

## Returning the sand to the Sandy Beach Hotel on Kosrae

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### Abstract

The construction of linear hard defences, such as revetments or seawalls, on open-coast beach environments often lead to negative environmental impacts, such as loss of beach fronting the defence, exacerbated end effects or downdrift erosion adjacent to the ends of the structure. In many cases initial construction of such defences leads to a cycle where the resulting impacts necessitate the extension or construction of longer and larger structures, which in turn leads to further or larger impacts, which then leads to further defences and so on. Breaking out of such cycles, once commenced, is not easy.

Such a cycle occurred over a number of decades on the north-east facing coast of Kosrae which led to the near loss of the Sandy Beach Hotel, Kosrae's first resort hotel. Constructed in 1982 the hotel consisted of nine local style units located behind a white sand beach on the wind-ward north-east corner of the island. From the early 1990s, the traditional style units were replaced by six concrete buildings containing 16 rooms and a restaurant.

The background to the erosion problems on the north-east coast of Kosrae stems back over a number of decades before the Sandy Beach Hotel was constructed, relating to the removal of large quantities of coral rubble from the intertidal fringing reef during the initial development of the circumferential road. However, it was during the widening of the circumferential road in the late 1980s that problems began to occur. Widening the road extended it on to the upper part of the beach with some rock rubble protection installed to protect the road. This rock quickly moved off west due to the prevailing wave induced longshore transport, resulting in a layer of black volcanic rock covering the white sand beach fronting hotel. Over the subsequent decade various gabion defences were installed to protect sections of the road, with the length of the defence ever increasing. However, the gabion baskets quickly broke down, releasing more volcanic rock that ended up covering the beach at the hotel resulting in a legal trial concerning the removal of the rocks from the hotel frontage.

A more substantial and longer rock armoured revetment was completed in 1998 which extended to the eastern boundary of the Sandy Beach Hotel. In the months following the construction, accelerated erosion occurred immediately to the western end of the rock revetment, undermining the Sandy Beach restaurant foundations and resulting in a net loss of beach along the entire frontage of the hotel. High tides and waves during December 1999 resulted in further loss of beach along the Sandy Beach frontage threatening most of the hotel property.

Whilst the hotel owner had consent to construct a rock revetment along the front of the property, extending the defence would continue to move the erosion problem further along the coast. The last remnants of the sand beach from which the hotel took its name would also have been lost. In a further legal case brought against Kosrae State by the hotel owner, the judge ruled that the State had the obligation to re-instate the sand beach and the protection it provided to the hotel.

To stabilise the downdrift effects and protect the hotel from further damage, a rock breakwater structure design was developed to control the future shape and stability of the beach. Beach nourishment was conducted along the hotel frontage to replenish the sand that had been lost due to erosion. The scheme was constructed in 2001 and has successfully maintained the sandy beach in front of the hotel. It has withstood a number of storms and has provided effective protection to the hotel, as well as alleviating the continued downdrift problems that had occurred previously.

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