

A Case of Utilizing Results

Results of Study on Resilient Structures for Coastal Dikes

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1. Introduction

The Coast Division of the NILIM studied resilient structure for coastal dikes from fiscal 2011 to fiscal 2014. The results of this study were organized as Technical Note of NILIM, and this paper introduces its outline.

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Table of contents of the Technical Note is as listed below.

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3. Outline of contents

The content of each item is outlined as follows according to the table of contents.

1. Outline

The position of the Technical Note, characteristics / technical limit / study policy for resilient structure, etc. is described.

2. Hydraulic phenomenon caused by tsunami overflow and mechanism of levee break

As hydraulic phenomena caused by tsunami overflow, which have been identified from damage in affected sites and model experiments, five phenomena have been cited --- "tsunami wave force, high flow rate, pressure change on the armor surface, scouring at the landward slope toe, and penetration and rise in the internal pressure of the dike." Also, as phenomena that trigger dike failure, seven phenomena -- "damage to parapet work, unstable landward slope foundation work (Photo), unstable landward slope armor, unstable top of slope, suction of dike material, piping, and slide / fall of upright breakwater" -- have been provided with the explanations of break failure mechanism.

3. Considerations and device for structure

Based on the break mechanism explained in Chapter 2, considerations are provided according to the structures of landward slope foundation work, landward slope armor, armoring work on crown, outer slope armor, outer slope

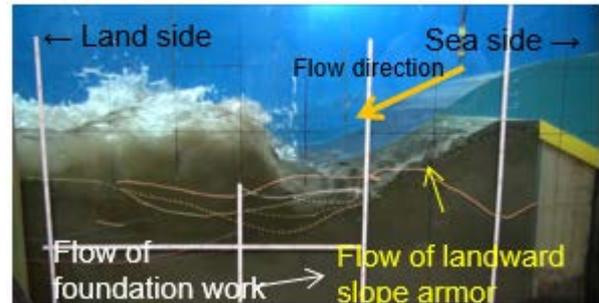


Photo: Experiment of break from the landward slope foundation work

toe, and embankment fill material.

4. Review based on break mechanism

Review items were determined by setting up tsunami wave force and estimating outer force and conditions for review according to each phenomenon that triggers break. For example, in review of the landward slope foundation work, slide and fall are reviewed based on outer force / conditions for review using fluid force, scouring amount, and load from armor works. The Figure below shows outer force / conditions for review and review items.

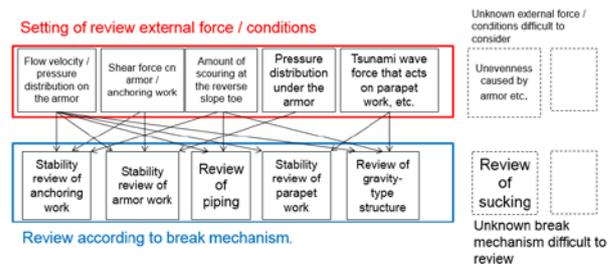


Figure: Outer force / conditions for review and review items

5. Disaster reduction effect of resilient structure

Resilient structure means device concerning structure and is in principle excluded from flood assumption, etc. for encouraging evacuation from tsunami. However, in order to expect effect appropriately in project evaluation, damage estimation, etc., the method of setting break delay time / complete collapse rate to be estimated in tsunami simulation and the result of sensitivity analysis were provided.

Appendix: Collection of data obtained by the model experiment

Flow rate / pressure distribution and amount of scouring at landward slope toe obtained from the model experiment were organized as appendix for reference in review.