TU Delft Delft University of Technology

CLIMATE ACTION PROGRAM

DEBRIS CLOGGING AT HYDRAULIC STRUCTURES

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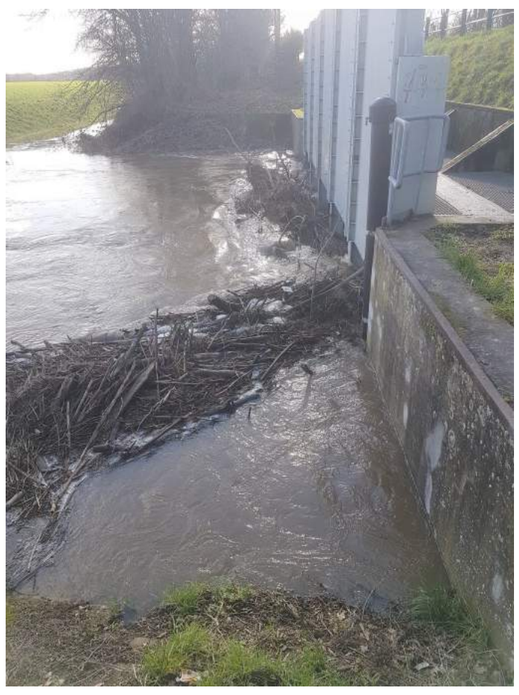
2021 Floods - Limburg (NL)



Inverted syphon in Bunde (Limburg, NL), where the River Geul crosses the Juliana Canal

During floods, the conveyance capacity of hydraulic structures is affected by the accumulation of large floating debris. This leads to an increase in upstream water levels, higher inundation depths and larger flooded areas. An example is the inverted syphon in Bunde (Limburg, NL), where a combination of debris and high downstream water levels induced flooding along the Juliana Canal.

Better understanding of debris accumulation at hydraulic structures is needed to develop effective debris mangement strategies.

At TUD we use physical modelling to understand and predict the behaviour of hydraulic structures affected by debris clogging.

Interreg EMR

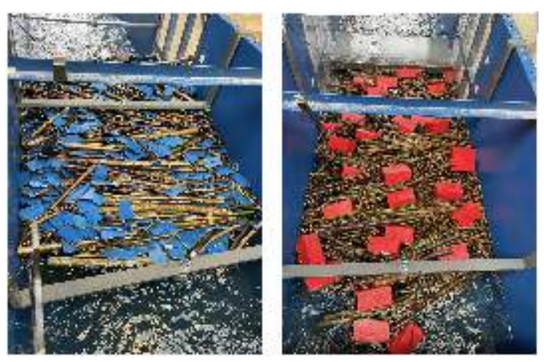
Interreg Euregio Meuse-Rhine European Regional Development Fund — EUROPEAN UNION — LIÈGE université — RWTH AACHEN UNIVERSITY

During the 2021 flood many bridges were affected by debris.


Germany


Belgium

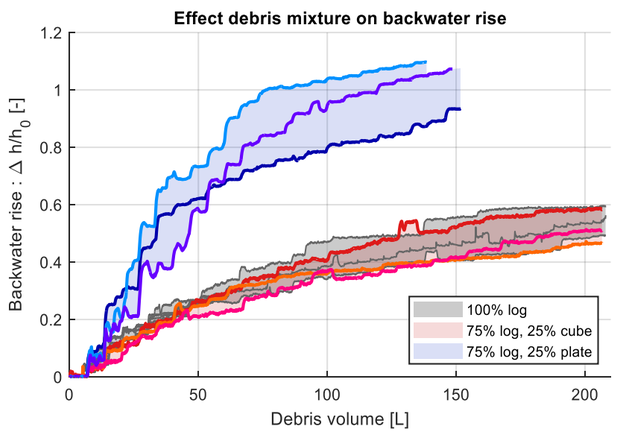
Laboratory experiments investigated the effect of debris on the bridge performance and induced upstream backwater level rise.



75% logs + 25% plates *75% logs + 25% cubes*

Results show that debris mixtures contain natural wood (logs) and manmade objects (cubes, plates).

Backwater rise is affected by the type of mixtures. Accumulations with plates are denser and can lead to higher inundation depths.



Plastic in Rivers

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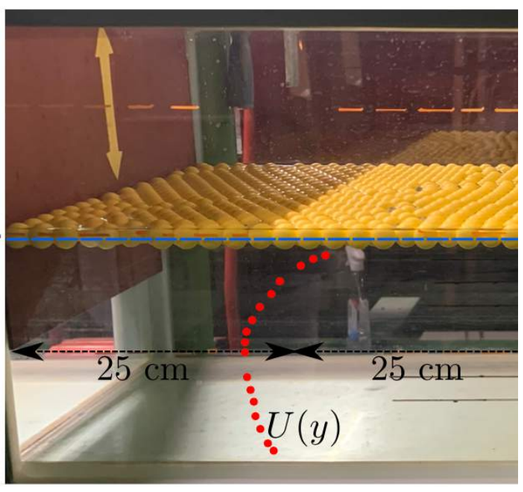

There exist similarities between the accumulation of (wooden) debris and plastic debris. This project aims at understanding the physical processes associated with the carpet formation at hydraulic structures, as shown in the picture above (Ghana).

Physical modelling is used to reproduce the accumulation of plastic debris upstream of a gate and velocity measurements are conducted to assess the flow's hydrodynamic behaviour.

What is next for this research?

Despite these results, debris clogging remains challenging:

(1) Install **Monitoring** systems to study (plastic) debris 's main characteristics (*e.g.* type, size, volume, arrival time)
(2) Develop **numerical simulations** that give complementary information on the behaviour of (plastic) debris.
(3) Translate experimental results into guidelines for better and more reliable **flood predicitions**.

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