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Optimal adaptation level in current and future climate

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Abstract

More intense and frequent rainfalls have increased the number of urban flooding events in recent years, prompting adaptation efforts. Economic optimisation is considered an efficient tool to decide on the design level for adaptation. The costs associated with a flooding event to the T-year level and the annual capital costs of adapting to the T-year level are described with log-linear relations. The total flooding costs are developed as the expected annual damage of flooding events above the T-year level and the corresponding annual adaptation capital costs. The value of T that corresponds to the minimum of the sum of the two 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, which is assumed to increase in time. Also, the log-linear cost relation is expected to increase with the 100-year climate factor. It is further anticipated that the adaptation is carried out in year t^* . Thus, a search for the minimum costs should be sought by varying both T and t^* . A comparison of the different options should be done in terms of the net present value (NPV) of all incurred costs. The optimal set of (t^* , T) providing minimum total NPV can then be identified and its sensitivity to the chosen model parameters analysed.