



## **Optimal adaptation to extreme rainfalls under climate change**

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More intense and frequent rainfalls have increased the number of urban flooding events in recent years, prompting adaptation efforts. Economic optimization is considered an efficient tool to decide on the design level for adaptation. The costs associated with a flooding to the T-year level and the annual capital and operational costs of adapting to this level are described with log-linear relations. The total flooding costs are developed as the expected annual damage of flooding above the T-year level plus the annual capital and operational costs for ensuring no flooding below the T-year level. The value of the return period T that corresponds to the minimum of the sum of these costs will then be the optimal adaptation level.

The change in climate, however, is expected to continue in the next century, which calls for expansion of the above model. The change can be expressed in terms of a climate factor (the ratio between the future and the current design level) which is assumed to increase in time. This implies increasing costs of flooding in the future for many places in the world. The optimal adaptation level is found for immediate as well as for delayed adaptation. In these cases the optimum is determined by considering the net present value of the incurred costs during a sufficiently long time span. Immediate as well as delayed adaptation is considered.