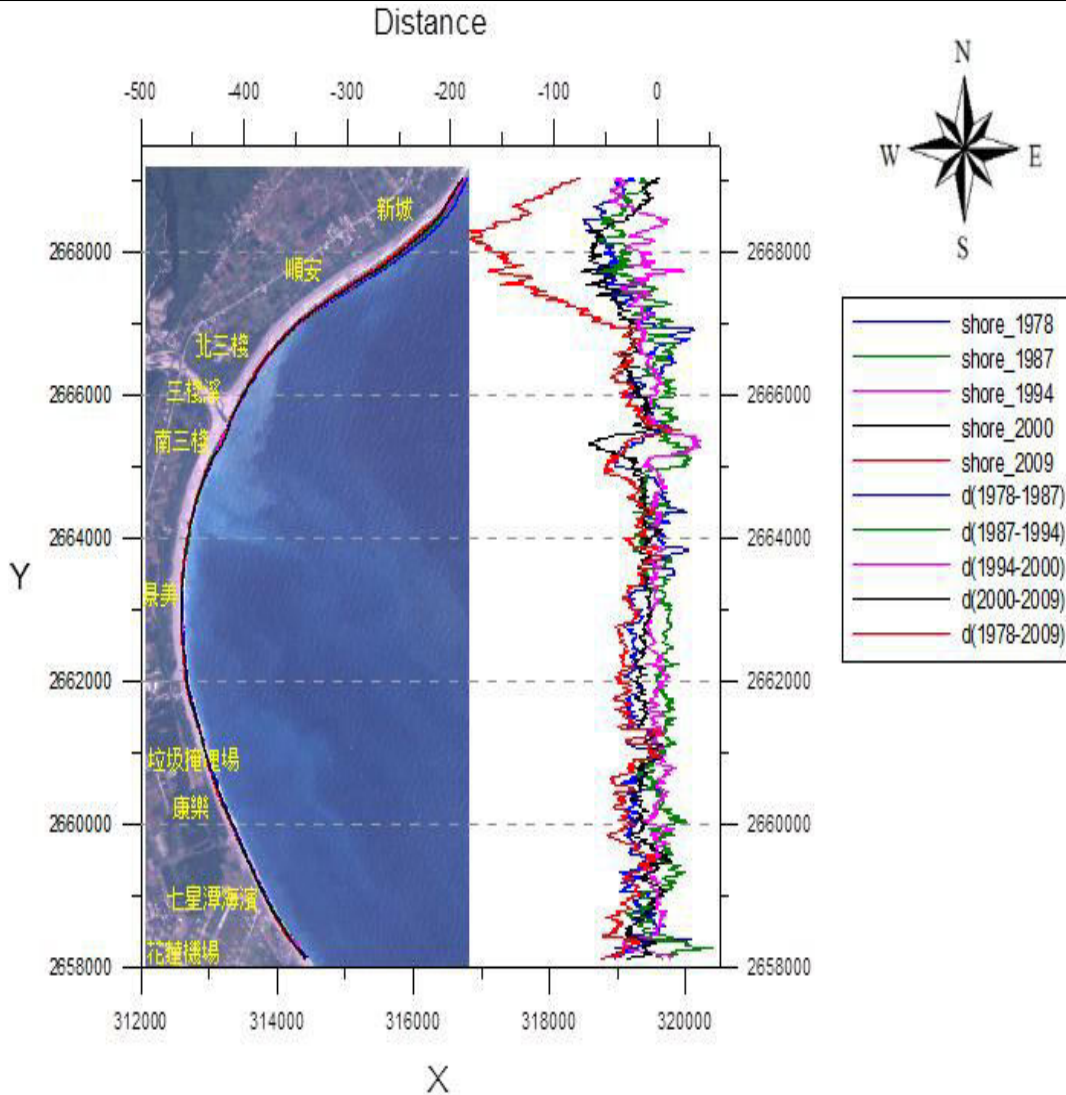


Figure 1 Historical shoreline change in Hualien city.

From Figure 1, the result shows that the coast of Hualien city almost was eroded since 1978 to 2009, especially more serious in the period between 2000 and 2009. The shoreline erosion rate is 1.82 m/yr between 1978 to 1987, and the maximum retreated rate is 2.21 m/year in 2000-2009. In the north area of Hualien city, shoreline retreated about 200m since 1978 to 2009. The Totally, about The other serious erosion place is at Nanbin coast; before 1987, most area of this coast are stable, and it began to erode since 1987 when Hualien harbor was constructed, the north breakwater blocking alongshore sediment transport and beach began to erode, shoreline retreat about 96m in 1987 to 1994. Also, shoreline erosion extended southward to Hwazen, the average erosion rate is about -3.6 m/year in this area since 1987 to 2004. The erosion was under controlled when a segment of submerged breakwaters are constructed since 1994 to 2000. However, because of storm wave action and sand drifting reduction, Hualien coast still threatening by coastal erosion.

**REFERENCES**

Ali, T. A.(2003) New Methods for Positional Quality Assessment and Change Analysis of Shoreline Features, the Ohio State University, Doctor of Philosophy.