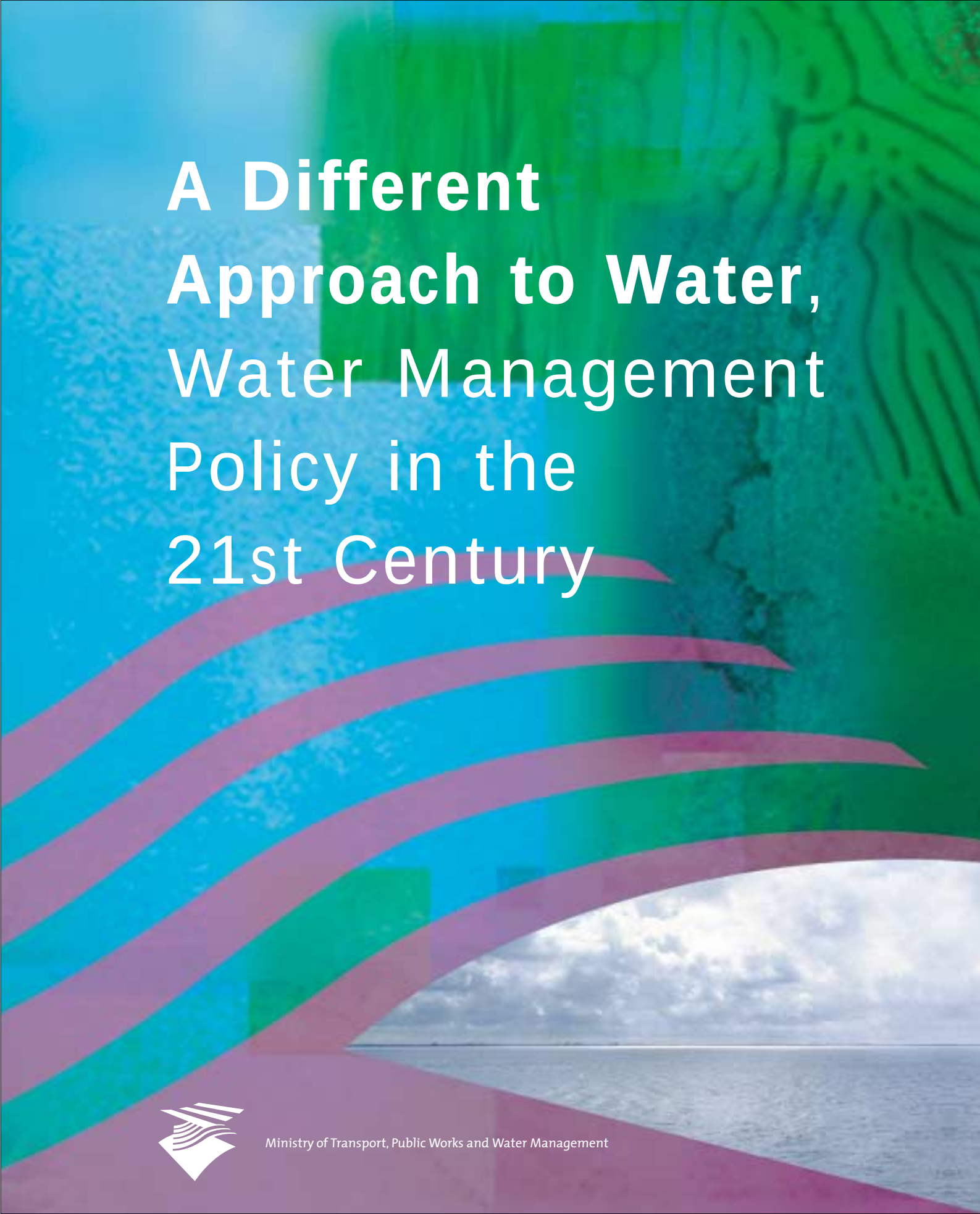


A Different Approach to Water, Water Management Policy in the 21st Century

Ministry of Transport, Public Works and Water Management

The same water

The same water whipped up by storm
that comes in furious squalls, causing anxiety
is also the water that, serene and calm
cures people from their misery

Our low-lying land by the sea is one large body
with veins, aortas, channels of blood
and all that branches off it – a busy industry
that regulates our painless breathing

It is not a network you can alter with impunity
with every clot it overflows
obstruction of one single artery
causes a thousand capillaries to explode

Every organ is a temporary sponge
when you plaster it with powder puff
and mortar, from head to toe, it becomes dry
and stiff - in the blink of an eye

Pamper the flow that runs through your body
give the blood, expertly tamed, free rein
And for those who abhor the surly squalls

Remember that a heart is never amputated
because it is capable of breaking. When you keep the water in check
because of its merciless attack, you kill the biotope

of all that is helpless and endangered
not unlike a gordian knot

The water itself, meanwhile, rises and falls.

Gerrit Komrij

VOORREDEN.

Wanneer ik, kort na dat de Wateren der Overſtrominge eenigzins afgelopen waren, ondernam de gevolgen van die alvernielende plage, in deze Landſtreek met eigen ogen op te neemen, was myn inzigt om deswegen eenige Aantekeningen voor myn byzonder gebruik te maken. Een klein Voetpad leidt ons meermaalen op een groteren Weg; en even zoo is het my in dezen gegaan. Want toen ik alle die Rampen by den anderen gevoegd had, dagt het my niet ongevoeglyk te zullen zyn, daar op een middel van Redres voor het toekomende te laten volgen, beſtaande in het maken van een Overlaat, ten einde de overtollige Opper-Rivierwateren naar den Bies-Bos af te leiden. Dit opſtel aan eenigen myner bekenden hebbende laten lezen, heeft my aanleiding gegeven om het in 't ligt te brengen; waar toe ik te

D E

VERSCHRIKKELYKE

WATERSNOOD,

Langs de Rivieren de WAAL en de MAAS, voorgevallen in de Maand February des Jaars 1757

Met derzelver

DROEVIGE GEVOLGEN,

Uit geloofbaare Berigten en eigen Bevindinge by een verzameld en beſchreven:

Waar by gevoegd is een

V E R T O O G

Over het eenig Middel van Redres,

Voor het toekomende.

DOOR

JACOB PIERLINCK,

Kapitein Luitenant en ordinair Ingenieur ten dienſte der Vereenigde Nederlanden.

Opgehelderd door een Kaart van de Rivieren.

Te AMSTERDAM,

By *ISAAK TIRION.* 1757.

Cabinet's position

Foreword

This document outlines the Cabinet's position on water management policy in the 21st century. Immediately fuelling this is my concern about increasing water levels in the rivers, flooding, and the accelerated rise in sea level. In a country like the Netherlands, the geography of which is dominated by the sea and the mouths of four great rivers, water and natural space are inextricably bound to one another. For centuries, spatial planning in the low-lying Netherlands has been a matter of separating and maintaining the separation between land and water. And we have benefited from this, considering the fact that two-thirds of the gross national product (around NLG 400 billion annually) is generated domestically.
But changes are brewing. Climatic changes are increasing the likelihood of flooding and water-related problems.
In addition, population density continues to grow, as does the potential of the economy and, consequently, the vulnerability of the economy and society to disaster. Two undesirable developments that, in terms of safety, potentiate one another – a growing risk with even larger consequences. As such, the safety risk is growing at an accelerated pace (safety risk = chance multiplied by consequence).

In 1999, together with the president of the Association of Water Boards (UVW), I requested an independent Committee to determine whether current water management policy is sufficiently equipped for the future – an effort that came none too soon. Across Europe and abroad, we have witnessed the consequences of superfluous water. The events in Switzerland, Italy and the UK have shown us the importance of looking ahead. The Committee concluded that the current water management system was not capable of responding to future

developments. In order to keep the Netherlands safe, liveable and attractive in terms of water for inhabitants and investors for the century to come, a change in water management policy and in the way we approach water is required.

This change involves the idea that the Netherlands will have to make more frequent concessions. We will have to relinquish space to water, and not win space from it, in order to curb the growing risk of disaster due to flooding, limit water-related problems and be able to store water for expected periods of drought. By this, I do not mean space in terms of the height of ever taller dykes or depth through continued channel dredging, but space in the sense of breadth. This will cost space, but in return we will increase safety and limit water-related problems. Safety is an interest that must play a different role in spatial planning. Only by relinquishing space can we set things right and if this is not done in a timely manner, water will sooner or later reclaim the space in its own, perhaps even dramatic, manner.

My argument to innovate water management policy appears to be widely accepted, but more is required. It demands creativity, energy, time and money. Protecting the Netherlands from flooding will require repeated investments over a long period of time.

Vice Minister of Transport, Public Works and
Water Management,
drs. J.M. de Vries

Table of Contents

Autumn of 2000

Heavy rainfall and occasional storms sweep across the Netherlands and the rest of Europe. As in previous years, the water system is unable to cope with these volumes of water. Rivers overflow, polders can no longer be drained and towns and villages are flooded. Where things really go wrong, damage runs into the billions (floods in Great Britain, for instance, cost the country 1 to 1.5 billion guilders). In the Netherlands, it stops raining just in time.

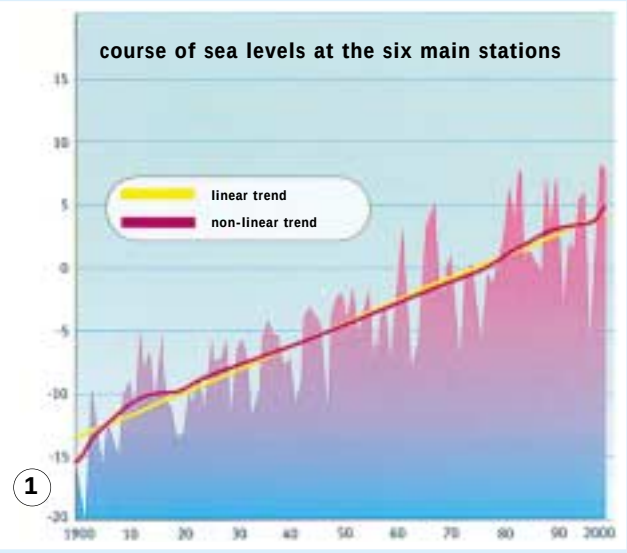
1. Rising Sea Level and Subsiding Land

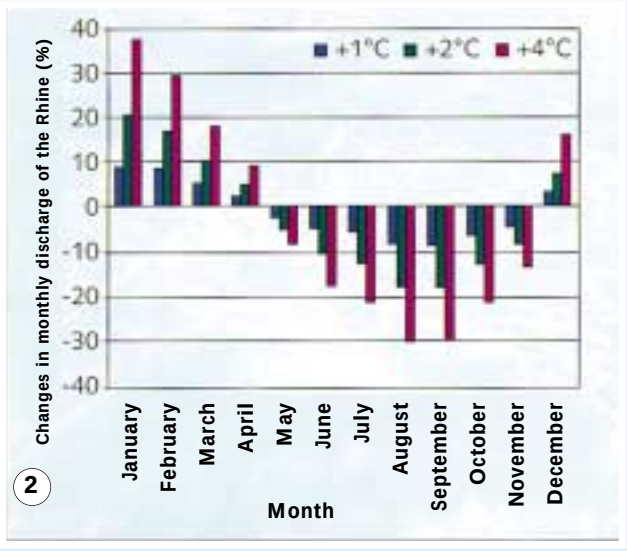
In 1993 and 1995, the Netherlands was startled by extremely high water-levels in the rivers. Inhabitants of and companies located in the Maas valley experienced a great deal of problems and substantial damage as a result. All along the Rhine and Waal rivers, people were evacuated as a precautionary measure, although the actual need for this would ultimately prove to be negligible. Shortly thereafter, inhabitants and farmers of yet another region of the Netherlands were burdened with water-related problems resulting from sustained rainfall. During the 1990s, the Netherlands also experienced several summers of dramatically low levels of precipitation. As a result, drinking-water companies, farmers and the shipping industry incurred losses. We cannot consider these events as isolated occurrences.

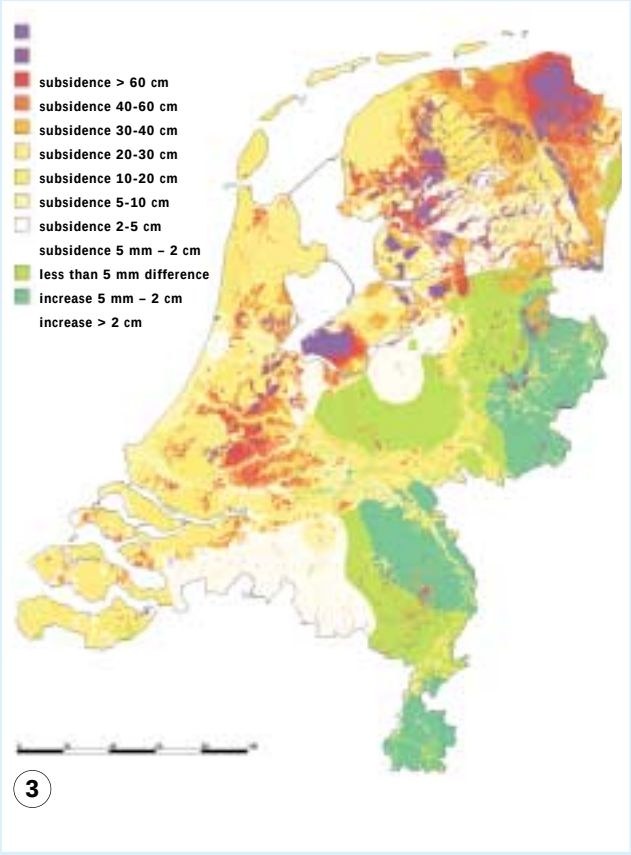
1.1 Definition of the Problem and the Objective

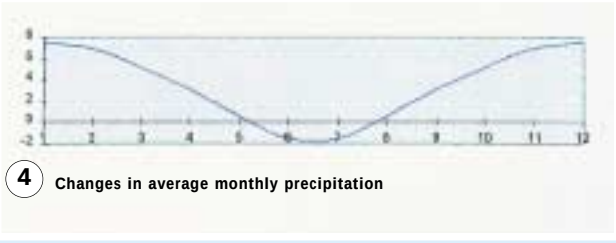
Most scientists agree that the climate, including that of the Netherlands, will undergo dramatic changes in the coming decades. These changes will result in wetter winters, drier summers and a rising sea level. At the same time, the Netherlands is subsiding. We will have to contend with conditions of increasingly frequent and dramatic fluctuations in the water supply. The conditions in a country like the Netherlands – dominated by the sea and the mouths of four great rivers, with a high population density and an expanding economy – will more frequently result in enormous problems unless a structurally different approach is implemented to counteract them.

The greatest source of concern is flooding or breaches of water-retaining structures along the coast, Rhine and Maas (Meuse) rivers or in the IJsselmeer lake region. Should this









1. The sea level is rising

The sea level has risen 20 centimetres in the past century and will rise even further by an expected average of 60 centimetres in the next century. This will also lead to a rise in the water level of the IJsselmeer lake.

2. River discharges are increasing

Climate changes will lead to a 40% increase in river discharges in winter and 30% lower discharges in summer.

3. The land is subsiding

In the low-lying parts of the Netherlands, soil subsidence will average between 2 and 60 centimetres by 2050.

4. Precipitation increases

Until 2050, precipitation volumes in winter will increase by approx. 10% and decrease in summer by a few percent.

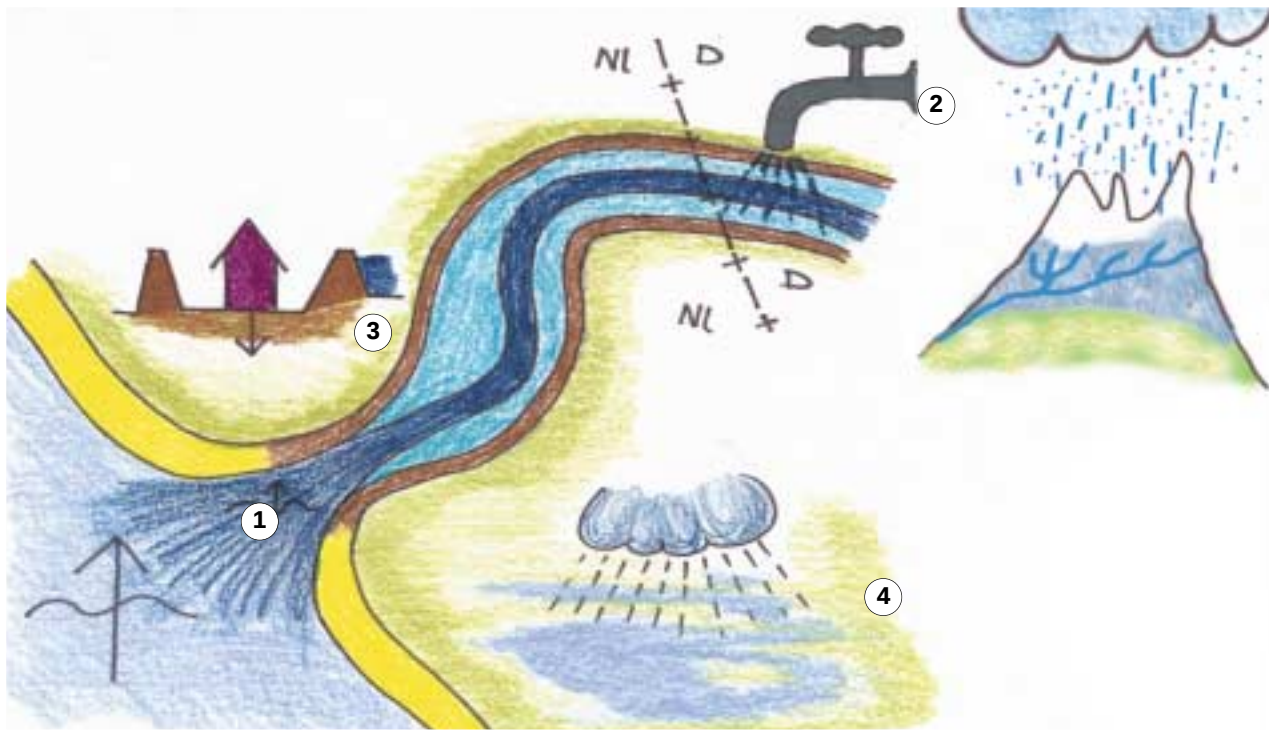
occur, it would result in substantial economic loss, as well as place human lives at risk – the safety problem is undeniable. Waterlogging is the situation where rivers, streams and ditches that are not dyked overflow or the water-table rises to extremely high levels, however, without posing an immediate danger to people. Recent flooding in the UK, Italy and Spain offer a glimpse of the seriousness of this problem.
Extreme lack of water is also a problem and can likewise result in dramatic economic loss. When the shortage persists for an extended period of time, this can lead to substantial problems with regard to the drinking water supply, shipping and dropping water-tables.

1 In the Approach to Water-Related Problems memorandum (1999), the Cabinet, provincial authorities and water boards present a joint plan for the prevention of water-related problems. The plan consists of four components: investigating water management in the 21st century, administrative measures, measures for the regional water management system and measures for the main water management system. The state of affairs is described in Appendix 1.

The Approach to Water-Related Problems memorandum[1] announces a study of water management in the 21st century. To this end, the State Secretary of Transport, Public Works and Water Management and the president of the UVW established the Water Management in the 21st Century Advisory Committee in the spring of 1999. The Committee was charged with 'making recommendations for desirable changes to the water management policy of our country, focusing on the consequences of climatic change, rising sea levels and land subsidence'.

Presenting its recommendations in 'Water Management Policy in the 21st Century' (August 2000), the Committee puts forth a succinct view: the water management system is inadequate now and will be so for the future. Without additional efforts, climatic change and land subsidence will cause safety levels to fall and water-related problems to occur more frequently. At the same time, the number of inhabitants that require protection is increasing as is the economic value of the property to be protected. The Committee also concludes that individuals and the Cabinet have paid too little attention to this issue. In addition, the control over water management policy is extremely fragmented.

The Water Management in the 21st Century Advisory Committee endorses the direction implemented under the fourth Policy Document on Water Management and the Approach to Water-Related Problems memorandum.
The Committee also supports the incorporation of spatial planning measures into the water management system.



1. The sea level is rising
The higher the sea level, the higher the water level in the IJsselmeer lake and the tidal river area and the harder it is for river water to drain off.

2. The risk of floods increases
River discharges increase.
The more water has to flow through the 'river channel', the higher the water level will be. The risk of floods increases.

3. The sea level rises, river discharges increase and the soil is subsiding
The larger the difference between water level and lower-lying polders, the greater the impact of floods.

4. Precipitation in winter increases
Impending flood risk.

Increasing water levels, increasing precipitation and subsiding soil
More frequent AND higher peaks in river volumes combined with reduced drainage of this increased quantity of river water to the sea as a result of (accelerated) rise in sea level are the expected results of climate change. The risk of water overflowing dunes and river dykes increases.
The higher peak volumes of rivers are caused by the expected increased frequency of violent rainstorms in winter. In summer, longer dry spells with increasing chance of water shortages are forecast.
The effect of higher high-water levels of sea and rivers is intensified by a steady advance in soil subsidence, resulting from the slow geological tilting of the Netherlands along the Groningen-Bergen op Zoom axis and rapid soil consolidation of drained polder areas in the Netherlands.

At the same time, however, it maintains that this policy is not sufficiently put into effect and recommends strengthening the sphere of influence of water management policy.
The Committee also adds a new element, believing that water management policy should better anticipate future developments in climatic change, land subsidence, population and economic value, instead of reacting to incidents.

The Cabinet's position presented in this document reflects the conclusions it has drawn from the recommendations of the Water Management in the 21st Century Advisory Committee as well as measures with regard to climatic change and land subsidence that it deems necessary to maintain safety and reduce water-related problems. Wherever possible, the Cabinet would like to combine the implementation of these actions with approaches to water shortages, dropping water-tables and water quality.
In light of this, the Cabinet is taking three other recommendations for water management into consideration that were published in the past year: 'The Provinces Must Make Space for Water' ('Provincies maken ruimte voor water') from the Leemhuis Committee, 'Capitalising on the Liquid Gold' ('Het blauwe goud verzilveren') from the Rathenau Institute and 'Over Flowing' ('Over stromen') from the National Council for Agricultural Research (NRLO), the Netherlands Advisory Council for Research on Nature and Environment (RMNO) and the Advisory Council for Science and Technology Policy (AWT). With regard to the last of these recommendations, the Cabinet presents an outline of its response in this document. The Lower House will follow with its reaction at the beginning of 2001.
The responses of the Netherlands Commission for Integrated Water Management (CIW), the Consultative Body for Water and North Sea Affairs (OWN) and the report from the Central Planning Bureau (CPB) with regard to the costs and benefits of allocating space for water were also taken into consideration in drafting the Cabinet's position.

1.2 Outline of the Cabinet's Position

In general terms, the Cabinet supports the recommendations of the Committee. The Cabinet underscores the need to anticipate expected developments in climatic change and land

Recommendations for water management from the Rathenau Institute and the Leemhuis Committee

The Rathenau Institute is an independent organisation advising the Netherlands Parliament on social and ethical aspects of new technology. In 1998, this institute started with the 'Sustainable water management in practice' survey, studying the extent to which the changed water management policy had been implemented.

Sustainable water management means a change from a primarily technical/economical approach to a much broader orientation, with a heightened emphasis on ecological and socio-cultural aspects.

The institute's conclusion is that policy and practice are still very much at odds. Although included in the policy paper, the mental shift to integrated water management taking into account the dynamics and values of water itself proved somewhat unmanageable in practice. 'Integrated water management is stifled by many concerns and interests and by a lack of political support beyond the realm of water management. Water management hardly plays a role in decisions regarding the spatial development of the Netherlands. If things do not change, this will mean that in future, parts of the Netherlands will become uninhabitable or only fit to live in at high cost.'

One of the Rathenau Institute's recommendations is to include the obligation to formulate objectives in concrete, reviewable terms in the Spatial Planning Act and the Water Management Act.

'Capitalising on the Blue Gold, integrated water management and the importance of a mental shift' Report from the Rathenau Institute, November 2000

'Provinces Must Make Space for Water' Report from the Leemhuis Committee, August 2000

For the Interprovincial Consultations (IPO) executive committee, the development of water management triggered the establishment of an ad hoc committee (Leemhuis Committee) to advise on interprovincial strategy. The committee's recommendation – 'Provinces must make room for water' – addresses the relationship between water management, spatial planning, the environment and the provinces' tasks and authorities in the event of flooding. Provinces must actually make space for water and ensure that water becomes a guiding principle in spatial planning.

It is the Committee's recommendation that provincial governments take the lead in controlling water-related problems and water shortages. They should also actively introduce the tiered approach as well as the regional catchment area approach into water management. They could play an active role in deciding on methods of national or international flood prevention.

To accelerate the creation of more space for water, an administrative agreement between the Ministry of Transport, Public Works and Water Management and the provinces should be concluded.

subsidence, continue to guarantee safety, prevent increased risk of flooding and limit water-related problems. Furthermore, allocation of extra space for water in addition to the implementation of technological measures and the conclusion of agreements on terms of reference between the various authorities are essential for the success of this policy. The Cabinet understands that this new approach requires a substantial additional effort.

A good mix of spatial and technological measures is required to address safety requirements and reduce water-related problems, for which the Cabinet prefers constant consideration of spatial measures, including widening or lowering flood plains and construction of water retention and storage areas, in addition to technological measures, including dyke heightening and reinforcement, dewatering operations and damming.

The Cabinet's position reflects the overall vision in its approach to ensure safety and address water-related problems. Naturally, the Cabinet would wherever possible like to combine the implementation of this with approaches to other water management problems, such as diffuse sources of pollution, contaminated water beds, water shortages and dropping water-tables. It also sees good opportunities to combine the plan's implementation with the objectives of other policy areas including the reconstruction of rural areas, construction of the ecological infrastructure, surface mineral extraction, land use and other area-specific projects, residential construction and development of business parks.

The Cabinets' approach to create additional space for water, in addition to the implementation of technological measures, serves the need to ensure safety and limit water-related problems. It also offers a crucial qualitative impulse to the spatial planning of our country.

The following tenets guided the Cabinet in drafting its approach to ensure safety and reduce water-related problems:

- Citizens do not sufficiently recognise and acknowledge the problems associated with water. The Cabinet must better communicate the nature and scope of these risks and, in addition to its own efforts, offer individuals the opportunity to contribute to risk reduction (Chapter 2).

- The need for a new approach to ensure safety and reduce water-related problems that is founded on three underlying principles (Chapter 3):
  1. anticipating instead of reacting;
  2. not passing on water management problems, by following the three-step strategy (retaining, storing and draining), and not passing on administrative responsibilities;
  3. allocating more space to water in addition to implementing technological measures.
- In addition to implementing technological measures, allocating more space for the (occasional) storage of water is required. Wherever possible, this space must also serve other objectives that are compatible with water storage (Chapter 4).
- A 'water test' must prevent the gradual decrease in existing space allocated for water through, for instance, the implementation of projects in the areas of land use, infrastructure or residential construction (Chapter 5).
- The new water management approach places new demands on the knowledge infrastructure (Chapter 6).
- The Cabinet, provincial authorities, water boards and municipal authorities are all responsible for ensuring safety and limiting water-related problems. Administrative agreements about the division of roles and co-operation must ensure rapid and effective implementation of measures (Chapter 7).
- Developments in climatic change and land subsidence and the new approach require repeated additional investments in both the main and regional water management systems.

1.3 Follow-up Process

During the follow-up process, the Cabinet will work in close co-operation with provincial authorities, water boards and municipal authorities, as well as with social interest groups and trade organisations.

In the Cabinet's position, the approach to ensuring safety and reducing water-related problems is rooted in policy.
In addition to concrete actions, this position identifies aspects that require more detailed research before a decision can be made. The results will be laid down in the policy documents and administrative agreements presented below.

In the short term, the Cabinet will draw up an Initial Agreement with Interprovincial Consultations (IPO), the Association of Water Boards (UVW) and the Association of Netherlands Municipalities (VNG), containing arrangements for the implementation of the new approach. The Agreement will also enumerate the actions that should enable the Cabinet and other authorities to draft terms of reference in an Administrative Agreement in 2002.

The spatial planning ramifications of the Cabinet's position have been incorporated in broad outline into the fifth Document on Spatial Planning.

In 2001, the second Green Space Structure Plan will be released, which offers an indication of how to combine the implementation of measures in rural areas for increased safety and flood prevention with measures for such objectives as improving water quality, combating dropping water-tables, reconstructing rural areas and improving the ecological infrastructure.

In the policy document 'Space for Rivers', the Cabinet concretely elaborates its position with regard to the Rhine river. Likewise, the third Governmental Coastal Report presents the Cabinet's position with regard to the Dutch coastline.

Vorwort

Liebe Mitbürgerinnen,
liebe Mitbürger,

Prof. Dr. Klaus Töpfer

Planen und Bauen von Gebäuden in hochwassergefährdeten Gebieten

Hochwasserschutzfibel

Das Bundesbauministerium informiert

What can citizens do themselves? Inhabitants of high-risk areas can take precautions to protect their homes and property and prevent a great deal of damage.

Following the 1995 floods, the German Ministry of Spatial Planning decided to issue a pamphlet to inform the public. In the foreword, the Minister makes a direct appeal to citizens and business' responsibility in limiting flood damage. The Minister believes that, in addition to the efforts extended by government authorities, citizens themselves must protect their property or even take into account the heightened risk of floods in the design of buildings. Examples given include:

- installing indoor heating, power and telecommunications systems as high as possible;
- use of water-resistant building materials (quarry tiles);
- making cellars waterproof.

There have been similar initiatives in the German federal states. North-Rhine Westphalia and Rhineland-Pfalz publish brochures to inform citizens about possibilities to limit damage to homes and industrial buildings. They include practical hints on what to do in the event of imminent floods (checklist including such issues as sealing, oil tanks and groundwater).

2. Individuals and Society

A river delta with its abundance of water offers attractive opportunities for living, working and recreation. But such low-lying areas are not without risks – absolute safety cannot be guaranteed and water-related problems cannot be ruled out. It is the Cabinet's duty to inform individuals of these risks, who can then, in addition to the efforts of the Cabinet, contribute to the prevention of damage and inconvenience.

2.1 Raising Awareness and Generating Support

Problem

Individuals and social interest groups do not sufficiently recognise and acknowledge the problems associated with water. They are often unaware of any looming threats. As a result, measures from the Cabinet come unexpectedly, for which there is little understanding.

Approach

The Cabinet would like to better inform individuals and social interest groups about the risks and opportunities of living in a river delta area. In 2001, under the management of the Ministry of Transport, Public Works and Water Management, the Cabinet will establish a national communication plan in co-operation with the IPO, UVW and VNG. Provincial authorities, water boards and municipal authorities will see to its continued implementation at the regional and local level. A 'water platform', as recommended by the Water Management in the 21st Century Advisory Committee, can help ensure that the focus on the issue of water does not wane. In the near future, the Cabinet will consider the need for and establishment of such a platform.

Drastic measures will be required in the short term to maintain safety and ensure flood prevention. Speed and

Living: water as an ally

Under ‘normal’ conditions, water is increasingly being appreciated as an element of our living environment. More and more water is being introduced in residential districts, filled-in canals are being re-opened and more and more wetland-type nature is being introduced to our urban culture. Water breaks through the hardness of concrete, brick and stress. Viewed in this light, water is not an enemy or victim, but rather an ally. The characteristics of water and the way in which it is perceived should form a basis for this. Innovative forms of ‘amphibious’ living are good examples of this new way of dealing with water, especially when increased quantities are introduced into the polders. That way, opportunities for living with and alongside water are seized without compromising safety.

meticulousness are competing for priority. Whenever it plays a leading role in the implementation of measures, the Cabinet will have to involve individuals and industry from the start of the preparation phase, enabling them to offer their opinions about the plans and help generate alternative solutions.

We must assume the need to store water along both the main and regional water management systems during times of excessive rainfall or high levels of river discharge. Administrators and water management officials may not pass on the adverse effects to the property owners and land users affected. In 2001, the Cabinet, together with other authorities, will develop possible compensation schemes as well as terms and conditions of use.

The Cabinet seeks to make damage resulting from floods insurable. Individuals, companies and weather-sensitive sectors can then determine for themselves whether or not to take out insurance for damage caused by such problems. Under the management of the Ministry of the Interior and in consultation with the insurance sector, an interdepartmental task force is investigating the (im)possibility of insurance coverage for weather-sensitive sectors. Rendering damage resulting from dyke breaches or flooding of main water-retention structures insurable is not feasible. In 1998, the Cabinet decided that it is responsible for compensation within the context of existing indemnification schemes.

2.2 Overview of the Risks and Opportunities

Problem

Flooding and water-related problems cannot be prevented. Citizens are insufficiently informed of what they may and may not expect from the Cabinet with regard to ensuring safety and combating water-related problems. The terms of reference for this are not entirely clear for a section of the water management system.

Approach

The Cabinet would like to offer individuals an understanding of the risk that the area will be affected by flooding or water-related problems. This will be incorporated into the communication plan.

For the main water management system, the Cabinet's terms of reference are laid down in the law in the form of safety standards. The Cabinet recognises that the severity of the ramifications of flooding is increasing due to population growth and increase in the economic value of the areas potentially affected. For this reason, maintaining safety standards is gaining importance. In 2002, the Ministry of Transport, Public Works and Water Management will outline the likelihood of flooding and possible weak links in each dyke ring. During the same year, it will also detail the ramifications of a flood to provide a better idea of the costs and benefits of investments in safety.

The degree of protection that regional authorities must offer individuals is not established for the regional water management system. Research conducted into the manner in and the status with which the standardisation of water-related problems can be implemented will be conducted under the management of the UVW and in co-operation with the Cabinet, IPO and VNG. The Cabinet will render a decision on this by 2002 at the latest.

Problems can arise even with water management systems already in place. An outline of how to secure the safety of people, livestock and goods in a timely manner is described in (inter)municipal contingency plans as well as the contingency plans of water boards. The Cabinet will encourage harmonisation of these plans, for which an amendment to the Disasters and Major Accidents Act and the Water Management Act is being prepared. Evacuation possibilities will also have to be investigated with the designation and planning of water storage areas. In addition, the necessary means of assistance must be arranged ahead of time. In 2001, the authorities involved will introduce a joint flood information system (HIS) that will provide water management officials with unambiguous information during times of pending disaster.

Living and working in close proximity to water is attractive but has come at the price of land that could have been allocated to water. The possibilities of living and working near water are good, as long as the demands for safety and water storage are taken into consideration, now and in the future. Government authorities must indicate whether, and if so on

which conditions, living and working near water is possible. This offers private individuals the opportunity to generate new and creative construction methods that incorporate the need to maintain space for water and address water-related problems.

3. A Different Approach to Safety and Water-Related Problems

The challenges of ensuring safety and flood prevention demand a new approach. The water management policy and spatial planning efforts in our country must already take expected changes in climate and land subsidence into account. Current opinion maintains that in the long run more space should be allocated to water – space that must be earmarked now. A clear strategy is required to prevent passing on problems associated with water to downstream areas.

3.1 Anticipation Instead of Reacting

Problem

People generally agree that in the coming decades the sea level will rise, the rivers' high water mark will shift upwards and the land will continue to subside. Summertime water shortages will also occur more frequently. If we do nothing, safety will decline and water-related problems will occur more often, while the population and value of goods requiring protection will grow. The consequence is that loss resulting from flooding will come at a higher price. It is almost a foregone conclusion that these developments will take place – their speed and scope, however, are still uncertain. The question is how we should handle this uncertainty.

Approach

The Cabinet would like to anticipate future climatic changes and land subsidence while taking the uncertainty associated with them into consideration:

- The frequency of flooding and waterlogging should not increase in the future with climatic changes and land

The risk of flooding

In a country like the Netherlands, most of which is below sea level, flooding can never be completely ruled out. In addition to anticipating rising sea levels and soil subsidence, we will also have to take into account the increasing chance of heavy storms.
And anticipation is an urgent necessity because nothing is so certain as the unexpected.

Example: the Hook of Holland

In the 1999-2000 winter, a relatively large number of storms raged across the North Sea and Western Europe. The question is whether there is a risk of severe material damage and victims as a result of such violent storms. Calculations have been carried out for the Hook of Holland with the 1953 storm surge as a reference. The standard used is the water level of an event that has the chance of occurring once every 10,000 years (the safety standard). The calculations show that extreme high water levels along the Dutch coast with severe material damage or victims should not be ruled out.

In its study, the Technical Advisory Committee for Water Defences ("from chance of exceeding to chance of flooding, June 2000) concluded that in the event of a sea level rise of 50 to 100 cm, the chance of breaches in dykes and narrow dune ranges is a factor 2 to 4 or 6 to 15, respectively,

		A	B
A	**calculated water level (m + NAP)**		
B	**difference from safety standard**		
I	the maximum water level measured during the 1953 storm of 3.85 m above NAP. Since then, sea defences have been reinforced, so that this water level can be checked safely in the **current situation**	**3.85**	1.20 lower (still safe)
II	Due to a **rise in sea level and soil subsidence** since 1953, the water level during a storm similar to the one in 1953 would already be approx. 20 cm higher	**4.05**	1.00 lower (still safe)
III	In 1953, not all circumstances were equally unfavourable. If, during the next storm, the **spring tide** is slightly **higher** and the direction of the **wind** slightly **less favourable**, the water level will rise by an additional 75 cm.	**4.80**	0.25 lower (still safe)
IV	And assuming the **storm were 4% more severe**, the water level will equal the current safety standard	**5.05**	equal
V	If the **storm were 10% more severe**, the water level would be approx. 40 cm above the level of the sea defences, and flooding of the hinterland is then possible.	**5.45**	0.40 higher (dangerous)

higher than in the current situation. Larger river volumes of the Rhine show a similar picture: an increase by 1,000 to 3,000 m3/s yields a chance of floods that is a factor 2 to 3 or 10, respectively, higher. As increasingly more investments are made in the low-lying part of the Netherlands, not only is there an increased risk of floods, but any consequences will also be more extreme – at least, if no countermeasures are taken.

subsidence. This requires a structural approach to water management.

- Measures implemented in the short term that offer protection against flooding or waterlogging should remain effective in the long term with continued climatic change. The water management officials (Directorate-General for Public Works and Water Management and water boards) must explicitly test measures against these conditions. In addition, the Cabinet intends to implement only measures for which there is sufficient social and financial support and that are required in the future with, for instance, continued increases in normative river discharge or rises in sea level. This will prevent an area from being confronted with repeated intervention (for example, moving back dykes twice) or actually allow the spatial quality or natural value of an area to be improved with minimal additional effort.
- Space that according to current opinion is required for the prevention of flooding or waterlogging must be earmarked now.

The Cabinet works from a basis that includes the climate scenarios maintained by the Intergovernmental Panel on Climate Change (IPCC) and the Water Management in the 21st Century Advisory Committee. Plans being drafted extend for a period of 100 years.

Periods of extremely low water levels are also expected to occur more frequently, the ramifications of which will affect the level of water-tables, salinisation, water quality and the navigability of waterways. Under the management of the Ministry of Transport, Public Works and Water Management, the Cabinet and the water boards will draft scenarios for extremely low water conditions. The crucial ramifications and measures to be taken will be outlined before 2002.

3.2 More Space in Addition to Technological Measures

Problem

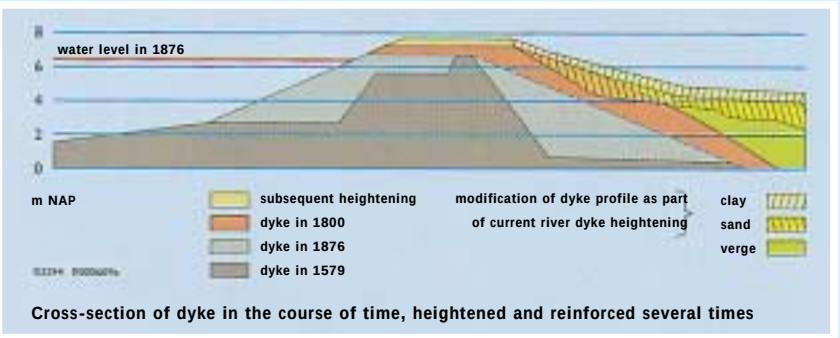
The total surface area of land allocated for water storage has dramatically decreased. Areas that could once bear the brunt of exceptional amounts of water without a problem have been put to other uses during the course of the twentieth century.

CPB study: spatial measures offer perspective

Space for water: costs and benefits of six projects and some alternatives, CPB, Nov. 2000

The Ministry of Transport, Public Works and Water Management recently commissioned the Central Planning Bureau (CPB) to carry out a social cost/benefit analysis of a number of projects aimed at maintaining safety and reducing future water-related problems. These are projects in the area around the Rhine, Waal and Meuse, projects along the coast, regional water system projects and flood retention area projects. An important characteristic of these projects is that they not only solve problems through technical measures as in the past, but also by means of spatial measures.
In so far as information was available, alternative measures were also analysed, for instance dyke heightening. Where possible, the analysis included all relevant costs and benefits, including those that are difficult to express in financial terms, such as consequences for biodiversity and potential victims.

The study's main conclusion was that the projects analysed are potentially promising in terms of social costs and benefits. In most projects, the calculated social benefits of spatial solutions surpass social costs.

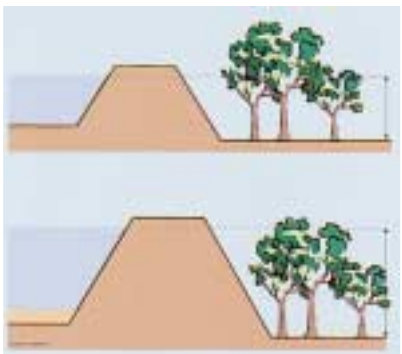


Cross-section of dyke in the course of time, heightened and reinforced several times

The positive balance of benefits versus costs is greatest for the dune widening project.
The Central Planning Bureau also concludes that it is better to discharge excess water into flood retention areas (which will, in principle, only be used once every 1250 years) in a controlled manner than to let water take its course. On the other hand, the CPB report casts more doubts on the regional water project, not only because of its substantial spatial claims, but also because these claims are made mainly on the densely populated western part of the country.

The scope of the conclusions is limited by the shortcomings in the specifications of the projects analysed and the deficiencies in the data available.
In this context, an important presupposition is that water storage areas are selected in such a way that they do not have an adverse effect on urban development.

More final conclusions would require additional study, for instance during the 'Space for the River' planning phase.


higher dykes, larger risks

The natural relief capacity of the delta has largely disappeared. We will reach the limits of what is possible if we only implement technological measures such as dyke heightening and draining. Land subsidence paired with higher dykes only exacerbate the effects of flooding – if things go wrong, the consequences will be disastrous!

The question is: which road do we follow from here? The CPB has also conducted research into the social costs and benefits of spatial planning solutions and technological measures. It concluded that the projects investigated are rich in potential in terms of social costs and benefits, but that no concrete and specific project-oriented conclusions could be made due to the nature of the studies conducted and the uncertainty that is an inherent part of projects during the explorative phase.

Approach

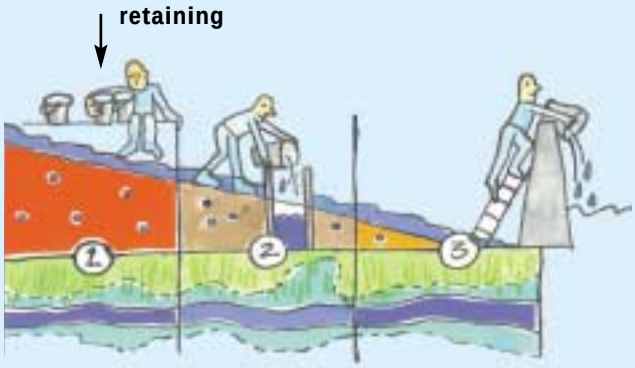
A good mix of technological and spatial planning measures is required to counterbalance the ramifications of rising sea levels, land subsidence and climatic change, for which the Cabinet prefers constant consideration of spatial planning measures, in addition to technological measures. Since it is a scarce commodity, space allocated for water storage in the main and regional water management systems must be combined, wherever possible, with other compatible objectives such as nature, recreation, surface mineral extraction and agriculture. Combinations involving living and working opportunities may also be possible under certain conditions.

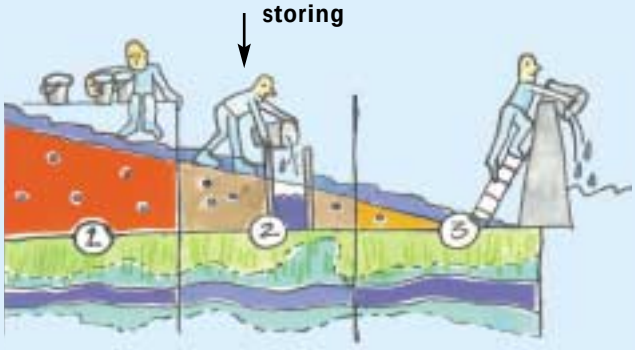
For concrete project-level proposals, measures will have to be assessed using a social cost-benefit analysis. Non-monetary costs and benefits such as those affecting nature and spatial quality must also be factored into this. Crucial to this process is whether the measures will also be effective in the long term and fit in with the national and international context.

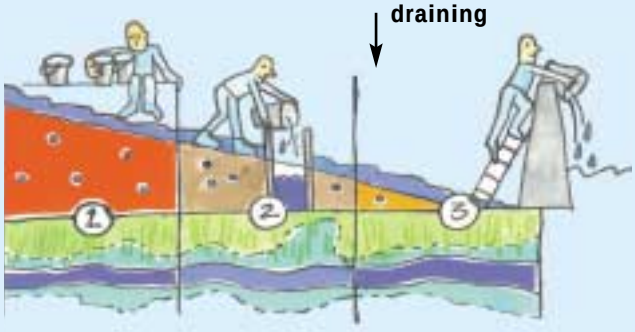
Space already allocated to water that is crucial for ensuring the integrity of the water management systems must be maintained. To guarantee this, officials must explicitly assess spatial planning decisions as to their effectiveness with regard to safety, water-related problems and dropping water-tables, while taking the climatic and land subsidence developments into consideration, the results of which must be included in an integrated assessment.

Three-step strategy to avoid passing on of water-related problems

The Water Management in the 21st Century Advisory Committee recommends the mandatory implementation of the three-step strategy of retaining, storing and draining water.







3.3 Not Passing on Responsibilities

Problem

It is tempting to drain water as quickly as possible during periods of excessive water. On a small scale, rapid draining can be a good solution, but this generally means that the problem is simply being displaced to an area situated downstream. In addition, a system geared to rapid draining also promotes dropping water-tables. As a result, problems associated with water shortages and salinisation will occur more easily during times when water is scarce, which periods are expected to occur more frequently.

Approach

The Cabinet would like to prevent passing on water-related problems and safety issues to downstream regions, which, if left unchecked, would create the same on a large-scale. To achieve this goal, the following strategy has been selected. During times of extremely wet conditions, all the space possible must be utilised. The three-step strategy of retaining, storing and draining is the guiding principle for the use of catchment areas. This means that precipitation should be held as long as possible in the catchment area where it falls. When this is no longer possible, the water is temporarily stored in the water storage areas created for this purpose. Excess water is drained only when these options have been used to their full potential. In the Approach to Water-Related Problems memorandum, the Cabinet indicated which measures are required for the main water management system to make this drainage possible (including expansion of the draining capacity near IJmuiden and Gouda, and expansion of the sluice capacity of the Barrier Dam.

Water should be held as long as possible even during dry and normal conditions. The objective is to prevent dropping water-tables locally, also in nearby areas, and to limit the influx of non-local water.

The strategy of ‘not passing on responsibility’ demands regionally-tailored efforts. In detailing such a strategy, the objectives for preventing dropping water-tables and salinisation and improving water quality must be incorporated. International agreements have meanwhile been concluded within the context of flood contingency plans for the Rhine and Meuse rivers to ensure that safety and water-related problems are not passed on to downstream areas.

European co-operation in high-water control

Following the high-water situations across Europe in 1993 and 1995, international co-operation in controlling high water has gained momentum. As part of the EU-supported IRMA programme, projects are being carried out throughout the catchment areas of the Rhine and the Meuse. Projects aimed at 'space for water' receive particular incentives. Examples of such national projects are (parts of the) Meuse works and enhancing throughflow at the railway bridge near Oosterbeek, combined with redevelopment of the nearby Rosande polder. The water boards are also working on many projects, most of which have the objective of retaining water longer.

Immediately across the border, in North Rhine Westphalia, efforts within the 'space for the river' realm are also being made. The 1992 'Gesamtkonzept' comprises the creation and maintenance of retention areas along the Niederrhein, natural improvement of watercourses and absorption of rainwater in the soil. Of the eleven projects, eight will probably take the form of moving back dykes (Flutpolder), while three will become retention areas (Taschenpolder). Moving back dykes will lower the extremely high water levels upstream of the projects. The retention areas near

Bylerward, Ilvericherbruch and Worringerbruch are of extreme importance to the Netherlands because they will be capable of storing part of the flow of extreme high water, lowering the water level at Lobith by approx. 10 cm.

4. Increasing the Amount of Space for Water

More space is required now as well as in the light of future developments to be able to store and drain water safely and without much hindrance. More space is required for all areas of the water management system - from the capillaries to the main water management system, as well as in sections of international catchment areas.

4.1 International Agreements

Problem

The Netherlands lies in the delta of the Rhine, Meuse, Schelde and Eems rivers. The water-retaining capacity of the catchment areas of these rivers has decreased over the last decades due to surface hardening, reduction in the size of flood plains and the cutting of bends in the rivers. Measures are also required in the upstream sections of catchment areas to reclaim storage capacity. The safety of people living in the Netherlands is partially dependent on this.

Approach

Co-operative efforts with other countries for the catchment areas of the Rhine and Meuse rivers have resulted in the formulation of joint flood action programmes and agreements on river-widening measures (Appendix 2). The European INTERREG-programme for the Rhine and Meuse rivers has served as an important stimulus. The same applies to bilateral co-operative efforts between the Netherlands and such border areas as the German state of North Rhine-Westphalia.
The measures implemented in countries lying upstream make an essential contribution to maintaining safety in the

Space for water in the main system

In and along the main water system, ambitious measures are required to increase the space for water.

Coast

Where there are weak links in the range of dunes, inland widening is preferred. If this proves impossible, the sea defences will be widened seawards.

Area around the Rhine, Waal and Meuse

More space for the river can be created by:

A. inland relocation of the winter dykes;
B. lowering the floodplains;
C. removing obstacles in the flood plains; and
D. creating retention areas.

IJsselmeer lake area

The discharge capacity of the Afsluitdijk will be increased to ensure safety of the surrounding area in the coming decades.

Netherlands. For this reason, the Cabinet will actively contribute to the development and implementation of European co-operative projects in the field of flood protection. Measures abroad can, however, only partially solve the problems faced in the Netherlands. For this, measures at home are also required.

4.2 Main Water Management System

Problem

More room is required in and along the main water management system to be able to maintain safety in the face of far-reaching changes in climate and land subsidence. Problems along the coast, rivers and in the IJsselmeer lake region are all interrelated. Accordingly, the solutions must also take an integrated approach.

Approach

Coast

The water-retaining efforts along the coast currently meet safety standards. A continually rising sea level, however, requires the reinforcement of a number of weak links in this system. In anticipation of this, the Cabinet will identify such weak links in 2001 in co-operation with regional authorities. The Cabinet intends to set aside the Callantsoog area, Delfland-Ter Heijde and parts of Zeeuws Vlaanderen for this purpose. The Cabinet would also like to ward off new activities in these areas that do not link up well with future damming efforts, and wherever possible, stimulate those that are compatible with such efforts, including the development of nature and recreation opportunities, which also improve the spatial quality.

Rivers

In 2001, the Cabinet will initiate the 'Space for Rivers' planning phase, during which packages of measures will be developed to reach statutory safety standards associated with draining, which are normative as from 2001. The packages of measures are comprised of a good mix of spatial planning and technological measures, for which the Cabinet prefers constant consideration of spatial planning measures, in addition to technological efforts. The Cabinet determines the underlying principles for the planning phase in a separate Cabinet position document.

In addition to river-widening measures, water storage (or retention) areas are required to handle the increasing draining volumes expected in the future. In any event, the Cabinet intends to set aside the Ooijpolder, the Rijnstrangen area, the Biesbosch nature reserve and space for the inland construction of the dyke at the Waalsprong for this purpose. In consultation with regional officials, the Cabinet will elaborate in as short a period as possible when and how these areas will be earmarked and the manner in which they will be used. The result of this effort will be incorporated into the Administrative Agreement (Chapter 7).
Due to possible cross-border effects, Germany will be involved in decision-making regarding the Rijnstrangen area and Ooijpolder.
No matter how well we anticipate increasing drainage needs with the 'Space for Rivers' concept, we will have keep the unpredictability of nature in mind. Things can go wrong.
In the event of such a disaster, the Cabinet would prefer to see flooding take place in as controlled a manner as possible.
An independent committee will, in close consultation with the Cabinet, provincial authorities, water boards and inhabitants of the region, elaborate the concept of controlled flooding and establish decision-making procedures in the event of imminent flooding.

IJsselmeer lake

The Cabinet would like to allow the water of the IJsselmeer lake to drain naturally into the Wadden Sea for as long as possible. This will require expansion of the draining capacity in the Barrier Dam in the short term. A study of this is underway as an extension of the Approach to Water-Related Problems memorandum. In 2003, a decision is expected to be taken with regard to expanding the draining capacity of the Barrier Dam.
Due to rising sea levels, however, the water level of the IJsselmeer lake will also have to rise in the long term for the water to continue draining into the Wadden Sea.
More flexible water level management can possibly increase the storage capacity of the IJsselmeer lake. Under the management of the Ministry of Transport, Public Works and Water Management, the Cabinet will investigate whether more water can be stored in the IJsselmeer lake by employing a different water level management regime, preferably one that

allows more natural water levels. Small adjustments to the water level management regime, within the allowable limits of the current water level decree, can be implemented in the short term. Additional optimisation measures can only be implemented after the expansion of draining capacity has been completed.
The Cabinet would like to stop developments that impede future water level increases or a more flexible water level for the IJsselmeer lake. Before the water level is actually increased, the dam around the IJsselmeer lake will have to be reinforced. Ideally, this will occur in the form of natural levees.

4.3 Regional Water Management System

Problem

Organising the regional water management systems and maintaining them is an important task. However, it is at present not known how much space will be required and which measures should be taken. Plans for the future organisation of the main and regional water management system are insufficiently geared to one another.
Legislation, policy and management in the Netherlands and bordering countries differ too widely to arrive at an effective approach to cross-border catchment areas.
In addition, the degree of protection the regional authorities must offer individuals has not been clearly outlined for the regional water management systems.

Approach

The Cabinet has requested the provincial authorities, water boards and municipal authorities to draft an Outlook on Water Management by 2002 at the latest that indicates how they plan to organise the regional water management system, while taking climatic change and land subsidence into consideration. Pending the decision on standardisation of water-related problems (section 2.2), the system suggested by the Water Management in the 21st Century Advisory Committee serves as a good foundation. The Outlook on Water Management will also include a 'water opportunities map', indicating where space for water is required.

Based on the Outlook on Water Management and the 'water opportunities map', the Cabinet will request the provincial

1. More space for water regionally
Both in the high parts and in the low-lying parts of the Netherlands, the water system is being modified to create more space for water and prevent water-related problems.

2. Additional bend in the stream
Remeandering streams proves to be an efficient measure in the high parts of the Netherlands to prevent water-related problems. These measures cut both ways: they decrease water-related problems and the financial benefits exceed the costs. Nature and recreation benefit as well.

3. and 4. Cabbage makes way for water
When, in September 1994, the rain finally stopped, large parts of the province of Noord-Holland were flooded because the pumping stations and polder reservoirs lacked capacity to drain such huge quantities of water in a short time. In the De Woudmeer and Speketer polders, most of the cabbage and carrot harvests were lost as a result. The Groot-Geestmerambacht Water Board concluded that the polders had insufficient open water to be able to act as a buffer. The water board started work.
Where the opportunity arose, the water board acquired land.
Farmers also recognised the need for additional water storage because of their damaged harvests. No one had to move and there was not a farmer who was forced to give up farming. When all the work was done, 13 hectares of open water had been added. Should it ever rain as hard as it did in 1994, the water level in the polders will never rise by a metre again, but only by a maximum of 60 centimetres.

authorities, water boards and municipal authorities to develop a 10-year implementation programme, which will form the foundation for an administrative agreement, including terms of reference between the Cabinet, provinces, water boards and municipalities. The Cabinet wants to conclude this administrative agreement in 2002.

Outlook on Water Management and implementation programmes can best be developed according to the system of 17 catchment areas distinguished by the Water Management in the 21st Century Advisory Committee. In elaborating these plans and programmes, care must be taken to ensure that they fit in with one of the four Dutch catchment areas outlined in the Framework Directive on Water. For borderland catchment areas, the provincial authorities will take the lead in reaching joint, cross-border plans. For this, the Cabinet will make an effort to promote favourable conditions and relations with the national governments of the countries involved.

The Cabinet, provincial authorities, water boards and municipal authorities each have their own responsibilities for organising and maintaining the regional water management systems. The water board will be responsible for the water management policy measures to be taken for the retention and storage of water. The provincial authorities are charged with spatial incorporation as well as managing the relationship of these two tracks. Based on an integrated assessment, provincial authorities will make a choice and lay it down in provincial policy and regional plans by 2005 at the latest. Municipal authorities will have to adjust their zoning plans to these, which the provincial authorities will supervise. The Cabinet will establish national frameworks, test their results and facilitate the process. The Directorate-General for Public Works and Water Management and water boards will work to guarantee and maintain the relationship between the main and regional water management systems. Measures for both systems must match one another well and not cause problems to be passed on.

Existing tools

The 'water test'

Based on current legislation, there are formal and informal opportunities at which water boards can promote their interests. The water board has the authority to formulate its own view on desired spatial developments in the form of water views or water opportunities maps. Such documents are important input for political decision-making by municipalities and provinces in terms of spatial planning. The water board can also open discussions concerning new, unplanned spatial planning initiatives with municipalities.
To this end, Article 10 of the Spatial Planning Decree was recently amended. In the event of undesired spatial developments, there also are various formal, often less legal opportunities to promote the interests of water, for instance via the Provincial Spatial Planning Committee. An appeal can be brought before the administrative law department of the Council of State if an undesirable zoning plan is adopted in unamended form by the Provincial Executive. In exceptional cases, the Minister of Housing, Spatial Planning and the Environment may make a 'substitution decision' on behalf of the Cabinet.

The national government lays down the spatial requirements of water in Key Planning Decisions (for instance the Spatial Planning Report). This forces other levels of government to include these requirements in their regional, structure and zoning plans, and offers the Ministry of Housing, Spatial Planning and the Environment the option of giving advice, on behalf of the Cabinet, to provinces on detailing their regional plans and to municipalities on zoning plans. The national government determines such principles as 'no passing on' and the 'storage triad' in its water policy, forcing provinces to take these into account in their water regime plan.

In detailing its regional plan (and, if present, the plan appraisal report) the provinces explicitly include the above-mentioned principles, forcing municipalities to take these as guiding principles in formulating their structure and zoning plans. In such a plan appraisal report, provinces can also require that the explanatory section of a zoning plan pay explicit attention to the impact on the water regime, as expressed in, for instance, a water paragraph. Requiring inclusion of such a paragraph facilitates evaluation of a zoning plan on all its merits during the approval procedure by the Provincial Executive.
In addition, it will improve consultations between the initiators, municipalities and water boards.

The province also adopts the principles in its water regime plan, forcing water boards to take these principles into account. The province cannot approve plans from water boards if they contravene provincial policy.

Finally:
Water quality is one of the environmental aspects tested in the Environmental Impact Assessments (EIA) that are mandatory for many projects under the Environmental Management Act. The Minister of Housing, Spatial Planning and the Environment and the Minister of Agriculture, Nature Management and Fisheries are formal advisors in the EIA procedures.

5. Maintaining Space for Water

At the very least, space that is currently available for protection against flooding and water-related problems must be maintained. It may not inadvertently be lost through the implementation of projects in the areas of new infrastructure, residential construction, agriculture or business park development.

5.1 'Water Test'

Problem

Spatial planning decisions are based on an integrated assessment of all the aspects at hand. According to the Water Management in the 21st Century Advisory Committee and the Leemhuis Committee, the Cabinet paid insufficient attention to the ramifications on safety and water-related problems in the past. As a result, a great deal of space was gradually reclaimed from the water management system. Although everything possible is being done to find space for water, the risk exists that space will be lost in the future.
Various stipulations of the Spatial Planning Act offer the possibility of testing the ramifications for the water management system. The Water Management in the 21st Century Advisory Committee ascertained that these possibilities are not being utilised to the full.

Approach

In the future, water will play an increasingly large role in spatial planning and land use in the Netherlands. New spatial planning decisions may not exacerbate the challenges to safety and water-related problems unnoticed. The consequences for safety and water-related problems will have to be explicitly addressed in a separate section in the explanatory policy document and form part of the integrated assessment. This applies to all phases of planning.

Arnhem, 1830

Arnhem, 2000

Venlo and Blerick

Kampen

Bottlenecks of the river

Growth of towns and cities along rivers in the Netherlands has had as a result that rivers have had to surrender a lot of space. Nowadays, the bottlenecks of the river can only be protected against flooding by means of drastic measures upstream and/or downstream.

Zutphen

The currently available statutory tools stemming from the Spatial Planning Act offer sufficient possibilities for this. As from this year, the Spatial Planning Act includes the new requirement that water boards must always be involved in consultations about zoning plans. The Cabinet would view the full utilisation of these possibilities as a satisfactory implementation of the 'water test' recommendation of the Water Management in the 21st Century Advisory Committee.

The 'water test' applies to all manner of spatial planning decisions, including amendments to zoning plans, regional plans, new plans for infrastructure, residential construction, business parks and redevelopment plans in urban and rural areas. The 'water test' allows the consequences for safety and water-related problems to be assessed in relation to the ramifications on water quality and dropping water-tables.

The Cabinet would like to see the 'water test' implemented by all local authorities as from now. As part of their regular duties, the Cabinet representatives in the region (spatial planning inspectorates and regional departments of the Directorate-General for Public Works and Water Management) will supervise the application of the 'water test' in such bodies as provincial planning committees. The application of the 'water test' will be evaluated in 2002, on the basis of which the Cabinet will decide whether it merits a different (statutory) substance.

5.2 Assessment Criteria

Problem

Citizens, companies and government authorities must better understand how the 'water test' works. How are the ramifications for safety and water-related problems evaluated?

Approach

The 'water test' must evaluate spatial planning decisions using the following criteria:

1. In designating a location, the activity may in principle not impede the retention, storage or drainage of water in the catchment area.
2. Incorporation of the activity should be guided by the underlying principle that water-related problems may not be passed from one catchment area to another. As much water

as possible must be retained on site (for instance, by minimising the amount of surface hardening), stored and only then be drained.

3. If, after an integrated assessment, a decision is made that has adverse consequences for (future) safety or exacerbates water-related problems, the measures that are required to keep the water management system in working order must be identified. These measures form part of the spatial planning decision; the costs will in principle be borne by the initiator of the proposed activity.

Following completion of the Outlooks on Water Management – and possible standardisation of water-related problems – these will also form the basis for the 'water test'. In co-operation with the IPO, UVW and VNG, the Cabinet will concretise the criteria and supplement them with criteria on water shortages, water quality and dropping water-tables.

5.3 Building Outside Dykes

Problem

The pressure to utilise areas outside of the dykes for all manner of zoning purposes is increasing. In the past, similar developments severely limited the resiliency of water management systems. In the long term, this will endanger the safety of areas within the dykes. In addition, the risk of water-related problems and loss incurred by the inhabitants of areas outside of the dykes is enormous and continues to increase with time.

Approach

Construction projects outside of the dykes along the main waterways – the unprotected areas outside of the water-retaining structures – are subject to strict regulations. Activities along the large rivers and the coast are governed by the 'not unless' principle, which states that, under certain conditions, only activities that are inextricably tied to the water management system or cannot be implemented elsewhere for reasons of important societal interest are permitted. An 'only if' policy applies to activities within existing residential nuclei.

Conditions for river areas are laid down in the Space for Rivers policy directive and for coastal areas in the third Governmental Coastal Report. In the context of the fifth

Spatial Planning Report, consideration is given to the question of whether certain aspects of the river policy directive should be modified somewhat to promote regional customisation. The establishment of a policy directive for the IJsselmeer lake is still under consideration, possibly as a component of the integrated outlook on the IJsselmeer lake region announced in the fifth Spatial Planning Report.

The motto: sharing knowledge

Habiforum, the Multiple Land Use Expertise Network, is an example of innovation in knowledge and the knowledge infrastructure. Habiforum's objective is to create joint ventures of science, government bodies, interest groups and market parties, in which the integration of the humanities, science and social studies plays an important role. Within Habiforum, 'Water and Space' receives special attention. New methods of generating and sharing knowledge are applied. An example is the 'Water Landscape of the Future' competition organised in co-operation with the Ministry of Transport, Public Works and Water Management, which encourages professionals to find design-oriented solutions for multiple land use in and along water. Integration of different disciplines, unusual consortiums and the involvement of organised interest groups are recommended courses of action.

6. Knowledge Development

The new approach currently being advocated is partly the result of knowledge generated in recent years. However, more new knowledge is required for the implementation of this policy. In addition, policy and management will face new problems, which the development of knowledge must anticipate. Because of the increasing scope of the water problem, professional co-operation between knowledge providers and users is crucial.

Problem

Modification of the layout and modus operandus of the knowledge infrastructure is required to make a contribution to the new approach to water management. This is the purport of the recommendation document 'Over Flowing', produced jointly by the AWT, NRLO and RMNO.

Approach

Innovation of knowledge and its infrastructure is a precondition for sufficient and responsible formulation of water management policy. Development of new knowledge and technology with regard to 'traditional' aspects of water management policy, such as safety and water quality, will continue to be necessary. In addition, societal developments and expansion of water management policy also demand new knowledge including new insights into social studies, spatial planning and public administration. In this way, societal and administrative aspects, in addition to technological solutions, can be investigated and the social support for the solutions can be assessed in advance.

Knowledge institutes must prepare for new knowledge requirements. Co-operation between institutes and the formation of alliances for this are essential. Within the research programmes, the departments involved should consider new themes, including how flooding and 'wet feet' are experienced, the 'value' of water, multiple uses of space for water, insuring water damage, etc. Interdepartmental

consultation will take place at the start of research into these new knowledge themes. A good example of this are the current preparatory activities for ICES-KIS-111, which addresses many of the themes outlined above. Even the recently initiated or ongoing ICES-KIS-11 projects, including EMR/Habiforum and Delfts Cluster, are at the heart of an integrated approach. In light of these developments, the Cabinet does not see the added value to be gained from a task force responsible for steering water management research efforts as was recommended by the three councils.

The Cabinet endorses the importance of knowledge development in regionally innovative practical projects, for which it would like to link up with projects already underway in various regions. Furthermore, the Cabinet would like to contribute agreements to this end in the Initial Agreement and Administrative Agreement.

The Cabinet will determine the extent to which the desired levels of innovation in knowledge development can be incorporated into the new ICES knowledge impulse.

At the start of 2001, the Cabinet will forward a separate response to the 'Over Flowing' recommendation document to the Lower House.

Management of the Delta

800 – 1250

- primarily farming communities in hamlets and settlements;
- rulers force their subjects to protect land AND water against the enemy (‘national defence’);
- peat excavation, resulting in surface level lowering.

1250 – 1600

- regional water boards;
- land loss due to administrative shortcomings;
- polders with mill drainage;
- regulations from national government.

1600 – 1800

- land reclamation from lakes;
- states take over water management from rulers;
- drainage by multi-stage sets of windmills.

1800 – 2000

- United Provinces of the Netherlands (Batavian Republic) with establishment of department of public works (‘Corps Ingenieurs’);
- Water management at national, provincial and water board levels;
- emphasis on water management policy.

7. Administration

In order to implement the new approach to water management, the various local authorities will have to take up their responsibilities. Administrative agreements between the national government, provincial authorities, water boards and municipal authorities will be required for rapid implementation.

7.1 Division of Roles

Problem

The new approach to water management policy requires an effort at all administrative levels. A clear division of roles is required to ensure effective co-operation. Bringing spatial planning policy and water management policy closer together reinforces the need for this.

Approach

The Cabinet agrees with the recommendation from the Water Management in the 21st Century Advisory Committee to start from the existing division of tasks and powers. Discussions regarding reallocation of land and reorganisation have a delaying effect.

7.2 Agreements on Terms of Reference

Problem

A contribution must be made at all administration tiers in order to be prepared in time for the consequences of climatic change and land subsidence. Administrators must know who assumes responsibility for what in order to ensure timely implementation.

Approach

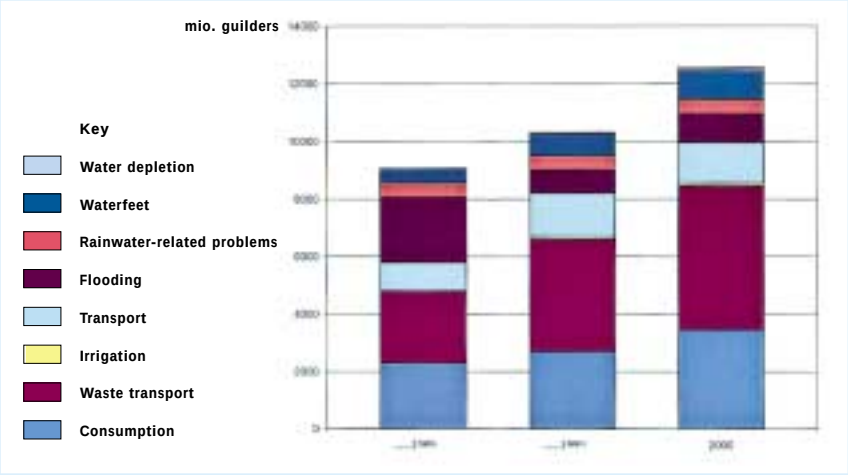
The Cabinet underscores the necessity for agreements on terms of reference between the administration tiers, as was recommended by the Water Management in 21st Century Advisory Committee and the Leemhuis Committee.
The Cabinet would like to achieve this in a two-step plan.
In order to get to work rapidly and dynamically, the Cabinet would like to conclude an initial agreement with the IPO, UVW

and VNG. This agreement will include arrangements regarding:

- underlying principles for water management policy for safety and water-related problems;
- formulation of regional outlooks on water management and implementation programmes combining the approach to safety and water-related problems with the approach to water shortages, dropping water-tables and water quality;
- designation and implementation of water retention areas and emergency flooding areas;
- assessment of the standardisation of water-related problems and the related decision-making process;
- application, monitoring and evaluation of the 'water test';
- formulation of a joint communication plan;
- combination of ongoing pilot projects to build up experience with the new water management policy and develop innovative knowledge.

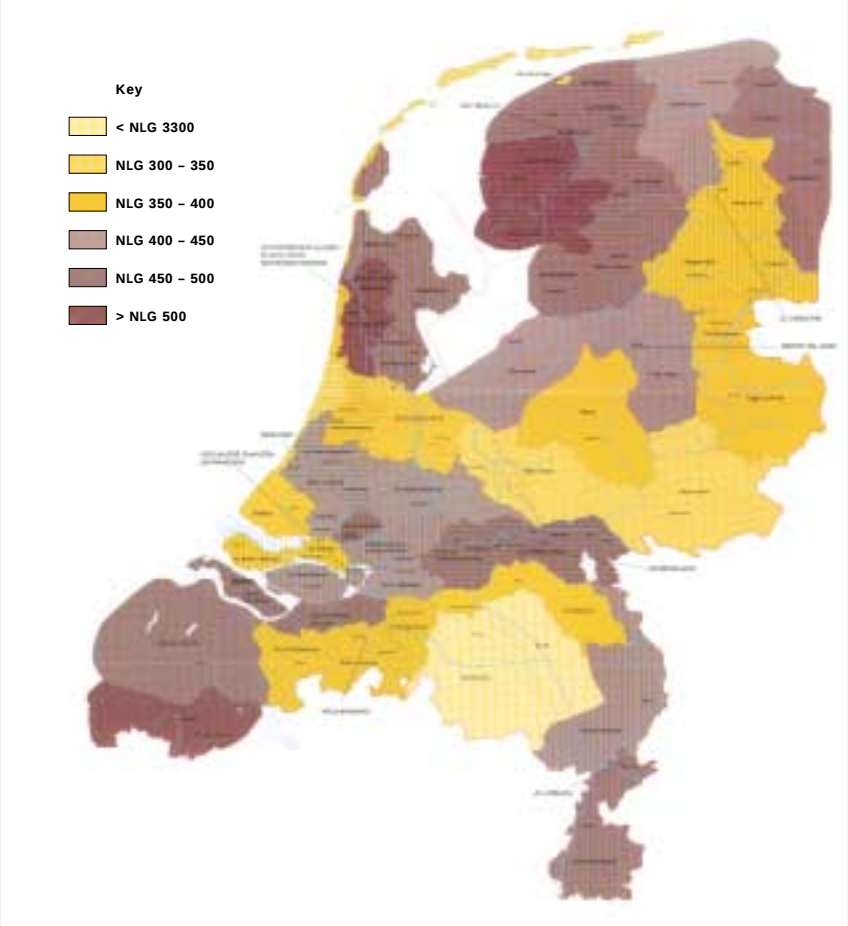
In 2002, the Cabinet would like to conclude a National Administrative Agreement on Water, in which the joint terms of reference for the Cabinet, provincial authorities, water boards and municipal authorities are laid down. At the same time, the measures to be taken for the implementation of projects will be formulated. The implementation programmes of the visions of water management will form the basis of the regional water management system. The Cabinet's implementation programme as is incorporated in the Infrafonds scheme forms the basis for the main water management system (Chapter 8).

The Initial Agreement and the National Administrative Agreement on Water constitute further elaboration of the 'space for water' section in the New Style Administrative Agreement (BANS). For this component, BANS government consultations will be elaborated in co-operation with the UVW.



Development of water management costs

Water management costs presently total over 12.5 billion guilders a year. More than half is spent on drinking water processing and on measures to improve water quality (including waste water purification). The costs of construction and maintenance of water defences structures, falling water tables, retention and drainage of rainwater and water level management differ from year to year, but represent approx. 20% of total water management costs.



Burden of regular expenses per household

The costs of regional water management are expected to increase in the years to come, resulting in an increased burden of regular expenses per household. Regular expenses per household differed significantly between water boards in 1999.

8. Financing

An effective, sustained organisation of water management in the Netherlands requires constant effort from all governments and authorities involved. Taking long-term developments into consideration will mean that Cabinet, provincial and municipal authorities and water boards will not be confronted with unexpected terms of reference that are difficult to incorporate financially. A long-term strategy offers the opportunity to consistently incorporate the total costs associated with the consequence of climatic developments and land subsidence.

8.1 Plan-Based Approach to the Main Water Management System

Problem

The Water Management in the 21st Century Advisory Committee believes that in the future more structural financial investments are required in the main water management system to prevent flooding and waterlogging.

Approach

The Cabinet assumes that a number of future developments, such as land subsidence and climatological changes, will result in substantial expenditure for the prevention of water-related problems. Currently, no package of measures has been elaborated for all the problems identified, partly because it is uncertain how climatic developments will unfold. For this reason, the scope and phased implementation of the means necessary in the long term to circumvent water-related problems have not yet been clearly formulated.

The (social) cost-benefit analysis will play a crucial role in the prioritisation and determination of a cost-effective mix of measures (space for water and effective technological measures) and the associated means. The Cabinet intends to draw up a progressive 5-year programme of concrete measures and projects for the main water management system that also offers a 10-year vision. The associated financial burden on the

Delfland invests in flood prevention measures

Following the flooding in 1998, the Delfland Water Board started its 'ABCDelfland' project, aimed at drastically reducing the risk of flooding as it occurred after the heavy rainfall of 13 and 14 September 1998.

In September 2000, this project resulted in a general administrative order from Delfland to invest NLG 126 million over five years to, first of all, make the polder reservoir system robust enough to be capable of absorbing 100 mm of rain per 48 hours following an already wet period without this posing a danger to the storage basin dykes. A subsequent project phase will address improvement of the water regime in the polders.

Maximum processing capacity of the polder reservoir in a rainy period when the undeveloped land is saturated presently amounts to approx. 50 mm per 48 hours. Experience has shown that when rainfall is heavier, water management measures are insufficient and there is an unwarranted risk of overflowing or even breaching of the storage basin dykes.

Implementation of 'ABCDelfland' aims at reducing the risk of flooding and absorbing heavy rainfall to the extent that, even though water-related problems are inevitable, more serious problems can be prevented.

In addition to increased storage and drainage capacity, this requires reservation of water storage areas. These areas maintain their current, often agricultural use, but can be used during emergencies to store enough water to relieve the polder reservoir.

Designation of such areas in the highly urbanised Delfland with its high density of glasshouses poses a major problem that has to be solved in conjunction with the municipalities, with their spatial planning powers.

The measures to be taken as part of the 'ABCDelfland' project are designed to be useful even after possible climatic changes and to link up with any more drastic measures that may be needed.

Over the next five years, the Delfland Water Board will double the capacity of the water system. As the situation is urgent (three consecutive years of flooding) and pumping stations can be enhanced rapidly, increasing pumping station capacity will be taken as a first step in 2001. Rendering areas suitable for water storage (the so-called 'storage reservoirs', similar to Polder Berkel) will also be tackled expeditiously.

Several emergency pumps have supported Boezemgemaal Westland since early 2000. During the storms of November 2000, they prevented worse things from happening. In 2001, the capacity of the pumping station was tripled permanently.

Prior to 1998, storage reservoir Berkel had not been used for water storage for decades. In 1998, 1999 and 2000, it had to be used to prevent flooding of the polder reservoirs (photo on the left: in use, photo on the right: dry again). In the next few years, over 100 hectares of farmland will be rendered suitable for use as additional 'storage reservoir'.

Infrafonds' budget for 'wet' infrastructure projects will be incorporated into the new, extrapolated long-term figures as from 2006 (2.8% growth corresponding to 'dry' infrastructure projects) and include the method of control maintained for 'dry' infrastructure projects, like that of the Infrafonds scheme through 2020 as indicated in the National Traffic and Transport Plan (NVVP). For the time being, the confrontation between necessary and available means is assumed for the period through 2020, in order to determine whether this approach is correct. Further research will then determine whether this approach can and should be continued for subsequent periods. The projects are primarily geared to generating safety and preventing water-related problems. The financial burden of the projects involves the financial responsibilities that the Cabinet has accepted and is all-inclusive, in other words, including expenditure for maintenance/management, research, land acquisition, reimbursements, compensation and incorporation of nature in so far as the measures are within the statutory requirements. If there are extra costs for the development of nature and recreational opportunities, these will be defrayed from the financial means earmarked for this purpose in the Ministry of Agriculture, Nature Management and Fisheries' budget. Based on the extrapolation of available financial means for wet infrastructure projects in accordance with the Infrafonds scheme's extrapolation methods for dry infrastructure projects, the measures can, in principle, be financed and no further claims will be necessary.
Possible cash flow problems for the period under consideration will be taken up by the Infrafonds, using any means not yet invested in 1-a projects for the necessary provisional, intertemporal displacements. This will be evaluated during the respective budget preparations on the basis of the implementation of concrete programmes.

8.2 Regional Water Management System

Problem

The Water Management in the 21st Century Advisory Committee believes that in the future more structural investments will be required in the regional water management system to prevent flooding and water-related problems.

Approach

The Cabinet maintains its position as formulated in the Approach to Water-Related Problems memorandum of December 1998, in which primary (financial) responsibility is assigned to the water management authority. The problems inventoried at this stage do not differ to such an extent as to merit reconsideration. For the extra expenditure for the regional water management system, the Cabinet maintains the position that this can in principle be addressed by the water boards. Accordingly, the Cabinet does not adopt the recommendation from the Advisory Committee that these investment costs, incurred in relation to accelerated climatic change and fundamental choice of space for water, be reimbursed by the Cabinet. The responsibility for these costs rests with the regional water management body. Depending on the measures taken, it is possible that the regional burden will increase as a result, through which regional differences can develop.

If the terms of reference for the regional water management system expand as a result of measures that the Cabinet implements in the main water management system, the Cabinet will cover the additional costs associated with the regional water management system. When there are additional costs as a result of combining interests, for instance, for the development of nature and recreational opportunities, these will be covered using the financial means earmarked for these purposes.

Appendix 1

State of Affairs of the Approach to Water- Related Problems

Objective of the Approach to Water-Related Problems

In recent years, the Netherlands has been confronted on several occasions with water-related problems caused by high water levels in the rivers (1993 and 1995) and by excessive rainfall (1993, 1994 and 1998). The amount of claims paid out by the Cabinet during these years totals an estimated NLG 1.5 billion, including compensation for water-related problems last autumn. This, however, is only a portion of the societal damage incurred.

In the lower parts of the Netherlands, rainwater is transported through the polders and reservoirs to larger bodies of water. In the higher parts of the Netherlands, the water is channelled via streams and rivers. The various components of these chains are closely interrelated. Most of the water-related problems experienced during the autumn of 1998 occurred in the regional waterways as a direct consequence of excessive rainfall. Consequently, water drainage was severely impeded by high water levels in such bodies as the IJsselmeer lake.

The sea level is expected to rise in the coming decades and the chance of dramatic levels of precipitation and extremely high river discharge levels is increasing. In addition, the land in the west and north of the Netherlands is subsiding. As a result, the chance of large-scale water-related problems is only increasing with time, as are the risks of incurring loss. Various actions have been incorporated into the fourth Policy Document on Water Management, which addresses these developments. Given recent experience, acceleration and intensification of policy on a number of points is merited.

Objective of the Approach to Water-Related Problems: to limit the risk of loss due to water-related problems in a sustainable manner

Solution

The solution to water-related problems must be sought in two areas. More water must be retained in the regional water management systems and the excess water must be drained more rapidly. In extraordinary situations, water can be temporarily stored in 'retention areas'.

The strategic approach to future-oriented water management is guided by the following principles:

- *safety first:* meet the standards as quickly as possible (Flood Defence Act);
- *prevent passing on problems:* solutions for one region must not lead to problems for another – catchment area approach;
- *space for water:* water as a guiding principle in spatial planning, flexible water management systems and designation of retention areas;
- *regional tailoring:* region-specific and integrated approach;
- *guarantees do not exist:* water-related problems cannot be prevented all the time.

Plan for the Approach to Water-Related Problems and the State of Affairs

'Water Management in the 21st Century' study:

On the basis of strategic principles for future-oriented water management, an independent study ('Water Management in the 21st Century') was conducted under the guidance of a Committee of independent specialists. The research effort was implemented in phases and focused on administrative, legal and water management aspects. On the basis of the results of the study involved, the Committee will develop recommendations for desirable water management for the Netherlands in the 21st century, paying attention to measures to be taken in the short term.

State of affairs:

The Water Management in the 21st Century Advisory Committee released its report 'Water Management Policy for the 21st Century' on 31 August 2000. The 'Water Management Policy for the 21st Century' document presents the Cabinet's response.

Administrative measures:

Intensifying co-operation through (temporary) administrative consultations about water-related problems between the Cabinet, IPO, UVW and VNG. In the short term, a package of 8 administrative and legal measures will be implemented. These

are primarily focused on strengthening the degree to which water management and spatial planning are tuned to one another, decision-making about river widening and designation of retention areas.

State of affairs:

The report from the Water Management in the 21st Century Advisory Committee addresses administrative measures. In the Cabinet's position document 'Water Management Policy in the 21st Century' and 'Space for Rivers', recommendations are made as to how to implement the points indicated. In addition, many issues will be jointly elaborated and implemented by the IPO, UVW and VNG.

Measures for the regional water management systems:

Based on activities already underway, the regional water management bodies can implement a variety of 'no regret' measures to improve the organisation of water management. The water management authority (water board) holds the first line of responsibility, also in a financial sense, for the (accelerated) approach to these problem areas. Additional measures in the regional water management systems are also investigated in the 'Water Management in the 21st Century' report.

State of affairs:

All the aspects of the regional water management systems (planning and implementation of the measures) have meanwhile been addressed by the regional parties (water boards, provincial and municipal authorities, social interest groups). The Water Management in the 21st Century Advisory Committee also paid a great deal of attention to this.

Measures for the main water management system:

In the near future, a number of measures can be implemented that are certain to contribute to the reduction of water-related problems during extreme conditions. These measures, for which no alternatives exist, are to be viewed as 'no regret' measures. It has been recommended that the preparations for and implementation of these measures can already begin. These involve the following measures, which are chargeable to the Cabinets' national budget:

- Expanding the draining capacity of the Noordzeekanaal/ Amsterdam-Rijnkanaal reservoirs near IJmuiden, Nieuwegein and Gouda by an approximate total of 110 m^3/s. Costs: NLG 125 million (including preparation costs). Planning period: 1999 – 2000. Implementation: 2001 – 2003.

- Preparatory activities for the expansion of the draining capacity of the Barrier Dam in combination with any water level adjustments and dyke reinforcement/ construction of levees. Planning period: 1999 – 2002. Costs: NLG 25 million.

State of affairs:

The preparations for the implementation of the drainage capacity expansion near IJmuiden and Gouda are on schedule. For reasons of efficiency, the expansion effort near Nieuwegein has been abandoned for an extra expansion effort at IJmuiden. The planning process for the expansion of the draining capacity of the Barrier Dam is also on schedule. Actual construction can be completed in 2007, provided that the required financial means are made available on time. Adjustment of the water level is projected following the completion of additional drainage capacity efforts.

Appendix 2

International Agreements

1. Political Frameworks

1.1 Declaration of Arles

In response to the flooding experienced in the Rhine and Meuse rivers during the winter of 1995, the Ministers of Environmental Affairs of France, Germany, Luxembourg, Belgium and the Netherlands laid down a joint declaration on 4 February 1995 in Arles, France, stating the necessity of taking measures to reduce the risk of future flooding.
The Ministers emphasised the following points in this declaration:

- concrete measures should be taken in a number of areas, including spatial planning, land use and water management;
- action programmes stating objectives and measures should be established for the Rhine and Meuse catchment areas;
- the action programmes for the Rhine should be formulated with the assistance of the International Committee for the Protection of the Rhine;
- the development of plans should involve an investigation of the possibilities for developing an internationally co-ordinated water management system, taking spatial planning measures that allow expansion of the water retention capacity in the entire catchment area (including changes in land use, afforestation, nature restoration, establishment of flooding areas, etc.), and prevention of urbanisation of vulnerable areas along the Rhine and Meuse rivers, as well as a possible prohibition on construction projects.

1.2 Declaration of Strasbourg

On 30 March 1995 in Strasbourg, France, the spatial planning Ministers of the countries mentioned above endorsed the recommendations of their Environmental Affairs colleagues regarding the necessity of implementing spatial planning measures. Although the operational measures would have a primarily local and regional focus, the Ministers emphasised that they should be established within a framework of

integrated visions for the entire catchment area of the Rhine and Meuse, respectively.
In addition, the spatial planning Ministers stressed the need for co-operation between policy areas when formulating measures to prevent flooding, including spatial planning, water management, nature management and environmental management.

1.3 The EC Framework Directive for Water

On 23 October, the European Parliament and the European Council established the EC Directive 2000/60/EC (or the Framework Directive for Water).
The objective of the directive was to establish a framework for the protection of surface and ground water. Additionally, it should contribute to abating the ramifications of flooding and periods of drought. The directive requires that member states establish joint action plans and programmes with regard to (international) catchment areas, or at least co-ordinate their implementation.
Although flood prevention and protection are not the primary objectives of the framework directive, it clearly emphasises the importance of taking measures involving all aspects of catchment areas to protect and strengthen aquatic ecosystems and promote sustainable water use, thus acknowledging that this also contributes to flood prevention and protection.

2. Implementation Plans

2.1 Flood Action Progammes

The formulation of flood action programmes for the Rhine and Meuse catchment areas were the direct result of the Declarations of Arles and Strasbourg. This was accomplished for the Rhine through the actions of the treaty participants in the International Commission for the Protection of the Rhine (ICBR). The 'Rhine Action Plan on Flood Defence' was approved at the 12th Conference of Rhine Ministers held in Rotterdam, the Netherlands, on 22 January 1998. It proved politically impossible to co-ordinate the formulation of the action plan within the context of the Commission for the Protection of the Meuse. Accordingly, a Flood Defence Task Force for the Meuse was established with a similar function as the International Committee for the Protection of the Rhine Against Pollution (ICR). On 8 April 1998 in Namurs, Belgium, the 'Meuse High Water Action Plan' was established by the Ministers of France, Wallonia, Flanders and the Netherlands.

The European Union supported the implementation of these plans with the formulation of the INTERREG IIC programme, IRMA, during the 1997 – 2001 period. ECU 137 million (1997) were earmarked for this programme.

2.1.1 The 'Rhine Action Plan on Flood Defence'

The objective of the Action Plan is to improve the levels of protection afforded to people and goods against flooding in accordance with the ecological improvement objective of the Rhine and its flood plains.
The objectives are to:

- reduce the damage risks by 10% by the year 2005 and 25% by the year 2020;
- reduce extreme flooding conditions downstream by damming the regulated section of the Upper Rhine by 30 cm in 2005 and by 70 cm in 2020;
- increase awareness of the risks of flooding;
- improve the flood warning system.

Among the most important categories of measures is the expansion of the water retention capacity of the Rhine catchment area (restoring natural water flow, changing over to extensive farming and afforestation) as well as along the Rhine itself (restoring use of flooding areas and construction of retention basins), technological provisions, precautionary measures using planning and flood prediction.
The estimated costs of implementing the Rhine Action Plan on Flood Defence totals ECU 12 billion. This plan should be implemented during the period 1998 – 2020. For the 13th Conference of Rhine Ministers on 29 January 2001 in Strasbourg, France, a mid-term review will be made of the progress of the implementation of measures during the first phase (1998 – 2000). The ICBR concludes that a great deal of energy has been put into the reduction of extreme flood conditions, reduction of the warning time, as well as raising awareness. Less progress, however, has been achieved with regard to the reduction of the risks for loss.

2.1.2 The 'Meuse High Water Action Plan'

The Meuse High Water Action Plan is in all respects less ambitious and concrete than the plan for the Rhine.
In this action plan, neither concrete objectives, nor concrete measures have been quantified. In addition, no estimate of the investment required has been given. However, the plan

incorporates a broad inventory of possible measures to be taken, although these are similarly not quantified.

The objective of the Meuse High Water Action Plan is to develop a coherent package of measures for the short, medium and long term to prevent and/or reduce losses ensuing from extreme flood conditions. The measures should be geared to reducing the chance of flooding, as well as reducing vulnerability should flooding indeed occur (loss risk reduction). The measures should be addressed through water management and spatial planning activities. In the event of negative consequences for other policy areas, compensatory measures should be implemented. Technological measures constitute the final element.

During the period up to 2000, various studies and research efforts should have been implemented to generate the required basic data that should form the basis for quantifying operational objectives in 2001.

The Meuse High Water Action Plan does embrace a number of strategic basic principles that also form part of the plan for the Rhine:

- increasing awareness and developing an approach to the risks;
- employing the three-pronged approach of retaining, toring and draining water;
- expanding space for the Meuse and its tributaries;
- improving the prediction and warning systems.

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