

# Challenge for Accuracy Improvement of Beach Deformation Prediction by Simulating Sand Movement in the Sea

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KATO Fuminori (Ph. D.), Head, NOGUCHI Kenji (Ph. D.), Senior Researcher, FUKUHARA Naoki (Ph. D.), Researcher, Coast Division, River Department

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## 1. To management of beach

Since the Coast Act was revised in 1999, beaches may be designated as coastal protection facilities but have never been designated so far mainly because there is no clarified method to control beach, which changes the shape every day, as a facility. In order to break this situation, the Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism is discussing the introduction of beach management scheme by PDCA cycle (Cycle of the large frame in Fig. 1) in the "Round-table Conference on Disaster Prevention Community Development and Beach Maintenance" ("Round-table Conference"). The discussion encourages change of awareness from the conventional "maintenance / recovery of beach by facility development" to "permanent management of beach."

## 2. Utilization of beach deformation prediction in management scheme

In the management scheme, project promotion and maintenance on the site will be conducted in the "nested project group" that promotes DO as shown in Fig. 1. The nested project group includes projects and operations in various timings and spaces required to achieve objectives and plays important roles to activate the PDCA cycle.

In making judgment on management, review, etc. of the nested project group, survey results for each profile of periodic sounding are compared with the predicted shape of beach profile for the year prepared at planning. Calculation of the predicted shape of beach profile (predictive calculation of beach deformation) needs to cover the whole coastal region because it simulates changes in sediment balance and predicts for a period of tens of years.

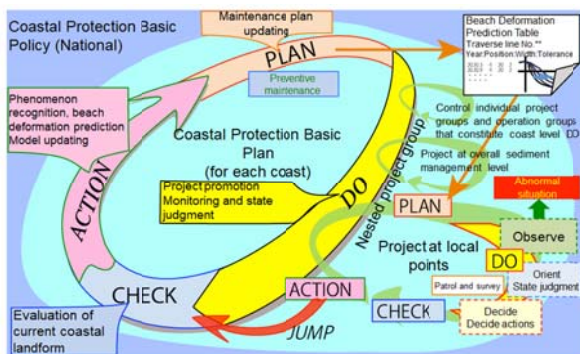


Fig. 1: System of the management scheme

## 3. Improve the accuracy of beach deformation prediction from sand movement

For predictive calculation of beach deformation, the method of obtaining topographic changes from the balance of longshore drift sand passing each profile is generally used. Amount of longshore drift sand is calculated by the distribution formula of water depth direction obtained from the experiment, etc.

In order to improve the accuracy of this distribution formula, this study conducted a hydraulic model experiment considering multiple wave conditions and installation of artificial reef / pier. Movement of sand in the coast was quantitatively grasped from measurement of plane flow around the artificial reef, etc. and direct measurement of sand movement in coastal direction with drift sand trap. As shown in Fig. 2, the distribution type differs between the conventional formula and the experiment result. In addition, floating of sand by wave breaking according to wave conditions, wave run-up, and flow by artificial reef affect distribution of the amount of longshore drift sand. Grasping these from the experiment, we are updating the distribution formula of the amount of longshore drift sand.

See the following for details.

1) NOGUCHI Kenji et al., (2018), "Hydraulic Model Experiment on Changes in Longshore Drift Sand with Installation of Artificial Reef," Journal of Japan Society of Civil Engineers, B2 (Ocean Engineering), 2018, Vol. 74, No. 2, p. I\_943-I\_948.

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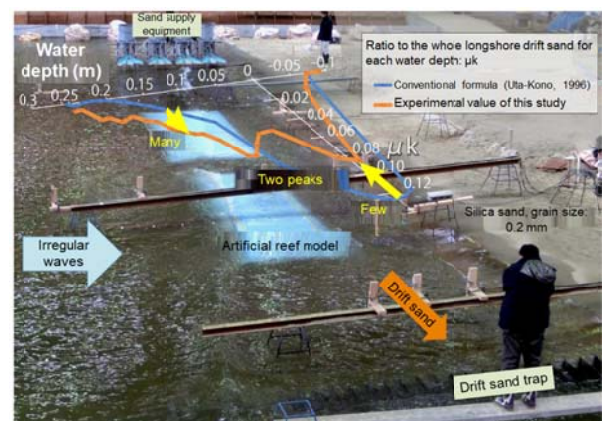


Fig. 2: Experiment condition and example of the longshore drift sand distribution in the water depth direction