



Island beach management strategy in China with different urbanization level – Take examples of Xiamen Island and Pingtan Island



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ABSTRACT

Because of a rise in tourism in Pingtan, beach resources are threatened by various pressures. This paper proposes beach management strategies for developing tourism on the island, using the experience of developed tourist islands. Pingtan and Xiamen were selected as case studies. This paper addresses beach management practices implemented on both islands, and the important factors affecting the effectiveness of beach management. The results show that the beach environment on both islands vary in types of use. In Xiamen, the coastal management scheme, beach nourishment, and coastal environment improvement programs played important roles in island beach management, according to our analysis of beach management processes. Certainly some negative aspects occurred in urban and tourism development. Comparison of beach management through SWOT analysis between locations indicates that the lack of a management scheme is the primary reason why beach management is so limited, and several environmental problems exist in Pingtan. Both islands implemented beach nourishment as their primary management activity for tourism development. This suggests that beach managers should learn from experiences, and put forward appropriate strategies in the future. For effective beach management, Pingtan also needs to establish interactive participation mechanisms, and enhance public awareness and local managers' perspective of public involvement.

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1. Introduction

Rapid urbanization usually leads to greater demand for land and space in coastal areas than in inland areas, because of the many attractive attributes of the former (Cui et al., 2004). Around the world, beaches dominate coastlines geographically, and much of the coastal urban development occurs behind beaches (Huijbers et al., 2013).

Beaches display a variety of functions, including coastal defense against storm surge and coastal tourism (Houston, 2008; Klein et al., 2004; Hanson et al., 2002), and act as important ecosystems (Schlacher et al., 2008). Beach research has traditionally concentrated on beach geomorphology and related coastal engineering (Ariza et al., 2008; Nel et al., 2014). Over the last two

decades, comprehensive studies have gradually become more prevalent, examining human use, beach management and economic value (Breton et al., 1996; James, 2000; Houston, 2008; Shivlani et al., 2003). Beach management research has attracted more attention than coastal tourism, with studies focused on amenity beach management (Frampton, 2010), users' perspective (Marin et al., 2009; Roca et al., 2009; Lozoya et al., 2014), beach quality evaluation and classification (McKenna et al., 2011; Botero et al., 2015), carrying capacity (Zacarias et al., 2011), and safety management (Hartmann, 2006).

China has a mainland coastline of 18,000 km and an island coastline of 14,000 km, with more than 5000 km of sandy coastline (Cai, 2013). These areas support more than 70% of the large cities and half of the population, and produce 55% of national income (Lin et al., 2009). Because of rapid urbanization and sea level rise caused by global climate change, increasing human activities and storm surges have led to coast erosion occurring on about 70% of beaches (Cai et al., 2009; Chen et al., 2010). With the extension of coastal tourism in China, the economic value of beaches has become

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important, bringing \$136.8 billion and 35.3% of the GDP of marine industries in 2014, ahead of other marine industries (SOA, 2015). Thus, maintaining sustainable beach development and effective beach management has become a common problem faced by coastal cities.

Sandy coasts have great entertainment value in highly urbanized islands, where beach nourishment projects or artificial beaches have been constructed to meet public requirements (Luo et al., 2015). Beach management processes are entering a new stage, with a proposed policy of marine ecological civilization. In contrast, the significant lag in management strategies has caused unplanned and disorderly exploitation of beach resource in islands with a low degree of urbanization (Liu et al., 2013).

As a well-known coastal tourist destination, Xiamen Island was one of the earliest cities in China to implement beach nourishment and management schemes. Although the scale of the tourism industry in Pingtan is relatively limited, it shows great development potential under the policies of 'Comprehensive Pilot Zone' and 'National Free Trade Zone' (Pingtan Government, 2015). Effective management and protection of key tourist resources, such as the beach, is a critical task for ensuring the island is a recognized International Tourism Island. This paper presents a review of the beach management situation in two islands, examining their management schemes and physical practices. The study aim was to guarantee beach quality in Pingtan, by borrowing beach management experiences and lessons from the analysis of beach management processes in Xiamen.

2. Study areas

Pingtan Island, located in the northern Taiwan Strait, is the fifth largest island in China. The establishment of the 'Pingtan Comprehensive Pilot Zone' in 2009 rapidly pushed the urbanization process. The urbanization rate reached 42.6% in 2014, up from less than 20% before 2009 (Pingtan Statistical Bureau, 2015). In recent years, Pingtan has attracted more and more tourists, who made more than 1.8 million trips in 2014 (twice as many as in 2013) and brought in revenues of \$70.8 million.

Pingtan Island is the main beach region in Fujian province. It has a sandy coastline, with bay beaches extending for 44 km, except for on the west side near the Haitan Strait (Fig. 1). Because of the low level of urbanization and economic development, there is a low proportion of tourism use (only 11.7%), and more than half of the coastline remains in a natural state (Fig. 1, Table 1). Traditional aquaculture dominates in coasts near populated areas.

Xiamen Island is located in the west of the Taiwan Strait, outside the Jiulong River estuary. It is one of the six special economic zones in China, and was named "Top Tourist City of China", "International Garden City", and "UN Habitat Scroll of Honor Award" in 2004. After rapid urban development through 1980–2008, the urbanization rate reached 81.4% in 2014, with the city listed in the top 10 of second-tier cities. Tourism has an important place in the economic development of Xiamen. In 2015, tourist numbers increased to 60,358,500, which produced \$12.82 billion of tourist income, an increase of 15.27% over 2014 (Xiamen Tourism Bureau, 2016).

Fundamentally, coastal tourism in Xiamen has developed based on beach resources, mainly distributed in the east and southeast of the island, stretching more than 20 km long from Shapowei to Wutong (Fig. 1). It has become a golden coast, offering sightseeing, leisure and vacation services for tourists (Cao et al., 2009).

3. Methods

Four methods were used in the study: (1) a literature search of published literature, including journals, books online and from

libraries related to beach management, coastal management, and beach nourishment in both islands; (2) examining available beach nourishment project reports, including localities, project types, sizes, and other design factors; (3) reviewing government reports, including statistics reports related to laws and regulations from 1994 to 2015, and environmental protection reports related to environmental quality, beach management, coastal planning, ecological restoration; (4) A Strength, Weakness, Opportunity and Threat (SWOT) analysis to identify beach management processes in Pingtan and Xiamen.

4. Results

4.1. Beach management on a developing island –Pingtan case study

4.1.1. Limited beach management process

4.1.1.1. *Longfengtou beach nourishment project.* Coastal erosion affected 57.3% of the sandy coastline in the Fujian province (Chen et al., 2010), while hard engineering (e.g. seawalls) has been widely used for coastal defense. Sea defense results in a reduction in the space available for beaches because of wave reflection from seawalls, and exacerbation of the loss of sediment from beaches (Cooper and McKenna, 2008).

Longfengtou beach is an example of an area where half of the bay was land reclaimed and a sea wall was constructed to manage coastal erosion. Before seawall construction in the 1990s, Longfengtou beach in Haitan Bay had developed coastal dunes and an intact natural beach. After construction, the natural dynamic processes of the beach profile were destroyed. Because of continuing wave attack, sediments in front of the seawall were transported offshore, and the beach no longer existed.

The Longfengtou beach nourishment project was instigated from Guimoyu Island to the Longwangtou headland (Fig. 2). The native beach type was dissipative, with existing fine sand ($M_z = 0.2$ mm). The project design parameters are shown in Fig. 2. After nourishment, this beach became the most popular tourist coast in Pingtan Island. Significant social and economic benefits were achieved by holding various activities, such as beach cultural festivals, international kite surfing competitions, and National Ocean Day.

4.1.1.2. *Local legislation.* Historically, there has been no local legislation in Pingtan because of its lower political status. With the rapid urbanization process, the local authority began to realize the significance of local legislation in guiding future development. Thus, the first local law, "Regulation of Pingtan Comprehensive Pilot Zone", was drafted and is currently being revised.

The Longfengtou beach nourishment project provided a key role to the beach economy in local tourism development. Beach protection became important to local managers. According to provision of law in the aspect of "ecological protection and construction", coordinated planning and management schemes should be implemented in regards to coastal resources. Within the scope of the coastal area, which extends from the mean high water level to 200 m landwards and seawards, respectively, construction, renovation, and the expansion of buildings are forbidden, except for key construction projects, disaster prevention and national and provincial mitigation projects.

However, as it is only a local regulation, it has limited use in improving beach management. More detailed information, such as use conflict resolutions, ecological restoration, and coastal erosion management, could not be found in this manuscript. Thus, it still needs the appropriate governing body to establish enforcement mechanisms in the future.

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