Deltares

FAQ

How can discharges of this kind be taken into account when designing the new weirs on the Meuse?

Update: 31-8-2021

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What damage was there to the weir complexes during the high water of July 2021?

The Meuse has a large number of weirs that, under normal circumstances, raise the water level for shipping so that there is enough draught. During periods of high water, the weirs have to be opened because the water level has to be kept as low as possible. Reports have come in indicating that some gates at the weir at Sambeek in the Maas could not be opened because they were stuck[1]. This meant that the weir could not be completely opened and it therefore acted as a larger barrier to the water. As a result, there was a possibility that the water level upstream of this weir could rise even further during the period of high water. In addition, floating debris in the river could have damaged the jammed gates, the frame and the footbridge. Rijkswaterstaat checked whether there had been damage to locks and weirs after the floods[2].

Scale model of the weir at Sambeek; Waterloopkundig Laboratorium, 1967 (source: Deltares)

The weirs in the Dutch section of the Meuse are almost 100 years old. The seven weirs in the Meuse were built in the 1920s and early 1930s. They have been renovated several times since and maintenance work is done regularly. The weirs will be replaced or renovated[3] as part of the Replacement and Renovation Programme from 2028 onwards. Research into possible damage to the weirs by fast-flowing water has been conducted in the past using scale models. One of those scale models was used in 1967 at the Waterloopkundig Laboratorium (now Deltares) for the

1 https://www.gelderlander.nl/boxmeer/water-maas-tientallen-centimeters-hoger-door-kapotte-stuw-sambeek-schip-moet-schade-door-drijfafval-voorkomen~aa9cc214/?referrer=https%3A%2F%2Fwww.google.com%2F

2 https://nos.nl/collectie/13869/artikel/2390164-vervuiling-na-overstromingen-limburg-zal-nog-lang-schade-veroorzaken

3 https://www.rijkswaterstaat.nl/water/projectenoverzicht/onderhoud-maas-en-kanalen-in-noord-

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brabant-en-limburg/projecten#:~:text=Groot%20onderhoud%20stuwen%20Maas,-De%207%20stuwen&text=Vanaf%202028%20worden%20ze%20binnen,gaan%20vanaf%202022%20in%20uitvoering

scour holes downstream of the weir at Sambeek (see photo). Scour holes are caused by the erosion of sand or clay in the river bed or bank by fast-flowing and turbulent water. If the resulting holes get too large and if they are situated close to the foundations of the weir, the entire weir can collapse. With this type of research, bed and bank protection, and gates, can be designed or adapted to prevent damage to the weir as much as possible, even when discharges are extremely high. A large proportion of research of this kind is now done using computer models.

Did the high water of 2021 generate new insights for the Replacement and Renovation Programme?

The original design for the current weirs in the 1920s was based on a maximum river discharge of 3200m3/s. We now know that, due to climate change, the maximum discharges will be higher and it is expected that higher discharges will also become more frequent. The high discharge of June 2021 may therefore become be a more common event in the future.

Rijkswaterstaat and the water authorities are responsible for the replacement and renovation of the water-based civil-engineering structures (weirs, locks, fish passages, pumping stations etc.). These structures have a range of functions: protection against high water, adequate water supplies, clean and healthy water, and smooth and safe shipping traffic. The replacement and renovation of these structures must take things like discharges in the future into account. It is expected that, in addition to high discharges, low discharges may also become more frequent. At low discharges, water must be retained as much as possible to maintain not only shipping traffic but also ecological values and fish passages. When discharges are high, it must be possible to remove water from the area but ships must also be able to pass the weir complexes safely for as long as possible. These questions are being further elaborated in the Water-Based Civil-Engineering Structures Knowledge Programme implemented by Rijkswaterstaat, Deltares, TNO and Marin, and a method is being developed to provide quantitative data indicating how effectively the structures work (for shipping, for example) in the light of these changing discharge patterns. In the Deltares ‘Replacement and Renovation Infrastructure’ research programme, an assessment framework is being developed and evaluated for the Replacement and Renovation of, among other things, Water-Based Civil-Engineering Structures that takes, among other things, climate change into account.

How can discharge peaks of this kind be taken into account when designing the new weirs on the Meuse (Grave, Sambeek, Belfeld, Linne)?

Since the periods of high water in 1993 and 1995, changes have been made in the river to create more room for the water. For example, the summer bed in the Grensmaas has been lowered and widened. As a result, the water level rises less when discharges are higher. The weirs themselves have been designed to obstruct the flow of the river during high water as little as possible, or not at all. They have been widened so that there is enough room when the gates are opened. The design produced in the 1920s took a maximum river discharge of 3200m3/s into account. That is slightly lower than what was seen in 2021. Because the maximum discharges in the future are expected to be higher, the new weirs must be made wider and deeper, for example. It is also possible to opt for gates and valves with actuators that are less likely to fail.