VERENIGING VAN
WATERBOUWERS

The impact of WFD on hydraulic engineering operations

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In the public domain, the Netherlands faces some major challenges related to water safety, waterway maintenance and habitat creation.

The Dutch hydraulic engineering sector plays a large part in solving those challenges and consequently makes a considerable contribution to the country's quality of living, its economy and its safety.

The Dutch Association of Dredging and Hydraulic Engineering (Vereniging van Waterbouwers) has observed that the Water Framework Directive (WFD) [in Dutch: Kaderrichtlijn Water, KRW] has an unintended yet detrimental effect on hydraulic engineering operations: the current interpretation of the 'principle of no degradation' is jeopardising work that needs to be done.

Appeal for review

Accordingly, the hydraulic engineering sector is calling for a review of the directive, so that the 'principle of no degradation' can be achieved in a manner that is socially responsible by:

- No longer regarding operations entailing the displacement of existing pollutants whereby no new pollutants are introduced as 'degradation';
- No longer regarding operations entailing adjustments, including temporary adjustments, to bodies of water to improve water safety, navigability and the creation of natural habitats in the Netherlands as 'degradation'.

Hydraulic engineering operations in relation to the WFD

Six effects have been identified that occur during hydraulic engineering work related to the WFD (ecology, water quantity and water quality).

1. Temporary ecological deterioration

A. Turbidity caused by stirring up the sediments to be dredged and/or by returning the water, or groundwater, that has been abstracted.

B. Temporary disturbance of the biotic water quality. The removal of existing flora and fauna (during execution).

2. Changes to the water quantity

C. Decrease in the water system's ecological potential due to a reduction of the water surface.

D. Changes in hydromorphology due to adjustments in environmental factors such as depth, flow, exposed underlying soil layers, hard river-bank stabilisation approaches, etc., which have an effect on the quality of the living environment of its flora and fauna.

3. 'Worsening' of the diffuse pollution already present

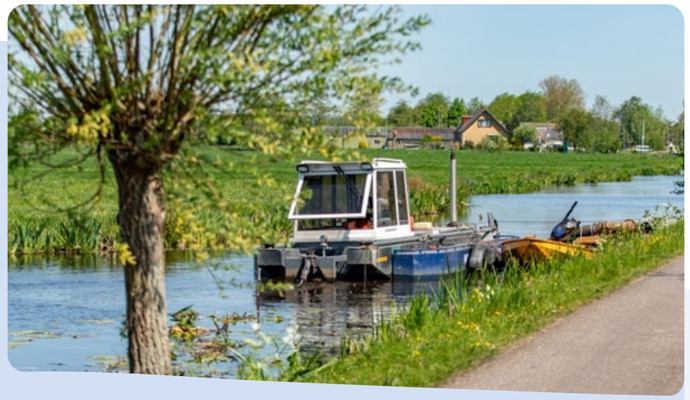
E. The release of pollutants in marginal quantities from the underlying bed.

F. The introduction of substances alien to the water when sections are treated (welding, grinding, conservation).

How does it affect hydraulic engineering operations?

Actual examples of hydraulic engineering operations and bottlenecks related to the WFD (based on the six effects identified above).

Maintenance dredging of navigational channels



Description:

Dredging is carried out to maintain the required depth in navigational channels. The dredged sediment is either distributed in deeper parts of the river system or the dredged spoil is taken to a government spoil depot, depending on the results of a quality inspection. Lightly polluted sediment is discharged through the bottom doors or from *the hopper* from the crane barge into an overdepth, causing the dredged spoil to be dispersed. Heavily polluted dredged spoil is pumped into the waste disposal system at the government spoil depot's discharge point.

Benefit and necessity:

The work is needed to keep the fairways navigable and to maintain the required flow profiles. The dredged sediment is dispersed as much as possible within the river system to prevent the abstraction of sediment from the system and to accommodate for the rivers' 'hunger for sand and sludge'.

WFD-effects: A D E

Realignment of navigational channels

(widening and deepening)

Description:

A navigational channel is diverted as part of the operations to upgrade a waterway. On balance, the channel is widened and deepened. In contrast to maintenance dredging, both the sediment and the – solid – bed are excavated and transported to a licensed treatment site or specific location where it is to be used.

Benefit and necessity:

The work is needed to maintain the waterway infrastructure and optimise it where possible to prevent congestion or ships grounding at low water. In addition, it is preferable to widen and deepen the fairway to guarantee that large ships can use the waterways, making transport and haulage over water more efficient and attractive. Moreover, channel realignment are also diverted to improve the flow profile.

WFD-effects: A D E

Dredging for the sake of quality/ WFD measure

Description:

The ground level is lowered in the floodplains, creating new biotopes. Such measures are often carried out as an opportunity as part of a dyke reinforcement project within the framework of the WFD measures. The larger part of the work consists of excavating the ground level (ranging from a few decimetres to several metres) while a small part of the work entails raising the height of the terrain to achieve the intended relief. The excavation work produces both reusable spoil and heavily polluted dredged spoil (Non-Usable Spoil, NS). The NS is transported to a spoil storage, while the remaining, reusable spoil is used, as far as possible, to reinforce the dyke.

Benefit and necessity:

The work is part of the programme of measures introduced to achieve the WFD objectives. In addition, such measures also mean that it is possible to have more water storage available when water levels rise. In the past, the Room for the River programme (more water storage areas to accommodate for high water levels) covered this work. At present, these and similar measures are being studied within the context of the Delta programme.

WFD-effects: A B D E

Maintenance on the river-bank structures

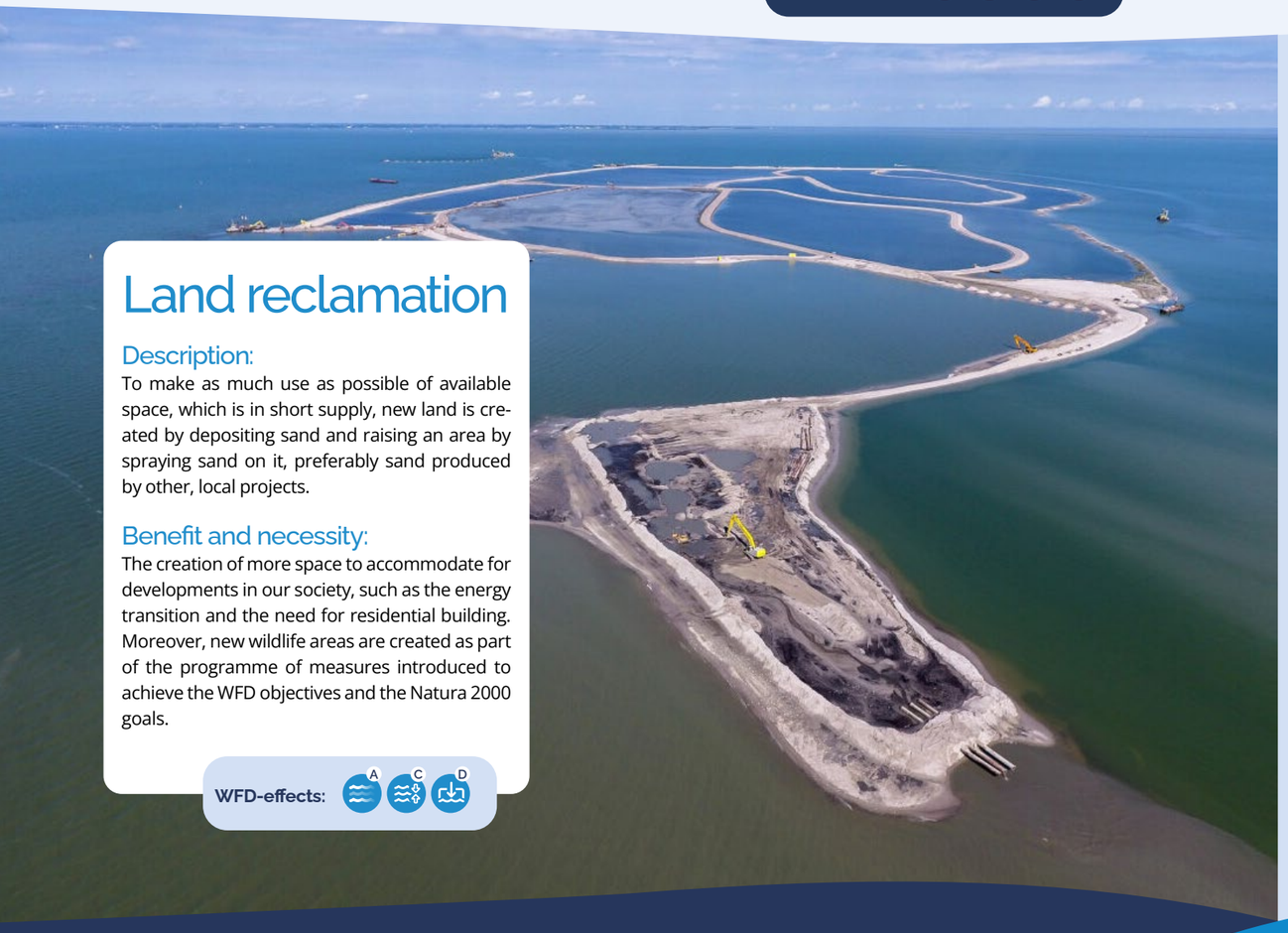
Description:

The sheet piling along the river banks needs maintenance and should be replaced where necessary to maintain and guarantee the waterways. To that end, a construction pit with either wellpoint dewatering or return dewatering – depending on the depth of the waterway and the stability of the river bank – is constructed. The sheet piling's anchoring is removed and new sheet piling and new anchorage are installed where necessary. To finish, the sheet pile capping beams are filled with soil that the work has produced. In town and city centres, the capping pieces are bricked up to comply with rules for conservation areas and heritage sites.

Benefit and necessity:

The banks are in such a poor condition that replacement is necessary. If they are not replaced, the vertical bank structure may fail, jeopardising the safety and stability of the water-control structure or flood defences. The water-control structure or flood defences could cave due to erosion and wave action, causing the nautical profile and the waterway profile to silt up, or causing subsidence of the earth body behind.

WFD-effects: D F



Land reclamation

Description:

To make as much use as possible of available space, which is in short supply, new land is created by depositing sand and raising an area by spraying sand on it, preferably sand produced by other, local projects.

Benefit and necessity:

The creation of more space to accommodate for developments in our society, such as the energy transition and the need for residential building. Moreover, new wildlife areas are created as part of the programme of measures introduced to achieve the WFD objectives and the Natura 2000 goals.

WFD-effects: A C D

Fender walls, lead-in jetties and engineering structures

New construction, maintenance and demolition

Description:

Maintenance on the fender walls and lead-in jetties at several locations is overdue. The aim is to provide a safe, accessible and reliable network of main waterways by implementing the measures necessary to resolve the overdue maintenance issues related to the fender walls and lead-in jetties as soon as possible and within the parameters and budget available. Maintenance on the engineering structures on and across the water (viaducts/locks, weir complexes, etc.) is a similar hydraulic engineering operation with similar objectives and ensuing WFD effects.

Benefit and necessity:

This kind of operation ensures a safe, accessible and reliable main-waterway network. Often, the fender walls and lead-in jetties are used to guide shipping under, past and through engineering structures. Locks and weir complexes also contribute to safe, reliable waterways while viaducts, tunnels and bridges ensure that the waterways are seamlessly incorporated into the railway and road infrastructure. As a mitigating measure, welding curtains are used to protect against spatters.

WFD-effects: A B C D E F

Clay, sand and gravel extraction

Description:

Clay for the ceramic industry (roofing tiles/bricks) is extracted along the major rivers, often leading to the creation of new wildlife areas (secondary channels, wetlands, wildlife-friendly river banks). Sand and gravel are extracted along the major rivers as raw materials for the building industry, etc.

WFD-effects: A B C E

Benefit and necessity:

The extraction of raw materials for the building industry. There are not enough building materials available to fully meet the demands of the building industry. In addition, more and more restrictions and upper limits are being applied to the choices of secondary building materials, which means that the extraction of primary raw materials is crucial to meet the demands of the Netherlands' infrastructure and construction industry.

Redevelopment of extraction sites

Description:

The creation of new wildlife areas by means of practical and functional reuse of soil and dredged materials produced locally and which can be used in old, previously deep stretches of water, both inside and outside the dykes. New wildlife areas are developed in previously deep stretches of water – which produced new building materials for the construction of infrastructure and other industrial purposes – by shoaling deep stretches of water, reusing soil and dredged materials in practical and functional ways and redeveloping the banks so the natural environment becomes more valuable and the WFD objectives are achieved.

Benefit and necessity:

The redevelopment of deep stretches of water by filling them with soil and dredged materials leads primarily to the creation of new wildlife areas by turning them into wetlands, wildlife-friendly river banks, shallow water and islands and consequently boosting biodiversity. These redevelopment measures also contribute to the WFD objectives. In addition, such projects mean that soil and dredged materials produced by local operations do not need to be transported over unnecessarily long distances.

WFD-effects: A D E

Dyke reinforcement

Description:

Many dykes are reinforced by means of bracing the dyke outwards so that the dyke body is expanded on the side of the water and the flood plains. The work starts with the removal of the sludge layer and the weak top layer at the site of the new dyke before the new dyke body is built on the side of the water and then joined to the existing dyke.

Benefit and necessity:

Dyke reinforcement is necessary to protect the unique Dutch delta and to prevent flooding. In this country, many people live in the low-lying areas immediately behind the dykes, so it is very much in the public interest to reinforce those dykes. 1,500 kilometres of dykes have been identified as needing reinforcement under the High Water Protection Programme [in Dutch: Hoog Water Beschermingsprogramma, HWBP].

WFD-effects: A B C D E

Glossary (in alphabetic order)

Caving: Erosion caused by wave action, the current and the effects of shipping; it undercuts river banks so that crumbling parts of the banks fall into the running water.
Biotic: Something that is alive.
Biotope: A habitat, such as a pool, a wood, a meadow or brushwood, but it could also be a river bank or wetlands.
Building pit: A temporary water-tight structure in which excavation work is carried out to create a structure, often made from sheet piling for a quay or the pillar of a bridge.
Well-point dewatering: A temporary facility to remove excess water or groundwater from the bed or building shell so the work can be carried out safely and stably.
Outward reinforcement: Dyke reinforcement seen from the river, looking inwards towards the dry land. In other words, not the flood plain.
Capping piece: A horizontal beam to cover a vertical wall, usually an earth-retaining structure (on top of sheet piling).
Flow profile: An underwater cross-section of a river or drainage ditch.
Ecology: A science, part of biology, that studies the interaction between organisms among themselves, in populations and ecological communities and their environment.
Wave action: Wave action is movement in the surface water caused by weather, the wind and by shipping.
Hydromorphology: How the landscape is shaped by water. In the Netherlands, there are three kinds of effect: 1. R-type: rivers, streams and tidal rivers. 2. M-type: lakes, drainage ditches and canals. 3. K&O type: coastal and transitional waters.
Ground-level lowering: Reducing the height of the original surface of the terrain.
Secondary channel: A channel running more or less parallel to the main current of a river, stream or ditch with running water. Mostly, the current will be slower and there will be more sedimentation. Its purpose is often to upgrade the quality of the water, but is also carried out as part of the Room for the River Programme (water storage areas to accommodate for high water levels).
Abstraction: Removing something mechanically, e.g. water from a building shell, spoil from a river, meaning removing material from a river.
Over-depth: The creation of more depth than necessary, e.g. to allow for sediment storage (so that fewer maintenance channels are needed while the required minimum depth can be maintained).
Fender walls and lead-in jetties: Extended, protective frameworks made from steel and/or wooden poles leading up to, under or along, bridges, quays, locks, etc. to protect the entrance of the locks, etc. against collisions by boats.
Return dewatering: Well-point dewatering 'in reverse': the water abstracted from the original surroundings is released back to that location.
Sediment: Material carried by the wind, water and/or ice, e.g. gravel, clay, sand, etc.
Sludge layer: Muddy soil deposited on the riverbed or stream bed.
Spoil, dredged spoil: Soil that is found on the water's bed.
Anchorage: The additional stays and the horizontal surface of vertical wall structures (sheet piling/retaining wall) so that thinner material can be used for the vertical wall structures.
Shoaling: Making created depths shallower (filling in deep parts).

Would you like to know more?

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The Dutch Association of Dredging and Hydraulic Engineering, which represents approximately 90 member firms, is the trade association in which contractors and service providers operating in the dredging and hydraulic engineering industry have united. The member firms work in the Netherlands and internationally and their operations include land reclamation, dredging, coastal and river-bank protection, constructive hydraulic engineering, port development, soil decontamination and terrain development. The sector is distinctive due to its sustainable, capital-intensive, innovative and international nature.

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