

## **Optimal investment in emergency management in a multilayer flood risk framework**

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**Abstract** Flood risk reduction can be obtained in many ways and by many measures. A common approach in the Netherlands is to divide the measures into three layers: flood prevention, land-use planning and emergency management. An important question is how to divide the investment between these layers. In this paper we follow an economic approach: the selection of measures is guided by minimising the total costs and maximising the benefits. It can be concluded that in the Dutch context, the main part of the investment is in flood prevention, but it is also optimal to spend a part of the budget (<5%) on emergency management. The smaller the optimal flooding probability, the smaller the part of the investment invested in emergency management. The method developed is based on a two-layer approach, but it can be extended by adding layers such as land-use planning.

**Key words** flood risk management; cost benefit analysis; multi-layer safety