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ROOM FOR THE RIVER
PRZESTRZEŃ DLA RZEKI

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1. INTRODUCTION

The waterboard of "Tieler- en Culemborgerwaarden" is a gouvernamental organisation in the centre of the Netherlands, dealing with water management. Its area is situated in the lower delta of the river Rhine. To protect the polder from flooding, it is surrounded by river dykes. We just completed a major improvement programme of these dykes. Our inhabitants are now protected from flooding up to a safety standard of 1/1.250 (i.e. the possibility of a dyke breach is reduced to a theoretical averige of once in every 1.250 years).

This can give one the impression we can lean back fearless. Human population, life stock, real estate and infra are well protected. High discharges of the river Rhine as they occurred in 1995 will no longer be a threat. But then we actually deny signals that this is all very deluding. Due to global climate changes, we will be faced with more severe rains that cause higher river discharges. In the Netherlands the clay and peat sediment of the subsoil is consolidating as a result of drainage works. These two counteracting factors are not to be triffled with in the near and faraway future.

As a result of a nationwide study a masterplan has been made to ensure sustainable protection against flooding by a number of measures to be taken. This plan, by the name of "Room for the River", is approved with by our national gouvernament last December. On a basis of further investigation, planning, engineering, discussion and decision-making it must lead to a mix of technical and spatial solutions. This will require a strong cooperation between involved gouvernamental organisations, of which Tieler- en Culemborgerwaarden is one. We can supply specific know-how of local subsoil and engineering of ground structures, and bring along experience with project planning.

These qualifications were reason for Lubuski Zarzad Melioracji i Urzadzen Wodnych to seek cooperation with our waterboard to exchange knowledge and experience on water management. As a result of the signed "Letter of intent" we frequently contact to improve our mutual performance and products. It has also lead to the invitation to attend this Conference and prepare this paper. The intention is to inform participants on sustainable protection against flooding in the lower Rhine delta, reguarding technical aspects as well as interests.

2. PROBLEM DEFINITION, POLICY OF CONTROL

The above mentioned developments reguarding the river discharge are effected in two ways: one of them is meteorologic, the other one has human activities as an origin. The first one can not be altered within a short span of time, thus the latter has to be adapted. From the Middle-Ages on within the Netherlands we have reclaimed land from the river bed in order to build our society. Even the area we call winter-bed is exploited by agriculture and industries such as brick-factories and shipyards. The summer bed is regulated to benifit shipping and the safe discharge of water, ice and sediment.

Higher discharges will, at the same velocity, need more space. To deal with this, we will have to raise the level of our dykes once more, or increase the discharge capacity by widening the river bed. It may be obvious that both these technical and spatial measures are so-called "end-of-pipe" solutions. In other words, the problem is solved by reducing the local or national effect of the changing circumstances, but has no impact on the actual proces taking place.

More sustainable solutions are created by measures at the source. Surely this not only includes the Swiss Alps, it is pointing at all opportunities to decrease or slow down the run-off of water throughout the whole of the Rhine basin. Therefore watermanagement of the future is on the agenda of the Europeen Commission. Results of this transnationally shared awareness are development programmes such as IRMA and INTERREG, supporting the development and construction of water control and flood relief works. Cooperation between nations is stimulated. At the same time, every member of EC has to take its own responsibility, including The Netherlands. Last year a national Advisory Committee on Watermanagement in the 21th Century formulated a number of recommandations for the nearby future. Crucial in the new approach is the sequence to hold back water first, then to stock it, and eventually dispose of it. The recommendations were approved by the national gouvernament and are to be taken into account by every gouvernamental organisation.

3. FOCUS ON THE RHINE DELTA

At the German-Dutch border, the Rhine changes from an erosion to a sedimentation river, meaning that the Rhine Delta lies almost entirally in the Netherlands. Just after entering the country, the river devides into three river branches: Waal, Nederrijn and Ijssel. The subsoil consists of sand with clay and pear on top of it. River dykes are made of clay. The land is very fertile, enabling agriculture to florish. Over the last decades, urbanisation and industrialisation have taken over the importance of the rural areas.

In this densily populated delta, we now face the problem of higher discharges by the major rivers. Through a mix of technical and spatial solutions we will have to accomodate these high tides. This nationwide project is therefore called "Room for the River". Because the rate of uncertenty increases over the years, the planning and type of measures is devided in three categories, matched to three spans of time.

From this year on until 2015 plans will be made and carried out to widen the winter bed. This is mainly to be acheeved with lowering the winter bed by removing sediment. Aim is to raise the maximum design discharge form 15.000 m^3/sec. to 16.000 mm^3/sec.

Partially the sediment is heavily polluted, due to waste disposal into the river in earlier days. This both hazardous and useless material will be stocked in a controlled way in excavations in the winter bed. The remaining sand and clay can be sold to market companies, to reduce the costs of the projects. An alternative way is the reconstruction of stretches of river dyke. This is an option in the remaining rural areas, thus excluding the cities built along the river.

To complete this ambitious programme a solid cooperation of all involved gouvernamental institutions is required. Participation of private investors related to building companies is foreseen. The total cost of "Room for the River" is estimated at 2.000.000.000,- Euro. Not only the financial means are important, dealing with interests and values such as land-owners and ecology is most necessary. Once more reaching the safety standard was and is paramount. The engineering of technical solutions therefore will have to take into account aspects such as soil mechanics, hydrology, hydraulics, morfology and nautics.

When all measures as mentioned above are completed, the design discharge may be tending towards 18.000 m^3/sec. Widening of the winter bed is no longer cost-efficient. Study is being made of peak shaving reservoirs which can contain up to 50.000.000 m^3 water each. These areas are existing polders, already fairly extensively populated or exploited. After preparing these polders, they will structurally be part of the flood control system. Main disadvantage of this type of measure is, that only regions and cities downstream benefit from the use of it. In the Netherlands this will be the lowest part along the North Sea, including cities as Rotterdam, the Hague and Amsterdam. In Germany, similar reservoirs are being constructed or planned along the river Rhine. Because our nation as a whole benefits from them, some of these projects are sponsored by our national gouvernament.

However physically impossible in the near future, the maximum discharge may in time exceed 18.000 m^3/sec. The structural flood defence system is not equiped to accomodate this huge amount of water. Flooding of the cities of central Holland is desastrous. Suggestions have been published to appoint so-called "calamity-polders" upstream. These polders can after evacuation of people and life-stock deliberately be flooded when necessary. The polder of Tieler- en Culemborgerwaarden is one of the areas to be examined on suitability. Inhabitants as well as local politicians disapproved strongly, because this idea was neither supported by studies, nor was it communicated on beforehand.

With current prospectives of maximum river discharges, the idea of "calamity-polders" may sound irrational. Only, the option must not be thrown away totally. This is demonstrated by the recent installation of a national Independent Committee to investigate the technical, environmental and social feasibility of calamity polders. The Committee is to report within 1 year. To be prepared for discussion on this item, several gouvernamental and non-gouvernamental organisations within the region, including our waterboard, have asked a leading engineering company to perform a case-study on our polder being a calamity polder. After assuming a (theoretical) high tide accompanied with a dyke-breach, the filling of the low lying polder is simulated by computer. The total amount of damage is composed of economic losses and repair costs. At this moment the results of the case-study are not yet available, but with a real estate worth

4.500.000.000,- Euro and main hinterland connections running through the area, the damage should be severe.

A more sophisticated option is to prevent urban areas and main roads from flooding. Water is to be stocked in rural areas after they have been emptied. Likely local society and national economy is less in dispair or harmed. One must take into account the investments that are related to the preparation works, such as water inlet, water outlet, separation dykes and junctions with infrastructure. This option too is to be calculated within the case-study.

The case-study was started last February and is to be completed in June. The results will be handed over to the chairman of the national committee as mentioned before. The case-study is based on approved formulas and figures on the item of hydraulics, economy and econometry concerning the region. However calculations are specific, the used approach and methods can be performed on any other part of the Netherlands. Thus, when examined, upstream areas may turn out to be far more effective than Tieler- en Culemborgerwaarden.

4. Planning of "Room for the River"

As explained before, accomodating the winter bed to the growth of the design discharge from 15.000 to 16.000 m^3/s in the nearby future is part I of the project "Room for the River". At this moment some pilot projects are under construction or being planned. In a few years all along the branches of the river Rhine, various projects will be carried out to restore safety and to create nature. The impact on the local scenery can not be denied, under construction as well as after completion. The dairy cattle owned by farmers will be replaced by more primitive species of cattle owned by preservative funds. Flat meadows will be reformed into a varied landscape of water, river dunes and shrubs. Because of their environmental impact, these large-scale projects require special law, organisation, communication, finance and construction.

Legislation of the public works as a result of "Room for the River" is comlex. Currently there is no law or act which is appropriate. Efforts are now being made to expand the existing legislation on flood relief works such as dykes, to enable the winter bed to be excavated for reasons of safety. An Environmental Impact Assessment may be obligated, as well as all kind of permits, p.e. to handle polluted soil or to tear down trees. Special attention has to be paid at the obtaining of land, eventually followed by the possibility of deprevation.

To realise the objected goals of restoring safety in time, a competent and powerfull organisation is required. In order to control the proces of planning and construction, the three river branches Waal, Nederrijn and Ijssel are seperately managed. The project teams concists of representatives of the province of Gelderland, the Ministry of Public Works, the Ministry of Forestry, waterboards and communities.

Communication on these large-scale projects in a county like ours, is not to be neglected. Variour interest groups and individuals will have to be informed, on different levels and at different mile-stones in decision-making. This calls for a communcation plan ahead and constant awareness during the proces. At a very global level one can

think of informing tourist interest groups on the changes ahead. At utmost detail level communicating right with a farmer who will have to move can be most critical.

Widening the winter bed as explained turns out to be expensive, but inevitable. Once again reinforcing the river dykes after we just completed our improvment programme will not be tolerated within our society. Parallel to dyke improvement, our region is not capable of financing this operation "Room for the River". As the whole nation takes interest in the project, most of the costs are paid for by the Ministry of Public Works and the Ministry of Forestry. When the excavation works are defined and approved of, private companies can become partner, in order to generate money from the merchandising of sand and clay. The contribution of Tieler- en Culemborgerwaarden will be the support by means of manpower. This is meant to guard our interests (to maintain the safety standard of our river dykes) and to share know-how on soil mechanics and project management.

When it comes to constuction of projects in the winter bed, a close estimation of the amount of ground to be excavated is not sufficient. Investigations during the planning proces must supplie reliant information on the environmental and physical qualities of sand and clay. Thus different destinations are to be found for the various quantities of material. Clay may be fitted for ceramics industry (brick-factories) and sand is useful to road works or concrete. Merchandising the sand and clay must be operated carefully in order not te disturb the existing and future market. Overload will lead to lower prices, thus not only disturbing the finance of "Room for the River" but also harming other suppliers.

5. THREATS AND OPPORTUNITIES

At this moment gouvernamental organisations in the Netherlands are mainly focusing on the planning proces of "Room for the River" in advance of construction. Completion of the total mission may be an even bigger achievement than reinforcing the river dykes submitted to the Major River Plan, which was carried out between 1995 and 2000. At the end of 2015 several tenthousends acres of winter bed will have to be reshaped in order to provide sustainable flood defence and nature. Apart from these clear objectives and time-table there are uncertenties to deal with. More specific, we face possible variation on the item of technical input, social acceptance, financial development, spatial borders and maintenance. They can turn out to be threats, but they can also create opportunities. It is a wise man who responds to these, trying either to adapt the project or withstand the resistance.

When eventually lowering the winter bed and partially deviating the river dykes do not supplie the extra discharge capacity objected, it will be made possible to take further dyke improvement into consideration. However this is not reguarded a sustainable measure, it will not be excluded in spatial planning.

Finally, apart from the energy and investments put into the safety standard and protection level of our inhabitants, we should not over-react. Damage from flooding is just one of the community risks of living in a high developed and low-lying society as ours. We will have to find ways to redevelop a high-water awareness that has been lost over the last generations.