

# Increasing Flood Safety with Side Channels

## a Nature-Based Solution along the Rhine

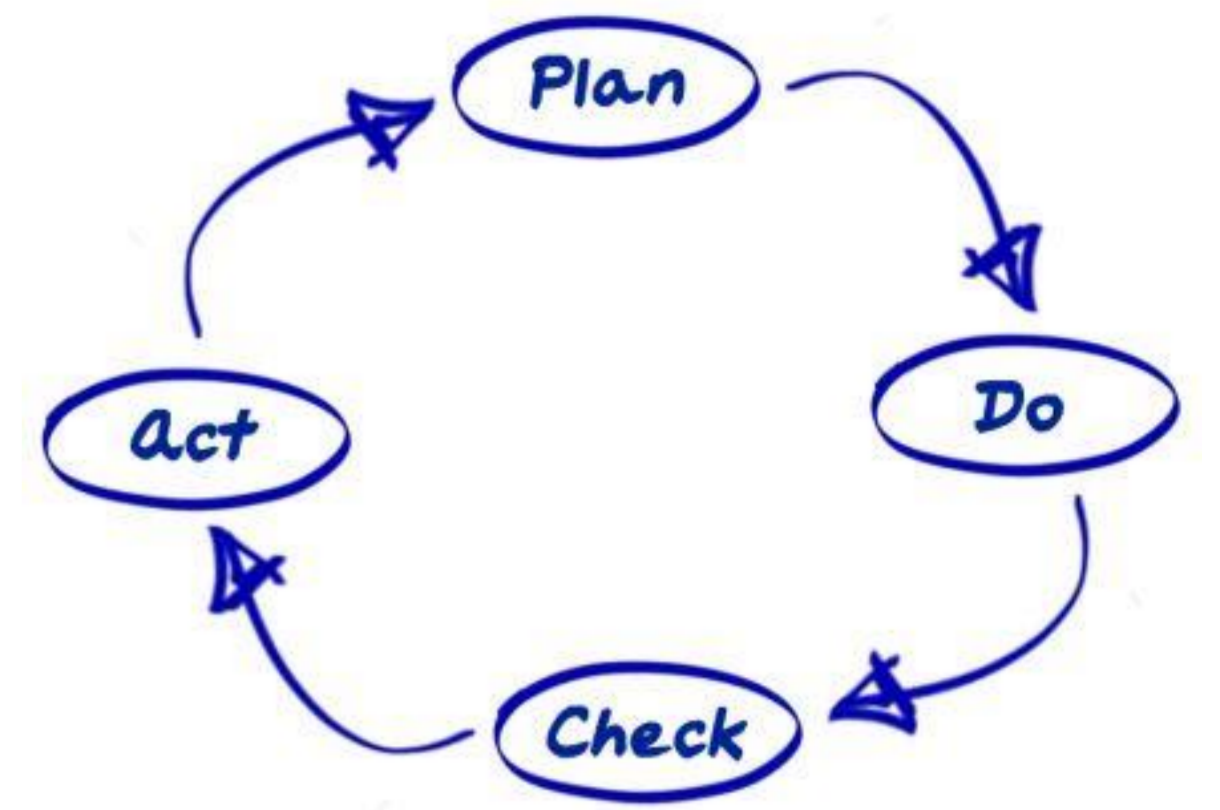


Rijkswaterstaat  
Ministry of Infrastructure  
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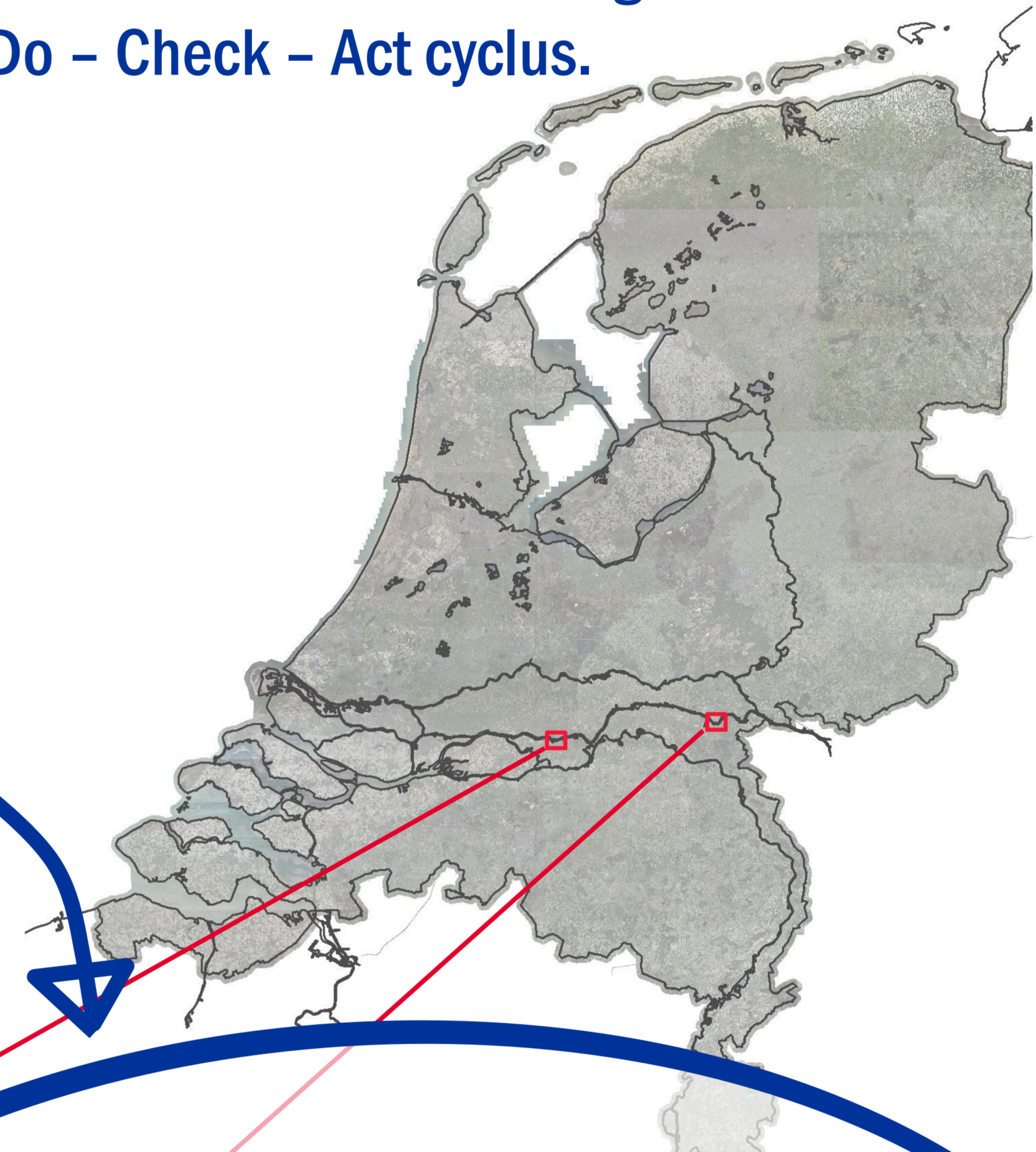


### Introduction

Within the river catchement workgroup of the Interreg-project Building with Nature, we want to gather science-based evidence that Nature-Based Solutions contribute to flood safety. The Netherlands participates with living laboratories: side channels along the Dutch Rhine Branches. Here, we will illustrate our laboratories and objectives by use of the Plan – Do – Check – Act cyclus.

### Plan

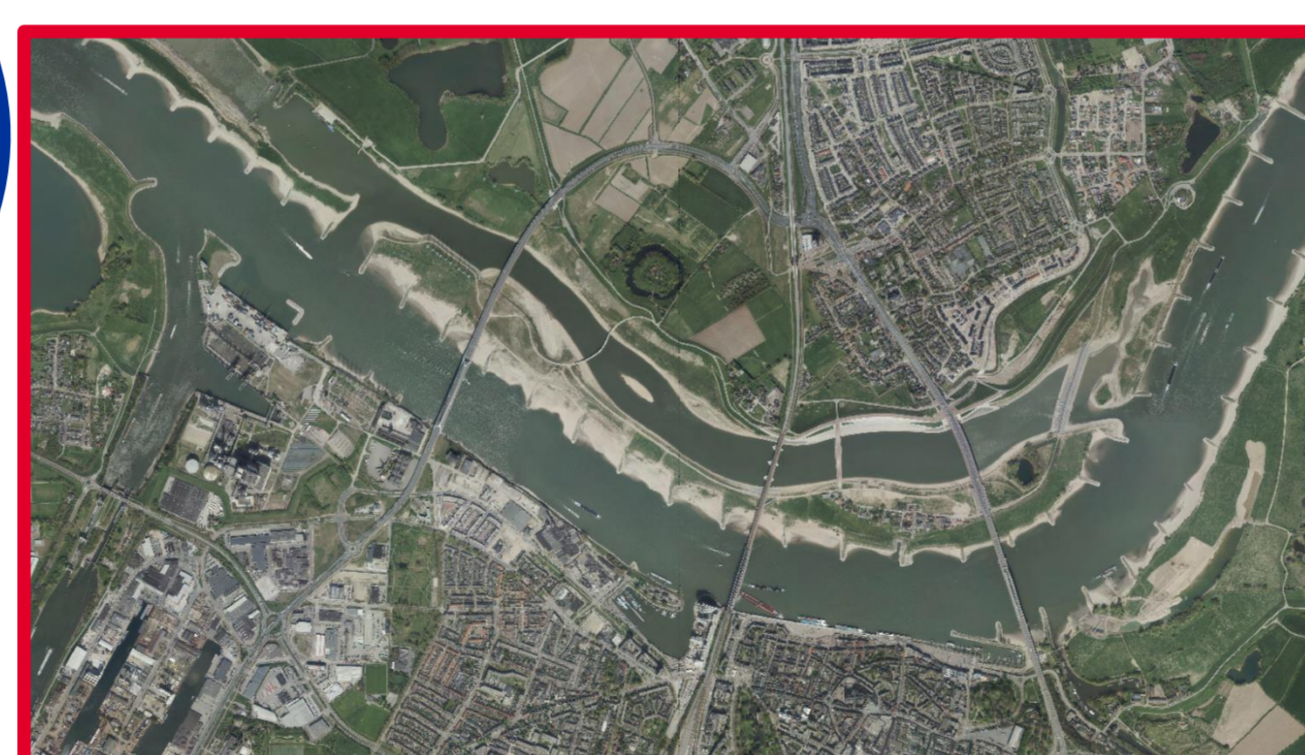
Due to the high river discharges of 1993 and 1995, awareness of flood risks grew. An increase in safety standards was needed. Urgent measures on dikes (e.g. dike relocation Gameren) were constructed. On the longer term, a plan was proposed to address flood protection, landscaping and improvement of environmental conditions. This led to the project 'Room for the River' in which over 30 measures were designed to increase discharge capacity and hence decrease high water levels. Among these are side channels, which also have a high ecological potential.



### Do

Here the focus will be on two locations with side channels contributing to flood safety: Gameren and Lent. Both locations are along the Rhine branche Waal and are realised in combination with dike adjustments.

- Gameren consists of a system of 3 side channels with different characteristics which are realised between 1996 and 1999.
- Lent has one large side channel and the construction was finished at the end of 2015.



### Act

Whether and which action is needed obviously depends on the results of the check. It is likely that maintenance will benefit. Information on the aggradation rate on prevailing discharges may be useful in programming maintenance by coupling the dredging activities to the return period of a certain discharge.

### Check

A check is required to verify whether the effect of the constructed measure corresponds with the aim. Morphological changes are likely to occur after construction. Side channels intend to aggregate over time, but this process strongly depends on the hydrograph. However, aggradation lowers the discharge capacity and thus the effectiveness on the long term.

Monitoring data needs to be gathered and analysed. Rijkswaterstaat has an extensive regular monitoring program on hydrodynamics and morphology of the entire river system. Additional monitoring is performed at the laboratories with respect to sediment characteristics (Westerhof, 2017), discharge distribution between the main and side channel(s) and preferably sediment transport.

Analyses will give insight on the effectiveness of the measure, which is of primary interest for Rijkswaterstaat. Additional information may come available on:

- the long term development of side-channels (Jans et al., 2004);
- the quality of the numerical models used during design;
- the mechanisms that cause erosion/sedimentation, which can be used to improve morphological models (e.g. Van Denderen et al., 2018);
- the ecological value of the measure by integrating ecological monitoring data.