

Features of the relationship between artificial coastal topographic changes and coastal plants in Hakata Bay, Fukuoka, Japan

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1. Introduction

Global sea level rise and increased human activity in recent years have eroded 70 percent of the world's sandy beaches. Japan's coast is losing 160 square kilometers a year.

In order to meet the needs of human life and urban construction. A great deal of land reclamation has taken place in recent years. To stabilize artificial shores and protect them from the waves. Artificial methods are used to build artificial beaches on some coasts, and artificial structures such as breakwaters are built on the nearshore side to protect the coast. The sand used to fill the beach has been washed away by the waves for a long time and has no natural way to replenish it, so it can easily cause coastal erosion, especially on artificial beaches.

Beach erosion mainly refers to the loss of beach material under wave action, which is mainly manifested as beach narrowing and slope enlarging. In recent years, global sea level rise and increased human activity have eroded 70 percent of the world's beaches and 90 percent of those in the United States. At the same time, with the construction of large and medium-sized reservoirs and DAMS, the amount of sand flowing to beaches has decreased significantly.

The purpose of this survey was to investigate the protective effect of coastal plants on artificial coastal erosion by observing the topographic changes and the presence or absence of plant growth.

2. Pre-investigation of survey sites

The sites of this survey are the Atagohama and Najima coasts of Hakata Bay (FIG. 1), both of which are artificial coasts constructed near landfills. The total length of Atagohama coast is 1.1 km, with offshore dikes built along the coast. Influenced by the rip current formed at the opening, the special coastal shape is formed (FIG. 2). The Najima coast is 0.23 km long and is a semi-open bay facing Hakata Bay with breakwaters at both ends and rocky reef-like terrain at the front. The Najima coast is heavily influenced by tidal currents. A preliminary survey of tidal current directions and coastal

erosion in coastal areas. Based on various factors and the nature of the coast itself, measurements are made to select points in the terrain. There are a total of five survey lines along the Atagohama coast and three along the Najima coast (Fig.3).



FIG.1 Survey site

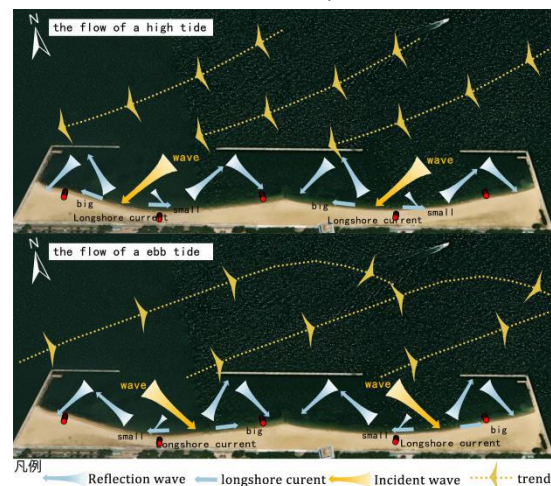


FIG.2 Atagohama offshore flow

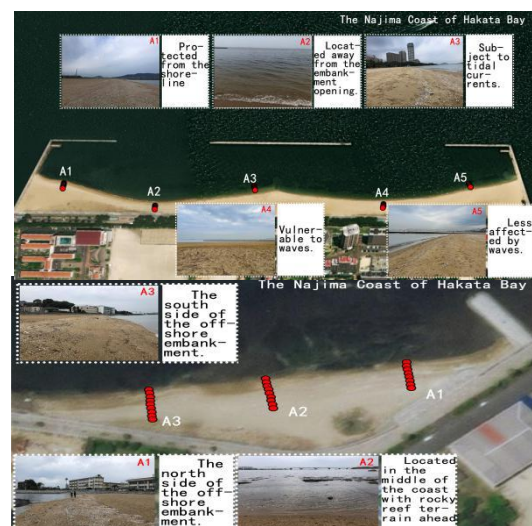


FIG.3 Measuring location

2. Surveys of the survey sites

3.1 Surveys of the Atagohama coast

The survey took two topographic surveys in September and December. Select a representative area and set the measurement area from the timberline to the revetment junction. Observation points are set up every 2 meters to observe the changes of coastal topography and coastal erosion.

According to the survey data of Atagohama coast, it can be found that there is almost no coastal plant distribution along the coast. Due to the influence of the outer offshore embankment, the inner offshore embankment forms a relatively stable sea area. Overall sand loss of the beach is not obvious. The internal change of the beach is obvious, and the phenomenon of coastal sand transport occurs in the interior of the offshore dike. Sand is easy to accumulate on both sides of the offshore embankment (FIG. 4). The most obvious place affected by waves is at the mouth of the embankment. The two surveys were conducted at high and low tide, when the wave direction changed. The change of slope surface under impact is also very obvious.

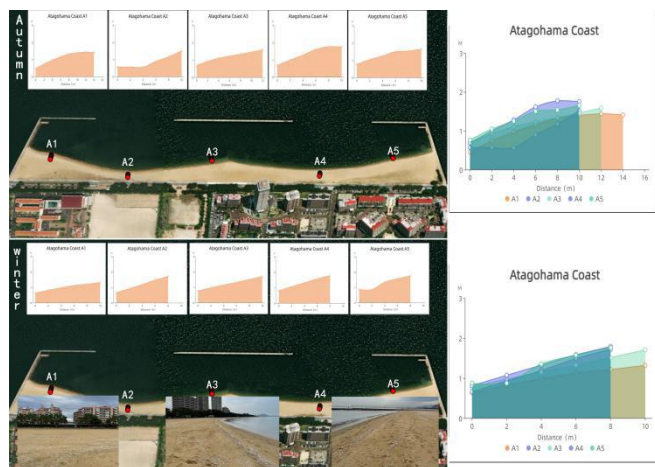


FIG.4 The Atagohama Coast topography changes

3.2 Surveys of the Najima coast

On the back coast of Najima, there are monophylls and a few sea anemones, which have the ability to consolidate sand (FIG. 5). During the Survey in September, the Najima coast had just been repaired, making it easier to observe sand loss. After completing work on the Najima coast. With no coastal protection, sand runs off the coast at a rapid rate. It'll settle down in a few months. There are lots of rocks in front of the shore which are good for waves. The changes caused by wave impact are basically the same in all coastal areas (FIG. 6).



FIG.5 Coastal plants on the Najima Coast

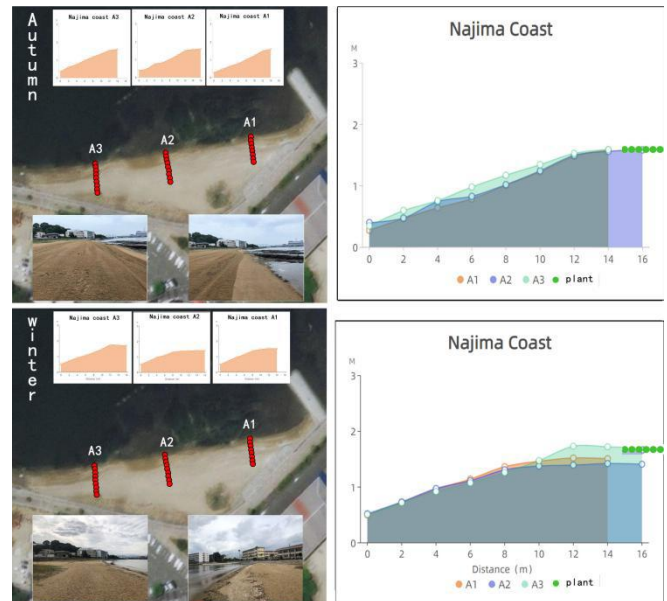


FIG.6 The Najima Coast topography changes

3. Conclusion

It can be seen from the above results that Atagohama can effectively prevent sand from flowing out due to the existence of offshore embankment, but it will also cause partial quicksand phenomenon. After the restoration of the coast, the South Island lost a lot of sand. On the Najima coast, after some time, the height and slope of the beach are almost even. You don't get particularly severe erosion in one area.

This can be seen in the topography of the artificial coast. Sand buried during coastal restoration is actually over-landfill. This part of sand will be quickly lost in a short time, unable to form a stable ecosystem. And coastal plants on the beach play an important role in creating a stable coastal ecosystem. It can also reduce the damage to the ecological environment.

By looking at different measures of artificial coastal construction, we can conclude a better approach to coastal construction and maintenance in the future. While protecting the coast, it also reduces labor costs and impacts on coastal ecosystems.