

HOW TO DEAL WITH 200 MILLION M³ OF CONTAMINATED RIVER SEDIMENT

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ABSTRACT: Today, rivers in the Netherlands have to discharge more water than they did years ago. The dikes and the flood plains (the strip of land between dike and riverbed) are unable to cope with large volumes of water during flooding. Flood control measures are therefore required. One of these is to excavate the flood plains, in which case a few million cubic metres of contaminated river sediment is removed. Conventional methods for dealing with such polluted soil are inadequate, because it is too expensive to transport and there is not enough space to dispose of such huge amounts. A new management policy has therefore been drawn up that will make it possible to deal with polluted soil in the river system itself. Costs could be reduced by several billion euros.

THE PROBLEM: FLOODING

The Netherlands is situated in the Rhine and Meuse delta. In their battle against the water, the Dutch have built over 1,400 km of river dikes in centuries past. As early as the mid-14th century, they had constructed a system of dikes that was almost entirely uninterrupted, giving rise to the characteristic landscape of the Netherlands. A strip of land is retained between the dike and the riverbed; this is known as the flood plain. When the river rises, the flood plains overflow and the dikes protect humans and animals from the water. The flood plains overflow several times a year and are inundated with huge amounts of water. The river system usually deals very well with floods.

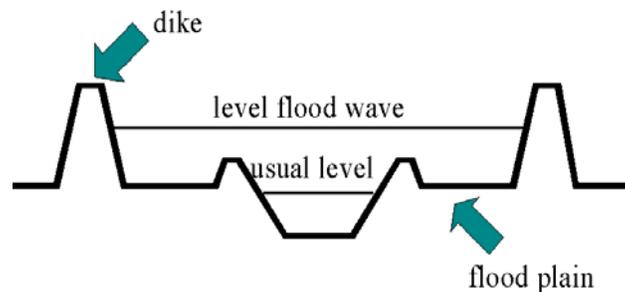


FIGURE 1. Cross-section of a river

However, changes to our climate are causing the land to subside and the water level to rise. Over the course of time, the amount of space available to cope with high water levels has diminished. In the past decade this led to several awkward situations in

the Netherlands: hundreds of thousands of people had to be evacuated from their homes because the dikes seemed ready to burst. It is important that flood protection measures are taken in the near future (before 2015) so that people can live safely behind the dikes again.



FIGURE 2. The river at its usual discharge level



FIGURE 3. The river when it floods

APPROACH: MORE SPACE FOR WATER

The rivers should remain controllable, no matter how much water is discharged. In the past, the height of the dikes has been increased over and over again to deal with the growing volume of water in the rivers. Continuing to raise the dikes means a greater risk if the dike actually bursts, because the land behind the dike would be flooding with huge amounts of water. The Dutch government therefore decided to anticipate the growing amount of water by:

1. preventing the water from reaching our country by taking measures upstream (e.g. keeping water in the river catchment area in Germany, or retaining water in the branches of the Rhine); and
2. giving the water more space by widening and deepening the rivers. These measures involve relocating dikes, enlarging the riverbeds and excavating flood plains. Such measures also correspond with international policies; they are providing more space for rivers to discharge into and offer greater scope for ecological recovery.

A NEW PROBLEM: 200 MILLION M³ OF CONTAMINATED RIVER SEDIMENT

Excavating the flood plains of the Rhine and Meuse river systems involves removing and dealing with a few hundred million cubic metres of soil. Much of this soil is polluted, with contaminated sediment having been deposited all over the flood plains during flooding. The pollution is caused by upstream emissions that are carried along by the river. The question now is: what should be done with these hundreds of millions of cubic metres of contaminated sediment?

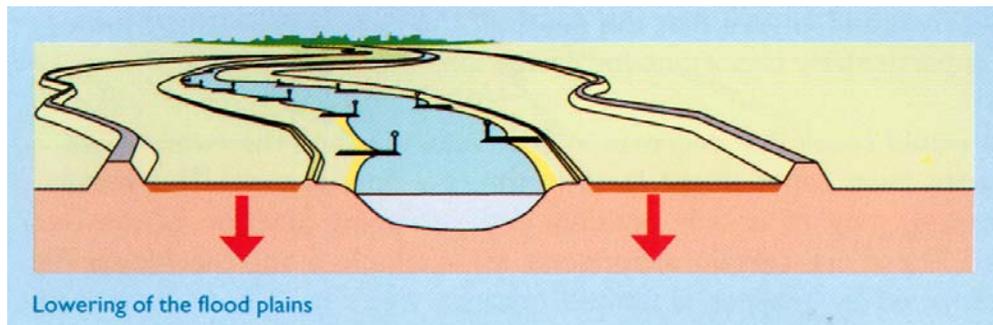


FIGURE 4. Lowering of the flood plains

Several governmental institutions are involved in contracting out the work in the river systems of the Rhine and Meuse in the Netherlands: the Ministry of Transport, Public Works and Water Management and the provinces of Gelderland, Limburg, Noord-Brabant, Utrecht and Overijssel. The local governments have cooperated in finding ways to dispose of these huge amounts of contaminated river sediment and decided to draw up a common management policy.

STANDARD SOLUTION

The standard policy for dealing with such polluted soil is:

- a. after the flood plains are deepened, the new top layer of soil must meet strict environmental demands: it has to be completely clean;

- b. only clean soil can be re-used again in the flood plains;
- c. polluted soil has to be cleaned or dumped in large-scale sediment disposal sites (minimum volume of several million m³).

The standard policy involves transporting and dealing with enormous amounts of contaminated sediment. Soil excavation is expensive in itself, but transport and disposal would really add to the cost. In addition to the financial problems, this would also lead to spatial problems in a highly populated country such as the Netherlands. Such standard solutions therefore do not offer a suitable answer to the problem.

NEW SOLUTION

The new management policy has some innovative aspects:

- a. the environmental requirements set for the new top layer take into account that the soil in the flood plains near the river will be recontaminated;
- b. soil that is less polluted than the anticipated level of recontamination can be re-used unconditionally in the flood plains;
- c. soil that is more polluted than this level can be disposed of in smaller sand excavation pits in the flood plains (minimum volume of 100,000 m³). These disposal sites are required to meet the usual environmental demands with respect to dispersion. Conventional solutions such as cleaning or dumping at large-scale sediment disposal sites can also be used.

POLITICAL CONSIDERATIONS

So far this paper has only described the technical aspects of the problem. Another essential component, however, is the process of political decision-making. Without political effort, none of the goals will be achieved. The decision-making process involves a variety of different parties, as in many major public processes. Each party has its own interests and plays its own part. The main goal of the project has to be defined very clearly from the start. In this case, the main goal is to take flood control measures. The problem of how to deal with contaminated sediment is derived from that goal. The decision-makers (politicians) have to accept that the soil cannot be completely remediated, as in the standard policy. Studies have indicated that it is neither financially, technically nor spatially possible to clear the rivers Meuse and Rhine entirely of all pollution. We have to accept that some of the pollution will remain.

The standard policy had more ambitious goals than the new policy, but because it was impracticable, projects could not in fact be carried out. The net environmental benefit was therefore zero. The new policy, however, is realistic and enables large-scale flood control measures. Much of the polluted soil can be excavated and dealt with. The net environmental benefit will be positive, and so the main goal – to take flood-control measures – will also benefit the environment.



FIGURE 5. More space for the water in the river

PILOT PROJECTS

While the new policy for contaminated sediment was being drawn up, a few pilot projects were carried out. These were relatively small-scale projects that involved widening and deepening the river Meuse along a 1,000-metre stretch. These projects were monitored closely on environmental, hydrological and nautical parameters. Policy-makers and politicians used the results to understand the consequences of the decisions they had to make.

CONCLUSIONS

Local governments believe that their new management policy offers a complete set of solutions that will make it possible to deal with the hundreds of millions of cubic metres of contaminated sediment. Several billion euros can be saved. More information on this subject (in Dutch) can be found at www.actief-bodembeheer-rivierbed.nl

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