

# Physical planning in the coastal region of Zeeland, The Netherlands

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**Abstract.** The Dutch province of Zeeland is situated in the southern part of the Delta region. The geographical location of the province and its history of inundation, land reclamation and dam-building, clearly illustrate the importance that water always has had and still has in The Netherlands. Coastal defence projects are of utmost importance for The Netherlands and the Delta Project is the crown project.

The importance of this project does not only regard the protection against the sea; the Delta dams also contribute considerably to the regional infrastructure. They are an important contribution to the abolishment of the former isolation of the region. They control inland navigation and form important boundaries for water management. They separate salt, brackish and fresh water as well as waters with or without tidal-influence and they also influence the ecological systems in and along the waters.

Through physical planning, including the coastal policy of today, land and water can be further integrated. This paper discusses the role of the Province in area planning, related to the division of labour between the various public authorities in The Netherlands: state, provinces and municipalities. Coastal and water policy at the provincial level have been largely integrated with relevant other interests.

It may be concluded that regional planning and coastal policy are beginning to adopt a new view towards dealing with water.

**Keywords:** Coastal zone; Delta works; Integrated coastal policy; Physical planning.

## Introduction

The Dutch province of Zeeland ('Sea-land') is situated in the southwestern Netherlands. There is no province so closely tied to the sea as Zeeland. The province has been and still is being formed by natural forces and human action. The Zeeland coastline functions as the more or less natural physical border between the land and the larger bodies of water, i.e. the North Sea and the estuaries of the rivers Rhine, Meuse and Scheldt.

Just as a large part of The Netherlands, most of Zeeland is situated below mean sea level. This precarious situation is well-expressed in the device of the province, 'Luctor et Emergo', i.e. "I struggle and emerge". The most important tools in this fight are the

coastal defence structures consisting of dunes, dikes and dams. At the same time, it is the very location of Zeeland on the coast which determines the nature and quality of the province, and which makes it an attractive and interesting place to live and work in, or to visit.

The task of the physical planning authority of the province, including today's integrated coastal policy, is to provide a framework for the development of both worlds: land and water.

## Zeeland and the waters: a history of defence and dependence

The history of coastal defence in Zeeland started around 1200 AD. People began building small dikes of clay, first to protect the existing land, but later also to reclaim land which had been lost to the sea. From the Middle Ages onwards there was a constant battle against the water, with varying success. Major flood disasters, with sometimes thousands of victims and loss of large areas of land, alternated with periods of land reclamation, usually small areas at the time, and the damming up of dangerous flood channels.

This history can still be traced in the present landscape, in (1) the many areas of reclaimed land, 'polders' separated by dikes, (2) the creeks which are remnants of former flood channels (see Fig. 1), (3) the breach sites, and (4) the remnants of villages and traces of habitation in areas which are nowadays situated outside the dikes.

Human impact was only small and local, at least in the beginning. The knowledge and implements needed to tame the sea were limited. Reclamation of new land into polders, in order to obtain fertile clay land for farming, was almost always done at private initiative. The present form and shape of Zeeland were obtained very gradually.

In the 20th century, two developments have been of decisive importance. In the first place, knowledge of coastal civil engineering and the availability of technical resources have increased rapidly, which enabled the construction of major 'coastal works'. Secondly, the



**Fig. 1.** Former tidal flood channel; 'De Pluimpot' (Tholen).

Delta Plan was initiated shortly after the flood disaster of 1953 in the southwestern Netherlands (see Fig. 2). During this storm flood 1835 persons and many hundreds of thousands of cattle and poultry were drowned. Many hundreds of km<sup>2</sup> of agricultural land were inundated with salt water and the material damage was enormous, may be as much as 10-20% of the Dutch Gross National Product.

This disaster finally led to the decision to obtain a much higher safety level for the entire Dutch coastal zone. This became a national matter, for which parliament had to pass a special act, the so-called Delta Act. It is on the basis of this Act that the imposing and famous works known as the Delta Project have been carried out in recent decades, particularly in the province of Zeeland.

Despite the 1953 catastrophe the sea should not only be seen as an enemy. Water is also very important for the economic development of the province. The fertile farmlands of the Zeeland polders are the result of clay deposits from the rivers and the sea. Almost all the natural assets of the province have a historical or contemporary link with the water. For as long ago as the Middle Ages, shipping and overseas trade carried on by Zeeland sailors and merchants have played a very important part in the prosperity of the province.

Favourable locations along deep navigation channels of the Western Scheldt, for example, led to new seaports being built at Vlissingen and Terneuzen. Both the establishment of seaport industries and the still-growing storage and transshipment activities at these ports created new jobs, as did the growth in supply industries and services. These jobs were needed in the province, as mechanization and upscaling reduced the traditional sources of employment in farming and related sectors.

Another major growth sector is recreation. Many Dutch and particularly foreign tourists have discovered the qualities of Zeeland's North Sea beaches in recent decades. This has led to a great increase in the number of camping sites along the coast, followed by the development of new holiday-home complexes. A great many other amenities have also been created to make the tourist's stay more attractive. The now partly closed-off estuaries also proved to be a great attraction because of the recreation facilities they offer. Many forms of water sports, such as sailing, wind-surfing, diving and sports-fishing are practised here, and amenities and accommodation have also been created for these tourists.

The provincial administration plays an important role in the development of these social-economic functions. This role consists primarily of steering and coordinating at the regional level, for instance by the policy instrument of physical planning. The Delta Project can be seen as an infrastructural framework for Zeeland and its physical planning.

### **The Delta Project and the regional infrastructure**

The prime objective in carrying out the Delta Project (see Fig. 3) was to reinforce the protection against new floods. Right from the preparation and design phase, however, it was understood that the importance of the project for Zeeland should go further than that. In particular, the dams would become an essential part of the main regional infrastructure.

The roads which were built on top of the dams connect the islands with each other and with the rest of The Netherlands. In this way there came an end to the



Fig. 2. Areas in the Delta region which were inundated in 1953.

rather isolated situation of large parts of Zeeland. These new road connections – as well as the impressive Zeeland bridge over the Eastern Scheldt (nr. 9 in Fig. 4) – made this major social-economic development of the region possible, notably the expansion of harbours and industry, and the rapid growth of the recreation business, would not have been possible. The dams also form the framework for the functions of the major water bodies in Zeeland.

Locks have been built in the dams to facilitate shipping: both inland trade-shipment and for recreational use. There are also discharge sluices and storm-surge barriers which are used for managing the water quality and -level. As the dams separate waters with different hydrological conditions – salt, brackish or fresh and tidal or non-tidal – the dams also enclose the altered and partly new ecological systems in and around these waters.

The Delta Project had also disadvantages for the society of Zeeland, albeit mainly locally. Several fishing ports lost a direct connection to the sea. The reinforcement of dunes and dikes led to the loss of valuable ecosystems and farmland, sometimes even including farm buildings. Jobs disappeared and landscape and nature changed, in some places very radically. It has to be mentioned that the public authorities and planners had taken this into account. Where possible, the plans were made in such a way as to minimize the damage, or

else compensatory amenities were built or new opportunities and perspectives created. Using the method the Dutch call ‘creating work with work’, it was possible to achieve a great deal without running into exorbitant additional costs. For example, fishing ports were relocated and working ports were turned into yachting marinas after completion of the Delta Project (see Fig. 4). New nature areas were created where possible, or conditions were provided for their development. A great deal of attention was also devoted to the structuring and completion of the new landscape, such as the building of artificial dunes near the former working platform Neeltje Jans in the mouth of the Eastern Scheldt.

The development and implementation of the plans for these additional amenities often took place on a project basis, usually involving the administrators, technicians and experts from the various public authorities, thus creating collaboration between central, provincial and local authorities, each with their own know-how and responsibility. Thus, apart from greater safety, the Delta Project also had an organisational and administrative spinn-off.

The provincial authorities played an important role in all this, partly because the provinces in The Netherlands have a special responsibility for integrated plan development regarding physical planning, and environmental- and water management. The integration of the Delta Project, the additional projects and, above all, the

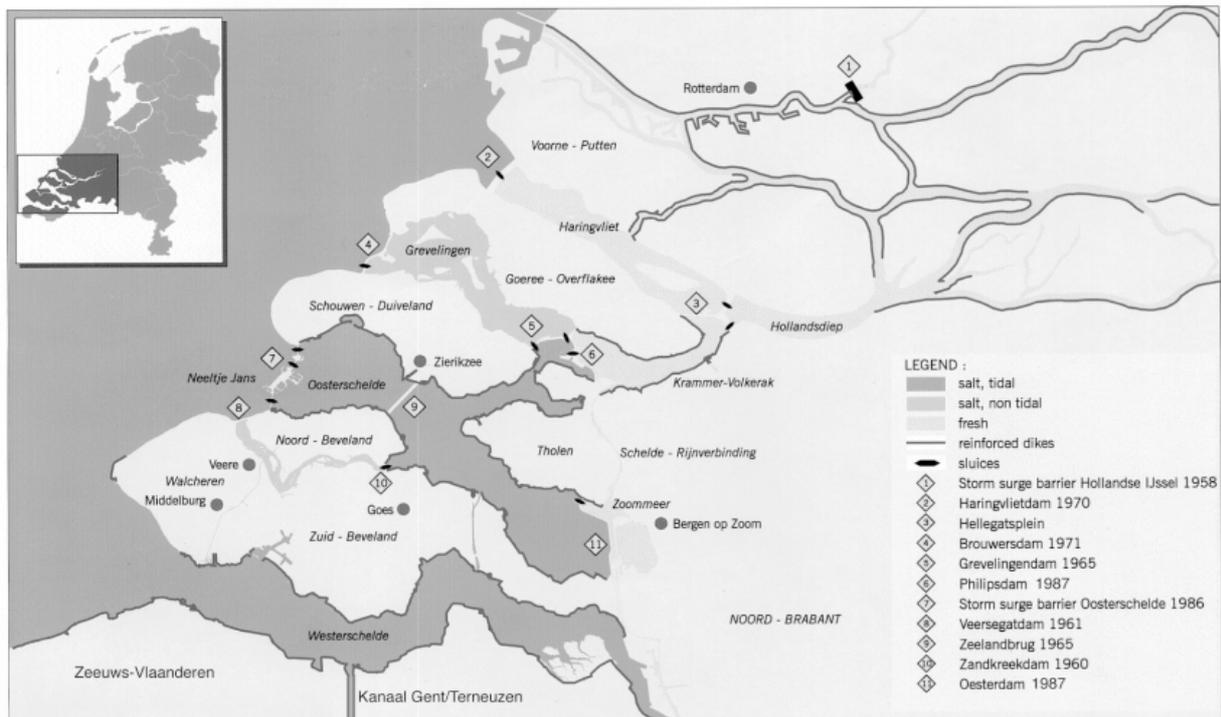


Fig. 3. The Delta Project.

new opportunities which have arisen in Zeeland, have led to an increased need for modern integrated planning for land and water areas.

Therefore, through the years, zoning plans (including shipping routes) have been developed for the Delta waters, such as the former estuaries Veerse Meer, the Grevelingen (see Fig. 6) and the Eastern Scheldt.

Although the suitability of integrated planning versus sectorial planning will not be explicitly discussed in this paper, it is worthwhile mentioning that integrated planning proved to be a very effective instrument. This is particularly the case at the level of local planning, when area boundaries, the nature of problems and the interest groups involved can be well-defined.

The more general the scale of planning (e.g. planning at a national scale) the more difficult integrated planning is presumed to be. Nevertheless it is supposed to be useful at the regional level of a province.

### Regional planning at the provincial level

In The Netherlands, policy tasks and responsibilities are divided among the various public authorities: the State, the provinces and the municipalities. The municipalities have little or no role in coastal defence and water management. Here, the water boards play an important role. Water Boards are functional adminis-

trative authorities on the regional level. In Zeeland the Water Boards are responsible for regional water systems. They are also responsible for the maintenance of most dikes in the province. In general, the main outlines of the legislation and regulations are reserved for the State.

The province of Zeeland, as the middle administrative layer, develops policy plans for physical planning, water management, environmental protection, nature conservation and development, economic development, recreation and tourism, as well as coastal and river-bank defences. These policy plans indicate the policy objectives and the way in which the province wishes to deploy the available resources. The formulation of the land-use plans, the water management and the environmental policy is a specific provincial task, regulated in the law. These plans also relate to the entire territory of the province.

Regarding the waters, the following plans can be mentioned:

#### Water management plan

This plan (Anon. 1993a) contains the integral policy for groundwater and surface water, and covers both the water quality and quantity aspects. It includes, for example, quality targets related to the functions of the water, criteria for the issuing of discharge and extraction licenses, as well as guidelines for the water management plans drawn up and implemented by the Water Boards.



**Fig. 4.** Roompohaven, a new yachting marina in a former working port.

#### *Regional plan*

This plan (Anon. 1988) indicates the functions of the various waters, and contains guidelines describing how protective measures should be included in the municipal physical planning projects for vulnerable functions such as nature conservation areas, coastal defence and drinking water extraction from the dunes (see Fig. 5).

#### *Nature policy plan*

In this plan (Anon. 1991a) the national nature policy plan (Anon. 1990) is adapted to the Zeeland situation. The plan gives a precise indication about which areas form part of the national ecological main structure, including both existing and planned nature areas. Where these areas are not yet managed as nature areas, there are schemes for acquiring and managing them, using government funding. In Zeeland the plan involves several thousand hectares of farmland which are to be returned to more natural systems, or whose natural assets are to be enhanced.

#### *Policy plans for the major water bodies*

This plan includes the Eastern Scheldt (Anon. 1994a), Western Scheldt (Anon. 1991b) and 'voordelta' (the sea area to the west of Zeeland) (Anon. 1993b). The policy plans set out the desired integrated policy for design, use and management of the large waters; sectorial developments have to be tested against this policy.

#### *Area-specific projects.*

Integral area-specific projects are either currently under way or in preparation for the area around the Terneuzen Canal to Ghent (Anon. 1992) and for the

coastal areas of Schouwen (Anon. 1994b, 1996a,b), Walcheren and Zeeuwsch-Vlaanderen. These projects are focused chiefly on the implementation of policy whilst ensuring the most efficient possible use of financial and other resources by the responsible participants, public authorities and the private sector.

#### *Policy plan for the Zeeland coast*

This plan (Anon. 1995) sets out the integral coastal policy, the elaboration of the national coastal defence policy, in relation to the existing and desired functions and interests in the coastal zone. (cf. de Ruig & Hillen 1997; de Ruig 1998, this volume).

#### **Policy developments concerning the coast**

The last mentioned policy plan for the Zeeland coast represents the translation and formulation at the provincial level of the modern coastal defence policy (de Ruig 1998, this volume). It includes attention for the interests and functions of each sector of the Zeeland coast. Although coastal defence remains the most important factor in the new coastal policy, it is now also possible to place the interests and functions of the coast in a framework of a future coastal policy. This is called integrated coastal policy: coastal defence, taking into account the interests and functions in the coastal zone. This also means that the policy in the land-water zone becomes more flexible, allowing for the constantly differing combinations of functions which are at work in different areas, or the different degrees in which they are present.

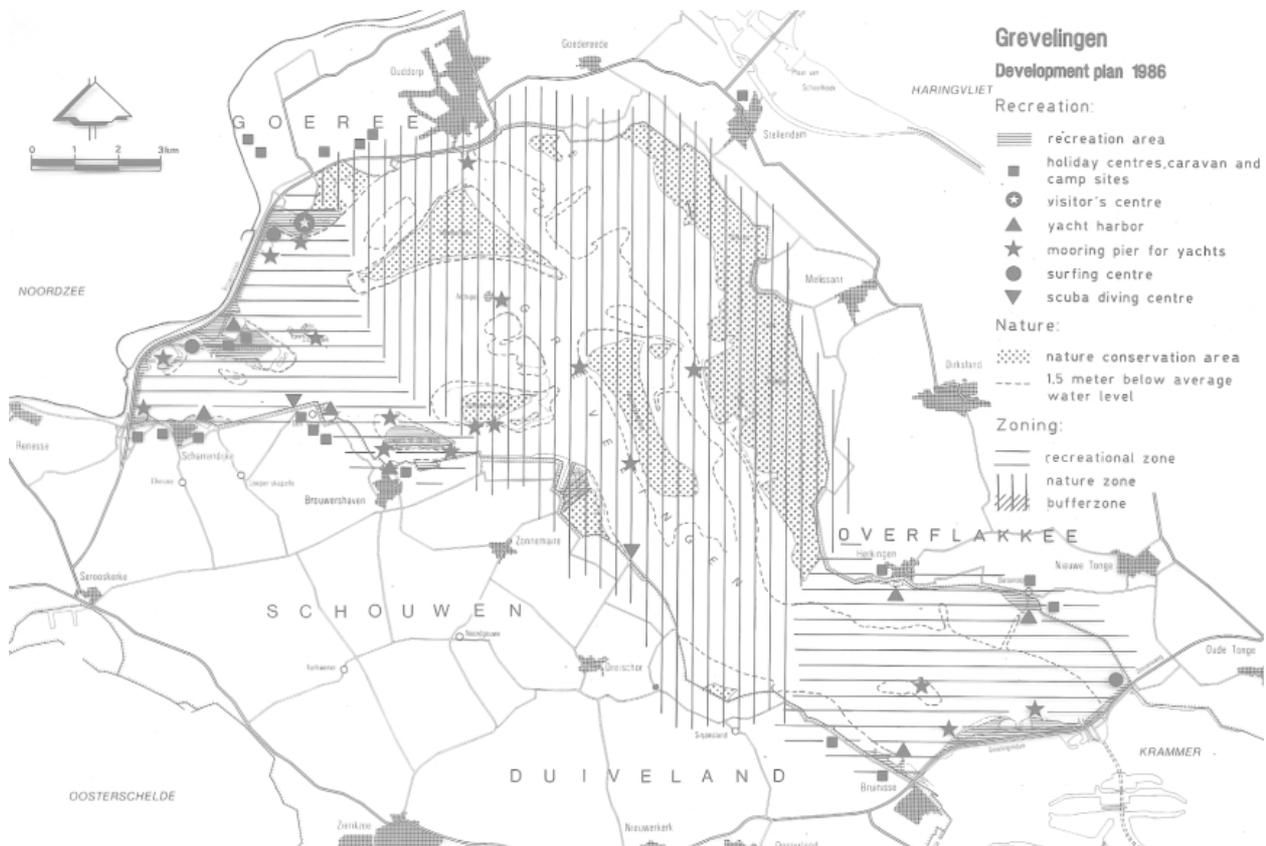


Fig. 5. Grevelingen Development plan.

In addition to coastal defence, the main functions of the North Sea coast of Zeeland are:

- nature conservation; the dunes are an integral part of the national ecological main structure and large sections are protected by law as areas of natural importance;
- recreation, and in particular beach recreation;
- local extraction of fresh water for drinking water purposes;
- local development for housing, holiday accommodation and the restaurant and hotel sector.

The central government policy of maintaining the coastline through beach nourishment (de Ruij 1998, this volume) means that the existence of the coastal area has been reasonably secured for many years, in the order of decades. This makes it basically possible to anticipate possible future developments, including long-term ones.

It is no longer necessary to adopt a purely defensive attitude towards the water. On the contrary, the added value of the coast and of the coastal waters can now be considered.

As regards nature, there are opportunities for more natural dynamics on the coastal ridge of the broader

dune areas in Zeeland (see Waterman et al. 1998, this volume). To date, the strict management of the outermost dune ridge has led to a narrow continuous green sand 'dike' in which the managers anxiously seek to hold the sand in place by erecting wind-drift screens and by planting marram grass. In the new coastal defence policy (Hillen & Roelse 1995), natural and geomorphological processes are again allowed more freedom, thus enhancing conservation values. This offers the possibility of some man-controlled natural erosion of the dunes, of the creation of wet dune valleys, of small man-made breaches in the outermost dune line with a resultant formation of small scale tidal inlets. In other words the originally dynamic character of the coastal dunes is restored to a certain extent.

However, it is necessary that the public authorities maintain (some) control over the new developments in the coastal region. Not all developments are compatible. The challenge is to strike a balance between the various policy sectors and authorities and to obtain the broadest possible support among policy makers and implementors, but also among the population.

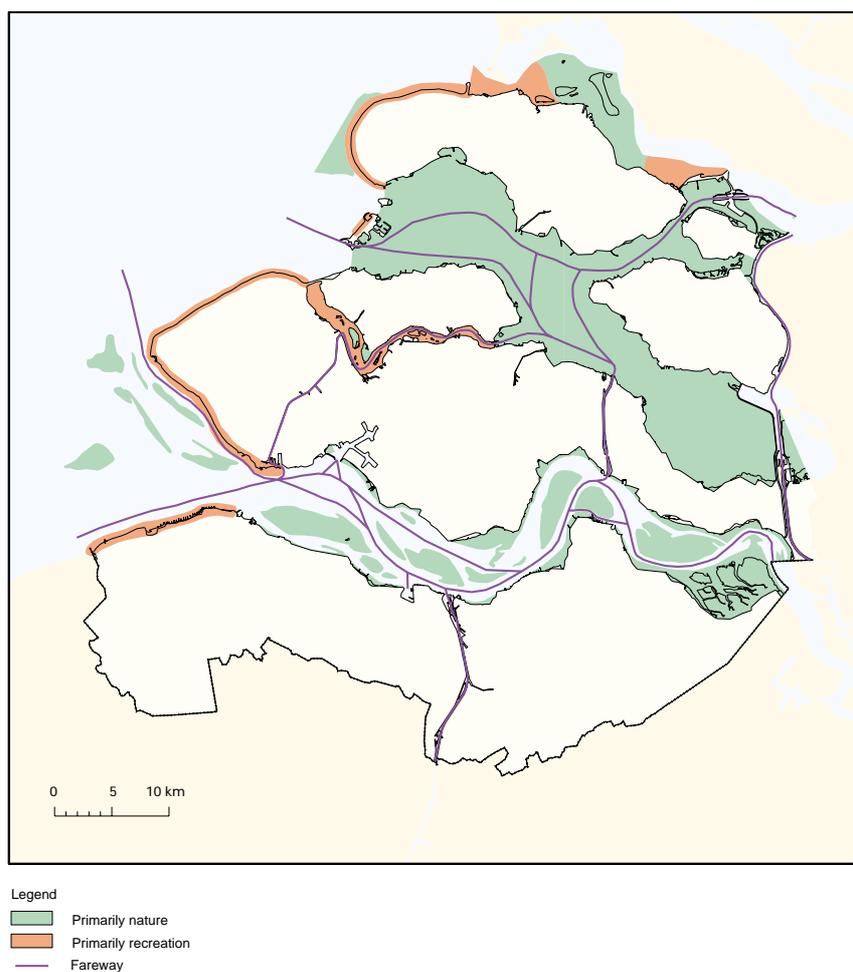


Fig. 6. General zoning of the Delta waters in a regional plan.

### A new view on the significance of coastal waters

The new integrated coastal policy, which is now much more than a simple coastal defence policy, involves a new view on the significance of the coastal waters. This view implies an area-based planning system in the coastal areas. Insights have changed and modern technical know-how and resources enable many developments which were unthinkable in the past.

For a long time, people living in low-lying areas, including Zeeland, have considered the water mainly as an enemy: how can we protect ourselves against its aggression by controlling it, enclosing it. Today, there is a growing awareness that water systems possess important qualities, which have to be protected and restored.

In Zeeland, striking projects have been carried out, and are being prepared, in the boundary zone of land and water which bear witness to this new view.

An example is the former 'work island' Neeltje Jans

in the mouth of the Eastern Scheldt, an important part of the storm surge barrier construction. During the construction several millions of cubic metres of sediment were released. Some of this dredged material was used to create artificial dunes and shoals providing habitats for birds. Another example is, the digging out of a working port to create an intertidal zone and the lowering of land inside the dikes to form a marshy and wet nature reserve on the northern banks of the Eastern Scheldt.

Here the modern coastal engineering technology has helped to make nature development a success. But not all plans were successful. For instance, plans for the Western Scheldt met resistance.

These plans concern the restoration of nature and natural dynamics in this estuary in order to limit the negative effects of deepening the shipping lane. One aspect is the 'depoldering' of the land that was once reclaimed for agricultural use. This leads to an increase in the extent of shallow waters where salt marshes and

mud flats can develop – these were the environments that were reduced in size due to the dredging of the shipping lane.

These plans met a great deal of resistance. On the one hand, the arguments of the government to support the benefits of the measures kept changing – at first the only purpose was to promote natural systems, then again they should also be useful and/or necessary for safety reasons. This ambiguity did not increase the credibility of these new plans. On the other hand, the region was not prepared to break with the centuries-old tradition of land reclamation and the struggle against water, simply because the neighbouring country (Belgium) wanted to deepen the shipping lane and consequently cause ecological damage. Only an integrated approach for the entire delta would be likely to offer any outlook for the future.

In an integrated cross-border approach, it is essential to have an idea which measures are possible. Moreover, it is of vital importance to make sure that those measures are evenly divided across the whole of the delta. The consequences for safety, nature, the needs of the estuary and delta, and the water defences must be very clear. The reasonableness and the effectiveness of the plans must be accepted by the public and not simply sold to them by a clever presentation. It should not be seen as outside interference. The various levels of government should coordinate their operations, with the provincial government being the ideal level at which constructive discussions can occur in the region. But it should be a real discussion, in which the practical experience of people living in the Westerschelde area should have an impact. There should be enough time to thoroughly discuss the issues with one another so that a long-term strategy with a broad basis of support for the Westerschelde can be accomplished. This is the key to achieving a permanently healthy estuary.

The Westerscheldt discussion arose many emotions, but that should not have a major influence on the general conclusion: man can only use the waters properly and sustainably if the tension between land and water changes into a peaceful coexistence and the apparent oppositions form a true union, as they do in the name of the province: Zeeland.

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