USAGE OF A TWO-DIMENSIONAL ANALYSING SOFTWARE, NEW-SASS, AGAINST DEBRIS FLOW DISASTERS

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INTRODUCTION

It is effective to simulate flooding area of debris flow for estimating its risk to human lives and properties. Though, many two-dimensional debris-flow simulation models are developed, it is difficult to evaluate the effects of facilities for the debris flows by these models.

The government of Japan has been making efforts to make mitigation plans against debris flows in steep torrents (over 10 degrees).We used to make plans of facilities against the debris flow like a check dam, based on sediment discharge calculated from soil depth around the torrents and water discharge at return period 1/100 scale rainfall. We calculate quantity of debris-flow sediment captured by the check dams from the difference between riverbed and design accumulating riverbed. The design quantity is not based on the characteristics of torrents like meandering of channel. So it is necessary to verify the design quantity based on the characteristics of the torrents. Moreover, the mitigation plans against debris flows have just focalized on sediment discharge, and has not been evaluated effects of facilities to control peak discharge and flooding area. Furthermore, we have not verify effects of facilities that constructed step by step because the mitigation plans have made only for return period 1/100 scale debris flows.

It is considered that we can solve these problems by using a two-dimensional debris flow simulation which analyses effects of facilities.

Therefore, we developed a two-dimensional analysing software, NEW－SASS※, for debris flows which analyses effects of facilities like check dam. In this paper, we introduce the outline of this software and an example of calculation to solve the problems.

OUTLINE OF TWO-DIMENSIONAL ANALYSING SYSTEM: NEW-SASS

This model uses Miyamoto's governing equations[1)] which consist of two phases of equations, debris flow equations and bedload discharge equations. From these two equations, we can simulate debris flow movement from upper stream to flooding area.

We developed user-friendly input-output application system. So we can easily set the input data and output graphically deposit depth, flow depth, flow velocity.

A CASE STUDY WITH NEW-SASS

In X catchment, two check dams planned at the top of the alluvial fun and its upstream (siteA and B) against return period 1/100 scale debris flow. Now, we assume a first step target as protecting downstream area against the maximum scale debris flow in the past (<the 1/100

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※ NEW-SASS was developed by Hiroshi Ikeya, Hiroyuki Yoshimatsu, Kazuki Matsumura, Yuji Yasuda and Kei Matsuki.

※ NEW-SASS is under application for patent by Sabo Technical Center.

scale debris flow). And we examin the priority for two check dams, and estimate quantitative effects of check dams by New-SASS.

① Examinination of priority to construct check dams at site A and B

Fig.1 shows the results of analysis of the maximum scale debris flow in the past by New-SASS under the condition of no check dam and one check dam (Hight=14.5m) at site A or B. In the case of no check dam (Fig.1 (1)), the debris flow overflows on the alluvial fun widely, and we confirmed necessity of measures. In the case of one check dam at site A where is upstream of site B (Fig.1 (2)), debris flow overflows on the alluvial fun, but the flooding area has reduced compared with no check dam. In the case of one check dam at site B (Fig.1 (3)), debris flow doesn't overflow on the alluvial fun, and flooding area disappears.

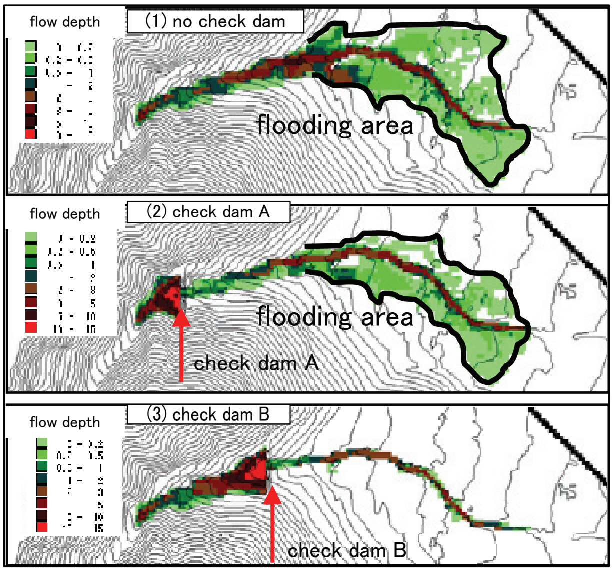

Fig.1: Flow depth of debris flow analysed by New-SASS

From the results analysed by New-SASS, we can give a priority for construcing check dam to site B than site A.

② Verification of quantitative effects of check dams

Table.1 shows the quantity of sedimentation analysed by New-SASS. We verify that the check dams have enough capacity to check debris flow against the maximum scale debris flow in the past.

	quantity analysed by New-SASS (m^3)	design quantity (m^3)	sediment discharge from the check dam (m^3)
siteA	10,200	9,000	0
siteB	12,100	18,000	0

CONCLUSION

We can give the priority to construct check dam at site A to protect downstream area against the maximum scale debris flow in the past analysed by New-SASS. Similarly, we will be able to construct facilities step by step by confirming effects of each facility by New-SASS. Moreover, we can analyse the flooding area in each steps by New-SASS. And we can notify the risk of debris flow to residents and promote evacuation effectively.

And we confirmed effect of check dam A which is more effective than the designed value (Table.1). It is considered that we can revise capacity of check dam A and implementation plan of facilities after analyzation of various scale debris flows.

1）Miyamoto K., Itoh T.(2002)：Numerical simulation method of debris flow introducing the erosion rate eqation, Jpurnal of the Japan Society of Erosion Control Engineering,Vol.55,No.2

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