

Project scale and cost of beach nourishment in Japan

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Purpose : Hard structures such as detached breakwater, groin, submerged breakwater (Artificial reef), sea wall had been used as common shore protection works in Japan. After new coastal law which commences April 2000 allowed a coastal engineer to use beach nourishment as a legal shore protection work in Japan. However, beach nourishment is not a common shore protection work in Japan yet, even though beach nourishment is standard and preferable shore protection work in US and EU countries. In addition, several states in US does not allowed using hard structure to protect a shore such as in North Carolina, California, and Florida states.



Photo. 1 Beach nourishment in Kashiwabara coast

To date, engineering education and qualification systems should be grovel standard to collaborate internationally, however it looks like that there is still much inconsistency regarding beach nourishment technology and its application in Japan and other developed countries. For instance, beach nourishment project in Japan seems to be small scale and expensive to one of the authors. In addition, beach nourishment is often criticized being short longevity in Japan. Therefore, it is better to compile beach nourishment data in Japan and compare it with US data to realize a reason not to use much beach nourishment yet and hopefully to have future recommendation on beach nourishment project in Japan.

Contents: A literature survey on a beach nourishment had been conducted based on JSCE Coastal Engineering Proceedings, however most of research paper does not contain an information of cost and borrow site. Therefore, the word 'Beach Nourishment' was searched in internet. Homepage addresses of public agency were selected from the search list. Then, questionnaire sheet was sent to whom in charge of coastal management at an agency. The questionnaire includes project place, project year, volume, length and width of beach nourishment, cost of beach fill material, cost of project, borrow area and etc. Up to date, nearly forty beach nourishment projects data has been collected from Hokkaido (Northern Island of Japan) to Kagoshima Prefecture (Southern part of Japan). Table 1 shows an example of reply. The data of volume and project year were collected for most of project, but other data were collected for some of the project.

Table 1 Example of questionnaire sheet

Area of beach nourishment	Tagi Port
Length	290m
Volume	42,000m ³
Total cost of project	442.5 million yen
Cost of sand	8,853 yen
Borrow area (origin)	China (Shingle)
Project term	2001 to 2007
Nourished volume by 2003	29,560m ³
Expense by 2003	262 million yen

Main conclusion: Main conclusions are as follows;

(1) Volume of beach nourishment is shown in Fig. 1. An average of beach nourishment for this study is nearly 44,800m³. Fig. 2 shows frequency distribution of the volume of beach nourishment. Fifty percent of beach nourishment is less than 28,000m³, and 79% of beach nourishment is less than the average volume. Therefore, it can be said that a beach nourishment project in Japan is relatively small compared to US standard.

(2) Length of beach nourishment is shown in Fig. 3. Only fourteen data out of 42 beach nourishment were available for the study. It is seen that more than 50 % projects are shorter than 200m, and nearly 90 % of the projects are shorter than 500m. This is probably due to that many projects are related to recreational beach created beside port and harbor facilities and bounded by coastal structures to entrap nourished material. In general, critics on short longevity of beach nourishment in Japan probably could arise from the short length of project, since the shorter the project length, the shorter the longevity of beach nourishment project in general.

(3) Cost of beach nourishment material is shown in Fig. 4. It should be noted that some data would include transportation and leveling cost. The most inexpensive cost is 300 yen (nearly US\$3) and the highest was 8,500 yen (nearly US\$80). Most of beach nourishment cost are in a range of 2,000 yen ~ 6,000yen. The most expensive beach nourishment material was imported from somewhere in China. The most inexpensive was dredged from the nearest river mouth and transported by one of national agency. Then, Kagoshima prefectural government paid only for the cost of leveling at the project cite. Generally speaking, it is seen that there is no linear relationship between the cost of material and transportation length in this data set. The cost of beach nourishment material is especially important if relatively large beach nourishment is planned.

It should be noted that this study does not contain whole beach nourishment projects in Japan, but contains the data from many prefectures in Japan. Therefore, again a macro-scope view of beach nourishment in Japan would be ‘small scale nourishment and expensive material’. However, some more beach nourishment data such as 1.15 million cubic meter beach nourishment in Kashiwabara coast (1933) and .67 million cubic meter beach nourishment in Kobe (1973~1988) is left for future study.

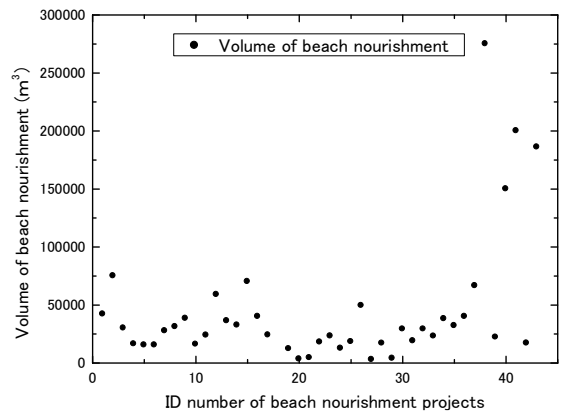


Fig. 1 Volume of beach nourishment in Japan.

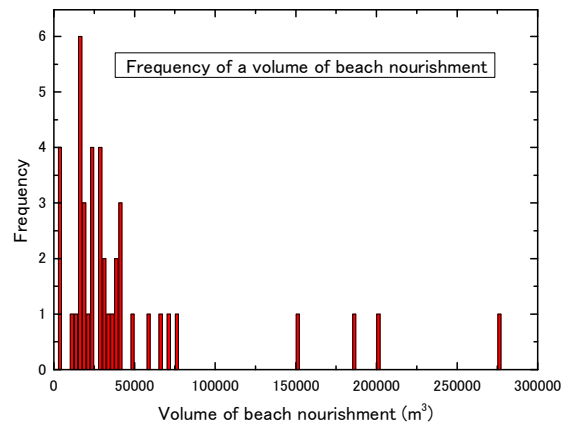


Fig. 2 Frequency distribution of a volume of beach nourishment in Japan

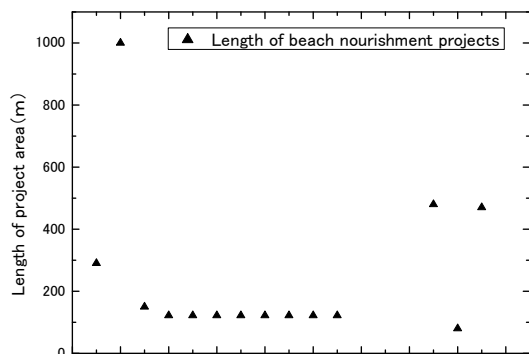


Fig. 3 Length of beach nourishment in Japan

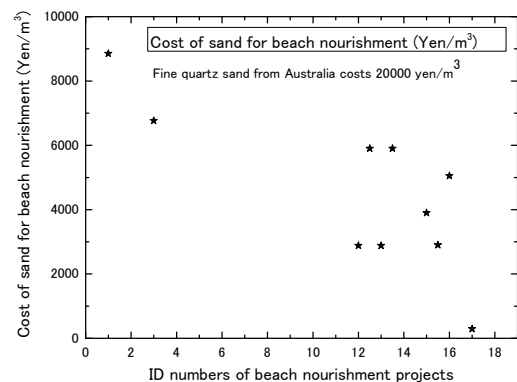


Fig. 4 Cost of sand for beach nourishment