SPATIAL PLANNING KEY DECISION
ROOM FOR THE RIVER

Explanatory Memorandum

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Closer consideration and assessment of the various options

Explanatory

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Introduction

1.1 Background

The Dutch Government wishes to increase flood protection to the level required by law by no later than 2015 and to improve the spatial quality of the "Rivers Region" (Rivierengebied) in the centre of the country. Given that the representative discharge levels in the country's rivers are expected to increase, the Government aims to do everything possible to ensure the necessary level of flood protection by taking steps to prevent representative high-water discharge levels from rising even further. This means that the emphasis will shift from improving the dykes to creating more room for the river. The Government's "Basic Package of Measures" [Basispakket van maatregelen] mainly comprises measures to create more room for the rivers that also offer the possibility of preserving and/or improving spatial quality, the proviso being that the measures involved must satisfy the existing technical and financial requirements and be implemented by no later than 2015.

The Government issued the Draft Key Planning Decision "Room for Rivers" [Planologische Kernbeslissing Ruimte voor de Rivier], also referred to as "PKB Part 1", on 15 April 2005. After this had been done, and the associated Environ mental Impact Statement (EIS) had also been issued, the public were invited to review and comment on it, administrative consultations took place, and the Environmental Impact Statement Committee [Commissie voor de milieueffectrapportage] and other advisers required by law to be consulted issued their recommendations. The responses and results of all this have been incorporated into "PKB Part 2". Additional studies have also been carried out regarding a number of points.

The present document is the Explanatory Memorandum accompanying "PKB Part 4", the decision adopted after approval by the Upper and Lower Houses of the Dutch Parliament. One minor change has been made to the PKB compared with Part 3 (see Section 1.5). The present Explanatory Memorandum substantiates and explains the PKB (Sections 1 to 16) and clarifies how the Government dealt with the results of public participation, consultation, recommendations, and additional studies (Sections 17 to 22).

1.2 Procedure since publication of PKB part 1

After publication of PKB Part 1, the following activities took place:
- ~ public consultation process;
- ~ administrative consultation;
- ~ recommendations by the EIS Committee and other advisers required by law to be consulted;
- ~ additional studies.

Public consultation process
The publication of PKB Part 1 was followed by a public consultation process in accordance with Section 2(a)(2) of the Spatial Planning Act [Wet op de ruimtelijke ordening]. An Environmental Impact Statement (EIS), a Cost-Benefit Analysis, the Strategic Framework for the Birds and Habitats Directives and the Regional Advisory Report were published simultaneously with PKB Part 1. This whole package was made available for inspection from 1 June 2005 to 23 August 2005. It was also available on the project website www.ruimtevoorderivier.nl. The public were able to express their views on PKB Part 1 and the EIS. A German translation was also published of PKB Part 1 and the EIS. These documents were also available for public consultation in Germany according to the normal German procedures.

Over the course of the public consultation period, a total of 2843 responses were received. PKB Part 2 includes a report on the main points of these responses.

Administrative consultation
Administrative consultation took place regarding PKB Part 1 in Wageningen (30 August 2005), Gorinchem (2 September 2005) and Zutphen (15 September 2005). The reports on these meetings are included in PKB Part 2.

Recommendations by the EIS Committee and other advisers required by law to be consulted
The EIS Committee provided its recommendations on the Environmental Impact Statement on 14 October 2005. The State Landscape Adviser [Rijksadviseur voor het landschap], acting on behalf of the Board of State Advisers [College

van Rijksadviseurs], also made recommendations on 26 October 2005, while the Netherlands Council on Housing, Spatial Development and the Environment [VROM-raad] gave its recommendations on 27 October 2005. Those recommendations were incorporated into PKB Part 2.

Additional studies
A number of additional studies took place after PKB Part 1 had been adopted. A partial decision in this regard had already been reached following the adoption of Part 1, but the studies were also prompted by the results of public consultation. They deal with the following subjects:

- Rhine Distributaries Discharge Distribution: necessary measures to maintain the distribution that has been decided on;
- Biesbosch embankments: value and necessity of reducing the height of the embankments;
- Overall Survey of the Meuse: options for most effective targets;
- Lower Rhine and Lek: improved combination of dyke improvement and spatial planning measures;
- Residents' alternative for Voorster Klei area (river side of dyke);
- Residents' alternative for Cortenoever (river side of dyke);
- Analysis of options on river side of dyke between Deventer and Zwolle;
- Lateral inflow into River IJssel: options for reducing flow when water levels are high;
- Dyke improvement: further analysis of the areas to be reinforced in the "Basic Package of Measures";
- Long term: further analysis of the need for land to be reserved;
- A27 motorway (at Gorinchem): coordination of Room for Rivers project with reconstruction work on the motorway;
- Soil disposal sites: detailed effects study to substantiate selection;
- Nature conservation: additional study of possible "external" effects of measures on Natura 2000.

1.3 Decision-making

Since its publication in 2005, PKB Part 1 has been the subject of public consultation, recommendations, and administrative consultation. The various responses and recommendations, and the reports on the administrative consultation, are included in PKB Part 2. The Government's position document (Part 3) is based on Part 1 and on an evaluation of all the responses and recommendations received. Part 2 and the Government's position document (Part 3) were submitted to the Lower and Upper Houses of Parliament, both of which approved the Government's position (the Lower House on 7 July 2006 and the Upper House on 19 December). The final result was set out in PKB Part 4, which was also made available for inspection and comment. The PKB came into force the day after it was published. It is not open to appeal. This does not mean, however, that planning has been completed. Now that the PKB is definitive, the individual measures can be worked out in detail. These will be the subject of a public participation procedure. Only when that procedure has taken place can the proposed measures actually be implemented. The various measures will be implemented by 2015.

1.4 Substantive changes compared to PKB Part 1

The changes that the Government has made to the PKB compared to PKB Part 1 relate to the following four subjects:

1 - Basic Package of Measures
Waal

- As regards Nijmegen, a choice has been made from the options included in PKB Part 1. The Government has decided that the dyke at Lent should be relocated further away from the river.
- Measures to correct the discharge distribution at Pannerdensche Kop were added to the Basic Package of Measures:
- reduction in the height of the groynes along the bends in the River Waal;
- extra excavation of the washlands at Millingerwaard;
- reduction in height of the Suikerdam and the Zandberg embankment as part of the Gendt polder.

Lower Rhine/Lek
The package of measures has been amended to a significant extent.

The following have been removed from the Basic Package of Measures:

- the dyke relocation at Lienden and the Marspolder depot;
- removal of obstacles at Elst brickworks.

The Basic Package of Measures for the area now comprises:

- dyke improvement between Arnhem and Amerongen;
- a number of spatial planning measures;
- excavation of the washlands at Meinerswijk (amended design);
- excavation of the washlands at Doorwerth (amended design);
- excavation of the washlands at Middelwaard and Tollewaard;
- removal of obstacles (school for crane drivers) at Elst;
- washlands complex at Vianen/Hagestein.

Alternatives in context of programme approach
The additional measures at Koppenwaard (IJssel), Heesselt and Hurwenen washlands (River Waal) have been abandoned.

The private initiatives planned for the washlands near Maurik have been included in the PKB as a promising addition to the Basic Package of Measures.

Disposal of soil
The appendix to PKB Part 1 includes a list of preferred sites and alternatives. In PKB Part 3, the list in the appendix (page 3) covers only sites needed for disposing of non-marketable soil that may be removed when implementing the Basic Package of Measures. The plan to dispose of soil in the Marspolder has been abandoned.

Reservation of land for the longer term
The following plans for reserving land for long-term measures have been abandoned:

- dyke relocation at Welsum;
- dyke relocation at Den Nul-Fortmond;
- removal of bridge obstacle at Keizersveer, including dyke relocation.

The limits of the land reserved for possible dyke relocation along the Bergsche Maas river at Drongelen have been altered.

The land reserved for dyke relocation at Oosterhout–Slijk Ewijk has been added. This dyke relocation has been added in addition to the dyke relocation at Loenen that was already included.

1.5 Substantive changes compared to PKB Part 3

The memorandum was discussed with the Lower House of Parliament on 19 June 2006, with nine motions being submitted. Voting on the motions took place on Tuesday 27 June 2006. One motion regarding compensation payments was adopted in amended form. This has no direct consequences for the PKB, but it is a precondition for the implementation phase.

Otherwise only one minor change has been made to the PKB compared with Part 3. The Lower House was informed of this in a letter dated 12 October 2006. When Part 4 was drawn up, it turned out that it may not be clear whether the important decision in Section 7 of the PKB applies to the "Appendix (page 3): Basic Package of Measures. Depots for depositing clean, slightly contaminated, and highly contaminated soil". This confusion was caused by the accidental omission of a sentence. In order to clarify that the decision in section 7 of the PKB does in fact apply to that appendix, the Minister of Transport and Public Works – acting also on behalf of the Minister of Housing, Spatial Planning and the Environment and the Minister of Agriculture, Nature and Food Quality – provided the Lower House with an amended version of the appendix. The Lower House approved this amended appendix on 31 October 2006 and passed it on to the Upper House.

1.6 Guide to this publication

This Explanatory Memorandum to the PKB consists of two parts. The first explains the position of the Government. The second deals in greater detail with the issues that were brought up during the public consultation process and the various alternatives that were taken into account during consideration of the proposed measures.

Part 1
Section 2 goes into the reasons for a new approach to flood protection in the Rivers Region. Section 3 deals with trends in river discharge levels and the main objective of protection against flooding. Section 4 deals in more detail with the second objective: improving spatial quality.

Section 5 describes the strategic policy decisions underlying the choice of measures to be implemented. Section 6 outlines the desired long-term measures and the measures that the Government wishes to see implemented by 2015.

Sections 7 to 11 explain the measures planned for each distributary. Section 12 deals with the soil that will be excavated when the measures are implemented and the sites where it will be disposed of.

Section 13 goes into the programme approach, i.e. the flexibility that the Government has built into the Basic Package of Measures.

Section 14 deals separately with the evaluation of the Basic Package of Measures that has taken place in the context of the national legislation and regulations on nature conservation.

Section 15 looks at the financial aspects of the PKB. Section 16 describes the various stages that will follow the PKB procedure, up to and including actual implementation of the measures.

Part 2
Section 17 deals with the questions that arose during the public consultation process and that apply to the Rivers Region as a whole. The Government's deliberations on these measures are also dealt with. Sections 18 to 22 deal with the issues arising from the public consultation process and the Government's deliberations regarding each distributary.

2

Major shift in approach to flood protection

2.1 The background to this PKB

The Rivers Region in the centre of the Netherlands is protected against high water levels in the rivers by a system of dykes. In the recent past – in 1993 and again in 1995 – the rivers ran at very high levels. Because in many places the dykes were not up to the required strength, it was not certain that they would hold. In 1995, 250,000 people and 1 million animals had to be evacuated as a precaution because it was not otherwise possible to guarantee their safety. The Government believes that the importance of effective flood protection should not be underestimated, given the serious effects of the high water levels in 1993 and 1995 for the country as a whole and particularly for the Rivers Region.

The high water levels in 1993 and 1995 led to the publication of the Delta Plan on Major Rivers, with the necessary work of reinforcing the dykes taking place sooner than had been planned. Now that the this plan has been implemented, almost all the country is safe from flooding even up to a rate of flow of 15,000 m³/s at Lobith (where the Rhine enters the country). Where the dyked section of the Meuse is concerned, the corresponding figure is 3650 m³/s at Borgharen (just north of Maastricht).

The representative discharge levels for the rivers were redefined in 2001 in line with the system set out in the Flood Defences Act [*Wet op de waterkering*]. In the light of the high water levels in 1993 and 1995, they were increased to 16,000 m³/s for the Rhine at Lobith and 3800 m³/s for the Meuse at Borgharen. The representative discharge levels are converted into extreme water levels ("assessment levels") that the dykes must be able to cope with. An increase in the representative discharge levels will generally also lead to an increase in the assessment levels. The increase in assessment levels in 2001 varied from 0 cm to 60 cm for most of the Rivers Region.

Measures need to be implemented to make it possible to discharge the extra quantities of water determined in 2001. The Government has decided on a radically different approach to flood protection, with the focus now being on creating more room for the country's rivers and thus preventing high water levels. The dykes will only be improved along stretches where this approach is not possible, or where implementing it is not economical given the overall amount of work to be performed. This new approach means that redeveloping parts of the Rivers Region becomes unavoidable.

2.2 Major shift in approach

The Netherlands is located in the deltas of the Rhine, Meuse and Scheldt. The Rivers Region has always been a fertile area, and the rivers themselves have been used to transport both people and goods. At the same time, high water levels in the rivers create risks. To protect the Rivers Region, dykes were constructed and have been increased in height and reinforced over the centuries.

Over the course of time, there has been increasing pressure on the available space as a result of economic growth and urban development, leading to space being occupied for these purposes in the river bed. This was particularly the case with the closing off of overflows during the twentieth century due to the problems they caused. In a number of places, building has also taken place in the winter bed, and the winter dyke has been relocated closer to the river. At various locations, the river itself has been canalised – with meanders being cut off – so as to improve water discharge and the economic functions of the river. This has led to the rivers being constricted between the dykes, which have made higher and higher over the course of time. Restricting the size of the river's bed in this way also means that the quantity of silt that is deposited finds its way into an ever-smaller area. As a result, the level of the washlands has become higher, with a consequent increase in water levels. The groynes, particularly in the upstream sections of the rivers, have also become higher, relatively speaking, because of a fall in the level of the summer bed as a result of autonomous morphological processes. Finally, the protected area on the landward side of the dykes is slowly settling, with a concomitant gradual increase in the height differential between the area on the landward and the river side of the dyke.

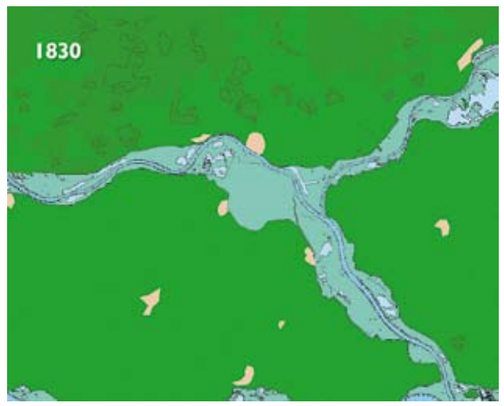
Certain factors that may lead to the dykes being breached by high water – i.e. "failure mechanisms", including "piping" and cracking – will play a greater role if the difference in water levels inside and outside the dykes increases. The higher a dyke is, the greater the material damage that will result from its being breached. This is because high dykes mean that a greater area of the "dyke ring" (i.e. the area protected by the dykes) can be flooded, but also because the water will then be deeper. The extent to which the damage increases depends on the local situation within the dyke ring. If the height of the dykes were to be increased by 1.5 metres for all the dyke rings concerned, then the potential material damage for all these dyke rings would increase by approximately 60%.

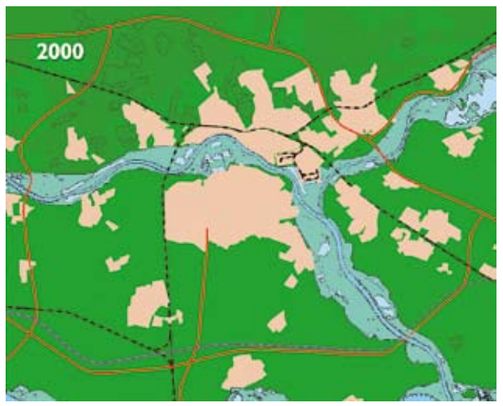
The Government expects that climate change will lead to increases in the representative discharge levels in the country's rivers over the course of the coming century. Intensive use of the land on and around the dykes, the continuing increase in high water levels and the greater amount of damage that can be expected due to the growth of population and prosperity means that the objective of protecting the country from flooding has become a very complex one. Further reinforcement of the dykes as a means of solving the problem is in fact technically possible, and will not render the Rivers Region unsafe from one day to the next. However, it is now realised that there are limits to the desirability of dyke reinforcement and that other methods of flood protection will be necessary.

[1] CPB Netherlands Bureau for Economic Policy Analysis (2005). Cost-benefit analysis of Room for Rivers. Part 1: Flood protection.

There has been a shift in policy and thinking as regards water, with a view to keeping the country safe, attractive, and with a good quality of life for the rest of the century. This shift first became apparent with the introduction by the Minister of Transport and Public Works in 1996 of the Policy Guideline "Room for Rivers". This is intended to retain the amount of space available for rivers. The Policy Guideline has since been amended and replaced by the new Policy Guideline on Major Rivers [Beleidslijn grote rivieren]. The Government published its position documents "Room for Rivers" and "Dealing Differently with Water; Water Policy for the 21st Century" [*Anders omgaan met water; Waterbeleid voor de 21e eeuw*] in late 2000; these were followed in early 2001 by the "Preliminary Agreement on Water Policy in the 21st Century" [*Startovereenkomst Waterbeleid 21e eeuw*]. These documents announced a shift in the way the country deals with its rivers, with a preference being expressed for giving them more room.

This shift in policy takes effect in this PKB. It means that strengthening the dykes will no longer be the default option as regards protecting the Rivers Region from flooding. As far as possible, spatial planning measures will be implemented aimed at reducing water levels, for example by excavating the washlands and relocating the dykes further away from the rivers. Where this is not possible, or where it is too expensive, technical measures can also be taken to reduce water levels, for example reducing the height of the groynes and deepening the summer bed of the river. The dykes will only be reinforced along stretches of the rivers where other measures are unsuitable or too expensive. This means that the Netherlands will accommodate itself to the water in its rivers and deploy spatial planning measures so as to give those rivers more room in certain places than is strictly necessary to comply with the standard required by law.





Urban development in the Arnhem area

Related developments
The high water levels of ten years ago led to various developments, or accelerated existing ones. The most important of these are listed below.

Flood Defences Act
The Flood Defences Act [*Wet op de waterkering*] came into force in 1996, setting out the standards for the country's flood defences. It also requires that the condition of the flood defences be checked every five years; the representative discharge levels for rivers and the associated assessment levels are also to be redetermined with the same frequency and if necessary adjusted.

Policy Guideline "Room for Rivers" or "Policy Guideline on Major Rivers"
The Policy Guideline "Room for Rivers" came into force in 1996 and was amended in 1997. It focuses on retaining the existing room available for rivers and constitutes the assessment framework for spatial development in the river bed. This Policy Guideline has since been evaluated and on 14 July 2006 was replaced by the Policy Guideline on Major Rivers.

Government position papers
The Government's position paper on "Dealing Differently with Water; Water Policy for the 21st Century" was published in 2000. This document determined that if no further work is done, there will be a reduction in flood protection levels and an increase in flooding due to climate change and land subsidence. The Government favours an approach whereby rainwater finds its way into the country's rivers less quickly, discharge peaks are levelled out by means of temporary storage of the water ("retention"), and the discharge capacity of the rivers is increased by giving them more room. The Government believes that this approach should involve a proper mix of spatial management and technical measures.

At almost the same time, the Government's position paper "Room for Rivers" (2000) provided that further increases in representative discharge levels should no longer be countered by means of further dyke reinforcement work. The Government intends ensuring that rivers are given more room so as to prevent flooding in the event of increased discharge levels.

Flood Action Plans for Rhine and Meuse
The policy pursued by the Netherlands links up with policy at international level. Collaboration between the various countries along the Rhine and Meuse in combating high water levels and flooding in the catchment areas of these two rivers has been intensified as a result of high water events. The governments of the countries concerned approved the Flood Action Plan for the Rhine in 1998, followed later the same year by a similar plan for the Meuse. The main concerns of these plans are to reduce the risk of damage by, for example, implementing spatial planning measures; reducing extremely high water levels by retaining water in the river catchment area and by giving the rivers more room; and improving warning systems in the event of high water levels.

A great deal of attention has been paid to the element of reducing high water levels, an approach also followed by "Room for Rivers". The Flood Action Plan has the objective of reducing high water levels in the Rhine by an average of 30 to 70 cm in 2005 and 2020, respectively. Those values are the estimates of what can be achieved by means of measures throughout the river catchment area, i.e. including the Netherlands. The main features of the Flood Action Plan for the Meuse are similar to those for the Rhine, except that the flood protection measures have not been closely specified, if at all, and the intended reduction in extremely high water levels has not been quantified.

Discussion of flood protection standards
In addition to this PKB, the Dutch Government intends pursuing the target of ensuring long-term flood protection by instituting discussion of the present approach to flood protection. The discussion will consider whether the present system is sufficient and whether the current classification of the likelihood of levels being exceeded is still adequate. Greater attention needs to be paid to the effects of flooding and how they can be prevented. The risk for the Netherlands is, after all, a combination of the likelihood of flooding and its consequences. The preliminary report (November 2005) on the "VNK" survey [*Veiligheid Nederland in Kaart*] of the applicable risks that was published in November 2005 is an important source of input for this discussion.

Flood Disaster Management Strategy (RBSO)
With the measures included in the PKB, the Government aims to comply, by 2015, with the legal requirements for flood protection. Nevertheless, there will always be a residual risk because flooding may occur regardless of all the preventive measures that are taken. Disaster management measures are therefore necessary to restrict the damage caused by flooding if it does in fact occur. The Government's position paper on "Flood Disaster Management Strategy" [Rampenbeheersingsstrategie Overstromingen Rijn en Maas' (RBSO)] (published in December 2003) refers to five options for restricting the likelihood and consequences of flooding in the "upper rivers area": international coordination, emergency overflow areas, compartmentalisation, more stringent flood protection standards, and organisational measures. An interim decision was taken in April 2005 to the effect that emergency overflow areas would not be used for the Rhine (Ooijpolder and Rijnstrangen). The Government expects to reach a decision on the other options in mid-2006.

EU Framework Directive on Water
The Framework Directive on Water (FDW) came into force on 22 December 2000. It obliges EU Member States, in general, to protect, improve, and/or restore all water bodies so that they have reached good condition by 2015. For implementation of the FDW in the Netherlands, the rivers are classified as "heavily modified water bodies". This means that there has been hydromorphological intervention (in the form of dykes, dams, etc.) such that achieving the good condition associated with a completely natural situation is not feasible. The objectives for this category must be formulated by 2009 in terms of "good ecological potential".

The FDW requires that an investigation be carried out to determine whether such hydromorphological intervention can be reversed. It is obvious enough that dykes and dams are vital for flood protection, as well as for shipping and freshwater management. This will need to be explained when the catchment area management plan is adopted in 2009. The draft plan will also describe how the formal FDW objective "good ecological potential" should be defined and what mitigating measures will be required.

The aim of the FDW is to coordinate catchment area management internationally. The Netherlands, as a country occupying a downstream delta, will benefit from this. A reduction in the amount of contamination upstream will in general lead to cleaner sediment and water.

Overall, one can say that providing more room for the country's rivers will make a major contribution to their ecological recovery. Decision-making in the context of this PKB for the Rhine distributaries is the basis for working out the morphological measures in the catchment area management plan for 2009–2015. Within the preconditions set by the PKB, the planning and implementation of the various projects will need to strive to optimise the contribution they make to achieving the FDW objectives.

2.3 Coordination with improvements in spatial quality

The new approach to flood protection in the Rivers Region will be coordinated with spatial planning. This is because space is necessary if we are to deal with large quantities of water while keeping water levels the same or reducing them. More room can be provided for water horizontally – by adding areas currently protected by dykes to the river bed – or by redeveloping the area on the river side of the dykes. Providing more room for the rivers opens up the possibility of improving the spatial quality of the Rivers Region while linking up with regional and local developments.

3

Flood protection in the Rivers Region

3.1 The challenge for the PKB

The Dutch Government has decided that by no later than 2015, the level of flood protection must be in line with the representative discharge levels determined in 2001 for the Rhine (16,000 m³/s at Lobith) and the Meuse (3800 m³/s at Borgharen). That is the main objective of the PKB, in which the Government sets out the measures necessary to achieve it. The Government has also decided on the necessary financial framework (see Section 15).

Current understanding suggests that ongoing climate change will lead to Dutch rivers having to deal with even higher discharge levels. The Government assumes a maximum discharge level in the Rhine of 18,000 m³/s and in the Meuse of 4600 m³/s, with a rise in sea level of 60 cm.

Measures taken in the short term (up to 2015) to improve flood protection as regards the discharges of these two rivers will need to remain effective ("no regrets") and continue to be utilised in the event of even higher discharge levels in the longer term. An overall approach has therefore been drawn up for the necessary long-term measures and the short-term measures have been assessed against that approach.

3.2 Long-term trends in river discharge levels and sea level

The Government intends the measures that are to be implemented by 2015 to form part of an overall approach to long-term trends and the measures needed to provide protection from flooding. There are various trends that will influence the long-term approach to flood protection.

Higher representative discharge levels in the Rhine and Meuse

The Netherlands is located in the lower reaches of the rivers Rhine and Meuse. As a result, the volume of water entering the country is determined primarily by the volume coming from other countries in the catchment areas of these two rivers, in particular Germany and Belgium. In order to determine how much room will be necessary for the rivers, estimates are needed of the discharge levels that can be expected for the Rhine and the Meuse.

Climate change is expected to cause the representative discharge levels to increase even further. The Government bases this expectation on the "medium scenario" proposed by the Intergovernmental Panel on Climate Change (IPCC) (a temperature increase of 2°C per century). In the light of this scenario, the Royal Netherlands Meteorological Institute (KNMI) calculates that there will an increase in precipitation in the catchment areas of the Rhine and Meuse over the course of the present century, particularly in the winter. A 20% increase in the volume of precipitation is expected for the annual maximum of the 10-day winter precipitation total. Working on the basis of a study published in 1997 by the International Commission for the Hydrology of the Rhine Basin (CHR), this figure has been used to calculate a representative discharge level for the Rhine of up to approximately 18,000 m³/s. For the Meuse, the expected increase in precipitation is likely to lead to a representative discharge level of 4600 m³/s. Other more recent international studies show that northwest Europe will need to expect an increase in the extent and frequency of high water levels.

The discharge levels that can be expected at Lobith and Borgharen need to be seen in the international context. The text box at the end of Section 2.2 deals with the Flood Action Plans, while that at the end of the present section looks at recent research by the Dutch-German Flood Protection Working Group (Arbeitsgruppe Hochwasser).

Research by the Working Group shows that even if the climate were to remain the same – and without taking account of water overflowing the dykes in Germany – the Rhine at Lobith may need to cope with a peak discharge level of 18,700 m³/s. If flooding in Germany is allowed for, then the level will be 15,500 m³/s. The study only considered long-term trends from a qualitative point of view. It confirms that the likelihood of extremely high water levels is increasing. An (assumed) higher discharge surge would produce the same flooding, with a discharge peak at Lobith of 16,500 m³/s. It should be noted that these results are based on the assumption that there will be large-scale flooding in Germany, with not just farmland but also urban and industrial areas being affected. The calculations do not take account of emergency measures in Germany.

The question that the Government poses is what trends can be expected up to the end of the century. At first sight, it would seem preferable that the quantity of water reaching the Netherlands should be restricted due to large-scale flooding occurring in Germany rather than in the Netherlands. But – quite apart from the fact that this kind of thinking does not give much evidence of solidarity – it is still questionable whether we can continue to assume that this will be the case. Although the study by the Flood Protection Working Group clarified a number of issues, others remain unclear. The Working Group recommends producing an inventory of the low-lying areas of Germany where flooding can be expected. It also considers that the effects of potential climate change need to be investigated and quantified in greater detail.

All in all, just what discharge levels can be expected to reach the Netherlands over the course of the coming century is very uncertain. Both the trends in the quantity of precipitation and the measures taken in response to this in Germany are unclear. That uncertainty will be all the greater the more neighbouring countries have to deal with large-scale flooding over the coming decades. The Dutch Government assumes a maximum discharge level in the Rhine of 18,000 m³/s at Lobith and in the Meuse of 4600 m³/s at Borgharen. This assumption makes it possible to provide sufficient space for flood protection over the course of the coming century.

International research on flooding

The Ministry of the Environment and Conservation, Agriculture and Consumer Protection of the German Federal State of North Rhine-Westphalia, the Dutch province of Gelderland, and the Dutch Directorate General for Public Works and Water Management (Eastern Region) commissioned the Flood Protection Working Group to carry out an investigation of the consequences of extremely high water levels in an international context.

The study focused on the following questions (assuming the situation in 2020):

- How much water can be expected from the catchment area of the Rhine under extreme conditions?
- How much water can be discharged between the dykes? How will high-water surges proceed and what effect will dyke overflows have on high-water surges?
- What will happen if water overflows the dykes? Where will this happen first? Is cross-border flooding a possibility?
- What will be the effect of measures – existing, planned and possible new measures – to reduce water levels?
- What effects will climate change have?

According to the study and assuming the existing climatic situation, the amount of rain falling in the catchment area of the Rhine may lead to the Rhine at Lobith having a peak discharge level of 18,700 m³/s. This is without taking account of dyke overflows in the upper reaches of the river and its lower reaches in Germany (i.e. the "Niederrhein"). If such flooding is allowed for – i.e. large-scale flooding in those areas – the expected peak at Lobith will be approximately 15,500 m³/s. On the Niederrhein, it will be the area between Cologne and Düsseldorf on the Niederrhein that will be flooded first, followed by the central section of the Niederrhein between Düsseldorf and the mouth of the Ruhr. Further downstream, there will be no more flooding, assuming that the improvements to the retaining wall in Emmerich have been completed. Flooding will lead to flows of water on the landward side of the dykes, parallel to the Rhine, causing areas to be flooded "round the back" that are actually protected up to a higher level. Some of the water involved will flow back into the river. This flooding will change the nature of the high water event, making it shallower but also making its duration longer.

The question of climate change has only been answered from the qualitative point of view. The likelihood of extremely high water levels will become greater, and there will be an increase in the amount of water discharged by the Rhine, particularly in winter. In order to estimate the consequences, a certain – greater – discharge surge has been assumed. Even if this greater surge takes place, flooding will occur in the same places and in the same sequence, with the peak discharge level at Lobith being 16,500 m³/s.

The study also shows that implementing water retention measures in Germany would reduce the discharge level at Lobith by 10 cm.

Rise in sea level
Climate change is likely to cause glaciers and icecaps to partially melt, leading to an increase in the amount of sea water and a consequent rise in sea level. In addition, the Netherlands is also confronted by a fall in the level of the land in the west of the country due to tectonic movements. Assuming the same medium scenario proposed by the IPCC, a relative rise in sea level of 60 cm can be expected by 2100. This will have an effect on the representative high-water discharge levels in the lower reaches of the rivers.

The rise in sea level will also make it more difficult to release water into the sea from Lake IJssel (IJsselmeer) using the force of gravity. The water level in Lake IJssel will need to be raised, which will affect the representative high water levels in the lake and consequently also the lower reaches of the River IJssel. This PKB assumes that it will be possible to maintain the water level in Lake IJssel over the next few decades by doubling the discharge capacity of the sluices in the causeway dyke (the Afsluitdijk) between Lake IJssel and the sea. The water level in the lake will then rise along with the sea level. We will therefore need to take account of a 20 cm rise in the representative high-water discharge level at the mouth of the IJssel over the course of this century.

Lateral inflow from regional waters
In the past, calculations of the representative high-water discharge levels in the River IJssel always took account of "lateral inflow" into the river from regional waters. It became clear after the high water emergencies in 1993 and 1995 that too low a level of lateral inflow had been allowed for. The level has now been raised to 250 m³/s, which is 200 m³/s more than in the framework conditions as defined in 1996 (in the Randvoorwaardenboek).

Deposition of sediment
In the longer term, it will not only be an increase in discharge levels that will affect high water levels in the rivers but also changes in the beds of the rivers resulting from the ongoing morphological processes of sediment deposition and erosion.

Calculations of high water levels in the rivers in the longer term have so far been based on the current morphology of river beds. No account has yet been taken of morphological changes, which are also likely to continue in the longer term.

These changes mainly concern:
- deepening of the summer bed in upstream sections as a result of a reduction in the supply of sediment and river management work (approximately 2 cm a year);
- a rise in the level of the bed in the lower reaches of the rivers due to sediment deposition. The rate at which this will take place depends on the supply of sediment and the action of the tides. The expected increase in riverbed levels will be in the order of 25 to 65 cm over the next 100 years, depending on the distributary concerned;
- a gradual shift in the discharge distribution between the various distributaries of the Rhine due to morphological changes in bed profiles. This will lead to the amount of water discharging via the IJssel increasing by approximately 15%.
- deposition of clay and sand in the washlands (Lower Rhine and Lek: 0.5 mm a year; Waal: 3 mm a year).

3.3 Targets to be met

3.3.1 Introduction

The representative discharge levels of Dutch rivers are linked to high water levels (assessment levels) that the dykes need to be able to cope with. Increases in the representative discharge levels will necessarily lead to changes in the assessment levels.

The short-term target is to cope with the difference between the 1996 assessment levels and those determined in 2001. This will need to be done by providing more room for the rivers so as to reduce water levels, or by reinforcing the dykes.

Calculations have also been carried out to determine what the long-term assessment levels should be in the event of a volume of 18,000 m³/s being discharged by the Rhine and 4600 m³/s being discharged by the Meuse, together with the rise in sea level already referred to. The long-term target will be to deal with the difference between these discharge levels and those for 1996. This target is merely an indication, in the sense that it has not been established by law but gives an indication of the measures that will be necessary in the longer term. These measures also help determine the measures that the Government will actually implement in the short term.

Map A: Indicative long-term target according to current discharge distribution

3.3.2 Indicative long-term target

Long-term assessment levels (not statutory) have been calculated on the basis of the above trends regarding river discharge levels and the rise in sea level. These calculations are based on the current discharge distribution between the various distributaries of the Rhine. The difference between these long-term assessment levels and those defined in 1996 (in the Randvoorwaardenboek) are the basis for the long-term target (see Map A). This varies from 20 cm to more than 120 cm for some stretches of the rivers.

One of the strategic policy decisions for this PKB involves revising the long-term target in the light of changes in the distribution of discharge. This is dealt with in greater detail in section 5 (Map D).

3.3.3 Targets up to 2015

General
One important aspect as regards the assessment levels is how the water that enters the Netherlands from Germany is then distributed into the various different distributaries of the Rhine. Table 3.1 shows the distribution between the various distributaries for the representative discharge levels as determined in 1996 and 2001.

Table 3.1 Representative discharge levels for each distributary as determined in 1996 and 2001

Distributary	Representative discharge level (m3/s)	
	1996	2001
Upper Rhine	15.000	16.000
Waal	9.530	10.165
IJssel	2.305	2.459
Lower Rhine/Lek	3.165	3.376
Meuse	3.650	3.800

Adjusted targets compared to Introductory Memorandum
A number of changes were made in the targets after the publication of the Introductory Memorandum. These changes have led to the assessment levels being revised and consequently to the targets for the PKB also being altered. For most stretches of river, the differences compared to the targets in the introductory memorandum only amount to a few centimetres. In some places, however, they are greater than this; ranging from a decrease of almost 5 cm along the Sallandse IJssel to an increase of almost 10 cm in the IJssel delta and the downstream section of the Waal.

Map B shows the adjusted targets that form the basis for the measures in the PKB. The target in centimetres is significantly greater along long stretches of the IJssel than that for the Waal and the Lower Rhine/Lek. This is because the IJssel not only has to deal with some of the water from the Rhine but also with a relatively large quantity of water from other tributaries and canals that run into it ("lateral inflow").

Current projects that contribute to flood projection
A number of measures that have already been carried out or are being prepared – including for nature development, whether or not combined with recreation – do not form part of the short-term measures (as included in the appendix to this PKB) but do contribute to the targets. Most of these measures are financed from the budget for "NURG" (i.e. Further Development of the Rivers Regions [Nadere Uitwerking Rivierengebied]). The Hondsbroeksche Pleij project and the Zuiderklip project (partly) are being financed from the budget for this PKB.

The contribution that these "current projects" make to the targets has been deducted from the target to be achieved by the measures in this PKB. This means that these measures are necessary to achieve the flood protection objectives of this PKB. The Government will ensure that current projects that contribute to achieving the flood protection objectives are completed in good time – i.e. before the end of 2015 – and that they do in fact produce the agreed reduction in representative high water levels. Table 3.2 and Map C show the projects concerned.

Map B: Short-term target

Table 3.2 Current (1 January 2005) national projects required to achieve the short-term targets

Project	River	Financing	Code	Contribution (minimum) to target (in cm)
Washland excavation Rijnwaarden washlands nature	Upper Rhine	NURG	W03+W04 +R01+R02_1L	11
Washland excavation Millingerwaard nature	Waal	NURG	W06_1L	6 [1]
Washland excavation Bemmel floodplain nature	Waal	NURG	W10_1L	5
Washland excavation Afferden and Deest floodplain nature	Waal	NURG	W20_1L	6
Nature development project Noordwaard	Lower reaches of rivers	NURG	MW46	17
Zuiderklip nature	Lower reaches of rivers	PKB RvdR (partly)	M45	2
Washland excavation Renkum lower floodplain and Wageningen lower floodplain nature and ferry slipway Lexkesveer	Lower Rhine	NURG	R16+R19_1L and 5000	18
Dyke relocation Hondsbroekse Pleij nature	IJssel	PKB RvdR	20501+20503	46
Washland excavation Welsum floodplain and Fortmond floodplain nature	IJssel	NURG	Y40_1L & Y41_1L	6-8
Obstacle removal abutment of Zwolle railway bridge	IJssel	Hanzelijn	11001	6

[1] This 6 cm figure includes relocating De Beijer. The Basic Package of Measures includes extra excavation of the Millingerwaard. The total target is 9 cm.

Map C: Current projects that contribute to achieving flood protection targets

4

Improvements in spatial quality

4.1 Introduction

Reorganising the existing area on the river side of the dykes or transforming the present areas on the landward side requires that consideration be given to coordination with other types of usage from the point of view of spatial planning. In certain situations, new types of usage are required in order to achieve an effective balance between existing interests and new possibilities.

Measures to create greater room for the rivers will also make it possible to retain or reinforce ecological, landscape, recreational, and heritage features. Such measures, with alterations in the situation on the river side of the dykes, can also ensure long-term prospects for land-based agriculture. The choice of flood protection measures must therefore link up as much as possible with a spatial strategy of maintenance, adaptation, and renovation.

The selection and design of measures to create more room for the rivers must also be linked to desired urban development. Enlarging the river bed near conurbations can bring about a renewal of the waterside frontage or develop recreational areas.

The measures that the Government intends implementing by 2015, and any further measures implemented in the light of higher representative discharge levels, will have a major impact on the Rivers Region, both locally and regionally. Given the value placed on the Rivers Region and the qualities it has, the selection of measures has in part been based on a coherent overall approach to the desired development of the Rivers Region. This approach serves as the frame of reference for the concrete decisions that the Government needs to make regarding flood protection and spatial quality, within the constraints of time and money.

4.2 Impact of National Policy Document on Spatial Planning [Nota Ruimte] in this PKB

Spatial quality

Spatial quality can be expressed in the concepts of utilisation value, "perception value", and future value. An area has a high utilisation value if it can be safely used for a variety of different functions that do not interfere with one another, that reinforce one another as far as possible, and that are accessible to all population groups and classes. The perception value of an area plays a major role as regards people's living environment. It involves such things as cultural awareness and diversity, a human scale, the presence of characteristic features (identity), and the visible presence of heritage elements and beauty. Spatial variety is also important in this connection. Future value has to do with such features as sustainability, biodiversity, robustness, adaptability, and flexibility over time, both as regards new types of use and openness to new cultural and economic values. The actual way in which the criteria for spatial quality will be effectuated will be determined in consultation with the parties concerned. These criteria may be substantive, process-driven or financial.

The Government has taken the National Policy Document on Spatial Planning [Nota Ruimte] as the basis for improving spatial quality in the Netherlands. The region of the major rivers is an important component in the National Spatial Planning Network [*Ruimtelijke Hoofdstructuur*]. This region is of international importance, economically, ecologically and from the perspective of the landscape.

The National Policy Document on Spatial Planning sets out the following objectives for this region:

- increasing the spatial diversity between the distributaries;
- maintaining and reinforcing the open character of the region, with its characteristic frontages along the water;
- maintaining and developing the landscape, ecological, geographical and heritage features, and improving the quality of the environment;
- improving options for use of the main waterways for commercial shipping and pleasure cruising.

In this PKB, the Government has in part based its choice of measures to create more room for the rivers on the contribution that they can make locally and/or regionally to maintaining or improving spatial quality. Other national projects and objectives will also contribute to achieving the objectives that the Government has formulated for the Rivers Region.

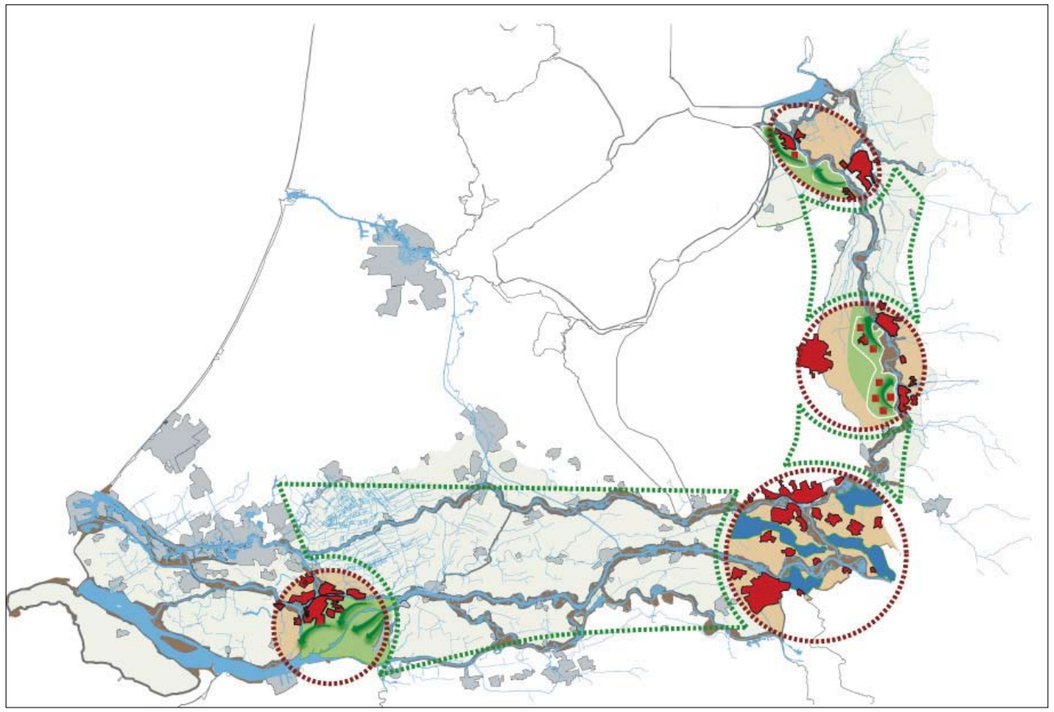
As the initiator, the Government is responsible for an integrated approach to flood protection and spatial quality. Selection and implementation of the measures will lead in many cases to maintaining and improving quality. However, the approach in areas where alterations or innovation are necessary also creates opportunities to link up with spatial planning and initiatives in the region. In these situations, there is also a demanding role and responsibility for other authorities (provinces, municipalities and water authorities), market parties, civil-society organisations and private individuals.

National Spatial Planning Framework

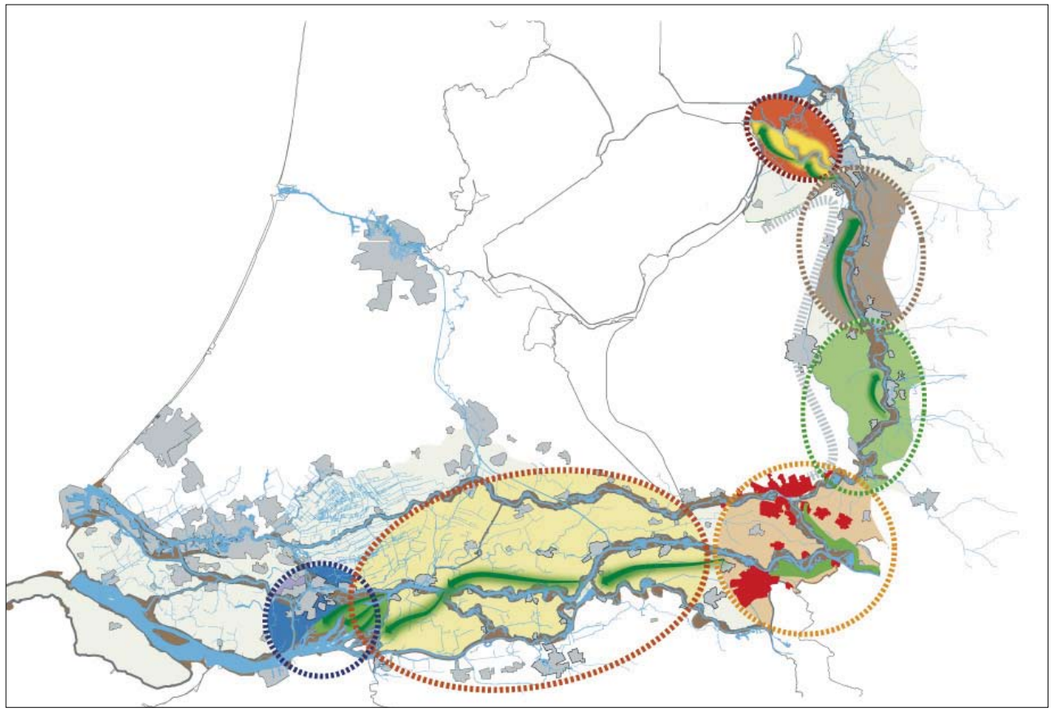
National policy in the context of this PKB has been used to develop the National Spatial Planning Framework [*Nationaal Ruimtelijk Kader*], which sets out the direction of spatial planning for various parts of the Rivers Region, together with the associated core tasks. The National Spatial Planning Framework views the Rivers Region from the point of view of the National Spatial Planning Network. Each of the various river stretches has its own specific core qualities.

Scenarios for the future

A number of different scenarios have been drawn up with a view to incorporating national objectives into a long-term overall approach. Each scenario presents a possible direction that development may take. The Government favours combining elements of the various different scenarios. Opportunities for combining urban development with the development of robust nature conservation core areas and opportunities for recreation exist close to the conurbations in the area where the various distributaries of the Rhine diverge at the Arnhem-Nijmegen conurbation, along the stretch from Zutphen to Deventer, along the Lower IJssel, and in the lower reaches of the rivers. Measures including urban high-water channels and water retention areas can be incorporated in these locations. In the west of the country, developments in the Biesbosch wetland area will reinforce the function of this area as a green buffer between the urban networks of Randstad Holland and Brabantstad. The other parts of the Rivers Region have been designated as "widened river ribbons". Development here will focus on increasing the size of the river's winter bed by relocating dykes, directly adjacent to the existing riverbed.



Impression of future scenario 1



Impression of future scenario 2

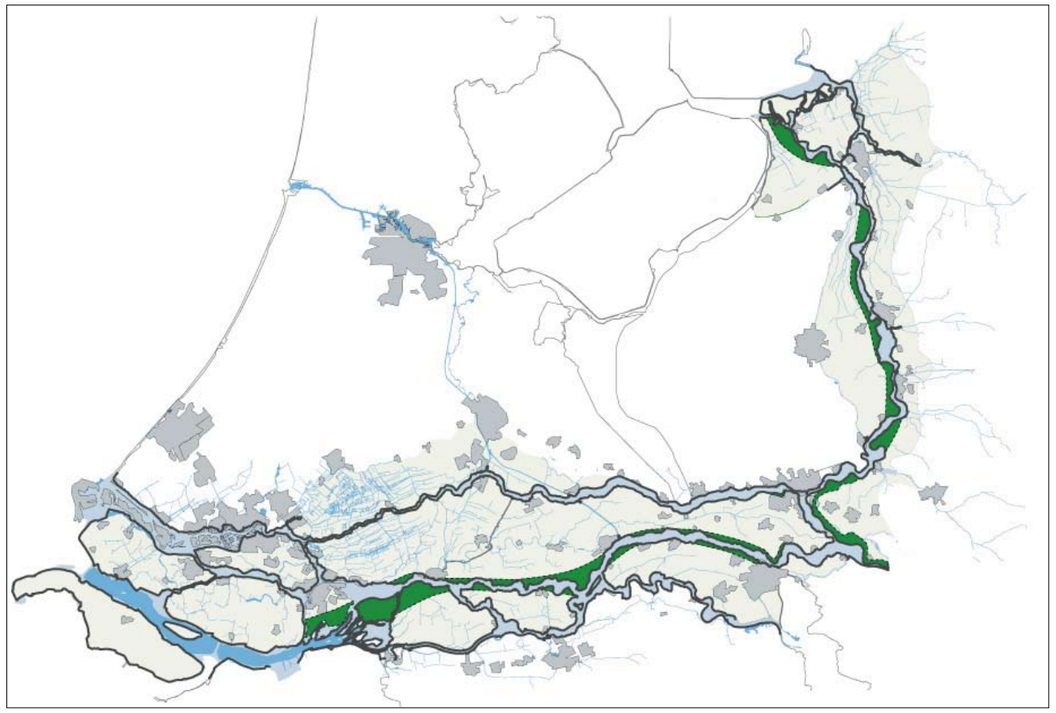
The Government has decided against constructing large high-water channels through the deep basin areas and open polders in the central Rivers Region. This is because such high-water channels would pass through deep basins and would need to be enclosed by extremely high dykes, thus splitting the dyke ring areas in two. This would create smaller new dyke ring areas, which would fill with water relatively quickly in the event of flooding. The new dykes would also need to be constructed in what is a flat, open landscape, thereby damaging that characteristic openness. If such new dykes were to be constructed, most of the high-water channels would cut across some of the main infrastructure elements. For these same reasons, the high-water channels for "retaining rivers" (i.e. river by passes or floodways) presented by the State Forest Service [*Staatsbosbeheer*] in its Lonkend Rivierenland report have not been included in the package of measures.

Future scenario 1: "Pearls on a necklace"

This scenario emphasises the link between the use of the area currently on the landward side of the dykes for discharging or retaining water during periods of high water and urban development. The main measures are retention of water in the area where the various distributaries of the Rhine diverge at the Arnhem-Nijmegen conurbation and "short" high-water channels near cities. This scenario offers opportunities for concentrated development around the cities, combined with nature development and recreation.

Future scenario 2: "Old and new river courses"
This scenario emphasises new structures for using the space on the landward side of the dykes in the basin areas and river valleys in rural areas for discharging water. Two variants have been developed, one for along the IJssel and the other for along the Waal. The main measure is excavation of the high-water channel, which will be possible in a number of places. This scenario offers opportunities for development in the longer term of large-scale new functions parallel to the river, particularly on the landward side of the dykes. The high-water channels along the IJssel can contribute to the ecological link between the IJssel and higher ground, while along the Waal allowing nature to develop in the high-water channels can improve the relationship between the core nature areas of Ooijpolder/Rijnstrangen, Fort Sint Andries, and the Biesbosch wetland area. Current land use can continue, but this will not provide any opportunities for new functions.

Future scenario 3: "The widened river ribbon"
This scenario emphasises the economical use of space through optimum utilisation of the land currently on the river side of the dykes and finding new space as close as possible to the river. The main measures involved are reducing the level of the washlands and relocating the dykes. This scenario offers opportunities for new functions throughout the whole area, particularly for nature development. The primary approach will involve lowering and widening the washlands, especially along the Waal, with it being possible and necessary to combine the measures with nature development. Agriculture will no longer be possible after the level of the washlands has been lowered. Relocating the dykes in a large number of places will further increase these opportunities because it will greatly increase the area on the river side of the dykes.



Impression of future scenario 3

Regional Spatial Planning Framework

To further clarify the objective of spatial quality, a process has been pursued – in combination with the combined future scenario – involving drawing up the Regional Spatial Planning Framework [Regionaal Ruimtelijk Kader].

The Regional Spatial Planning Framework has been created by combining information at regional level with information at national and local level. Efforts will be made to specify opportunities and development tracks for desirable use of land and functions to be applied in the Rivers Region.

The Regional Spatial Planning Framework will help understand the current spatial features of the area, the combination of functions with the need for flood protection, future options for multiple use of space, and the desired direction of development for an area. It provides the basis for development strategies for maintenance, adaptation and renewal for each component section and indicates where there are opportunities for linking up with spatial developments. Where preserving important features is concerned, it is better to look to measures in another component section. Where renewal is involved, maximum use must be made of opportunities for linking up with possible and desirable spatial developments. A target date of 2050 has been selected for the Regional Spatial Planning Framework. That framework therefore offers a development perspective for selecting measures. The main lines of this spatial framework will be dealt with in greater detail when the various different distributaries are described in Sections 7 to 11.

Spatial quality in the design and implementation phase
Based on an integrated approach to flood protection and spatial quality, the PKB offers a strategic choice of measures in the form of a selection according to the type of measure and the location. This strategic choice is for measures that will be implemented by no later than 2015 and for measures on the landward side of the dykes for which space will be reserved.

Once the measures have been selected, they will be worked out in detail within the applicable conditions as regards time and money. A number of different implementation variants will be explored and considered during the planning study phase, during which the parties concerned will produce a concrete, cohesive, shared approach to achieving the flood protection and quality objective. Retention and/or improvement of spatial quality will be determined during this phase. Whether the assumed potential can be utilised will become clear in the follow-up to this PKB.

5

Strategic policy decisions

Before specifying how concrete measures can be deployed to deal with the expected river discharge levels in both the long and the short term, the Government has made a number of policy decisions at strategic level. These will shape the choice of measures according to a number of main lines.

Initial step towards a robust river system
The package of measures for the short tem (up to 2015) must remain effective in the longer term and must not constitute an impediment to measures that may prove to be necessary at a later date. The make-up of the package of measures should be seen as an initial step towards a more extensive and robust river system, one intended to make follow-up measures possible in the event of further increases in representative discharge levels.

Uncertainty as to future discharge levels
In drawing up the package of measures to be implemented up to 2015, the Government has assumed that climate change may lead to increased river discharge levels for the rest of the century. Due to the uncertainty surrounding climate trends and the response to these in other countries, it is not currently possible to determine to what extent and at what pace measures will be necessary after 2015 (see also Section 3.2).

Limits to the discharge via the River Lek
The options for creating more room for the rivers and the consequences of doing so differ according to the distributary concerned. In the case of the Lek in particular, the dykes are located close to the river and there are either no washlands or only a very narrow strip. This means that providing more room for the river by lowering the level of the washlands is virtually impossible. If the summer bed is deepened along the Lek, the stability of the dykes may need to the improved along certain stretches of the river. Reinforcing the dykes along the Lek is not an impossible task, but it does demand sophisticated solutions. Along long stretches, there are buildings right up to the dykes, and the dykes are also located in an area with a soft peat subsoil.

Compared to the Waal and the IJssel, measures along the Lek will cause major problems mainly in the longer term. A decision has therefore been made that any extra discharge above the level of 16,000 m³/s should be discharged via the Waal and the IJssel. This means that after 2015, the Lower Rhine/Lek will not be required to deal with any extra water. This will be achieved by constructing a control system at Hondsbroekse Pleij.

Map D shows the indicative targets for the longer term that form the basis for the measures in the PKB. These include restricting the amount of discharge via the Lower Rhine/Lek.

Distribution of discharge via the Waal, Lower Rhine/Lek and IJssel
The percentage discharge distribution between the various different distributaries of the Rhine at a representative discharge of 15,000 m³/s will also be maintained for the representative discharge of 16,000 m³/s that was determined in 2001. The package of measures takes account of this. Given that the Lek (and therefore also the Lower Rhine) will not be affected in the longer term, the extra discharge above 16,000 m³/s will need to be distributed via the Waal and the IJssel. This will take place according to the current ratio of discharge between the Waal and the IJssel.

Retention
Retention measures will not be applied in the short term. There is currently insufficient support for doing so. The Government's view – in line with the position that the relevant local and regional authorities set out in their Regional Advisory Report [Regioadvies] – is that enough other kinds of measures are available to achieve the same level of flood protection. Assuming implementation of the indicative package of measures for a discharge level of 18,000 m³/s, as described in Section 6, it will be unavoidably

Map D: Indicative long-term target, with revised discharge distribution

necessary to make use of retention. For the moment, however, retention is considered to be the final stage in measures for the longer term.

Contribution made by the area on the river side of the dykes to river discharge
The basic assumption underlying measures to be implemented in the current area on the river side of the dykes is that they should not have too great an effect on the landscape, nature and heritage features of that area. Providing more room for the rivers by excavating the winter bed is therefore subject to a maximum. Calculations have shown what proportion of the representative discharge can be dealt with in the longer term based on this assumption for the area on the river side of the dykes.

Compared to a representative discharge level of 15,000 m³/s at Lobith – the level for which the dykes along the various distributaries of the Rhine are currently calculated – an extra 3000 m³/s will need to be dealt with in the longer term. It is estimated that 1400 m³/s of this can be discharged via the area on the river side of the dykes, with 1000 m³/s going via the Waal, 200 m³/s via the Lower Rhine/Lek, and 200 m³/s via the IJssel). Locally, however, there may be more space available than required for these figures, particularly along the Deventer–Veessen stretch.

Balance between preservation and development
The necessary level of flood protection will be achieved as far as possible by implementing spatial planning measures to reduce water levels in times of representative river discharge. It has been decided that maximum use should be made of the areas currently on the river side of the dykes. This means that – to the extent allowed by the basic preconditions of nature, landscape, and heritage – measures will be implemented such as lowering the level of the washlands and the height of the groynes and removing various structures. In addition to measures on the river side of the dykes, measures on the landward side will also be taken with a view to the short term. Both the river side and landward side solutions involve tension between preserving existing features and developing new core qualities in the area concerned. This can produce a conflict, for example, between preservation of heritage elements or structures and nature development if the level of washlands is reduced. It may also affect the wish to preserve the agricultural function and the development of recreational facilities or residential areas. The Government assumes that opportunities will be utilised to combine the flood protection objective with developments regarding nature, recreation, and urban development, but also active soil management and extraction of minerals. In the case of heritage features, the basis will be the "Belvedere" policy of "Conservation through development".

Anticipating future developments
The Government intends implementing a number of measures in the short term that make a greater local contribution to flood protection than is required by the currently applicable standard. These fit in with the desired package of measures for the longer term. This decision also involves the consideration that developments in spatial planning, such as building homes, can later be a serious obstacle to implementing such measures. The Government also intends preventing successive measures being necessary in a single area. It may also be relevant that such a measure makes a major contribution to improving spatial quality. The Government is, however, bound by the available funds for such future-oriented investment.

Birds and Habitats Directives
A Strategic Framework for the Birds and Habitats Directives has been drawn up in the context of the Room for Rivers PKB. This explores the Natura 2000 features that are relevant to the Rivers Region, together with how flood protection and nature can be combined. Virtually all the area on the river side of the dykes along the various the Rhine distributaries and the lower reaches of the rivers has been designated as a Special Protected Zone in the context of the Birds Directive. A number of areas have also been registered as Special Protected Zones in the context of the Habitats Directive. This means that the Netherlands has taken on the obligation to preserve or restore a situation that is favourable for the species and habitat types concerned. Providing more room for the rivers on the river side of the dykes can in many cases be combined with nature development, but the existing features also need to be taken into account. A number of areas, for example, have been given a "hands off" status, meaning that no excavation is permitted there. The washlands are also important as a feeding area for geese, swans, and waterfowl, a function that must be retained. Drafting the Room for Rivers PKB has already taken account of the existing features. In the long term also, some of the extra discharge will take place in the area on the river side of the dykes. All this means that flood protection measures can be implemented but that they will be required to comply with a number of conditions. This is an important consideration for further action.

On the landward side of the dykes, there are only a few areas where the Birds or Habitats Directives apply. These are the Rijnstrangen and Biesbosch wetland areas and a few areas close to the latter, for example the Steurgat and the Zuiderklip. It is expected that it will be possible to create more room for the rivers if the existing features are taken into account. Measures such as dyke relocation can in fact be highly advantageous from the point of view of the development of Natura 2000 features.

After PKB Part 1 was published, the 1998 Nature Conservation Act [Natuurbeschermingswet 1998] came into force on 1 October 2005. Amongst other things, this legislation provides for the protection of Natura 2000 areas.

Projects currently underway
The Government has decided that a number of measures that are currently being prepared – including with a view to nature development, whether or not combined with recreation – should form part of the solution as regards the short-term targets, even though they are not included in the Basic Package of Measures for this PKB.

6

Desired long-term measures and approach up to 2015

6.1 Desired long-term measures

Introduction
The package of measures that the Dutch Government intends implementing in the period up to 2015 needs to fit in with a long-term perspective and is a means of ensuring a robust river system in the future. The overall approach to the necessary long-term measures constitutes the assessment framework for the Basic Package of Measures in the short term. Section 6.2 of the PKB and the appendix describe the short-term measures (i.e. the Basic Package of Measures). Sections 7 to 11 of this Explanatory Memorandum describe in greater detail the measures decided on for each distributary.

It is important to know what measures might be necessary in the more distant future. Long-term measures may make short-term measures superfluous. It may be advisable for a measure to be implemented more thoroughly so as to avoid having to take action more than once at the same location. Finally, there are locations where spatial development will make future measures impossible or extremely expensive.

The end of the twenty-first century has been taken as the time horizon for long-term developments. The long-term approach focuses on opportunities for preservation and development in the Rivers Region. Bearing in mind the river discharge levels and rise in sea level that must be allowed for, this has been worked out in detail in a package of desired measures that will provide a solution as regards the indicative targets for the longer term. Meeting the long-term flood protection challenge will require measures to be implemented on both the river and landward sides of the dyke.

The measures for the area on the river side of the dykes have been specified in general terms, complying with the strategic policy decision on "Contribution made by the area on the river side of the dykes to river discharge" as described in Section 5. In order to make possible this extra discharge through the area on the river side of the dykes, it will be necessary to lower the level of the washlands by an average of between 1.5 and 2 metres, as well as to remove obstacles and reduce the height of the groynes. Along many stretches, reducing the level of the washlands will mean that agriculture in its current form will no longer be possible. In many places, reducing the level of the washlands will be carried out by excavating side channels.

It is not necessary to specify the measures for the river side of the dykes in detail at this stage. The Policy Guideline on Major Rivers (previously the Policy Guideline on Room for Rivers) offers sufficient protection against undesirable development in all areas on the river side of the dykes. This Policy Guideline does not, however, apply to the area on the landward side of the dykes. Protecting the areas concerned against undesirable development will require land to be reserved for the measures that will be required in the longer term. The long-term measures on the landward side of the dykes are therefore specified in this PKB. This PKB assumes that dyke reinforcement will only take place as a final measure, in other words if no suitable measures for creating more room for the rivers are possible. The financial constraints mean that in certain areas the total package of necessary measures will need to be made up of measures that are cost-effective. Reducing the height of groynes will be possible along the Waal, for example, with deepening of the summer bed taking place in the lower reaches of the rivers and in the IJssel delta.

The main lines of the desired long-term measures are described below for each distributary and summarised in Table 6.1.

Upper Rhine/Waal
If one takes the strategic policy decision on the contribution made by the area on the river side of the dykes as the basis, then a discharge of 18,000 m³/s at Lobith will require at least one water retention area if spatial measures are to meet the long-term target. The Regional Spatial Framework designates the Rijnstrangen area as the most promising of the potential retention areas. There is relatively little in the way of housing in this area and suitable contours are already present to a large extent. Using the Rijnstrangen as a retention area will lead to effective reduction of extreme water levels in the Waal, the various distributaries of the Merwede, and the IJssel. For the moment, the Government sees this retention as a final measure. The other potential retention areas that can affect the extreme water levels in the Waal and the various distributaries of the Merwede have a number of major disadvantages, for example the need to enclose certain built-up areas in such areas within their own protective dykes.

Along the Waal, as much new space as possible will be created on the river side of the dykes, as far as the landscape, nature and heritage features allow. Obstacles will be removed and the level of the washlands lowered to the maximum extent possible. This will make it possible to avoid affecting the ribbons of dykes that stretch along the Waal and that are important from the landscape point of view. Reducing the height of groynes will be unavoidable here for reasons of cost-effectiveness that affect the whole package of measures. But meeting the long-term targets will not be possible solely by means of measures on the river side of the dykes. In a few places, it will be necessary to relocate the dykes, namely at Lent, Heesselt and Brakel. In these locations, there are no spatial alternatives on the river side of the dykes that can deal fully with the river management challenge. The same applies to the stretch between Nijmegen and Dodewaard. The various different dyke relocation measures can be expected to have negative effects, for example on a country estate on the northern edge of Loenen and on the heritage features just to the south of Beuningen. A decision has been made to reserve an area of land on the north side. Besides reserving land at Loenen with a view to possibly relocating the dyke further away from the river, an area has also been reserved for the same purpose at Slijk-Ewijk in response to a request from the region. This means that more land has been reserved along this section of the Waal than is actually necessary.

Merwede
In order not to affect the sensitive urban area in the west of the country (Rijnmond – i.e. the Rotterdam region – and the seven municipalities making up the "Drecht Towns") where cost-effective spatial solutions are not available, the strategy will focus on discharging as much water as possible down to the mouth of the Amer. This will be achieved by means of a number of measures around the Biesbosch wetland area and around Gorinchem. The strategy referred to will focus on returning reclaimed land to the river ("de-poldering") in the agricultural area of Noordwaard. At Gorinchem, a series of measures will be necessary to remove the bottleneck there. These will include excavating the washlands at the Avelingen industrial estate; making it possible for water to flow past the southern bridge abutment of the A27; and a number of excavations of the washlands on the river side of the dykes. In the Biesbosch wetland area, a number of measures will be combined with nature development; these will be implemented in the area currently on the river side of the dykes. One spatial planning alternative for this package of measures is the extremely radical high-water channel through the area known as the "Land van Heusden en Altena". This does not form part of the Regional Spatial Planning Framework and has little support in the region.

Bergsche Maas/Amer
Along the Bergsche Maas (i.e. the canalised lower stretch of the River Meuse), the Overdiep polder will come to be located on the river side of the dykes. This measure will be combined with broadening and deepening the summer bed of the river. It will also be necessary to relocate the dyke at Drongelen. The latter measure does not fit in well with the Regional Spatial Planning Framework, but no effective spatial alternatives are available. The decision on what measures will in future be needed along the Bergsche Maas is in part dependent on the measures implemented along the upstream stretch of the Meuse. More far-reaching coordination will be necessary.

Lower Rhine/Lek
Spatial planning measures along the Lower Rhine will have unacceptable effects on the existing valuable landscapes there. There is little space for such measures along the Lek, and they would also involve technical complications. Along the Lower Rhine/Lek, only those measures will be implemented that are necessary to process a proportionate quantity of the water discharged in the Rhine of 16,000 m³/s at Lobith.

IJssel
Where the IJssel is concerned, there are enough options on the stretch from Westervoort to Doesburg for lowering the level of the washlands. This will be preferable to relocating the dyke at Lathum, which would be a low-quality option where spatial quality is concerned.

A decision has been taken to implement dyke relocation further downstream (Voorster Klei and Cortenoever), because this can be fitted in effectively in this area. These measures are preferred to reducing washland levels because of the heritage, landscape, and nature features in a large number of places.

High-water channels are foreseen at Zutphen and Deventer. From the spatial planning point of view, these can be combined effectively with urban development and

Table 6.1 Desired long-term measures on the landward side of the dykes

Name of measure	Code	Included in Basic Package of Measures PKB
Upper Rhine/Waal		
Retention Rijnstrangen	90001k_hl	
Dyke relocation Lent	50009a	x
Dyke relocation Oosterhout – Slijk Ewijk		
Dyke relocation Loenen	20203a	
Dyke relocation Heesselt	30212a	
Dyke relocation Brakel lower floodplains	W45_dvl	
Dyke relocation outer polder Munnikenland	W45-W48_4	x
Merwede		
De-poldering Noordwaard (flowing with river)	MW18_1	x
Bergsche Maas/Amer		
De-poldering Overdiep Polder (flowing with the river)	M31	x
Dyke relocation Drongelen	M27	
Rhine-Meuse estuary		
Retention in Volkerak/Zoommeer	M40/3	x
IJssel		
Washlands (not specified in detail)		
Dyke relocation Cortenoever	50007c	x
High-water channel Zutphen	Bypass-zut-kort	
Dyke relocation Voorster Klei	20505d	x
High-water channel Deventer	Bypass-dev-lang	
High-water channel Veessen-Wapenveld	50006c	x
Dyke relocation Westenholte	20509d	x
High-water channel Kampen	40503hl	
Dyke relocation Noorddiep	40501a	

recreation. There are no spatial planning alternatives to these measures as regards the target associated with a discharge level of 18,000 m³/s. The high-water channel through the rural area at Veessen-Wapenveld is also included in the package of measures. This is preferable to alternative solutions that have been considered, for example relocating the dykes at Herxen and Marlerwaarden, alternatives that are less desirable as regards spatial quality and that would also affect a significantly greater number of homes. In the IJssel delta, the high-water channel at Kampen and the Westenholte (Zwolle) and Noorddiep (Kampen) dyke relocations form part of the package of measures. No spatial alternatives are available for these measures if one assumes the discharge level associated with the target (i.e. 18,000 m³/s).

Dyke reinforcement in the lower reaches of the rivers
In the longer term, the expected rise in sea level will have an effect in the lower reaches of the rivers. Broadly speaking, the areas involved will be those downstream of Gorinchem/Brakel along the Waal and Hagestein along the Lek. As a result of this influence, a certain amount of dyke reinforcement will be necessary in the long term along the Lek, amounting to 10 or 20 cm; this will be in addition to the target for the short term. Additional areas of dyke reinforcement will also be necessary, mainly along the Nieuwe Maas and the Oude Maas, the Merwede, the Hollandsch Diep and Haringvliet, and along the IJssel downstream of Kampen.

Retention of water in the Volkerak/Zoommeer
The flood defences on the seaward side will be closed when water levels are high. Storing the water from the Haringvliet/Hollandsch Diep in the Volkerak-Zoommeer can prevent the level of the river water rising too high behind the flood defences in the Rhine/Meuse estuary area.

Management of storm surge barriers
In the longer term, changes may be necessary in the management of the Maeslantkering barrier, the Hartelkering barrier and/or the Haringvliet sluices in connection with the necessary dyke reinforcement work behind these barriers.

Dyke reinforcement work is unavoidable in the Rhine/Meuse estuary area due to the rise in sea level in the longer term. A different management approach will have a positive effect on the schedule and extent of this work.

6.2 Approach up to 2015 (Basic Package of Measures)

A Basic Package of Measures to be implemented up to 2015 has been drawn up on the basis of the package of desired long-term measures. The options are restricted not only by the available budget and the required implementation by 2015 but also, for example, by the quantity of earth that needs to be moved in relation to the feasibility of carrying out the work within the set time. Taking the target for flood protection (a minimum of 16,000 m³/s) as the underlying principle, the Basic Package of Measures combines the aims for spatial quality (as set out in the Regional Spatial Planning Framework) with the budgetary framework. This means that decisions have been made and various factors emphasised within the overall approach to the desired spatial developments.

The long-term overall approach and information regarding the basic alternatives and modules taken from the EIS played a role in drawing up the Basic Package of Measures. The Government also took account of the recommendations made by local and regional authorities regarding the measures that should be preferred.

Hardly any cost-effective solutions are possible along the Lower Rhine/Lek or the IJssel without reinforcing the dykes. The situation for the other distributaries is different. In the case of the Meuse, the various distributaries of the Merwede, and the IJssel delta, the cheapest solution is to deepen the summer bed. This measure is less desirable, however. The Waal is the distributary where a technically feasible and relatively cheap solution – reducing the height of the groynes – is the most suitable possible measure. From the point of view of feasibility, it would not be wise to decide on large-scale excavation of washlands rather than reduce the height of the groynes.

On a few stretches, the dykes are already high and strong enough to hold back the representative high-water discharge levels that were determined in 2001. At those locations, no measures will be implemented. In addition, there are a number of current projects that contribute to the flood protection target for 2015 but that do not form part of this PKB. Different budgets are available for these projects.

Amongst other information, the appendix to the PKB indicates the hydraulic target (i.e. the reduction in water level to be achieved) that will apply to the various different measures when determining the measures after the PKB procedure. This target for each measure is such that all the measures taken together – including the current projects – can achieve the target for the PKB.

Land has been reserved for those measures on the landward side of the dykes that form part of the desired package for the long term but not of the Basic Package of Measures.

The following sections (7 to 11) describe the measures selected for each distributary; they also give an outline of the design for each measure that this PKB is based on. That design will be worked out in greater detail after the PKB procedure. Although alterations may still be made, it will not be possible to simply abandon the basic principles because doing so would directly affect the contribution made to the targets.

6.3 Programmatic approach

The Government has decided on a programmatic approach in this PKB. By doing so, it has created scope for flexibility alongside the Basic Package of Measures. This already expresses itself in this PKB through the fact that for a number of locations it will be possible to choose between measures contained in the Basic Package of Measures and alternatives. Supplementary measures can also be added.

In order to enable regional initiatives to link up with this PKB, the regions have also expressed a preference for the PKB adopting a programmatic approach. The Government endorses this, considering that scope needs to exist for measures other than those indicated in this PKB, or for new insights or technology that can achieve the objectives more effectively, or because the measures involved are preferable for other reasons. Improving spatial quality and/or cost effectiveness are important criteria in this regard. It will also be possible, with a view to future developments, to make use of new opportunities within the PKB. Section 13 explains the programmatic approach in greater detail, together with the applicable criteria.

6.4 Reserving land

Short term
The necessary land has been reserved to make it possible to implement measures in the short term. Existing rights, for example to build, will remain in force. The areas concerned will be kept free of development that might make flood protection measures difficult to implement. In the light of this government policy, regional authorities have been requested not to assign any new rights that run contrary to this system of reservation.

Table 6.2 Locations to be reserved for the long term

Distributary	Locations to be reserved
Upper Rhine/Waal	Rijnstrangen (retention) Dyke relocation Oosterhout – Slijk Ewijk Dyke relocation Loenen Dyke relocation Heesselt Dyke relocation Brakel Lower floodplains
Maas/Amer	Dyke relocation Drongelen
IJssel	Dyke relocation Drongelen High-water channel Deventer High-water channel Zutphen High-water channel Kampen Dyke relocation Noorddiep

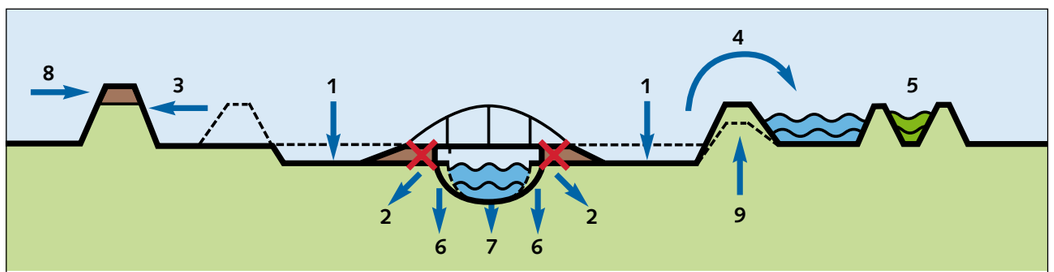
Long term

One important effect of drawing up a long-term approach accompanied by an indicative package of measures is that it makes clear which locations on the landward side of the dykes need to remain available in order to meet long-term targets. For most of the measures making up the package there are no suitable alternatives. For some of them, such alternatives do exist but they are less effective as regards improving spatial quality. Given that pressure on the Rivers Region is increasing, particularly due to urbanisation, it is important to protect these locations against large-scale and/or capital-intensive development that would seriously impede the implementation of measures to provide more room for the country's rivers.

This is why the areas required for flood protection measures in the longer term have been reserved in the PKB; doing so will make it possible to take a decision – as and when necessary – on the measures that need to be implemented. In these areas too, existing rights will remain in force but in the light of the Government policy set out in this PKB regional authorities have been requested not to assign any new rights that run contrary to this system of reservation.

A number of measures forming part of the indicative package for the longer term have for various reasons being included in the Basic Package of Measures in the short term. For the remaining measures on the landward side of the dykes (i.e. those measures in the long term package that cannot be brought forward), an area will be reserved that will be protected against large-scale or capital-intensive development. The locations concerned are those where long-term measures are foreseen as included in Table 6.2.

The project areas envisaged for the alternative measures will for the present be reserved for the longer term. The areas concerned are those for the high-water channels at Zutphen and Kampen. If it is decided that these measures should be included in the Basic Package of Measures, the system of long-term reservation will be changed to one of short-term reservation. If it is decided that the high-water channel at Zutphen should be included in the Basic Package of Measures, reservation of the areas at Voorster Klei and Cortenoever where dyke relocation is envisaged will be changed from short term to long-term reservation.The maps show the project areas where land has been reserved for high-water channels; these are the areas which our current understanding suggests are the most suitable for the measures required. The point is to ensure that there will remain sufficient space for the high-water channel despite the urban development that can be expected to take place. Insights regarding the best way of dealing with the areas surrounding the high-water channels will still need to be made specific. If a decision is taken that a high-water channel should be included in the Basic Package of Measures, then reservation of the necessary land in the PKB will only need to affect the regional or zoning plan where that particular area of land is concerned. This can be done if the Minister of Transport and Public Works, in consultation with the Minister of Housing, Spatial Planning and the Environment, considers that there will continue to be sufficient room for a high-water channel in the long term. The Minister will reach his/her decision taking account of the desired urban development.



1 Washland excavation
2 Removal of obstacles
3 Dyke relocation
4 Waterretention and storage
5 High-water channel
6 Height reduction of groynes
7 Deepening of summer bed
8 Excess height of dykes
9 Dyke improvement

7

"KAN" area

7.1 Description of the area

The "KAN" area ("Knooppunt Arnhem-Nijmegen", i.e. the Arnhem-Nijmegen conurbation) is where the various distributaries of the Rhine diverge. It is here that the Upper Rhine splits into the Waal, Lower Rhine/Lek and IJssel. This is a complex area from the point of view of river management, one where major changes to the river system have been made over the course of time, for example construction of the Pannerden Canal.

The distributaries within the KAN area are the Upper Rhine from Lobith, the Waal down as far as Nijmegen, the Pannerden Canal, and the Lower Rhine as far as Arnhem.

In the Lobith area, the push-moraines to the north and south of the river provide clearly visible boundaries. Between Montferland and the Heuvelrug at Nijmegen, the River Rhine enters the Netherlands and thus the province of Gelderland, giving the area its name of "Gelderland Gate" [Gelderse Poort]. The river flows into the country from Germany between the push-moraines in a series of large bends and the area is relatively open and empty. Extensive use is made of the area on the river side of the dykes. Dynamic nature development takes place in the Gelderland Gate area. Further downstream, there is the intensively utilised area where the cities of Nijmegen and Arnhem are gradually growing towards one another. The Waal is primarily a working river, not only because of its busy shipping but also because of the large brickworks in scattered locations along it and the excavation that has taken place in the washlands.

The point at which the river splits into the Lower Rhine and the IJssel is located in the heart of the conurbation around Arnhem. The fact that the north bank of the Rhine is bounded by the Veluwe heathlands means that hardly any dykes are necessary here. In this urban area, the open landscape of the river and its washlands provides a contrast to the buildings of the city. There are a number of extensive core nature areas on the periphery of the urban area: the Huissen washlands along the Pannerden Canal and Meinerswijk to the west of Arnhem along the Lower Rhine. One typical feature of the Pannerden Canal (which is an excavated watercourse) is that it cuts through the natural levee running along the Waal. Until the Second World War, the Rijnstrangen area formed part of the winter bed of the river. In that area, the river's influence is still clearly visible in the routes of earlier dykes and the raised habitation areas ("terps").

7.2 Flood protection

The current system for distributing water between the various distributaries of the Rhine means that of the 1000 m³/s extra discharge at Lobith (i.e. the difference between 15,000 m³/s and 16,000 m³/s) that has been allowed for since 2001, 65% will go via the Waal and 35% via the Pannerden Canal. The amount of water flowing into the Waal will account for the greatest part of the extra discharge in absolute terms, but in relative terms it is equal to that for the IJssel and the Lower Rhine. Because the Upper Rhine and Waal are relatively large rivers, this large proportion of the increased discharge will not require any enormously high target to be dealt with. The short-term target for the KAN area varies from about 5 cm to a maximum of 40 cm. From the point of view of the number of centimetres involved, this area is therefore in the middle bracket as regards targets for the whole of the Rivers Region.

As far as the longer term is concerned (when the representative discharge at Lobith is expected to increase to 18,000 m³/s), the Waal will need to deal with a good 1600 m³/s more water and the Pannerden Canal with approximately 365 m³/s extra. In terms of water levels, this means that there will be an increase unless measures are taken to create more room for the rivers. If one includes the short-term increase, the increase in water levels will be a maximum of 120 cm in the Upper Rhine and between 60 and 100 cm in the Waal as far as Nijmegen and in the Pannerden Canal.

7.3 Improvements in spatial quality

The challenge we are facing is to create more room for the rivers so as to bring about a qualitative improvement in the dynamics of the rivers, in the urbanisation of the KAN area,

and in the natural features of the Gelderland Gate. The area to the east of Nijmegen, with the Rijnstrangen area and the Ooijpolder, is of such high quality that the desirable implementation strategy will be to preserve it and perhaps make certain changes. The Gelderland Gate area must remain an important link in the international migration routes for birds. New river dynamics in the Rijnstrangen area will fit in with the Gelderland Gate and the historic rivers landscape. A well-thought-out design, with a suitable rivers system, can improve the quality of the Rijnstrangen area. Along the Pannerden Canal, the city and the river at Arnhem can be coordinated more effectively with one another. This can be done by linking up urban development and measures implemented at the point where the Lower Rhine and IJssel split, for example by developing nature areas so as to allow them to be used for recreation by city-dwellers, and by means of river-oriented building.

The area around Nijmegen forms an interface zone between the river and the city, a highly dynamic area. It requires a renewal strategy that provides new space for the River Waal. Improving the urban waterfronts, the economic activity associated with the river, and developing dynamic natural features of the river in the washlands will not only preserve the zoning of the river, in combination with the natural levees and basin areas along the Waal, but will also reinforce them. This will involve preserving the open character of the basin areas.

7.4 Overall approach to decisions for the long term

As much new space as possible will be created on the river side of the dykes along the Upper Rhine, Waal and Pannerden Canal, including by excavating washlands (as far as the above considerations allow this to be done). This by itself will not make it possible, however, to fully achieve the long-term target.

The remaining portion of the long-term target will be achieved by means of measures implemented on the landward side of the dykes. The Government has decided that this will involve water retention and dyke relocation. A water retention area will be created in the long term so as to temporarily store part of the discharge surge. In order to make this area as effective as possible in protecting the Rivers Region, it will need to be constructed as far upstream as possible.

The Regional Spatial Framework designates the Rijnstrangen area as the most promising of the potential retention areas. There is relatively little in the way of housing in this area and suitable contours are already present to a large extent. Using the Rijnstrangen as a retention area will lead to effective reduction of assessment levels in the Waal, the various distributaries of the Merwede, and the IJssel. The other potential retention areas that can affect the extreme water levels in the Waal and the various distributaries of the Merwede have a number of major disadvantages, for example the need to enclose various built-up areas in such areas within their own protective dykes. The Rijnstrangen water retention area will not be able to meet the whole target for this area, meaning that dyke relocation will be necessary in the KAN area at Lent (on the opposite side of the river from Nijmegen).

7.5 Short-term measures

The short-term target for the Upper Rhine, Waal, Pannerden Canal, and Lower Rhine is only a restricted one and can be achieved primarily by means of measures implemented in the area on the river side of the dykes.

Upper Rhine and Waal as far as Nijmegen
No measures are necessary in the short term along the Upper Rhine. From Lobith to Pannerdensche Kop, the dykes have sufficient excess height to provide the required level of flood protection.

Excess height of dykes along Upper Rhine
The dykes along the Upper Rhine between Spijk and Millingen aan de Rijn were designed and constructed to hold back higher water levels; this was done on the basis of the higher representative discharge levels calculated at the time. The dykes along the Upper Rhine are therefore high and strong enough to be able to withstand the representative discharge levels as currently calculated; they have sufficient "excess height" to meet the flood protection requirement in the short term. For the present, no measures need to be taken to create more room for the rivers in this area other than the ongoing Rijnwaarden washlands project.

The distribution of discharge at Pannerdensche Kop (where the Waal and the Pannerden Canal split) is not the same as the policy-based distribution; this is the result of autonomous development (erosion) and the increase in representative discharge to 16,000 m³/s. Correct discharge distribution is crucial to achieving the required level of flood protection: every additional 10 m³/sec of water along the IJssel or Lower Rhine, for example, will lead to a 1 cm rise in water level under representative conditions. It is therefore important that the PKB should be a means of implementing measures to correct the distribution of discharge. This will involve an extra washland excavation project at Millingerwaard, reducing the height of the Suikerdam and the Zandberg polder embankment at Gendtsche Waard, and reducing the height of the groynes between Pannerdensche Kop and Nijmegen.

Extra excavation of the washlands at Millingerwaard
The current project at Millingerwaard involves excavating a side channel and reducing the height of the dam giving access to the flood-free area at De Beijer. The height of a number of embankments will also be reduced. This plan will bring about a reduction in water level of 6 cm, which is necessary if the short-term target for this stretch of river is to be achieved. In order to make changes in the discharge distribution at Pannerdensche Kop, the PKB foresees an extra target for Millingerwaard. The total package of measures to be implemented at Millingerwaard is intended to bring about a reduction in water level of 9 cm. One way of achieving this reduction is to reduce the height of the Millingen dam. It is expected, however, that this need not be done and that the reduction in water level can be achieved by means of other measures implemented in the washlands. A means will need to be found of ensuring access to the homes that will be affected and to the flood-free area at Klaverland.

Reduction in height of Suikerdam and Zandberg embankments in the Gendtsche Waard area
The height of the embankments on the upstream side in the Gendtsche Waard area will be reduced. As a result, the water will be more likely to flow into the Gendtsche Waard. The water level reduction that this will bring about in the Waal will mean more water flowing into the Waal at Pannerdensche Kop. The detailed plans will include a means of access to the homes and businesses affected.

Height reduction of groynes
The purpose of groynes is to stabilise the river and to ensure a minimum navigable depth in the waterway. Over the course of time, the height of the groynes has increased, relatively speaking, due to scouring of the navigable channel (the summer bed). The height of the groynes along both sides of the Waal will be reduced. This will make it easier for the water to flow, while at the same time retaining the navigable channel. The average height reduction will be 1 metre. This will mean that the groynes will be visible during periods of low water but submerged when the water level is somewhat higher than normal. The visibility of the beacons marking the groynes will not be affected. The height of the groynes along the upper reaches of the Waal between Pannerdensche Kop and Nijmegen will reduce the water levels in this stretch of the river, meaning that the river will draw in more water. Between Nijmegen and Gorinchem, reducing the height of the groynes will serve to reduce the water level under representative conditions.

Dyke relocation at Lent
Relocation of the dyke is envisaged in one particular location, namely at Lent (on the other side of the Waal from Nijmegen), where the dyke will be relocated further away from the river. The Waal passes through a kind of bottleneck at Nijmegen; this is one of the problem locations in the country's river system.

Parallel to the PKB procedure, a planning study/ Environmental Impact Statement procedure is underway to investigate two alternative solutions for dealing with the Veur-Lent bottleneck: either relocating the dyke further away from the river or excavating the washlands in the short term, combined with preserving land so as to relocate the dyke in the longer term. The Government has decided that the dyke should be relocated in the short term, and this measure has been included in the Basic Package of Measures. This measure will go a long way to solving the problem in both the short term and the long term. Moving the dyke further away from the river will increase the amount of space available between the main dykes and will bring about a sufficient reduction in water level in the short term for the whole series of bends in the Waal between Pannerdensche Kop and Nijmegen. One significant disadvantage of relocating the dyke further away from the river is the effect this will have on the important heritage features that exist here, with it also be necessary to demolish fifty homes. The Government is nevertheless in favour of relocating the dyke because doing so now will make it unnecessary to implement measures in this area a second time. Definitive measures can already be implemented and no doubts will then be raised regarding the feasibility of reserving the area on the landward side of the dyke.

Dijkteruglegging Lent
Relocation of the dyke is envisaged in one particular location, namely at Lent (on the other side of the Waal from Nijmegen), where the dyke will be relocated further away from the river. The Waal passes through a kind of bottleneck at Nijmegen; this is one of the problem locations in the country's river system. Parallel to the PKB procedure, a planning study/Environmental Impact Statement procedure is underway to investigate two alternative solutions for dealing with the Veur-Lent bottleneck: either relocating the dyke further away from the river or excavating the washlands in the short term,

combined with preserving land so as to relocate the dyke in the longer term. The Government has decided that the dyke should be relocated in the short term, and this measure has been included in the Basic Package of Measures. This measure will go a long way to solving the problem in both the short term and the long term. Moving the dyke further away from the river will increase the amount of space available between the main dykes and will bring about a sufficient reduction in water level in the short term for the whole series of bends in the Waal between Pannerdensche Kop and Nijmegen. One significant disadvantage of relocating the dyke further away from the river is the effect this will have on the important heritage features that exist here, with it also be necessary to demolish fifty homes. The Government is nevertheless in favour of relocating the dyke because doing so now will make it unnecessary to implement measures in this area a second time. Definitive measures can already be implemented and no doubts will then be raised regarding the feasibility of reserving the area on the landward side of the dyke.

Pannerden Canal and area around Arnhem

Along the Pannerden Canal, excavation of the washlands has been included in accordance with the private initiative for the Huissen washlands. This project will reduce the water level to a sufficient extent and, if the design is properly thought out, can make a positive contribution to spatial quality. A declaration of intent regarding this washland area has been drawn up between the municipality of Lingewaard and the private party responsible for the initiative. Excavation of the washlands at Huissen will also be necessary in the longer term. Reducing the height of the groynes in the Pannerden Canal has been included in this PKB as a fallback option.

Excavation of washlands at Huissen

A private party has drawn up a plan for the washlands at Huissen. This involves the extraction of minerals and redevelopment of the area. The plan focuses on providing more room for the river and allowing nature to develop, while at the same time taking into account such features as heritage, ecology, recreation, accessibility of industrial areas, and extensive agriculture. A planning study is already underway.

This PKB envisages a solution for the Lower Rhine/Lek downstream of Arnhem that will involve dyke improvement and a number of spatial planning measures. Expectations are that if no measures are taken, there will be an increase in the volume of water discharging into the IJssel compared to the Lower Rhine/Lek due to a wide range of both planned measures and autonomous development.

In order to prevent this happening, creating more room for the river at Meinerswijk is the most obvious measure to implement. This will be a measure of restricted extent that can be coordinated extremely well with municipal plans to develop this area.

Washland excavation at Meinerswijk

A minor excavation of the washlands will be necessary at Meinerswijk so as to correct the distribution of discharge. It will produce a correction of 7 cm. The water level reduction that this will bring about in the Lower Rhine/Lek will ensure that more water flows into the Lower Rhine at IJsselkop. The dykes at this location are able to withstand the water level produced by a discharge of 16,000 m³/s at Lobith, although small-scale measures will be necessary for the dyke at Westervoort. Slightly contaminated soil that is excavated but cannot be sold will be returned to the project area.

The region is "messy" from a landscape point of view and is not utilised in the best way possible. As far as heritage is concerned, Meinerswijk is located in the extremely valuable area of the limes, the border defence system of the Roman Empire. Its location on the river at the heart of Arnhem makes Meinerswijk extremely suitable as a recreational area, and it also creates a valuable link between Arnhem North and Arnhem South. The city of Arnhem intends developing a park island in Meinerswijk. This will create spatial cohesion in the area, with a role being given to recreation, nature, and urban development. This ties in with the "EMAB" status (experimentation with specially adapted building) for urban blocks. The planned park island will require the high-water channel to be deepened so that it can cope with a greater volume of water. This fits in with the requirements of the Room for Rivers approach for a reduction in water level of some 7 cm. A measure has therefore been defined on the basis of Room for Rivers in the "green river" (floodway) to the east of the John Frost Bridge. These measures may be supplemented by a reduction in the height of the groynes and other measures in the area of the control system at the west end of the area. An attempt will be made to adopt the integrated approach desired in this area.

This area also includes the Bakenhof site, where the dyke has already been relocated, and the planned dyke relocation at Hondsbroekse Pleij.

Dyke improvements

In addition to reducing the water level by means of spatial planning measures along the Lower Rhine/Lek, supplementary dyke improvements will be necessary (see also Section 10.5: dyke improvements Lower Rhine/Lek).

Dyke improvements Lower Rhine, Arnhemse Broek and Velperbroek (dyke ring 47, at around river kilometres 881-883)

Improvement of the dyke will involve increasing its height. The existing flood defence construction (steel sheet piling faced with stone or concrete) will be adapted to deal with high water levels. There will be hardly any difference in the amount of space required.

Dyke improvements Lower Rhine, Arnhem-Huissen (dyke ring 43, at around river kilometres 878-881)

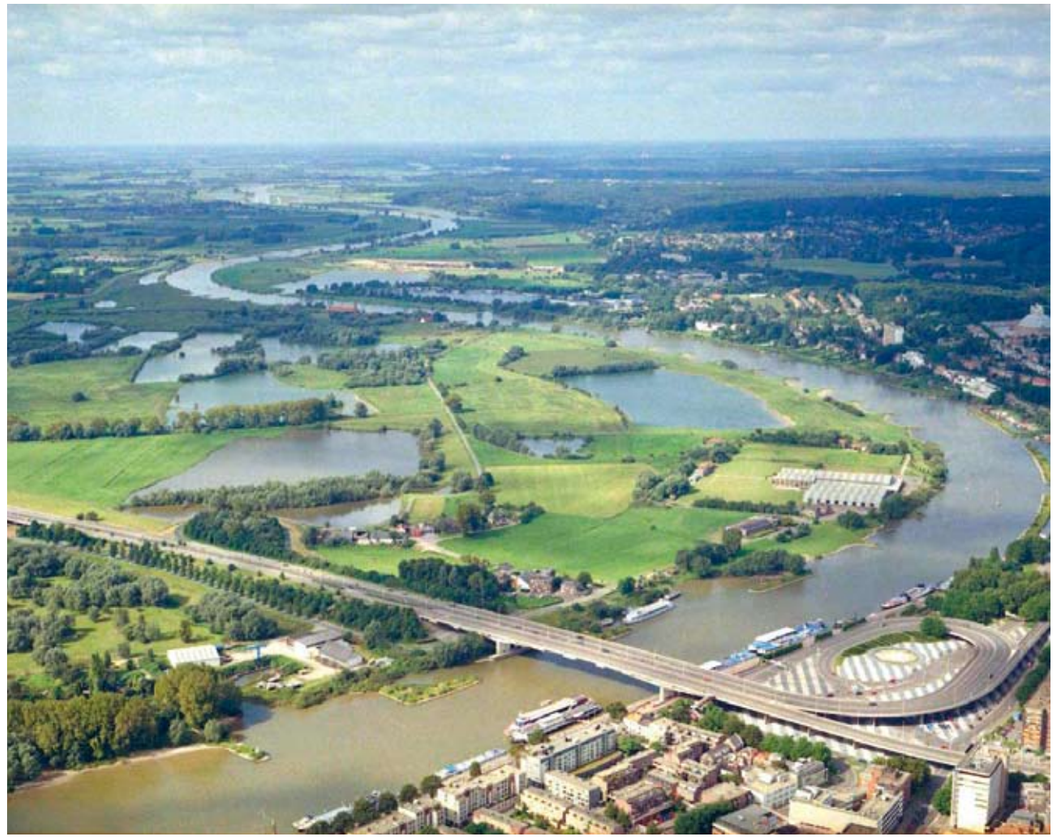
Along most of these sections of the dykes, the dyke crest is already high enough. To cope with higher water levels, however, it will be necessary to reinforce the dyke. This may involve increasing the height of the revetment on the landward side of the dyke and also making it wider; this may or may not be combined with making the slope less steep. In places where buildings or other valuable structures are located close to the dyke, dyke reinforcement may involve installing sheet piling or other constructions.

7.6 Reserving land

This PKB reserves the areas on the landward side of the dyke that will be necessary for measures in the longer term that are not included in the Basic Package of Measures. In the case of the KAN area, space will be reserved for the Rijnstrangen water retention area.

7.7 Opportunities for measures

A number of parties are extremely active within the KAN area. The dominant feature of all of this is development of the core nature area at Gelderland Gate. For many washland areas, plans are well advanced for new natural development. Many of these plans are included as projects that are currently underway (see Table 3.2). These plans also include private initiatives such as that at Lobberdensche Waard (part of the plan for the Rijnwaarden).



8

Waal (from Nijmegen to Gorinchem)

8.1 Description of the area

The stretch of the Waal that will be dealt with in this section runs from just downstream of Nijmegen to Gorinchem.

The Waal is the largest and busiest river in the Netherlands. Its broad, slightly meandering bed and large-scale washlands make it a robust, grand river. Dyke reinforcements in the past have removed many of the buildings on the dykes, enhancing the large-scale nature of the river. The Waal is primarily a working river, not only because of its shipping but also because of the large brickworks in scattered locations along it and the excavation that has taken place in the washlands. This stretch of the Waal runs through rural areas.

The dykes along the Waal are full of twists and turns, whereas the Waal itself has lost almost all of its bends. This combination means that the dyke regularly touches the river at certain points. These places offer a characteristic view over the river. They are also often the urban and village waterfronts along the river. This stretch of the river is also the ecological corridor between the Gelderland Gate area and the Biesbosch wetland area (via Fort St Andries).

There are alternating river-natural levee-basin areas along the entire section of the river from Nijmegen to Woudrichem, forming characteristic "ribbons" in the landscape. The river is one ribbon (the river ribbon), the washlands another, and the buildings and villages on the natural levees are a third. These features then make way for the equally characteristic open river basin, which is farmed.

8.2 Flood protection

The current system for distributing water between the various distributaries of the Rhine means that of the 1000 m³/s extra discharge at Lobith (i.e. the difference between 15,000 m³/s and 16,000 m³/s) that has been allowed for since 2001, 65% will go via the Waal, i.e. approximately 630 m³/s. Because the Waal is a relatively large river, this large proportion of the increased discharge will not require any enormously high target to be dealt with. For much of this section of the river, the target ranges from 0 to 20 cm. For the final stretch, after Zaltbommel, the target rises to no more than 40 cm.

As far as the longer term is concerned (when the representative discharge at Lobith is expected to increase to 18,000 m³/s), the Waal will need to deal with a good 1600 m³/s more water. In terms of water levels, this means that there will be an increase unless measures are taken to create more room for the river. If one includes the short-term increase, the increase in water levels will be between 60 and 100 cm along most of this stretch, rising to up to 120 cm near Gorinchem.

8.3 Improvements in spatial quality

The waterfronts and the economic activity associated with the Waal can create opportunities to preserve and enhance the river's zoning, the natural levee, and the basin area. Spatial quality can also be improved by introducing a renewal strategy that will make the natural river features in most of the washlands more dynamic. One requirement for this renewal is that the historical structures must remain as recognisable as possible so that the area retains its unique character. This will involve preserving the open character of the basin areas.

The dynamic natural processes of the washlands must be compatible with the natural features of the Gelderland Gate and the Biesbosch wetland area. Fort St Andries, situated halfway down, functions as an important core nature area, providing a link to the Meuse washlands. This is where the Waal and the Meuse almost touch, with little space available on either the river side or the landward side of the dykes. Creating more room for the river must go hand-in-hand with enhancing the fort's ecological and heritage function. There are also opportunities to improve the ecological cohesion and heritage features of the New Dutch Waterline at Brakel and Loevestein Castle. Here again, creating more room for the river must go hand-in-hand with enhancing the ecological and heritage function of the washlands. Most of the washlands are subject to a renewal or an adaptation strategy. Some washlands, such as those at Neerrijnen, are subject to a full or partial preservation strategy.

New Dutch Waterline
The New Dutch Waterline (*Nieuwe Hollandse Waterlinie*, NHW) is an important "Belvedere" area, as it is an historical example of a plan in which water played a central role. The NHW is a system of dykes, canals, locks and inlets that made it possible to inundate polders (or sections of polders) in order to defend the western Netherlands against the enemy. The NHW is located along the Waal, the various distributaries of the Merwede and the Meuse, but also along the Lower Rhine/Lek.

8.4 Overall approach to decisions for the long term

To the extent possible, the intention is to create new space along the Waal on the river side of the dyke. Obstacles will be removed, the height of the groynes reduced, and the level of the washlands lowered as much as possible. This will make it possible to avoid affecting the natural levees and basin areas along the Waal, which are important from the landscape and heritage point of view. The dynamic development of natural features in the washlands will also go to enhance the National Ecological Network. The measures taken on the river side of the dykes can also be designed to be compatible with the development of waterfronts at Zaltbommel, Tiel and Druten, for example. All such plans will have to be assessed against the requirements set out in the approach to long-term flood protection, but also the criteria set for the Waal – the main distributary of the Rhine – as Europe's most important navigable waterway.

But meeting all of the long-term targets will not be possible solely by introducing measures on the river side of the dykes. In a few places, it will be necessary to relocate the dykes. Between Nijmegen and Gorinchem, that will be the case at Loenen, Heesselt, Brakel and Munnikenland (at Loevestein). In these locations, there are no spatial alternatives on the river side of the dykes that can deal fully with the river management challenge. In addition to the land set aside at Loenen, an area of land has been reserved along the stretch between Nijmegen and Dodewaard for possible dyke relocation, i.e. Oosterhout-Slijk Ewijk. Owing to the presence of important landscape and heritage features in these areas, further careful consideration will be necessary as soon as a decision is taken to relocate the dykes.

8.5 Short-term measures

The short-term target for the Waal region is only a restricted one and can be achieved primarily by means of measures implemented on the river side of the dykes.

Nijmegen-Gorinchem: reduction in height of groynes
Based on the notion of improving spatial quality, the preferred strategy for the Waal is to develop the washlands area. It has become clear, however, that if washland excavation is not combined with cost earners such as sand extraction or housing construction, it will be very expensive and that a large quantity of unmarketable soil will need to be disposed of, requiring many new disposal sites. Implementing such measures generally requires a relatively long period of time to be set aside for research, preparation and for entering into public-private partnerships (PPP). It is estimated that the time available, up to 2015, will undoubtedly be too short for this. These measures can, however, be utilised to meet the long-term flood protection challenge. There is a short-term alternative available that is effective in terms of both costs and hydraulic impact: height reduction of groynes. As along the section of river between Pannerdensche Kop and Nijmegen, the height of the groynes will be reduced between Nijmegen and Gorinchem, as a means of achieving the target set. This particular measure will have virtually no negative impact.

Reduction in height of groynes (Nijmegen-Gorinchem)
The height of the groynes along both sides of the Waal will be reduced between Nijmegen and Gorinchem. This will make it easier for the water to flow, while at the same time retaining the navigable channel. The average height reduction will be 1 metre. This will mean that the groynes will be visible during periods of low water but submerged when the water level is somewhat higher than normal. The visibility of the beacons marking the groynes will not be affected.

Traject Zaltbommel-Loevestein
Given that reducing the height of the groynes between Zaltbommel and Loevestein will not be sufficient to meet the target entirely, excavation work will also be carried out in the Brakel washlands, combined with the relocation of the dyke in the Munnikenland polder. This combination is the most cost-effective and inexpensive solution, after reducing the height of the groynes.

Relocating the dyke will help considerably to create more room for the river and improve the spatial quality of the area, and it is also compatible with nature development

projects in adjoining areas. This measure can also key into the plans for the New Dutch Waterline and offers opportunities for the development of recreational facilities.

The Government considers this reason enough to include dyke relocation, which forms part of the package of measures for the longer term, in the Basic Package of Measures in the short term. The dyke relocation will affect relatively few homes and businesses.

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Excavation of Brakel washlands and dyke relocation in Munnikenland polder

The Brakel washlands consist primarily of open rural landscape. The Bloemplaat, with its riverine grasslands, is of particular botanical importance. The washlands currently have a valuable geographic relief. The area also has various heritage sites, for example Loevestein Castle. The area on the landward side of the dykes, the Munnikenland polder, consists of arable land and other farmland.

The dyke in the Munnikenland polder will be relocated landward, and the current dyke levelled. A side channel will be constructed from the Waal to the "Afgedamde Maas" (a distributary of the Meuse) through the Brakel washlands. A number of summer embankments will be removed or lowered. The Bloemplaat will retain its botanical value. The construction of a bridge over the side channel will ensure that Loevestein Castle remains accessible. The new area created on the river side of the dykes will be reserved for nature conservation. The land will either be purchased or agreements reached about how it is to be managed in future.

8.6 Reserving land

This PKB reserves the areas on the landward side of the dyke necessary for measures in the longer term that are not included in the Basic Package of Measures for the shorter term. These measures involve having space to relocate the dykes at Oosterhout-Slijk Ewijk, Loenen, Heesselt and Brakel.

8.7 Opportunities for other measures

Druten washlands

A private party has taken steps to redevelop the Druten washlands, combined with extraction activities. The initiators have developed three models for the plan. Among the issues of concern are the impact on river morphology (in relation to the Waal as a main transport artery), the relationship with the Policy Guideline on Major Rivers, whether the plan can help to achieve the long-term target, and the effects within the context of the Birds Directive. The plan for the Druten washlands is regarded as a supplementary measure.

Druten washlands

A private initiator has drawn up a plan for the Druten washlands. The initiator wishes to excavate a side channel in the washlands (by means of sand extraction) and to allow nature to develop there. The plan will be compatible with the current Fan of Channels [Waaier van Geulen] project in the western part of the washlands. The initiator also wishes to redevelop (expand) the industrial estate and to construct housing on the river side of the dykes at Druten (after the boatyard has been relocated). A permit under the Public Works (Management of Engineering Structures) Act [Wet beheer rijkswaterstaatwerken, Wbr] will be required for this measure, with the application being considered in the context of the Policy Guideline on Major Rivers. Consideration will also be given to the expansion of the industrial estate and the construction of homes on the river side of the dykes.

Other plans

In addition to these specific plans, both public and private initiatives are possible along the Waal. The likelihood of their succeeding will be greatest if they are compatible with the flood protection and spatial quality strategies developed by local and regional authorities and the national government. Specifically, the initiatives concerned involve mineral extraction companies. Given the scope of the measures involved, the most important point of concern is the potential impact on the navigability of the Waal, which is a significant economic factor for the Netherlands.

9

Lower reaches of the rivers

9.1 Description of the area

The lower reaches of the rivers are located in an area to the west of Krimpen aan de Lek, Gorinchem and Hedikhuizen. This is where the Lek, the Waal and the Meuse are split up into the Nieuwe Maas/Nieuwe Waterweg, Oude Maas, the various distributaries of the Merwede, the Bergsche Maas/Amer and the Hollandsch Diep/Haringvliet.

In their lower reaches, the major rivers flow through major residential and commercial areas, extensive farmlands and large, dynamic nature conservation areas. An urban area begins near Gorinchem, at the Upper Merwede, that continues along the Lower Merwede until the Nieuwe Waterweg. The companies in this zone that focus on water-related activities are often located on the river side of the dykes. The south bank is the location of various small towns as well as the extensive farmlands of the "Land van Heusden en Altena".

The Upper Merwede, Lower Merwede and New Merwede are broad rivers and busy shipping routes. Only a few rural accents remain in the urban frontage. The landscape changes abruptly at the point where the Lower Merwede and the New Merwede diverge; the New Merwede, a canalised river, flows through the Biesbosch, one of the largest and most dynamic nature conservation areas in the Netherlands. The Biesbosch and the Noordwaard and "Land van Heusden en Altena" area constitute an almost entirely rural buffer between the urban conurbation in the northwest (the "Randstad") and the towns and cities of Brabant in the south. The creeks and shallows created by the tides make the Biesbosch a unique area.

The Bergsche Maas, a canalised river, has a rigid, robust profile with high dykes. It forms a striking contrast to the surrounding riverine landscape, with its ancient water courses and historic fortified towns and polders, including the Overdiep Polder. Various drainage channels connect the line of towns in Brabant and the Bergsche Maas.

9.2 Flood protection

The current system for distributing water between the various distributaries of the Rhine means that of the 1000 m^3/s extra discharge at Lobith (i.e. the difference between 15,000 m^3/s and 16,000 m^3/s) that has been allowed for since 2001, 65% will go via the Waal (630 m^3/s) and 20% via the Lower Rhine/Lek (more than 200 m^3/s). Along the lower reaches of the rivers, these volumes are distributed between the Nieuwe Maas/Nieuwe Waterweg, Oude Maas and Hollandsch Diep/Haringvliet as they move towards the sea.

The short-term target for much of the lower reaches of the rivers is only a restricted one. That is because the assessment levels in this area are determined not only by extreme discharge levels, but to a significant extent by the storm surges from the sea. The representative high water levels in the coastal area – for which the dykes were designed – are influenced primarily by the sea and to a much lesser extent by increases in river discharge levels. An increase in the representative river discharge levels, as happened in 2001, therefore only has a limited impact on the assessment levels. When the assessment levels were altered accordingly in 2001, it was assumed that the rise in sea level would be restricted up to 2015 (6 cm). As a result, the assessment levels applicable throughout most of the area were increased to a maximum of 20 cm or lowered to a maximum of 20 cm in 2001, depending on the location. The assessment levels for the Bergsche Maas and the Steurgat were subject to a larger increase, however: up to 40 cm south of Werkendam and up to 60 cm between Geertruidenberg and Drongelen.

As far as the longer term is concerned (when the representative discharge at Lobith is expected to increase to 18,000 m^3/s and the sea level will rise by 60 cm), the assessment levels will need to be increased further. The increase on the north flank of the lower reaches of the rivers, along the Nieuwe Maas/Nieuwe Waterweg, will be no more than 40 cm, including the short-term increase. On the south flank, along the various distributaries of the Merwede, the Hollandsch Diep and the Haringvliet, the increase will vary between 60 and 120 cm. The increase along the Bergsche Maas will exceed 120 cm.

9.3 Improvements in spatial quality

The "Randstad" conurbation and parts of Brabant are becoming ever more urbanised and densely populated. The Biesbosch wetland area and the "Land van Heusden en Altena" constitute a valuable, partially open buffer between the two urban regions. The buffer will be reinforced by allowing the Biesbosch to develop more naturally and dynamically and by shifting the focus in the "Land van Heusden en Altena" to agriculture. More space can be created in these areas for water-related recreation.

The tidal creeks in the Noordwaard show that it borders the Biesbosch. This farming area, with its splendid contrasts between open landscape and wooded creeks, offers interesting opportunities to seek out new combinations of functions in which agriculture will preferably retain its prominent role. The relationship to the dynamic system of creeks and shoals can be restored in part when combined with measures intended to create more room for the river.

Gorinchem is a water and traffic node, and there is considerable economic activity along the river. The task of revitalising the industrial estates on the north side and restoring parts of the New Dutch Waterline can be combined with measures to create more room for the river.

The aim along the Bergsche Maas is to retain the straight but flowing design of this link between the river and the delta, a striking canalised "river" (constructed 1904). That aim can be achieved by combining agriculture and water retention, for example in the Overdiep Polder.

9.4 Overall approach to decisions for the long term

Considerations
The hydraulic features of the lower reaches of the rivers differ from those of the upper reaches. The rivers are wider and flow more slowly here. The assessment levels in this area are determined not only by extreme river discharge levels, but to a significant extent by the storm surges from the sea. Sand is not scoured out of the summer bed; instead, it settles there. This means that effective flood protection measures in the two regions differ.

Creating more space on the upstream side of the lower reaches will reduce water levels sufficiently to have an effect on the assessment levels. This can be achieved by adding space on the landward side of the river, or by introducing measures in the river bed. The further downstream measures are taken to create more room for the river, the less effective they are. Dyke reinforcement is the only option in those areas.

As far as measures taken in the river bed are concerned, deepening the summer bed is basically an option because sand tends to build up naturally along the lower reaches. This measure also has disadvantages, however. Reducing the height of the groynes is not effective along the lower reaches, precisely because the accretion of sand prevents any increase in their height (unlike in the Waal).

Overall approach to decisions for the long term
In order not to affect the sensitive urban area in the west of the country (Rijnmond – i.e. the Rotterdam region – and the seven municipalities making up the "Drecht Towns"), where cost-effective spatial solutions are not available, the strategy will focus on discharging as much water as possible down to the mouth of the Amer. This will be achieved by means of a number of measures around the Biesbosch wetland area and around Gorinchem.

This strategy will focus on returning reclaimed land to the river ("de-poldering") in the agricultural area of Noordwaard. At Gorinchem, a series of measures will also be necessary to remove the bottleneck there. These will include excavating the washlands at the Avelingen industrial estate; making it possible for water to flow underneath the southern bridge abutment of the A27; and a number of excavations of the washlands on the river side of the dykes. In addition, in the Biesbosch wetland area a number of measures will be combined with nature development; these will be implemented in the area currently on the river side of the dykes.

Along the Bergsche Maas (i.e. the canalised lower stretch of the River Meuse), the Overdiep polder will come to be located on the river side of the dykes. This measure will be combined with broadening and deepening the summer bed of the river. It will also be necessary to relocate the dyke at Drongelen. The latter measure does not fit in well with the Regional Spatial Planning Framework, but no effective spatial alternative is available. The long-term reservation of land on the north bank, associated with the removal of the obstacle at Keizersveer, has been cancelled, as it is not really hydraulically effective. In addition the current river bed will need to be dredged in a number of locations in order to maintain it.
The measures that will become necessary along the Bergsche Maas must be viewed in connection with those that are being considered within the context of the Overall

Survey of the Meuse [Integrale Verkenning Maas, IVM] for the upstream section of that river. The PKB and IVM project organisations have coordinated with each other on this point. Closer study has revealed that all the long-term measures proposed in PKB Part 1 for the Bergsche Maas will be necessary along the lower reaches of the rivers, including the dyke relocation at Drongelen. It is also clear that it is not a realistic option to "swap" measures (e.g. including extra long-term measures in the PKB in order to offer IVM a solution, or vice versa). Even if all the measures considered possible are implemented along the lower reaches of the river, the results will still fall just short of the long-term target in the transition area. Drastic measures introduced within the context of IVM may make it possible to achieve the target set for the area upstream of Hedikhuizen (the boundary of the project area for this PKB) – but only just. Follow-up studies must demonstrate to what extent measures taken upstream can help to meet the remaining long-term target downstream of Hedikhuizen (at Geertruidenberg and west of the Overdiep Polder).

Creating more room for the rivers is not an adequate solution in the western part of the lower reaches – the " true" lower reaches. It will not have the desired hydraulic effect, making additional dyke reinforcement necessary.

When the sea rises, water is channelled from the Haringvliet and the Hollandsch Diep via the locks at the Volkerak Dam towards the Zeeland Delta. The river water is disposed of for a short time in the Volkerak-Zoommeer, the third-largest fresh-water lake (artificial) in the Netherlands. To make it possible to store the river water, a minor amount of work will have to done to the dykes, construction works and drainage facilities in the area. The water can then be channelled to the Oosterschelde or the Grevelingen.

The long-term measures will also depend, in part, on the way the Maeslantkering barrier, the Hartelkering barrier and the Haringvliet sluices are managed (i.e. whether there will be changes to they they are managed). If their management is altered such that there will be more space in the delta to store high-water surges in the river, then future dyke reinforcement work along the arms of the river can be limited.

9.5 Short-term measures

The distributaries of the Merwede
In order to lower the assessment levels at Gorinchem, it has been decided to "de-polder" the Noordwaard and to excavate the washlands at Avelingen industrial estate. One important reason for this decision is that it constitutes the first and most important step towards a sustainable, long-term solution for this area. It will also give the spatial quality of the area an important boost. De-poldering the Noordwaard will help to create a more natural, dynamic area around the Biesbosch wetland area. The open character of the landscape will be maintained by ensuring that farms there can continue to operate. Finally, according to a flood protection study carried out by the Netherlands Bureau for Economic Policy Analysis [CPB] for PKB Part 1, de-poldering is a logical choice here, given that it will require a huge investment to maintain the present flood protection levels in this area with little return on that investment. Once the washlands at Avelingen industrial estate have been excavated, there will be an opportunity to revitalise this industrial area on the urban north bank of the Upper Merwede while giving the river more space.

One effect of de-poldering the Noordwaard is that it will cause the water of the Bergsche Maas and the Amer to back up, making a relatively large amount of dyke reinforcement work necessary around Geertruidenberg and along the Donge. To keep this to a minimum, it will be necessary to redirect some of the water flowing from the Noordwaard to the west of the Petrusplaat shoals. That is why the Kleine Hilpolders, a set of three agricultural polders located on the river side of the dykes, are included in the Noordwaard project area. They will prevent some of the water from backing up in the Amer and the Bergsche Maas, obviating the need for dyke reinforcement around Geertruidenberg and along the Donge.

Noordwaard (flowing with the river)
The Noordwaard polder is situated on the south side of the New Merwede (between kilometre 963 and kilometre 971). The Biesbosch wetland area lies on the south side of the Noordwaard. In the current situation, the Noordwaard is primarily an agricultural area with both arable farming and livestock farming. The area measures 2,050 hectares and has 49 homes and 26 farms. Some of the homes and farms in the Noordwaard are listed buildings. The north-east corner of the polder has an industrial estate, a small residential area and Fort Werkendam. This was the southernmost fortification of the nineteenth-century New Dutch Waterline. The Noordwaard currently consists of agricultural polders screened by woods along the creeks. The polders are relatively small (approximately 1 to 2 km across). The landscape varies considerably between open and enclosed areas, with sharp contrasts between farmland (broad fields), natural features (creeks) and heritage elements (terps, embankments and polders).

Using the Noordwaard to create more room for the river will result in a major fall in the water level of 60 cm at Werkendam and 30 cm at Gorinchem. The measure involves levelling the dykes on the inflow and outflow side of the polder to a height of approximately 2 m above Normal Sea Level at Amsterdam (NAP). The "flow area" is flooded at least a couple of times a year, especially in the winter. That is much less the case in the other sections of the polder. Depending on the design of the embankments, these areas will flood once every 100 to 1000 years. Once the measure has been worked up into a planning study, it may be necessary to redirect some of the water from the current arable farmland through the Gat van Kampen and another portion through the lower channels of the nature development project area to the Gat van den Kleinen Hil and possibly on to the Hilpolders to the New Merwede, in order for this measure to achieve maximum effect and to prevent the water in the Amer from backing up. The water will then flow via both sides of the Petrusplaat reservoir.

In the new situation, the area will not be suitable for farming as it is now practised, especially in the "flow area". The measure therefore offers opportunities to extend the natural surroundings and leisure-time amenities of the Biesbosch wetland area. It will remain an open area in order to allow water to pass unimpeded when necessary.

The basic idea is to make it possible for the current residents to remain in the Noordwaard.

The Noordwaard project will result in a sufficiently large new feeding area for overwintering herbivore water fowl to compensate for the loss of such land at project level, where necessary.

In order to achieve the short-term target at Gorinchem, an additional measure is required besides de-poldering, specifically one that will be effective at Gorinchem-Oost. The most cost-effective measure, and the one that is most feasible in the short term, is to excavate the washlands on which the Avelingen industrial estate is located. This measure also represents the first step towards improving the economic infrastructure in this area, one of the region's wishes.

Avelingen industrial estate
The Avelingen industrial estate is located between kilometre 955.8 and kilometre 957.7 on the north side of the Upper Merwede. In the present situation, there are forelands (grasslands) with transverse dams on the river side of the dykes on both sides of the A27 road bridge over the river. The forelands protect the inner harbours from the river and the transverse dams guide boats to the inner harbours. The forelands tend to flood when the water level in the river rises. The industrial estate is shielded by a dam on the west side (kilometre 957.7). Seven bridge piers can also be found in the forelands, the remnants of an emergency bridge erected during the Second World War. A channel will be excavated through the forelands, with soil remediation also being carried out. The washlands under the A27 bridge will be excavated and the old bridge piers removed. To prevent the channel from flowing along with the river at low discharge levels, a sill will be constructed at kilometre 957.1. This, combined with the Noordwaard measure, will solve the problems of the Gorinchem bottleneck.

Bergsche Maas
The de-poldering of the Overdiep Polder along the Bergsche Maas provides a cost-effective method of meeting the short-term target (with the effects being felt as far away as Lith), and it also helps to improve the spatial quality of the area. This measure is also entirely compatible with the long-term approach. Planning for this project has already begun, with the Province of Noord-Brabant taking responsibility ("front runner" project).

It would be similarly cost-effective to deepen the summer bed (the alternative to de-poldering the Overdiep Polder); however, this measure would not help to improve the spatial quality of the area. Dyke reinforcement would be a dis-investment, seen from a long-term perspective.

There is a further target to be met in the environs of Geertruidenberg, as de-poldering the Overdiep Polder will have little or not effect on this area. According to the design on which this PKB is based, de-poldering the Noordwaard will furthermore cause the water levels in the Amer to rise. Reducing the height of the embankments in the Biesbosch wetland area will help reduce water levels at Geertruidenberg and Keizersveer, making it possible to achieve part of the target. Reducing the height of the embankment (ring dyke) around the Allardspolder is a particularly effective measure. It may be possible to largely undo the increase in the water levels in the Amer by optimising the de-poldering of the Noordwaard during the

design phase (after the PKB procedure). If that is not the case, additional dyke reinforcement around the historic fortified town of Geertruidenberg will be unavoidable between now and 2015.

Overdiep Polder
The Overdiep Polder is located on the south side of the Bergsche Maas, between Geertruidenberg and Waalwijk. The area is bounded by the Bergsche Maas on the north and the Oude Maasje on the south. The polder narrows to a point both on the east side (kilometre 241.2) and the west (kilometre 247.2).

The Overdiep Polder consists of a polder and a washland. The polder (landward) measures 550 hectares and the washland 180 hectares. The washland is separated from the river's summer bed by a summer embankment. In the current situation, the Overdiep Polder (polder and washland) is a farming area. Sixteen mixed dairy and arable farms are located there. There is also an intensive pig farm, a marina (340 berths) and a military training area. The western edge of the polder has long been used to dispose of soil excavated from the Bergsche Maas; the layer of soil deposited there rises to approximately 5 m above the surface. A small wooded area is situated on the east side of the polder, mainly willows and alders planted within the context of a land consolidation programme. The relevant measure involves moving the main flood defences to the south side of the Overdiep Polder. The houses and outbuildings that have been moved will also be situated on terps up against the relocated flood defences. The basic premise is that normal agriculture must remain possible in the polder. The measure will lead to a reduction in the local water level by approximately 30 cm (maximum). Because the measure will have a significant impact far upstream, it will help to achieve the target along a long stretch of the Bergsche Maas.

Biesbosch embankments
The relevant embankments in the Biesbosch wetland area are situated between kilometre 251 and kilometre 253.5 on the north side of the Amer. The Allardspolder is part of the Groote Polder and lies south-west of Aakvlaai. In the current situation, the area south of the water extraction plant's reservoirs is covered in deciduous woodland, osier beds, reed beds and marshes. An embankment was constructed in the area long ago in order to drain the entire Biesbosch and turn it into a polder. A house is situated on this embankment. There is another piece of polder land between the reservoir (De Gijster) and the embankment, known as Polder Kinden. The entire area is devoted to nature conservation. The Allardspolder is located in the most south-westerly corner of the Groote Polder and is currently ringed by dykes. The polder is no longer drained and, although it is not dry, it is overgrown with brushwood.

The measure involves reducing the height of the dyke around the Allardspolder. It will be implemented in combination with the Noordwaard project. De-poldering the Noordwaard will cause the water (at Geertruidenberg) to back up locally; the present measure will serve to mitigate this effect.

Hollandsch Diep, Haringvliet, Spui
Closing off the flood defences on the seaward side of the sea arms causes water in the rivers to build up rapidly behind the defences in periods of high-volume discharge. The compartmentalisation of the delta region – the result of completing the Delta Works – means that the water can no longer be distributed across the entire delta. The solution is to reduce the degree of compartmentalisation. That is only possible under specific conditions, i.e. that the storm surge barriers and fresh-water supply for farming can be maintained, and that the non-tidal shipping route between Rotterdam and Antwerp is preserved. Retention in the Volkerak-Zoommeer (VZM) is regarded as the appropriate measure in this respect.

Storing water from the Haringvliet/Hollandsch Diep in the Volkerak-Zoommeer (VZM) when the storm surge barriers are closed will prevent a rapid rise in the water levels in the Rhine-Meuse estuary area. Storing the water in this way will make it possible to meet the short-term target for the Hollandsch Diep, the Haringvliet and the Spui. For the moment, a limited amount of work will be necessary to enable water to be stored in the VZM; this will serve to ensure the stability of the dykes around the lake, the structural works in those dykes and the drainage facilities of the Volkerak and Krammer locks. The detailed plans to be drawn up after the PKB procedure will review any negative effects. To achieve the short-term target, it will only be necessary to use this retention option in circumstances that arise an average of once every 1400 years. This is a highly cost-effective measure, and feasible in the short term.

Retention of water in the Volkerak-Zoommeer
The Volkerak is bounded on the east by the Province of Noord-Brabant and on the west by the island of Goeree-Overflakkee, which is part of the Province of Zuid-Holland. The Volkerak-Zoommeer (VZM) encompasses (from north to south) the Volkerak, the Krammer, the Eendracht, the Zoommeer and the Bath discharge canal. The VZM borders the dyke ring areas 25 (Goeree-Overflakkee), 27 (Tholen and St-Philipsland) and 34 (western Brabant).

The Volkerak has been separated from the Hollandsch Diep, the Grevelingen and the Oosterschelde by dams. The locks allow shipping to pass through. In addition, four discharge sluices have been constructed in the dam between the Volkerak and the Hollandsch Diep. Two can be deployed immediately; in the case of the other two, the drive mechanism must first be reinstalled. The locks cannot be used to release built-up water without considerable alteration[3]. The Volkerak and the Zoommeer are part of the non-tidal shipping route that leads from the Rhine to the Scheldt. Agreements must be reached with Belgium concerning its preservation.

Water can be stored in the Volkerak-Zoommeer by making a small number of adjustments to the Volkerak and Krammer sluices and to the dikes and structural works dotted around the two bodies of water. By draining the water through the Volkerak locks to the Volkerak-Zoommeer when extremely high water is expected in the Hollandsch Diep, the water levels in the Haringvliet, the Hollandsch Diep, the Spui, the Amer, the Oude Maas, the Dordtsche Kil and the Noord will fall, allowing the target to be met in the Haringvliet, the Hollandsch Diep and the Spui, among others. Deploying this measure may make it more difficult to drain the delta in Brabant. The planning study will investigate whether that is the case.

Dyke reinforcement along the lower reaches of the rivers
Several sections of dyke (approximately 15 km in all) along the Oostwaard, the Bergsche Maas, the Oude Maas and the downstream stretch of the Lek will be reinforced.

A survey carried out by the Ministry of Transport, Public Works and Water Management exploring how best to improve the quality of the water in the Volkerak-Zoommeer has shown that "Estuarian Dynamic: salt-fresh tidal flow" offers the best guarantee of sustainable development. This is one of the possible solutions being explored in the planning study, which has now commenced. As for making any changes to any facilities that allow water to drain into the Oosterschelde or Grevelingen, it may be possible to do so in the long term within the context of the "Room for Rivers" policy. In periods of high discharge levels, it may be possible to store water in the Volkerak-Zoommeer while also allowing it to drain into the Oosterschelde or the Grevelingen.

9.6 Reserving land

This PKB reserves the areas on the landward side of the dyke that will be necessary for measures in the longer term that are not included in the Basic Package of Measures for the shorter term.

An area is being reserved along the lower reaches of the river for dyke relocation along the Bergsche Maas near Drongelen.

9.7 Opportunities for measures

The A27 and allowing water to flow past the bridges at Gorinchem and Keizersveer
The long-term package of measures for the lower reaches of the river involves work being carried out on two bottlenecks, both of them associated with the A27 motorway. The first is located at Gorinchem on the Upper Merwede; making it possible for the water to flow past the southern bridge abutment of the A27 is vital to the task of achieving the long-term target. To ensure feasibility, this measure has been linked to the possible redevelopment of the motorway. The planning study investigating the A27's accessibility problems (at Lunetten-Hooipolder) will commence with an Introductory Memorandum EIS that will also explore the potential "win-win" effects of a combined approach.

The second bottleneck is located at Keizersveer and Geertruidenberg on the Bergsche Maas. The reservation of land intended to remove this bottleneck has been cancelled, as the hydraulic effectiveness would be minimal in the present situation.

[3] Rapportage Verdiepingsslag Volkerak-Zoommeer (draft), Rijkswaterstaat/RIZA Nadine Slootjes, Dordrecht 9 December 2003.

10

Lower Rhine/Lek

10.1 Introduction

The stretch of river covered in this section begins west of Arnhem. This is where the Lower Rhine flows along the push-moraines of the Veluwe heathlands and the Utrecht Ridge [Utrechtse Heuvelrug]. The river is renamed the Lek at Wijk bij Duurstede. This stretch continues until Krimpen aan de Lek, where the Lek joins the Noord.

The Lower Rhine is a medium-sized barraged river with three barrage complexes. Once the river reaches the push-moraines, there is a sharp contrast between the built-up and wooded edges of the push-moraines and the open washlands. The location of the push-moraine results in frequent fluctuations between dry/wet, high/low, and nutrient-poor/nutrient-rich. The fluctuations have led to exceptional heritage and ecological features, in particular on the north bank of the river. There are virtually no dykes along the north bank as the river passes along the south of the Veluwe heathlands. Thanks to the push-moraine, there is seepage along the river, which allows for very special flora and fauna. The Netherlands' premiere fruit-growing area, the Betuwe, lies on the south side of the river and has natural levees that run parallel to the river, with open basins behind them. There are a considerable number of historic buildings and structures on and along the dyke. The Rhine used to form the limes, the north-western frontier of the Roman Empire, and is therefore of major historical, cultural and archaeological significance. Other important historical structures are the New Dutch Waterline and the Grebbe Line, a system of defence works.

The Lek is a typical freshwater tidal river. It is not very wide and becomes ever narrower and straighter the further it flows downstream. It is a busy river, with many local marinas and water sports facilities along its banks. The Lek crosses open, low-lying peat grassland. That means that its dykes are important elements in the landscape. The dyke systems have developed into urbanised peripheries that accommodate homes and businesses. These communities tend to face the river along its entire length. The waterfronts at Schoonhoven and Ammerstol are places of particular interest in this system. On the landward side of the dyke, the series of windmills at Kinderdijk, a World Heritage Site, are unique. The influence of the tide is noticeable along the downstream stretch of the Lek, producing particularly exceptional ecological features. A number of historically significant washlands and the Old Dutch Waterline are located between Vianen and Schoonhoven.

10.2 Flood protection

The current system for distributing water between the various distributaries of the Rhine means that of the 1000 m^3/s extra discharge at Lobith (i.e. the difference between 15,000 m^3/s and 16,000 m^3/s) that has been allowed for since 2001, slightly more than 20% will go via the Lower Rhine/Lek (more than 200 m^3/s). This means that the short-term target varies between 0 and 40 cm.

As far as the longer term is concerned (when the representative discharge at Lobith is expected to increase to 18,000 m^3/s), a proportionate share will need to be discharged via the Lower Rhine/Lek. Because there is little scope to make more room for this particular river, it has been decided to redistribute the discharge between the IJssel and the Lower Rhine in such a way that when the representative discharge exceeds 16,000 m^3/s at Lobith, no additional water will be discharged via the Lower Rhine/Lek. The long-term representative discharge of the Lower Rhine/Lek will therefore level off at approximately 3380 m^3/s.

10.3 Improvements in spatial quality

The characteristic contrast between the push-moraine on the north side of the Lower Rhine and the open landscape on the south side must be preserved, and improved wherever possible. Leisure facilities, nature conservation and agriculture can all be enhanced along the Lower Rhine in the area west of the push-moraine near Arnhem, without this having a negative effect on its heritage value. The strategy for the north side is focused on preservation, and on the south side on innovation while maintaining the open character of the landscape. It will be necessary to select a single main function in some of the washlands, instead of a patchwork of different functions. Recreational facilities should be improved all along the Lower Rhine, for example by constructing marinas for boats that are passing through and places to call in. Emphasising the features of the limes, the Dutch Waterline and the Grebbe Line will enhance the river's historic and cultural significance. The amount of land dedicated to nature conservation can be increased by allowing seepage marshes, grasslands, shallow lakes and side-arms to develop.

Conditions at Vianen are right to combine giving the river more room with creating recreational facilities for the nearby urban population. These efforts are complementary to existing heritage sites and yet will permit development. As we follow the Lek further downstream, the historically significant wash-lands and parts of the Dutch Waterline limit the amount of room that can be created for the river, but there are also opportunities to improve these features and emphasise their presence. The quality of the final stretch of the Lek down-stream will be improved by making the influence of the tide more visible and by restructuring and upgrading the industrial estates.

10.4 Overall approach to decisions for the long term

The ecology, heritage sites and landscape along the Lower Rhine and the Lek are of such significance that spatial measures may have an unacceptable impact. The existing landscape and its small-scale, modest quality must be preserved, and where necessary restored. There is little space for such measures along the Lek on either side of the dyke, and they would also lead to technical complications. In accordance with the strategic policy decision, the Lower Rhine/Lek will not be required to take in extra water when the representative discharge exceeds 16,000 m3/s. Any excess discharge will be distributed between the Waal and the IJssel. Given that the sea level is expected to rise, the dykes along the Lek will eventually need to be reinforced, however.

Creating more room for the river is not an adequate solution in the western part of the lower reaches (see also section 9.4), as it will have little hydraulic effect. This also applies to the Lek. Although a maximum discharge will eventually be imposed on the Lower Rhine and Lek (see also section 5), it will be necessary in the long term to reinforce the dykes.

10.5 Short-term measures

In anticipation of the PKB, a number of projects were carried out near Arnhem that satisfy the PKB objectives. These projects involve relocating the dyke at Bakenhof, altering the railway embankment at Oosterbeek to allow water to pass through it, and reducing the height of the weir island at Driel. These projects and one other (the Lexkesveer project, which will involve replacing a ferry slipway by a bridge and excavating the washlands on both sides of the river) will result in considerably lower water levels in this section of the Lower Rhine/Lek. Efforts have been made to identify an appropriate package of measures that satisfies the wishes of the region. The additional studies have demonstrated that no solution can be cost-effective unless it is based on dyke reinforcement. It is unfortunately the case that any spatial measures carried out along the Lower Rhine/Lek will be less cost-effective than those carried out along the IJssel and Waal. Only limited use can be made of measures on the landward side of the dyke and they would lead to a public outcry.

The Basic Package of Measures for the Lower Rhine/Lek features a combination of dyke reinforcement and spatial measures intended to improve flood protection to the desired levels. Spatial measures are selected on the grounds of the following criteria:

1 Hydraulic necessity:
For example, it might be necessary to correct the unequal distribution of discharge at the point where the distributaries diverge (IJsselkop).
2 Reduction of hydraulic bottlenecks:
Bottlenecks are locations where high discharge causes the water to back up locally because the river's winter bed is narrower. Plans have been drawn up for these locations that will not only bring about the desired reduction in the water level but will also contribute to improving the spatial quality of the area. This approach will produce a robust situation at the site of the existing hydraulic bottlenecks. Reducing the water levels locally makes it easier for the water to flow through the bottleneck, making the flow more constant.
3 Reducing or preventing the negative impact of dyke improvement measures:
The planned dyke improvements will be difficult to carry out along a number of stretches of the river. Every centimetre that the water level can be lowered by giving the river more room can help simplify a technically complex dyke reinforcement.

The Basic Package of Measures along the Lower Rhine/Lek covers five washlands: Vianen/Hagestein, removing an obstacle (former school for crane drivers) at Elst, Tollewaard, Middelwaard, Doorwerth. Private initiators will perhaps add a number of plans to this list in future. The initiative proposed for Maurik has been included as a promising alternative. The Basic Package of Measures keys into the

wishes of the region. There is more emphasis in these washland measures on improving spatial quality, and as a result the excavations are not on the same scale as in PKB Part 1. Not relocating the dyke at Lienden also means that the water levels will not drop as much as in PKB Part 1. The dyke reinforcement programme to be carried out along the entire length of the river will be sympathetic to the landscape; where possible, the measures will be combined with nature development in the adjoining washlands. When it commences, the dyke reinforcement programme will be based on the most up-to-date situation.

These measures were selected on the basis of the three points mentioned above. The Meinerswijk washland at Arnhem will be needed to correct the distribution of the discharge between the Lower Rhine/Lek and the IJssel (see section 7 on the "KAN" area). Like the projects that have already been carried out and the excavation of the washland at Doorwerth, only limited dyke improvement is needed along the Lower Rhine to achieve the flood protection objectives. The Lower Rhine's bottleneck is situated at the bridge at Rhenen. Water levels will be lowered here by work carried out in the Middelwaard/Tollewaard washlands and by removing the obstacle (former school for crane drivers), so that the water will no longer back up locally. Excavation work has been proposed near the dam at Hagestein and the washlands at Vianen.

Excavation of the Doorwerth washlands
Doorwerth Castle and a brickworks are located in the Doorwerth washlands; the washlands themselves are situated in a transition zone between the wooded push-moraine and the open/semi-open Rivers Region. This measure involves removing the summer embankments, making the natural depression of the washlands available to take up extra discharge. The flood-free site at the access road to the brickworks' loading/unloading dock will be lowered in order to remove a hydraulic bottleneck. To ensure that the loading/unloading dock remains accessible, a road will be constructed. The washlands in this lower-lying area will be used for nature conservation purposes, with the hawthorn shrubs along the natural levees being preserved. An embankment will be constructed on the natural boundary between the lower and higher-lying areas of the washlands, so that the land around the brickworks can be used for agricultural purposes (including a combination of agriculture and nature management). Efforts will also be made to key into nature development projects west of the A50 motorway, and attempts will be made to adopt the integrated approach favoured by local and regional parties in this area.

Excavation of the Middelwaard washlands
The Middelwaard washlands consist primarily of open rural landscape. The washlands are dissected by a bridge on piers and a short bridge abutment that takes the provincial road between Ochten and Veenendaal (N233) across the Lower Rhine. There is an industrial estate and various lakes with a small marina in the western part of the washlands. Given the intention for the Lower Rhine, the preference is to lower the surface level so as to allow a marsh to develop. In order to achieve the necessary reduction in the water level, it is very likely that a lake will have to be excavated. In this area, preference is given to excavating the ditch that lies parallel to the dyke in the middle of the washlands. The current rigid shape of the ditch will be retained, and natural banks will be created along it if possible. Besides excavating the ditch, the overall surface level will be lowered and the summer embankments removed. The area will no longer be used for farming, but for nature conservation.

Excavation of the Tollewaard washlands
The Tollewaard washlands are an open man-made landscape that is used for farming and industry. They have two brickworks with access roads. They also have the remains of a channel and a number of lakes. Given the intention for the Lower Rhine, the preference is to lower the surface level so as to allow a marsh to develop. The preferred option is to excavate a channel from the river downstream that would have as little effect as possible on existing (and potential) archaeological features and on the historically significant low embankments, sluices and geographic relief. If the summer embankments are lowered or removed, it may be possible to cut a smaller channel than described in the Basic Package of Measures. There is a natural depression in the washland which can be emphasised during redevelopment. This measure will make the area more suitable for marsh-dwelling birds. The land will be used for nature conservation instead of farming. Reducing the water level will mean that the washlands will flood more frequently. This will affect the accessibility of the two former brickworks sites, a problem that will need to be solved.

Removing the obstacle (former school for crane drivers) at Elst
The flood-free site of the former school for crane drivers on the edge of Elst is situated in the washlands there. The site is a hydraulic bottleneck. It was purchased by the Government as part of the "Room for Rivers" project. Lowering parts of the site (which measures 5.5 hectares in all) will allow the water to flow through the washlands at Elst to the Amerongse Bovenpolder when the water levels rise. This will remove some of the bottleneck. At low water levels, the quality of the seepage water will be preserved.

The upstream and downstream washlands at Elst and the Amerongse Bovenpolder are part of the National Ecological Network and are part of a nature development plan involving the north bank of the Lower Rhine. The measure will create a corridor between the two washlands. The project teams for the two initiatives will therefore consult closely on the details of the obstacle removal scheme.

Excavation of the Honswijk washlands, Hagestein island (weir), Hagestein washlands and Heerenwaard washlands
The washlands near Vreeswijk/Nieuwegein and Vianen play a significant role in spatial quality terms by providing the populations of these towns and the Utrecht conurbation as a whole with a recreational area. The Room for Rivers PKB can enhance this role by making the Heerenwaard and Hagestein washlands more accessible and appealing.

Both Vianen and Vreeswijk are urban conservation areas. To give them the best possible setting as heritage sites, it is important to preserve the open nature of the adjoining washlands and to guarantee that they remain so. Removal of the summer embankments and shallow excavation of the washlands will increase the frequency of flooding, making farming impossible. Slightly contaminated soil that is excavated but cannot be sold will be returned to the project area. Turning this area into a nature conservation site with recreational facilities and natural grassland will more than satisfy the wish to create a suitable heritage setting for Vianen. The ferry slipway will be altered to allow water to flow through it; this will be done in a way that is as sympathetic as possible to the townscape. The summer embankment, which crosses through the Heerenwaard washland in a jagged line, will be preserved for its heritage value and its contribution to an historical landscape. This measure is also in line with the "Belvedere" philosophy: "Conservation through development".

There is no reason to emphasise heritage upstream of Vianen, where the new residential area De Hagen has been constructed. The historical pattern of the landscape will, however, provide a basis for nature development. It is interesting to note that two very different washlands will emerge within the urban recreational area, each meeting different recreational needs.

Dyke improvement
In addition to reducing the water level by means of spatial planning measures, supplementary dyke improvements will be necessary along the Lower Rhine/Lek. The dykes were improved as part of the Delta Plan on Major Rivers (still being carried out in a number of places), based on the assessment levels recommended by the first Boertien Committee (Commissie Toetsing Uitgangspunten Rivierdijkversterkingen, 1993). The dyke improvement plans were developed in accordance with the national policy of the time, i.e. that the switch from "dyke improvement" to a policy of "creating more room for the rivers" would obviate the need to increase the height of the dykes. It was thought at the time that any measures taken would be restricted to reducing the water levels in order to ensure protection against flooding in the event of a rise in the representative river discharge. In the expectation that higher representative discharge levels would be adopted, the region had nevertheless wanted any dyke improvement plans to already reflect the assessment levels associated with that higher representative discharge. The lack of any statutory basis to do so made this impossible, however.

It has now become clear that the budgetary framework of the present PKB (among other things) makes it impossible to achieve the required level of flood protection only by reducing the water levels. Various sections of dyke will therefore be improved along the Lower Rhine/Lek. Their precise location – as specified in this PKB – can be altered once the results of the five-year dyke assessment become clear (the following assessment will take place in 2006).

The dyke improvement measures carried out within the context of the Delta Plan on Major Rivers had an enormous impact on the dykes as an element of the landscape, and on their direct environs. The dyke improvements required under this PKB are more limited in scale; they primarily involve dyke reinforcement (for example extending the revetments and, to a much lesser extent, increasing the height of the dykes).

Dyke improvement along Lower Rhine, Gelder Valley (dyke ring 45, at around river kilometres 905-907)
The dyke is currently high enough (with the exception of a short stretch) to cope with the higher water levels, but in fact it is not strong enough to do so. The necessary reinforcement work will mainly involve making the dyke more resistant to seepage in order to prevent piping (i.e. the dyke being undermined by seepage water).

Dyke improvements along Lower Rhine, Betuwe/Tiel and Culemborg washlands (dyke ring 43 up to Amsterdam-Rhine Canal, at around river kilometres 892-928)
Along most of these sections of the dykes, the dyke crest is already high enough. To cope with higher water levels, however, it will be necessary to reinforce the dyke. This may involve increasing the height of the revetment on the landward side of the dyke and also making it wider; this may or may not be combined with making the slope less steep. In places where buildings or other valuable structures are located close to the dyke, dyke reinforcement may involve installing sheet piling or other constructions.

Dijkverbetering Lek, Betuwe/Tieler en Culemborgerwaarden
(dijkring 43 (AR-kanaal tot Fort Everdingen), ± rivierkilometer 930-942)
Almost all of the dyke is high enough along this stretch, but it is too weak in various sections (as indicated). It will be necessary to increase the height of the revetment on the landward side of the dyke and also make it wider; this may or may not be combined with making the slope less steep. In places where buildings or other valuable structures are located close to the dyke, dyke reinforcement may involve installing sheet piling or other constructions. Minor dyke reinforcement on the river side will also be necessary in a number of places. and compensation will need to be found for the narrower river bed. Great care must be taken when making modifications to Fort Everdingen, a heritage site.

Dyke improvements along the Lek, Alblas washlands and the Vijfheerenlanden (dyke ring 16, at around river kilometres 942-980)
It will be a complex job to increase the height of the dykes here and reinforce them. The nature of the subsoil means that it will become compacted after the height of the dykes is increased. Increasing the height of the dyke in the built-up areas will have a direct impact on how the houses there are used and their occupants' enjoyment of them. In these areas, it will be necessary to extend or modify earlier flood defence structures. It will also be necessary to increase the height of the revetment on the landward side of the dyke and also widen it. In particular, a considerable amount of space will be required to expand the revetments intended to prevent piping. Some of the proposed dyke improvements are covered by the programme of improvements currently being carried out between Everdingen and Hagestein and between Vianen and Tienhoven.

Dyke improvements along the Lek, Lopik washlands and Krimpen washlands (dyke ring 15, at around river kilometres 958-971)
The height of the dykes needs to be increased as well as improved locally. In most cases, the improvement work can be carried out on the landward side of the dyke. Where there is no room to expand the revetment or make the slope less steep, the improvement will involve installing flood defence structures (sheet piling, etc.).

10.6 Reserving land

From Arnhem onwards, the Lower Rhine/Lek will not be affected by river discharge levels in excess of 16,000 m³/s (at Lobith). It will therefore not be necessary to take further measures in this section of the project area, meaning that no land need be reserved.

10.7 Opportunities for measures

Maurik
Various private initiators are joining forces to develop a plan to create more room for the river around Maurik. The plan consists of various components, including a minor dyke relocation, excavations in the washlands, improving opportunities for recreation, and building a number of homes. The plan is not yet definite, but the region does regard it as an opportunity to improve the spatial quality of this section of the Lower Rhine. The plan can be regarded as supplementary to the Basic Package of Measures. It will, however, need to be assessed against a number of financial, economic and technical criteria.

Other plans
In addition to these specific plans, both public and, in particular, private initiatives are possible along the Lower Rhine/Lek. The chance of their succeeding will be greatest if they are compatible with the flood protection and spatial quality strategies developed by local and regional authorities and the national government. Specifically, the initiatives concerned involve mineral extraction companies. It is possible that these plans, combined with the Basic Package of Measures, will make dyke reinforcement less necessary.

11

IJssel

11.1 Description of the area

The IJssel flows from the point where it diverges from the Rhine (near Arnhem) northwards along the Veluwe heathlands. Until Deventer, it cuts through an area of sandy soil. At this point the river has broad meanders and lies lower than the surrounding landscape. It is also fed by a large number of tributaries in this section. Many of the washlands have been maintained in the same small-scale manner for a long time, and have an exceptional morphology as a result. The small-scale nature of the landscape can be detected in the different ways in which the land is used; farming and nature conservation form a patchwork quilt in many areas. The land in the washlands is used in the same way as that on the landward side of the dyke in many places, especially in the case of country estates that have property holdings both on the river and landward side of the dyke. The historic towns of Zutphen and Deventer, with their waterfronts, are also located in this area. Zutphen and Deventer are conurbations; these two towns have chosen to expand on the opposite bank of the river, i.e. west of the IJssel.

Between Deventer and Zwolle, the IJssel flows like a long ribbon through a broad river valley. It scarcely meanders here; the river valley roughly divides the Veluwe heathlands from Salland (which is why the river here is called the Salland IJssel). The orientation of the landscape is north-south here, parallel to the river. The landscape on both sides of the dyke is open and therefore harmonious. Scattered building along the dykes is typical of this section of the river. North of Zwolle, the river flows through an open polder landscape. Almost all of the farms operating here are large-scale in nature. The mouth of the IJssel is almost unrecognisable as a delta nowadays. The IJssel flows through a narrow winter bed past the urban area of Kampen, an attractive Hansa town. A large number of development projects have been scheduled for the Zwolle/Kampen region in the years ahead: a major housing project, the construction of the Hanze railway line with a new station, and the upgrading of the N50 provincial road to motorway status.

11.2 Flood protection

The IJssel is different from the other distributaries of the Rhine. Its short-term targets are relatively high, ranging from approximately 5 cm in the initial and final stretches of the IJssel to approximately 50 cm between Zutphen and Zwolle.

The current system for distributing water between the various distributaries of the Rhine means that of the 1000 m³/s extra discharge at Lobith (i.e. the difference between 15,000 m³/s and 16,000 m³/s) that has been allowed for since 2001, 15% will go via the IJssel (150 m³/s). In the IJssel, however, the discharge from the side rivers under representative conditions (including the Oude IJssel and the Twente Canal) makes a considerable contribution to the target. In 2001, the discharge from the side rivers was found to be 200 m³/s more than established in the framework conditions as defined in 1996 (in the Randvoorwaardenboek). That means that in 2001, the representative discharge downstream of Deventer was increased by a total of 350 m³/s. Because the IJssel is only a small river, this is a fairly dramatic increase.

As far as the longer term is concerned (when the representative discharge at Lobith is expected to increase to 18,000 m³/s), the IJssel will need to deal with a good 350 m³/s more water. In terms of increased water level, this means that unless more room is created for the river, the water level will increase by approximately 35 cm in the long term.

11.3 Improvements in spatial quality

The valuable historic cityscapes of the Hansa towns of Zutphen, Deventer and Kampen must be preserved. Urban renewal plans must be combined with measures intended to create more room for the rivers, robust nature cores, and leisure-time amenities. Where possible, residential and business property should be developed along the water. In the areas in between, the solution will be sought in widening the winter bed and/or implementing measures in the washlands. The entire IJssel valley, and particularly the area on the river side of the dyke, is currently of immense spatial quality. In the most upstream section of the IJssel, from the point where it diverges from the Rhine at Arnhem/Westervoort, city and river can be made more harmonious by creating nature conservation areas with recreational facilities along the urban periphery. The characteristic features of the transition area between the push-moraine (the Veluwe heathlands) and the river must be preserved. The character of the IJssel as it winds its way from Dieren to Deventer can be enhanced by restoring the pattern of old meanders. Efforts must be made to retain current land-use practices and land division patterns in the washlands as much as possible.

As in other places, in the IJssel delta the open nature of the land on both sides of the dyke and the dykes themselves should be retained by intervening as little as possible in the washlands. The delta-like nature of the area should be enhanced where possible, for example by allowing water to flow once again in the old arms of the river.

11.4 Overall approach to decisions for the long term

Considerations

The decisions taken were based on the following considerations:

- The strategic policy decisions state that the current landscape, geomorphological, natural and heritage features on the river side of the dyke should be affected as little possible. The Regional Spatial Framework [Regionaal Ruimtelijk Kader, RKK] designates the current quality of the entire IJssel valley, and specifically the area on the river side of the dyke, as high. Many of the washlands are designated as either a "preservation area" or an "adaptation area" in the RRK. In order to maintain these washlands in the chosen manner, a maximum limit has been set on the room that will be created for the current winter bed. For the IJssel, the space created will make it possible for 200 m³/s extra water to be discharged compared with the current situation. Somewhat more water can be discharged along certain stretches of the IJssel on the river side of the dyke.
- There are also a number of washlands along the IJssel of which large areas are considered "hands-off" under the Strategic Framework for the Birds and Habitats Directives. Spatial interventions on the river side of the dyke in these areas would have a predominantly negative impact on the protection offered under the Birds and Habitats Directives. Excavation is not desirable in these areas, or only to the most limited extent.

Overall approach to measures for the long term

Combining the relatively high long-term target with high spatial quality makes it difficult to select measures to be implemented along the IJssel.

There are only restricted opportunities to achieve the desired reduction in water levels on the river side of the dyke. There are few hydraulic obstacles along the IJssel that can be removed. The groynes in the river are relatively short and low, and reducing their height will therefore do little to lower the assessment levels. Deepening the summer bed is only an option in the downstream section of the river. Further upstream, deepening the summer bed would have a much too negative effect on the morphology of the river bed and the infrastructure there, for example bridge piers and embankments. It would therefore be mainly in the washlands that more room for the river could be created on the river side of the dyke. That is only desirable to a limited extent for the reasons cited above, and will not by any means be sufficient to achieve the long-term target. That is why measures have been sought to give the channel of the river more room on the landward side of the dyke.

The stretch of river between Westervoort and Doesburg is an exception; there are sufficient opportunities there for measures to be implemented on the river side of the dyke, and they are furthermore preferable to dyke relocation. In addition, old meanders can be made part of the river again. Downstream of Doesburg, the preference is to implement measures on the landward side of the dyke, specifically dyke relocation at Voorster Klei, Cortenoever and Westenholte. These will be reasonably to very effective in the area. New meanders will also be added to the river at Zutphen and Deventer, in the form of high-water channels. From the spatial planning point of view, these can be combined effectively with urban development and recreation.

The area between Veessen and Wapenveld affords an opportunity to develop a "green" high-water channel. Doing so will eliminate the need for large-scale dyke relocation and washland excavation in an area with valuable natural features. The open nature of the landscape that typifies this area should be preserved. Farming can continue here, but it will also be possible to develop new uses for the land, for example nature conservation and recreation. The high-water channel will have less impact on the local population than dyke relocation, which would otherwise become necessary.

Creating a high-water channel at Kampen makes it possible to "branch" the IJssel delta into a system of distributaries, returning it to the way it used to be. A "blue", flowing high-water channel offers the greatest potential for improving

spatial quality by combining urban expansion, recreation, nature conservation and creating more room for the rivers. The dynamic interplay between the river and the wind set-up from Lake IJssel will make it possible to develop the natural features typical of deltas. There are also opportunities north of Kampen to open up old arms of the river by relocating a dyke at Noorddiep.

These measures, to be taken on the landward side of the dyke, and supplemented with limited excavation work in the washlands, will create enough capacity to achieve the long-term target.

In the long term, dyke reinforcement will be required along the IJssel downstream of Kampen. This is because of the continuing long-term rise in the level of Lake IJssel, not because the discharge of the River IJssel will increase.

11.5 Short-term measures

General
The reasons for creating more room for the rivers on the river side of the dyke cited in the overall approach to measures for the long term also apply for the short term. Measures introduced on the river side of the dyke, i.e. washland excavation, will help to meet part of the target. Introducing more such measures would, in theory, make it possible to meet even more of the target; however, taken as a whole they represent a major excavation project that would affect the existing spatial quality to an undesirable extent. That is why even in the short term, measures taken on the landward side of the dyke will be used to create more room for the river at certain spots along the IJssel.

In the long term, even more room will need to be created for the river on the landward side of the dyke. When combined, the landward measures described here are so effective that some of the projected washland excavation may no longer be necessary. That is why, for the IJssel, it has been decided to already implement a large number of measures in the short term on the landward side of the dyke. These measures are derived from the indicative package of measures for the longer term.

The public consultation process following the publication of PKB Part 1 generated many different reactions to the proposed measures on the landward side of the dykes along the IJssel. The Government is sympathetic, but sees no other solution within the preconditions and objectives set. It will deal very carefully, however, with the interests of those directly affected. In this respect, a tailor-made approach is essential, something that can lead to "win-win" situations for both individuals and the community as a whole through the efforts of all the public authorities involved.

Arnhem-Doesburg
The Basic Package of Measures set out in this PKB makes use of the excess height of the dykes along the IJssel from Arnhem to Doesburg. The dykes along this stretch are high and strong enough to offer protection against flooding even when the discharge at Lobith rises to 16,000 m³/s.

Doesburg-Deventer
There are a number of small-scale washlands between Doesburg and Zutphen with exceptional structures; they are part of the "hands-off" area protected under the Strategic Framework for the Birds and Habitats Directives. These washlands must be retained in their present state and cannot therefore help to create more room for the river. Instead, measures will be introduced on the landward side of the dyke. In the long term, three such measures will be required along this stretch (dyke relocations at Cortenoever and Voorster Klei and the high-water channel at Zutphen). In the short term, either the two dyke relocations or the high-water channel at Zutphen will be necessary. For now, it has been decided to relocate the dykes at Cortenoever and Voorster Klei in the short term. The high-water channel will be twice as expensive as the two dyke relocations combined.

Both dyke relocations are based on the assumption that the chosen design will retain the existing dykes as much as possible, preserve the current landscape in the new area created on the river side of the dyke, ensure that the new dykes are sympathetic to the existing landscape, and allow the land to continue to be used in the current manner as much as possible.

The high-water channel, however, represents a better opportunity to improve the spatial quality than do the two dyke relocations. If it becomes clear in time that the high-water channel is financially feasible and can be implemented before 2015, then it can still be included in the Basic Package of Measures. The two dyke relocations will then be used to solve flood protection problems in the longer term.

Dyke relocation at Cortenoever and Voorster Klei
The dyke relocations at Cortenoever and Voorster Klei both involve relocating an existing main dyke approximately a kilometre further away from the river (main flood defences). A section of the old dyke will be preserved, but it will be levelled at the site of the inflow and outflow opening. To ensure that the water is properly channelled at the inflow opening, a lake will be created in the Cortenoever project, and the sewage water treatment plant will be enclosed by its own protective dykes. The precise location of the new dykes has yet to be determined, but a number of houses and a few farms will come to lie on the river side of the dyke. There are various solutions for the buildings involved, in part owing to the fact that they are on higher ground. A tailor-made approach should be taken within the context of the follow-up procedure (development and planning phase). The options depend on the way the new area on the river side of the dyke is developed and the future flood frequency there.

Deventer-Zwolle
Some parts of the washlands along this section of the river should be retained in order to preserve the existing landscape, natural features and heritage value. In view of the ambitious target, there is insufficient opportunity to create the necessary room for the river on the river side of the dyke. The Government has decided to include the high-water channel between Veessen and Wapenveld in the Basic Package of Measures for the short term. It is an effective measure that will obviate the need for other measures with a greater impact. It will also make it possible to leave valuable washlands as they are.

Constructing a high-water channel between Veessen and Wapenveld will also help to meet the target downstream, along the stretch that flows roughly between Veessen and Deventer. Supplementary measures will be necessary along this stretch; they will key into plans being developed within the context of the NURG programme for nature development in the Keizer and Stobben washlands and around Lake Bolwerk. The approach selected at Deventer involves creating a channel on the river side of the dyke outside Worp Park and the IJssel Hotel. Combined with the work being carried out in the Ossen washlands, the channel will make an important contribution to meeting the target and improving spatial quality in the area. This approach also makes it possible to cancel a measure planned for the Wilpsche Klei washlands.

High-water channel Veessen-Wapenveld
The high-water channel between Veessen and Wapenveld will be constructed through the Wapenveldsche Broek with an inflow point south-west of Veessen. The outflow point of the channel will be in the Hoen washlands, east of the Veluwe pumping station. New dykes will guide the free-flowing water from south to north and to protect the area on the landward side. According to the plan, the high-water channel will not flood very often, so that the farms in this area can continue to operate.

The precise location and design of the two new dykes has yet to be determined, but it is likely that several houses and a dozen farms lie in the path of the new high-water channel. There are various options for the buildings involved; a tailor-made approach should be taken within the context of the follow-up procedure (development and planning phase). The options depend on the way the new area on the river side of the dyke is developed and the future flood frequency there.

What is clear is that the impact of the new high-water channel will stretch beyond the project area; the implications will be felt, for example, in the way farms divide up their land and run their operations. The measure is such that it will be possible to redivide the land in a much larger area, something that will make a tailor-made approach all the more feasible. The same may apply to adaptations to the water management system. Close coordination with other plans, for example the reconstruction plan, is essential. The measure will then have a positive impact on the area and lead to "win-win" situations.

After further study, it may turn out that other solutions are necessary or desirable that go beyond the remit of the measure. That will, however, have to be the outcome of consultations between the relevant parties and interests. What is most important is that the parties directly involved are consulted.

Excavation of Lake Bolwerk, Worp and Ossen washlands
This measure involves cutting a channel that will begin just upstream of Lake Bolwerk. From there, the channel would run in front of the IJssel Hotel towards the Ossen washlands to the IJssel. Worp Park will not be affected. According to the prevailing insights, it is not necessary for the channel to be constructed straight through to the Wilpsche Klei's summer polder. That makes it possible to

preserve the current situation there. There is very little room at the site of the IJssel Hotel. In hydraulic terms, the channel and the IJssel must be separated by an embankment. Doing so makes it possible to enhance the image of the IJssel Hotel and environs (the ferry jetties) and the existing contrast of stone and greenery. The foot-passenger ferry from Worp Park to Deventer town centre will be retained. The campsite in the park will be closer to the water's edge. Lake Bolwerk will become a nature conservation site after redevelopment. A layer of clean and slightly contaminated material (Class 0-2) will be added to the bottom of the lake, making it shallower.

Excavation of Keizer and Stobben washlands and Olster washlands
The Keizer and Stobben washlands and Olster washlands are located just north of Deventer (although the name encompasses multiple washlands, the proposed measure is restricted for now to the Keizer and Stobben washlands and their environs). The excavation work concerns the construction of a channel that will start in a lake at Deventer. The channel will cross through the Keizer and Stobben washlands and flow into the lakes in the Hengforder washlands towards the IJssel. According to the prevailing insights, it is not necessary for the channel to be constructed straight through to the Olster washlands.

The channel will be approximately 100 metres wide. Besides the channel, only small-scale excavation work will take place in the washlands (some dozen hectares) on the west wide of the channel at Terwolde. The excavation work will make nature development possible. The high-lying part of the washlands, near the Nieuw Rande country estate, will be unaffected and offer opportunities to introduce modified forms of nature management. The measure was designed in accordance with existing plans for this area and the Nieuw Rande estate, drawn up by the IJssel Landscape Foundation and the provincial authorities. The land will be used for nature conservation purposes. At the moment, it is a recreational area for the urban population of Deventer. The measure may enhance the area's local recreational function, but it can also make it a suitable site within the regional recreational network.

Zwolle-IJssel delta
The approach taken at Zwolle involves relocating the Westenholte dyke. The measure is in keeping with an existing nature development project being carried out in the Vreugderijk washlands, which will increase the recreational options for the population of Zwolle. The dyke relocation also keys into an initiative to develop a new country estate in this area. On the other side of Zwolle, the measure for the Scheller and Oldeneel washlands keys into the Community [Buurtschap] project. Thanks to a strong basis of support, planning has already commenced for both projects ("front runner projects").

The measure selected in the IJssel delta involves deepening the summer bed. The available funding has made this relatively inexpensive alternative a logical choice. Some of the material that will be excavated from the summer bed consists of peat and clay. A suitable processing location has yet to be found.

Deepening the summer bed may have a negative impact on certain habitats (for example the species-rich grasslands) in the Natura 2000 area that lies further upstream ("external" effects). That impact may be the result of sedimentation and a reduction in the duration and frequency of inundation. These effects can be mitigated by reducing the height of existing embankments in the washlands. The mitigating measures will – where necessary – be carried out at the same time as the summer bed is deepened in order to avoid negative effects.

Dyke relocation at Westenholte
The dyke relocation at Westenholte involves relocating the dyke on the east bank of the IJssel land inward by about half a kilometre. The old dyke will be removed and a channel excavated in the new area on the river side of the dyke that will be connected to the river at one end. Marshland may develop in the shelter of the new main dyke; the new area on the river side of the dyke will be used mainly for nature conservation purposes.

The precise location of the new dyke has yet to be determined, and the implications for one house in the area are as yet unclear. The dyke relocation will enhance the recreational function of the area for the local urban population.

The dyke relocation is compatible with existing nature development projects and measures to create more room for the river in the Vreugderijk washlands. It may also be possible to key into plans to create a new country estate.

Excavation of Scheller and Oldeneel washlands
The Scheller and Oldeneel washlands serve as a recreational area for the population of Zwolle and for day excursions. The measure will enhance this function: it provides for a channel that will start in the south, under the IJssel Bridge and the lakes in the Engelse Werk washlands and continue north to the IJssel. The channel will hence be compatible with existing nature development projects in the Engelse Werk washlands. Farming will largely give way to nature conservation in the washlands. The houses and outbuildings in the area will remain accessible. As an integral part of this measure, clean and slightly contaminated material (Class 0-2) will be added to the bottom of the small lake in the Scheller and Oldeneel washlands, making it shallower. A shallow lake is a good habitat for flora and fauna. An overall approach has already been developed for these washlands within the context of the Community project. The measure described above is compatible with and keys into these plans.

11.6 Reservations

This PKB reserves the areas on the landward side of the dyke that will be necessary for measures in the longer term that are not included in the Basic Package of Measures for the shorter term. For the IJssel, the measures concerned are the high-water channels at Zutphen, Deventer and Kampen and the dyke relocation project at Noorddiep.

11.7 Opportunities for other measures

The IJssel delta area offers good opportunities to restore the historical structure of the "branched" delta (in part). Various spatial plans – construction of the Hanze railway line, upgrading of the N50 provincial road to make it the A50 motorway, and a large housing project (4000-6000 homes) – will soon become significant in the area southwest of Kampen. There are opportunities to coordinate these projects and create "win-win" situations, with work leading to more work. Such coordination can also generate added value in terms of spatial quality, for example a pleasant, quality residential environment with a new waterfront, aquatic sports and nature development.

The National Policy Document on Spatial Planning [Nota Ruimte] designates the "IJssel delta" project as a development planning pilot project. It is a joint initiative taken by the national government, the Province of Overijssel and other public authorities and partners in the region. The region is working on the master plan for the area south of Kampen. It will provide for an agreement to which public (and potentially private) parties will commit themselves. The high-water channel at Kampen is part of this project. If it becomes clear that the "blue" high-water channel is financially feasible and can be implemented in terms of flood protection before the end of 2015, it will be included in the Basic Package of Measures for the short term. From the long-term perspective of spatial planning and sustainability, constructing a high-water channel is the preferred option.

One thing that will in any case be necessary is a partial change in the Route Decision [Tracébesluit] for the Hanze railway line so as not to create a future obstacle to a high-water channel for the IJssel at Kampen. The current configuration for the railway line will certainly need to be altered. In order to create a flood-free route for the high-water channel at the point where the Hanze railway line crosses the N50 road and De Slaper, it will be necessary to construct an additional structure. The new railway line will also need to be raised over a longer route. Another, less drastic alteration would involve increasing the height of the dyke protecting the railway and moving it a certain distance "land-inward". This is important where the passage of the high-water channel close to the mouth of the tunnel is concerned.

For Zutphen and Deventer as well, there are also opportunities to combine achieving the flood protection targets with local urban development plans along and on the opposite bank of the IJssel. In the longer term, it is likely that high-water channels will have to be constructed near these towns. Such opportunities can be exploited by means of integrated planning and public-private partnerships. If it becomes clear in time that the plan for Zutphen is financially and technically feasible (including maintenance) and can be implemented in terms of flood protection before the end of 2015, it will be included after all in the Basic Package of Measures for the short term.

12

Soil balance and disposal sites for soil

12.1 Introduction

The measures described in the Basic Package of Measures involve a great deal of earth-moving work. Much of the soil that is excavated in the context of one measure can be reused in another, or be sold on the open market for use in projects unrelated to the Room for Rivers Basic Package of Measures. The potential for reuse depends on the requirements set for the soil in terms of both its physical and chemical properties. In addition, the distance over which the soil can be profitably transported also depends on the type of soil. Except for clay and cement and masonry sand, the potential demand for reuse should come from the area where the soil is excavated. The implementation plans will attempt to match the material that is excavated to the material that is needed as closely as possible ("work leads to work"). Where this is not possible, other solutions will be sought.

Some of the surplus soil is contaminated. In the course of time, the silt in the river and the upper layer of the washlands have been contaminated by the river water, which used to be highly polluted. If such soil is excavated as a result of the projects, part of the soil flow will be contaminated. Soil that is excavated from the river system, including areas that will come to lie on the river side of the dyke, is defined in the regulations as "dredging spoil".

Dredging or excavating soil from the summer bed or washlands of the rivers, or using or disposing of such soil, is subject to European and Dutch legislation.

With respect to earth-moving work along the rivers, the area-specific policy Active Soil Management of River Beds [*Actief Bodembeheer Rivierbed*] has been defined in greater detail in the policy rules Active Soil Management for the Distributaries of the Rhine (Upper Rhine, Waal, Pannerden Canal, Lower Rhine/Lek and IJssel) and the Meuse [*Actief Bodembeheer Rijntakken (Boven-Rijn, Waal, Pannerdensch Kanaal, Neder-Rijn/Lek en IJssel) en Maas (ABR/ABM)*]. Implementation of this policy is subject to the "ABR/ABM Rules". The PKB applies these rules to the soil balance of the Basic Package of Measures. The ABR/ABM does not apply to the lower reaches of the rivers; here, the area-specific policy has been defined in the Overall Approach to Remediation along the Lower Reaches of the Rivers Region [Saneringsvisie Benedenrivierengebied].

12.2 Active Soil Management for the Distributaries of the Rhine

The ABR and ABM indicate how to deal in an environmentally responsible manner with the widespread diffuse soil contamination in the Rivers Region, taking the specific characteristics and/or functions of the area into account. The recommendations are meant to prevent societally relevant projects – such as creating room for the rivers – from coming to a standstill or becoming unaffordable.

According to the ABR/ABM, every land development project is regarded as a partial soil remediation project for which a remediation plan must be drawn up. The ABR/ABM indicates the remediation targets (the minimum quality of the soil) but it also describes the potential for processing or reusing the soil excavated in the course of large-scale development projects in the same project area.

Because there are restrictions on moving soil between separate projects, measures intended to create room for the rivers in the upper reaches are considered to be a single, integrated project within the meaning of the ABR.

The general quality of the soil in the distributaries of the Rhine is based on what is described in the Soil Zoning Map for the Rhine Distributaries [Bodemzoneringskaart Rijntakken]. The ABR distinguishes between various soil quality zones. A zone is a unit consisting of sections of a site or a sub-area that are expected to have the same characteristic pattern of diffuse organic and inorganic soil contamination. A total of five soil quality zones are defined, with the soil within each zone varying in quality in a particular manner, both horizontally and vertically.

The ABR and ABM Rules were drawn up so that the ABR/ABM policy would be implemented uniformly while the development projects are being carried out along the distributaries of the Rhine and the Meuse. The Rules were adopted by the relevant competent authorities in November 2005 and were used to define the soil balance and to estimate the cost of the Basic Package of Measures for the PKB. Specifically, this means that earth-moving projects will be based on the average soil quality per "soil zone", with Class 3 or 4 soil no longer needing to be kept separate within these zones. The soil in each soil zone will be categorised as being clean to slightly contaminated or as heavily contaminated.

12.3 Overall approach to remediation along lower reaches of rivers

Along the lower reaches of the rivers, the area-specific approach has been worked up in detail in the document Overall Approach to Remediation of Banks and Lake and River Beds along the Lower Reaches of the Rivers [*Saneringsvisie oevers en waterbodems benedenrivierengebied*] (2000). An overall approach to remediation has been developed for each sub-area. Those for the Lek, the Dordtsche Biesbosch wetlands and the Haringvliet /Hollandsch Diep West have been completed.

The overall approach to remediation focuses on remediating the contaminated beds of rivers and lakes. Various remediation options are considered, for example removing the contaminated material or covering it. In the overall approaches, the basic idea is that the soil will be removed and disposed of in a large-scale soil disposal site (central disposal). The existing site (De Slufter) and the future Hollandsch Diep site are available for this purpose.

The overall approaches also consider the use of slightly contaminated soil within the river system. For example, the Haringvliet/Hollandsch Diep West approach allows slightly contaminated soil (Class 02) to be used as a covering for heavily contaminated remediation sites.

12.4 Disposal locations

Basic principles for soil balance

~ The uncertainty concerning the amount of soil that will be excavated and the nature of that soil has meant that the estimated disposal capacity required is based on an upper limit approach. It may turn out during the planning study phase that one or more of the disposal sites included in the PKB will not be necessary. The remaining capacity can also be used to dispose of soil from other projects.

~ The soil balance defined in the Basic Package of Measures is based on the average quantities of soil to be excavated and required for each measure. This information has been used to draw up the cost estimate for the Basic Package of Measures.

~ The soil balances of the private projects (for example the Huissen washlands and Druten washlands) have not been included in the soil balance of the Room for Rivers Basic Package of Measures.

Order of preference and basic principles for disposal locations
In terms of the disposal locations, the soil balance is based on the following order of priority:

1 *Use as building material* - Projects intended to create room for the rivers will produce a great deal of sand and clay that can be sold on the open market. Some of these materials can also be used in projects to create more room for the rivers, for example to construct and reinforce dykes.

2 *Reuse of surplus soil* - It may be possible to use clean to slightly contaminated soil in nature development projects, to cover remediation sites (river and lake beds) or for river-based measures involving terps, high-water refuge areas, and dykes.

Dredging spoil has been used in the foreshores and islands of the Lake IJssel area in the past few years. Along the lower reaches of the rivers, surplus soil can be reused as a covering at remediation locations in the Haringvliet, this being linked to nature development projects.

The functional reuse of surplus soil in projects elsewhere must be investigated in greater depth during the planning study phase. The PKB identifies soil disposal sites in the event that it is not feasible to reuse surplus soil within the projects or elsewhere.

3 *Making sandpits shallower within the project areas* - In the first instance, efforts were made to concentrate the surplus soil in flooded sand extraction pits located in one of the project areas. The only former sand extraction pit large in enough in volume to serve as a disposal site for soil excavated outside its own area can be found in the Scheller and Oldeneel washlands, where excavation work will be carried out as part of a measure.

4 *Disposal of soil in existing flooded sand extraction pits along the distributaries* - If there is no suitable sand extraction pit in a particular project area, the surplus soil will be concentrated in a sand extraction pit along the same stretch of river where the soil has been excavated. This will keep the transport distance to a minimum. The aim in the Basic Package of Measures is also to concentrate soil disposal at a restricted number of sand extraction pits.

While the PKB was being prepared, a study was conducted into suitable new pits. The impact assessment carried out within that context showed that a number of deep pits are highly suitable for nature development purposes. The basic assumption is that the water will be deep enough beyond the fill-in level of the sandpit to continue to provide a habitat for aquatic flora and fauna. There are no objections in nature conservation legislation to making these pits shallower.

The factors that were reviewed when considering suitable disposal sites were: whether enough disposal capacity was available, whether a temporary passage to the river exists or can be created, and whether the location is logistically strategic and cost-effective.

5 *Returning or disposing of soil within the project area* - A "closed soil balance" is possible in the case of a number of measures. This means that all the excavated soil can be sold on the open market or can be returned to the site or disposed of within the area covered by the measure. Private projects such as the Huissen washlands and Druten washlands are based on a closed soil balance design.

6 *Disposal of heavily contaminated surplus soil in large dredging spoil disposal sites* - The basis for determining the quality of the soil is the method set out in the ABR/ABM Rules and the Overall Approach to Remediation along the Lower Reaches of the Rivers [Saneringsvisie benedenrivierengebied]. Heavily contaminated soil excavated as part of a measure being carried out in the upper or lower reaches of the rivers will be disposed of in existing dredging spoil disposal sites, for example IJsseloog, Cromstrijen, Kaliwaal and De Slufter, and the new Hollandsch Diep site.

12.5 Soil balance and selection of disposal sites for soil

Upper Rhine/Waal
When the dyke at Lent is relocated further away from the river, a large quantity of filling sand (some of it industrial) will be excavated that can be sold on the open market (approx. 2.5 million m³). Heavily contaminated surplus soil (approx. 0.3 million m³) will be disposed of in an existing dredging spoil disposal site. The specific site will be selected during the implementation phase. The Kaliwaal and Cromstrijen/Hollandsch Diep sites are being considered. Slightly contaminated soil that cannot be returned to the project area will be disposed of in the existing lake in the Oosterhout washlands. If the capacity there is insufficient, some of the soil can be disposed of in the Havik washlands or the Gouverneursche Polder.

Cromstrijen/Hollandsch Diep dredging spoil disposal site
Heavily contaminated soil excavated as a part of the measures being implemented along the lower reaches of the rivers and along the Lower Rhine and the Waal can be disposed of in the Cromstrijen site or in the new Hollandsch Diep dredging spoil site.

Kaliwaal
Heavily contaminated soil excavated as a part of the measures being implemented in the washlands along the Lower Rhine and the Waal can be disposed of in the existing Kaliwaal disposal site on the south bank of the Waal at Druten.

Oosterhout washlands
Slightly contaminated soil excavated during the dyke relocation project at Lent will be used to make the lake in the Oosterhout washlands shallower. The lake is located in the washlands on the north side of the Waal and borders the Lent dyke relocation project area. This means that the soil transport distances can be kept to a minimum. The lake has an open connection to the river, so that the soil can be transported by barge. After it has been redeveloped and made shallower, the lake will be highly suitable for nature development and landscape restoration. It will become a valuable addition to the urban recreational area on the river side of the dyke at Lent. Because the current disposal capacity (about 0.4 million m³) is insufficient to dispose of all the slightly contaminated soil excavated during the dyke relocation project at Lent, the remaining quantity can be disposed of at the Gouverneursche Polder soil disposal site. This is located close to Ochten on the north bank of the Waal.

Havik washlands
Slightly contaminated soil excavated as part of the measures being implemented along the IJssel will be used to make the lake in the Havik washlands shallower. This site in fact consists of a number of lakes and is located on the north bank of the IJssel at Doesburg. Although the project areas and the disposal sites are quite far apart, the lakes offer sufficient disposal capacity (approx. 2 million m³) and soil can easily be transported there by barge. The lakes are covered by the overall development policy for the IJssel Valley. The disposal capacity in the Havik washlands can be increased considerably within the context of private development plans. After surplus soil is used to make the lakes shallower, they will be very suitable for nature development combined with projects to restore and develop the landscape. This approach will make a valuable contribution to preserving seepage-dependent flora and fauna in the immediate surroundings.

Gouverneursche Polder
The extra soil disposal site in Gouverneursche Polder is suitable for disposing of slightly contaminated surplus soil excavated as part of the measures being carried out along the lower reaches of the rivers and along the Waal. This surplus soil cannot all be disposed of in the Haringvliet and the Oosterhout washlands. Gouverneursche Polder is located in the washlands on the north side of the Waal at Ochten and is favourably situated for disposing of soil from the measures referred to above. The disposal capacity is approximately 1.0 million m³. The fact that the lake has an open connection to the river means that soil can easily be transported there by barge. After the lake has been made shallower, it will be a highly suitable, dynamic habitat for river-based flora and fauna, producing crucial added value for the area.

There are two measures – the Brakel washland excavation project and the dyke relocation project in Munnikenland in the downstream section of the Waal – that will produce a great deal of surplus clay. It has been assumed that some of this material can be reused in the dyke relocation project planned there.

The heavily contaminated soil excavated from the downstream section of the Waal will be disposed of in the Cromstrijen/Hollandsch Diep dredging spoil disposal site (approx. 0.3 million m³).

Some of the clean to slightly contaminated surplus soil (approx. 1.0 million m³) that is excavated from the Brakel washlands and the dyke relocation project in Munnikenland can be disposed of in the existing sand extraction pit in the Haringvliet or the Gouverneursche Polder. Other options are to use the soil to cover remediation locations in the Haringvliet or to use it to create shallower areas within the context of ecological recovery and redevelopment. It is still unclear, however, whether the excavated soil will in fact be suitable for these purposes. Given this uncertainty, the Kerkenwaard soil disposal site has been cited in the PKB as an extra option.

Distributaries of the Merwede, Bergsche Maas/Amer, Rhine/Meuse estuary area
The measures planned in the Rivers Region will be accompanied by major earth-moving activities, with a total of approximately 4.4 million m³ of soil being moved. In addition, dyke improvement projects along the lower reaches of the rivers will require a limited amount of sand and clay. A considerable quantity of soil can be reused for the dykes, embankments and terps (approx. 0.9 million m³) covered by the measures. In addition, reusable material can be shared between projects, provided that implementation of the measures is properly coordinated.

The heavily contaminated soil excavated as part of these measures can be disposed of in the Cromstrijen/Hollandsch Diep dredging spoil disposal sites (approx. 0.3 million m³). Some of the total quantity of slightly contaminated surplus soil (approx. 3.1 million m³) will be disposed of in the existing pit in the Haringvliet, as will material from the downstream section of the Waal. As the pit is not large enough (it can hold approx. 1.8 million m³) to contain all the surplus soil, some of it will have to be used or disposed of in other disposal locations. It may be possible in that context to reuse the surplus soil to cover remediation sites in the Haringvliet. Another option is to reuse the soil to create shallower sections in the Haringvliet within the context of ecological recovery and redevelopment. It is still unclear, however, whether the soil excavated to create more room for the rivers will in fact be suitable for these purposes. That is why the Kerkenwaard site has been cited in the PKB as a back-up option.

Haringvliet pits combined with covering of Haringvliet remediation sites, recovery measures and/or nature development
Slightly contaminated soil excavated as part of the short-term measures being implemented along the lower reaches of the rivers and the lower reaches of the Waal will, in the first instance, be disposed of in the deep pits of the Haringvliet. Current understanding shows that the disposal volume of the pits (a maximum of 1.8 million m³) is insufficient to take all the surplus soil. That is why efforts will be made after the PKB procedure to study the extent to which the surplus soil is also suitable for use in remediation locations and to create shallower lakes and rivers within the context of ecological recovery and development. Because the precise location, the scale of the disposal measures, and the method of implementation are as yet unknown, it is still not possible to determine the extent to which these measures can or do comply with nature conservation legislation. This is still a gap in our knowledge, and for that reason the PKB cites Kerkenwaard as an extra soil disposal site.

Kerkenwaard
The extra soil disposal site at Kerkenwaard cited in the PKB can be used if the slightly contaminated surplus soil excavated as part of the measures being implemented along the lower reaches of the rivers and the lower reaches of the Waal cannot or cannot all be disposed of in the Haringvliet soil disposal sites. Kerkenwaard is located on the north bank of the Waal at Haaften, opposite Zaltbommel, and can dispose of approximately 3.8 million m³. The site is now a refuge harbour for commercial shipping, and soil can easily be transported there by barge. The transport distance from Noorwaard to Kerkenwaard is the same as the distance to the Haringvliet.

Lower Rhine/Lek
The total amount of soil to be excavated here comes to approximately 1.9 million m³. Dyke improvements will also be carried out, which will require clay and sand.

Heavily contaminated surplus soil will be disposed of in existing dredging spoil disposal sites. The Kaliwaal and Cromstrijen/Hollandsch Diep are being considered for this purpose. The new site that is now being prepared in the Ingen washlands could also be used, if this option becomes available.

Various disposal locations have been proposed in the PKB for clean to slightly contaminated soil. With respect to the Vianen/Hagenstein and Meinerswijk measures, such soil will be returned to or disposed of in the project area. The amount of soil concerned is approximately 0.4 and 0.2 million m³ respectively.

For the measures being implemented along the Arnhem–Amerongen section of the river, preference is being given to disposing of clean to slightly contaminated soil in the existing pit in the Ingen washlands. This location is relatively close to the areas in which the soil will be excavated. The total amount of soil to be disposed of comes to approximately 0.6 million m³.

Ingen washlands
Slightly contaminated soil excavated as part of the measures being implemented in the washlands along the Lower Rhine will be used to make the lake in the Ingen washlands shallower. The lake is located on the south bank of the Lower Rhine at Lienden and Ingen. It has a disposal capacity of approximately 3.6 million m³. The fact that the lake has an open connection to the river means that soil can easily be transported there by barge. After it has been partially redeveloped and made shallower, the lake will be suitable for nature development and landscape restoration.

The "Eiland van Maurik" development project referred to earlier is a private initiative. The basic idea is that such initiatives must maintain a closed soil balance and that the private parties involved are responsible if they dispose of heavily contaminated soil elsewhere.

IJssel
The total amount of soil to be excavated along the IJssel is approximately 8.6 million m³. Although there are no plans to reinforce any dykes along the IJssel or to increase their height, a number of dykes will be relocated, requiring a large quantity of sand and clay. The large-scale excavation work involved and the many different ways in which the soil can be reused make the soil balance here a relatively complex affair. Close coordination between the various measures will be necessary to ensure that the soil is in fact reused.

According to the soil balance for the IJssel, the approximately 1.3 million m³ of clay and sand that will be excavated in the course of the various measures can be reused within the context of those or other measures. In addition, approximately 2.6 million m³ of filling sand, much of it taken from the summer bed of the Lower IJssel, will be sold on the open market.

The heavily contaminated soil excavated along the IJssel can be disposed of in the IJsseloog dredging spoil disposal site. Approximately 0.5 million m³ of soil is involved, some 0.3 million m³ of which comes from the summer bed.

IJsseloog
Heavily contaminated soil excavated within the context of measures being implemented in and along the IJssel will be disposed of in the large-scale IJsseloog dredging spoil site in Lake Ketel.

The slightly contaminated soil (approx. 4.2 million m³) will be disposed of in existing sand extraction pits. Some of it will be disposed of in a pit located within a project area (Scheller and Oldeneel washlands). Most of the pits in the washlands along the IJssel are relatively small, making it necessary to dispose of the slightly contaminated soil at a number of different locations. Given the uncertainty about the volumes of soil and the disposal capacity of the existing lakes, preference will be given to a limited number of other larger disposal locations.

Excavation of Scheller and Oldeneel washlands
The Scheller and Oldeneel washlands serve as a recreational area for the people of Zwolle and for day excursions. The measure will enhance this function: it provides for a channel that will start in the south and run under the IJssel Bridge and the lakes in the Engelse Werk park/washlands, continuing north to the IJssel. The channel will hence be compatible with existing nature development projects in the Engelse Werk washlands. Farming will largely give way to nature conservation in the washlands. The houses and outbuildings in the area will remain accessible. As an integral part of this measure, clean and slightly contaminated material (Class 03) will be used to make the lake in the Scheller and Oldeneel washlands shallower. A shallow lake is a good habitat for flora and fauna. An overall approach has already been developed for these washlands within the context of the Community project. The measure described above is compatible with and keys into these plans.

The soil excavated from the upstream section of the IJssel will be disposed of in the Havik washlands (approx. 1.5 million m³). Other reuse locations in Lake Ketel/Lake IJssel/Lake Marker are being sought for the slightly contaminated surplus soil excavated from the downstream section of the IJssel. Some 2.2 million m³ of soil is involved, much of it peaty/clayey material that will be excavated from the summer bed. One possibility is to dispose of the soil in deep pits in Lake IJssel at the Flevo power station. It is quite possible that doing so will have a major impact on protected fish-eating birds that feed there, however. The Directorate-General for Public Works and Water Management is developing a comprehensive management plan for creating shallower pits in Lake IJssel and the chain of lakes bordering it (the "Randmeren"). The plans indicate how much dredging spoil can be disposed of in the pits at the Flevo power station, and under what circumstances that can be done.

Pit at Flevo power station combined with nature development measures
Slightly contaminated soil excavated as part of the Veessen-Wapenveld measures and the excavation of the summer bed of the IJssel can be used to make the pit at the Flevo power station shallower. The available disposal capacity is as yet unknown, however. In preparing the management plan for the pits in Lake IJssel and the "Randmeren", efforts are being made to determine the conditions under which dredging spoil can be disposed of in these pits, including the pit at Flevo power station. Much of the dredging spoil taken from the summer bed is clayey/peaty material; given the properties of this material, it may only be suitable for use in nature development projects (Lake IJssel/Lake Marker) or under specific conditions in terps or dyke reinforcement projects. The feasibility of these options must be studied after the PKB procedure has been concluded. Given these uncertainties, some of the slightly contaminated soil can be used to make De Waarden shallower.

One alternative to disposing of the dredging spoil is to reuse slightly contaminated soil in redevelopment projects, for example the construction of island sanctuaries and foreshores. Given the available disposal capacity, disposing of slightly contaminated soil in the small pits north of Deventer is not a satisfactory solution. If the disposal locations in Lake IJssel cannot be readied in time, the back-up option is to store the soil in the Havik washlands and in De Waarden. Given the large transport distances, however, these options are not preferable.

The various dyke relocation projects will require an extra 1.6 million m³ of clay.

Mineral extraction options

As the description of the soil balance demonstrates, the measures set out in the Basic Package of Measures do not offer many opportunities for cement/masonry sand extraction outside of those undertaken by private parties. The Huissen washlands, Druten washlands and "Eiland van Maurik" measures offer good opportunities to extract millions of cubic metres of good quality sand and gravel.

It has also been estimated that a total of approximately 5.3 million m³ of filling sand will be excavated along the Waal and the IJssel within the context of a number of measures. It is not profitable to transport this material over long distances. Various projects are being planned in the same area that will require filling sand. Whether the material can be sold profitably on the open market will depend largely on whether implementation of the measures can be coordinated with the schedules of projects in which the sand can be used.

The Basic Package of Measures is not expected to produce much saleable ceramic clay. The dyke relocation and improvement projects are expected to require 1.8 million m³ of clay, much of this being needed to construct the new dykes along the IJssel. Part of the planning study phase involves determining the extent to which clay extraction will be possible in projects intended to create more room for the rivers.

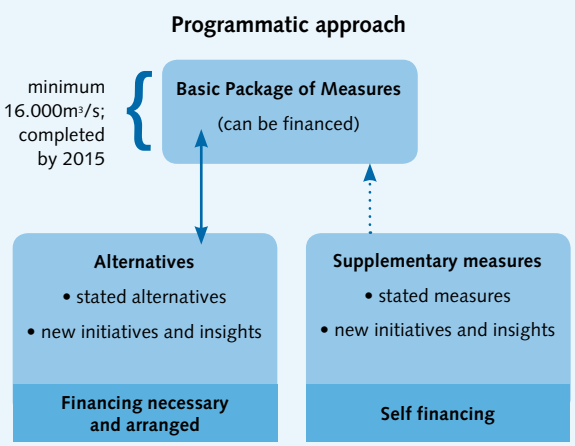
13

Programmatic approach

13.1 Introduction

This PKB elects for a programmatic approach, which allows for flexibility. The Government indicated in the National Policy Document on Spatial Planning that it attached a great deal of importance to the strength of regional development.

Figure 13.1 Programmatic approach



The flexible nature of the programmatic approach is shown by the fact that for a number of locations it is still possible to choose between measures contained in the Basic Package and promising alternatives (see Figure 13.1). The PKB also includes supplementary measures, and makes explicit reference to a number of alternative and supplementary measures. The programmatic approach also makes it possible to give a place to future developments in the Room for Rivers PKB.

The Appendix to this PKB and the maps show which alternatives and supplementary measures have already been specified.

13.2 Relationship between Basic Package of Measures, alternatives and supplementary measures

The Basic Package of Measures comprises measures that can in any case be implemented within the available budget. The alternatives relate to measures with a broader perspective for the region. At some locations, they can replace one or more of the measures making up the Basic Package of Measures. Supplementary measures are not directly necessary to achieve the objective of flood protection. They must, however, contribute to doing so if it is the long-term objective that is concerned. Inclusion in the PKB is based on the improvement a measure makes to the spatial quality of the area where it is to be implemented.

This means that the alternative will only be included in the Basic Package of Measures if it has been sufficiently demonstrated that the measure concerned complies with the conditions that have been set. The Government is leaving the possibility open that the definitive decision on this will only be taken after the PKB has been adopted; this is because the measure is extremely complicated due to coordination with other spatial planning developments. In these cases, there must be sufficient prospect of financial cover for the measure. The PKB indicates the final date for taking the decision and whether the national projects procedure will apply. One example of a complex measure is the high-water channel at Kampen. The National Policy Document on Spatial Planning designates the IJssel Delta project as a model development planning project. This project is a joint initiative by the province of Overijssel and other authorities and partners in the region, all of which are working on a master plan for the area to the south of Kampen. The plan provides for an agreement engaged in by public parties and perhaps also private parties; this will have an effect on the Room for Rivers PKB.

A supplementary measure can only be included in the PKB if its financial-economic and technical feasibility has been established. From the technical point of view, the measure

must specifically be hydraulically or morphologically robust. It must also be self-financing and risk-neutral.

13.3 Flexibility in the future

The Government does not exclude the possibility that new initiatives will present themselves in the coming years, for example with the development of new insights and new technology, meaning that it will be better possible to achieve the objectives. It is also conceivable that such initiatives will lead to cost reduction. The initiative may be an alternative to an existing measure, may supplement it, or may mean that the nature or location of the measure concerned or the land use need to be changed.

Some initiatives can also contribute to other objectives, such as mineral extraction or the disposal of surplus soil. The success or prospects of such initiatives depend in many cases on local public-private partnerships and a readiness to link flood protection to other functions associated with the river, with improved flood protection being accompanied by improvements in spatial quality.

The Government will make an assessment, at strategic and supra-local level, of these new initiatives and the associated project decisions that present themselves after adoption of the PKB.

The PKB policy will be applied as the assessment framework for the initiatives. This means that it will be possible to implement them if the financing has been arranged and if the usefulness and necessity of these measures have been established in relation to the desired flood protection and improvement of spatial quality, together with their cohesion with the other measures and the soil balance. The Government will also respect the obligations imposed by the strategic environmental impact assessment and will carry out an assessment regarding nature conservation.

Alternatives, supplementary measures, and new initiatives must also fit in with the Policy Guideline on Major Rivers. The Government will ultimately determine which is the most responsible choice (Basic Package of Measures as opposed to alternative measure) in the light of the objectives and preconditions.

When compared to the Basic Package of Measures, the alternative measures may produce a greater quantity of excavated soil, which will need to be made use of or disposed of. This PKB does not yet indicate any locations for this.

The Minister of Transport, Public Works and Water Management can take the decision to deviate from the PKB in favour of a new initiative or insight, doing so in consultation with the Minister of Housing, Spatial Planning and the Environment and after the substance has been assessed and the public preparation procedure has been followed as specified in Section 3.4 of the General Administrative Law Act [Algemene wet bestuursrecht]. The Lower House of Parliament must be informed.

Within the period covered by this PKB, there are two successive phases:

- In the first phase (2006–2008), there is room for initiatives that can lead to shifts within the package of measures, if these fit in with the long-term approach and the available finances.
- In the second phase (2009–2015), there will be hardly any more leeway for such shifts within the package of measures, given that in that phase the emphasis will be on actually implementing the measures to create more room for the rivers. Given that preparing the project decision-making process and then implementing it will in general take many years, the second phase (implementation) will take up the major portion of the period covered by this PKB.

The Appendix to this PKB indicates for each measure in the Basic Package when the definitive project decision will need to be taken; this is also the final date for exchanges with other projects. Where measures in the summer bed of the river are concerned, this can be done at a later date – this only requires the normal river permits needed for work – than for dyke relocation, for example, for which extensive zoning plan amendments and land acquisition procedures will be necessary.

13.4 Criteria for exchanging or adding measures

In assessing the alternatives, supplementary measures, and new initiatives, the Government will apply the following criteria for both the opportunities and developments already referred to and for those that arise in the future.

Flood protection
The initiator will need to show that the project will in fact achieve the intended reduction in water level. If there is a difference of opinion regarding this, a second opinion will be requested from an expert body or firm of consultants.
If the project leads to alterations to the main flood defences, the water authority concerned will need to assess the safety of the project from the point of view of civil engineering.

Time
The initiator must accompany the project application by a schedule that is considered realistic by an administrative regional advisory group and that that group considers can be implemented on time. Insofar as the project assumes that there will be zoning changes, a statement from the relevant municipality/municipalities will be required when it is submitted to the effect that it/they intend cooperating with such changes.

Money
It must be certain that the project can in fact be implemented. The initiator will need to show that the cost of the project is covered. Whether that is in fact the case will be determined by the State Secretary at the Ministry of Transport, Public Works and Water Management and on the basis of a financial-economic estimate (according to the "PRI" system applied by the Directorate-General for Public Works and Water Management and including the associated quantified risks). If there is any doubt about this aspect, an independent firm can be requested to provide a second opinion. In the case of an interchangeable measure, an application can be made to the State Secretary at the Ministry of Transport, Public Works and Water Management for additional co-financing from the [4] budget for Room for the Rivers for an amount that is basically no greater than the amount that the interchangeable measure replaces.

Spatial quality
Projects must be assessed against a master plan drawn up for each stretch of river or, if no such master plan exists, the Regional Spatial Planning Framework. It can already be stated that the projects referred to as interchangeable in the PKB already comply with this requirement. New alternatives will need to be tested against this framework. This will be done as part of the guarantee of spatial quality indicated in the present Explanatory Memorandum (see Section 16.4.4).

Assessment in the light of long-term approach
Projects must be assessed in the light of the long-term approach so as to prevent investments being made that will in the long term need to be reversed, or that will become superfluous.

Fallback option
It may turn out after an alternative has been included in the Basic Package of Measures for the PKB that it is not possible to achieve that alternative in time for the flood protection objective to be achieved by 2015. Should that be the case, recourse will be had for the stretch of river concerned to the original measure or cluster of measures, or to another alternative that can in fact be achieved in time, for example a more technical alternative.

[4] In the case of an interchangeable measure, an application can be made to the State Secretary at the Ministry of Transport, Public Works and Water Management for additional co-financing from the budget for Room for the Rivers for an amount that is basically no greater than the amount that the interchangeable measure replaces.

14

Nature conservation

14.1 Introduction

The Dutch Rivers Region is an important area for Natura 2000, the European network of nature areas that must be preserved and developed. More than 70% of the whole area on the river side of the dykes along the various Rhine distributaries and the lower reaches of the rivers has been designated as a Special Protected Zone (SPA) in the context of the EU Birds Directive. A number of areas are also included in the common list of SPAs that the European Commission adopted in December 2004 in the context of the EU Habitats Directive. The Netherlands is required to designate these areas – which provide space for special habitats, flora and fauna – as SPAs.

After PKB Part 1 was published, the 1998 Nature Conservation Act [Natuurbeschermingswet 1998] came into force on 1 October 2005. Amongst other things, this legislation provides for the SPAs. All the relevant provisions of the Birds and Habitats Directives have now been implemented as national legislation. The provisions regarding the protection of species had already become national legislation with the introduction of the Flora and Fauna Act. Where decision-making in the context of this PKB is concerned, it is therefore no longer primarily the Birds and Habitats Directives that are relevant but national nature conservation legislation.

The package of measures selected by the Government in this PKB was subjected to "appropriate assessment" at an overall level as provided for in Article 19j of the 1998 Nature Conservation Act. In adopting this PKB, it was not necessary to assess the measures in the light of the Flora and Fauna Act because doing so would require more detailed information regarding how the measures would be implemented. After the measures have been determined at the level of redevelopment plans, they will be assessed (again) against the provisions of the 1998 Nature Conservation Act and the Flora and Fauna Act.

14.2 Appropriate assessment at strategic level

In order to determine whether the proposed measures will have significant effects on the conservation objective in the Birds and Habitats Directives areas, an appropriate assessment of this PKB was carried out at the strategic level in accordance with Article 6 of the Habitats Directive. Given the direct operation of Article 6(2-4) of the Habitats Directive, such assessment was already required before the 1998 Nature Conservation Act came into force on 1 October 2005.

The appropriate assessment on which this PKB is based is an overall one because of the strategic nature of this PKB. Only the location and type of measures were determined.

Designs for the measures were drawn up for the EIS and the appropriate assessment, giving a specification of the measures at the location concerned that fits in with the objectives of this PKB. The designs will be further improved, if possible, when the final redevelopment plans are drawn up. When the measures are determined after the PKB, a definitive appropriate assessment will be carried out at the level of the redevelopment plans in the context of Section 19j of the 1998 Nature Conservation Act.

The appropriate assessment has been integrated into the Room for Rivers EIS. The appropriate assessment also has independent status. It complies with the requirements of Article 6(3-4) of the Habitats Directive and those of Section 19j of the 1998 Nature Conservation Act. As required by the legislation, the appropriate assessment looked solely at possible negative effects of the measures. In assessing the possible effects, account was taken of the conservation objectives. The consequences for Natura 2000 are also part of the assessment criteria in the EIS. In that context, both negative and positive effects of the measures were taken into account which are in line with the requirement for improvement of Natura 2000.

The results of the appropriate assessment of the package of measures in the PKB play a guiding role as regards further improvement of measures in the phase after adoption of this PKB, so that damage to protected natural features can be avoided as far as possible and opportunities grasped for reinforcing Natura 2000.

14.3 Conservation objectives

The Minister of Agriculture, Nature and Food Quality is required to formulate conservation objectives for every SPA. Those objectives then form the frame of reference for the appropriate assessment. In preparing this PKB, the conservation objective for the Rhine distributaries and the lower reaches of the rivers was taken account of by means of the Strategic Framework for the Birds and Habitats Directives, which forms part of the Explanatory Memorandum for this PKB. The Strategic Framework and the associated Background Document take account of the currently applicable designation decisions for areas subject to the Birds Directive and of the species and habitat types for which the Habitats Directive areas have been reported to the European Commission. The Minister of Agriculture, Nature and Food Quality will determine conservation objectives for all SPAs commencing in late 2006. For the Room for Rivers project area, those objectives will be worked out in accordance with the Strategic Framework.

14.4 Strategic Framework for the Birds and Habitats Directives

The Strategic Framework specifies which current Natura 2000 features are important throughout the Rivers Region and must be preserved. It also describes the challenge regarding the recovery and improvement of natural features, including from the international perspective. The Strategic Framework comprises the following two major elements:

1 *Current natural features*
The "**hands off**" principle applies to the preservation and recovery of a number of habitats and species that are rare and/or associated with specific locations. No measures may be implemented at these locations, and the effects of measures in the surrounding area must be subjected to critical consideration to prevent negative effects occurring. The "**be careful**" principle applies to areas where herbivorous waterfowl feed, for example geese, swans, and wigeon. The overall amount of feeding area in the Rivers Region must be preserved. Measures may be implemented on condition that the key factors of peace and quiet, openness, and the availability of sufficient food are maintained.

2 *Requirement for improvement*
An indication of how the natural features can be improved has been given for the Rivers Region as a whole – i.e. not merely for the SPAs – from the perspective of Natura 2000. This has been specified for each distributary. The main outline is given below.

Gelderland Gate
In this area, marshy systems in areas of low dynamism must be reinforced by improving and extending the amount of hardwood riverine woodland. Space must also be provided for emerging river dunes with riverine grassland and species-rich hay meadows in areas of high dynamism.

Waal
Along the Waal, there is a major challenge regarding habitat types associated with highly dynamic and low-lying systems including softwood riverine woodland and pioneer vegetation on mudflats. Along this river, there is a great deal of space for side channels providing opportunities for fish, macrofauna and fish-eating birds.

Lower Rhine/Lek
Along this distributary, it is possible to increase the proportion of marshy systems in the low-lying areas of the washlands. Attention also needs to be given to strengthening the relationship between the areas on the river and landward sides of the dykes (transition from woodland on the push-moraine to hardwood and softwood riverine woodland).

IJssel
The relationship between areas on the river side and landward side of the dykes also needs to be improved, with the amount of low-dynamic marsh with seepage relationships and hardwood riverside woodland being increased. There are also opportunities for improving the natural character of the delta (i.e. the branching estuary of the IJssel).

Lower reaches of the rivers-Biesbosch wetlands
Opportunities need to be utilised for increased tidal action and a better quality of water in order to benefit tidal willow woodland, muddy banks, and reeds; marshy situations with species-rich brushwood and reeds need to be improved. The function of providing a resting place for herbivorous waterfowl should also be strengthened.

For the integrated approach to Natura 2000 to be properly effective for the Rivers Region, as set out in the Strategic Framework, it is advisable for the various different

distributaries to all be jointly designated as a single SPA. The Government will attempt to achieve this. Should this turn out not to be possible, the above-mentioned integrated elements from the Strategic Framework will in each case form part of the conservation objectives and management plans – which are still to be determined – for the individual SPAs.

14.5 Assessment

Full account was taken of the elements of the Strategic Framework for the Birds and Habitats Directives when drawing up the Basic Package of Measures. Initially, hundreds of measures were available for inclusion in the PKB. Measures for which it was clear from the start that significant harmful effects could not be prevented and for which an alternative was available were dropped at an early stage. Where this was possible within the project preconditions, measures were selected that would have a positive effect on Natura 2000.

A number of points in the Basic Package of Measures have been amended as compared to PKB Part 1 in the light of the public consultation procedure, consultation of advisers as required by law, and additional studies. In a number of cases, other variants of measures in the Basic Package have been included.

The appropriate assessment of the package of measures has been carried out at three different levels, namely the Basic Package of Measures as a whole, per distributary (existing SPA), and for each measure separately. Each of the sites for disposing of surplus soil that are included in this PKB has been the subject of an appropriate assessment at strategic level. The possible external effect of measures on a SPA were investigated in detail in the period up to PKB Part 3. The results were allowed for in the assessment. Implementation of this PKB is not expected to have any effects on prioritised species or habitats.

With a view to any cumulative effects, it is important to take account of the fact that a large number of other plans and projects are envisaged for the Rivers Region, both in the context of "Further Development of the Rivers Region" (NURG) and of the provincial elaboration of the National Ecological Network (EHS). The "current projects" included in this PKB (see section 3.3.3) form part of these. These plans and projects relate specifically to the development of more natural river-related ecosystems in locations currently made up of agricultural grassland. Implementation of the measures included in this PKB (Basic Package of Measures) in combination with the other plans and projects may perhaps have significant negative effects on overwintering herbivorous waterfowl. This PKB includes measures to prevent the Basic Package of Measures having such effects throughout the whole of the Rivers Region. This PKB also assumes that the possible effects on other protected species or habitat types can be prevented by optimising the design in the course of detailed planning of the measures. Table 14.1 presents a summary. If this is done, there will be no cumulative effects. As far as relevant, any cumulative effects will be taken into account during the appropriate assessment at the level of the redevelopment plans.

Assessment of Basic Package of Measures
The Basic Package of Measures as a whole will have no negative effects on the natural features of the Rivers Region as a whole that are protected under the EU nature directives and the 1998 Nature Conservation Act. Where it is not possible to exclude negative effects of a component of the Basic Package of Measures at this stage, an indication has been given of how those effects can be prevented in the redevelopment plan for the measure concerned or – if this is not in fact possible – how other measures in the Basic Package can neutralise those negative effects.

Assessment per SPA
At the level of the individual distributaries, there may be significant negative effects on the IJssel SPA. A maximum of some 2000 hectares of feeding area for overwintering herbivorous waterfowl (geese, swans and wigeon) will be lost due to grassland being turned into more dynamic river-related natural areas. The species and habitat types associated with these new natural areas are included in the improvement requirement formulated in the context of the Strategic Framework for the Birds and Habitats Directives.

Assessment per measure
At the level of the individual measures, negative effects cannot be excluded for a number of measures. This primarily concerns the measures already mentioned along the IJssel that will lead to the loss of feeding areas for overwintering herbivorous waterfowl. The three measures that may have this effect are the washland excavations at Bolwerksplas, Worp and Ossenwaard; the excavation of the Keizer and Stobben washlands and the Olster washlands (nature); and the washland excavation at the Scheller and Oldeneel washlands (nature). The measure planned for Tollewaard on the Lower Rhine/Lek may also lead to a loss of feeding areas for overwintering herbivorous waterfowl.

The assessment of the design for the measure involving excavation of the Brakel washlands and dyke relocation in the Munnikenland polder (nature) found that negative effects could not be excluded. Possible negative effects on the riverine grassland habitat type will be prevented by taking account in the redevelopment plan of the presence of this habitat type within the project area. Possible negative effects of the Huissen washlands measure will also need to be neutralised in the redevelopment plan.

Finally, there may be an external effect of the deepening the summer bed of the Lower IJssel on the Duur washlands, Vreugderijk washlands, Zalk woods and De Zande/Scherrenwelle along the IJssel. The negative effects concerned may involve an impact on habitat types that depend on periodic flooding and sediment deposition (for example species-rich grassland). If necessary, these effects will be mitigated by combining deepening of the summer bed with reducing (or further reducing) the height of the existing embankments in these washland areas.

It is not possible to exclude the occurrence of "external" or indirect negative effects of reducing the height of the groynes along the Lower Waal on Natura 2000 features in the Rijswaard area. If necessary, this measure will therefore be combined with mitigation measures in the Rijswaard area, consisting of reducing (or further reducing) the height of the existing embankment/embankments. Further elaboration of the extra washland excavation project at Millingerwaard and removal of the obstacles at the Suikerdam and the Zandberg polder embankment must take account of potential "external" effects on the protected natural features in the Natura 2000 area that lies behind them. Optimisation of these measures is possible.

Table 14.1 gives an overview of the measures in the Basic Package, together with potential negative effects on Natura 2000. The table also indicates how these effects will be neutralised when the measures are being worked out in detail.

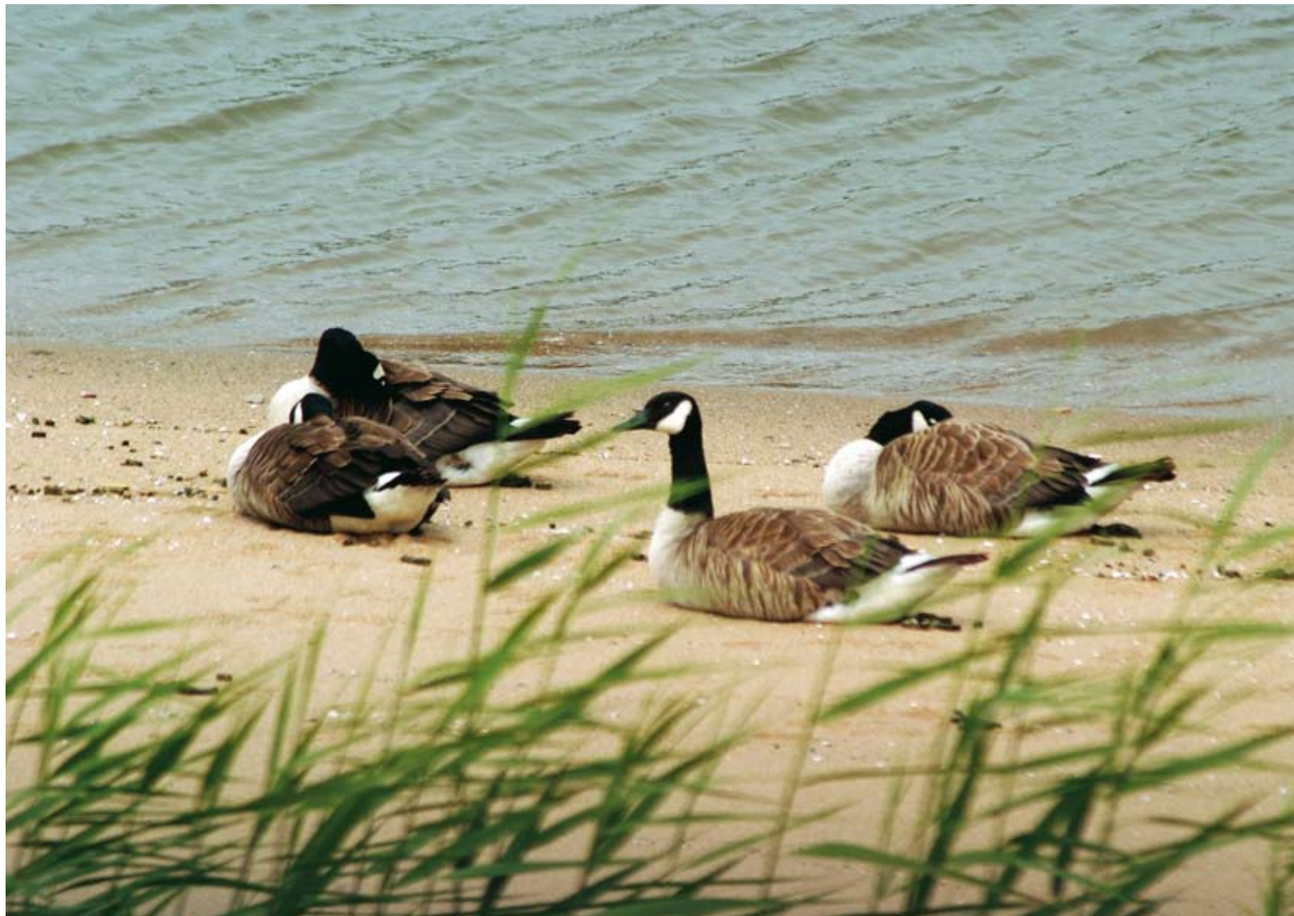


Table 14.1 Possible harmful effects of the Basic Package of Measures on SPAs and proposed mitigation and compensation

Distributary	Measure	HD	BD	Possible harmful effects on Natura 2000 network	Proposed mitigation/compensation
Waal	Excavation of Brakel washlands and dyke relocation in Munnikenland polder nature	x		Max. 19 ha riverine grassland	Mitigation in redevelopment plan
	Reduction in height of groynes along Lower Waal	x		"External" effects: reduction in quality of species-rich grassland in Rijswaard	Mitigation measures: reduce height of embankments in washlands
"KAN" area	Excavation of Huissen washlands	x	x	Max. 4 ha riverine grassland Max. 146 ha feeding area for overwintering herbivorous waterfowl	Mitigation during redevelopment and management, if necessary compensation
Lower Rhine/Lek	Washland excavation at Tollewaard		x	Max. 50 ha feeding area for overwintering herbivorous waterfowl	Mitigation during redevelopment and management, if necessary compensation
IJssel	Summer bed deepening along Lower IJssel	x	x	"External" effects: reduction in quality of speciesrich grassland in Duur washlands, Vreugderijk washlands, Zalk woods and De Zande/Scherrenwelle	Mitigation measures: reduce height of embankments in washlands
	Excavation of washlands at Bolwerksplas, Worp and Ossenwaard nature		x	Max. 50 ha feeding area for overwintering herbivorous waterfowl	Mitigation during redevelopment and management, if necessary compensation
	Excavation of Keizer and Stobben washlands and Olst washlands nature		x	Max. 111 ha overwintering herbivorous waterfowl	Mitigation during redevelopment and management, if necessary compensation
	Washland excavation at Scheller and Oldeneel washlands nature		x	Max. 32 ha overwintering herbivorous waterfowl	Mitigation during redevelopment management, if necessary compensation

Promising alternative and supplementary measures
At the moment, the possibility cannot be excluded that a number of alternative, promising and supplementary measures in addition to the Basic Package of Measures will have negative effects on Natura 2000. This applies in particular to the supplementary measures along the Waal. If one of the promising or supplementary measures listed in the Appendix to the main text of this PKB, or a fallback option, is included in the Basic Package of Measures, then it will need to be shown at that point that implementation will not lead to additional negative effects on Natura 2000.

Mitigation and compensation
During further elaboration of the measures (redevelopment and management), negative effects on protected natural features will need to be prevented as much is possible by further optimising the design and by means of management.

Compensation or mitigation outside the measure itself will be possible for the Basic Package of Measures for this PKB as regards the loss of feeding areas for overwintering herbivorous waterfowl (geese, swans and wigeon). This is an important function of the Rivers Region, but one that is only tied to particular sites to a relatively limited extent. In accordance with the Strategic Framework, the overall feeding area function will be maintained within the Rivers Region. In that context, account will be taken of the key factors applying to such feeding areas, namely peace and quiet, openness, and the availability of sufficient suitable food.

Whether this should be referred to as mitigation or compensation depends on the limits of the SPAs. The Room for Rivers project differs from most other projects in that when the PKB was formulated, the project area covered several SPAs. In the context of the forthcoming designation of areas subject to the provisions of the Habitats Directive, the Government aims to designate the areas subject to the provisions of the Birds Directive, the Rhine distributaries, and the lower reaches of the rivers as a single SPA.

The system provided for in the 1998 Nature Conservation Act and the EU nature directives only allows for mitigation within a single SPA. In all other cases, one is dealing with compensation. Before providing compensation, it is necessary to determine whether there are alternatives and it must be shown that implementation of the plan serves compelling reasons of major public interest. An extensive study of alternatives took place in the context of the EIS. The Basic Package of Measures is the best alternative for a coordinated package of measures with the fewest possible negative effects on Natura 2000. Given the basic principles and strategic policy decisions in this PKB, dyke reinforcement cannot be viewed as an alternative to a spatial planning measure. The requirement that there should be compelling reasons of major public interest is complied with because this PKB is intended to improve the safety of the public.

Mitigation or compensation for lost feeding areas for overwintering herbivorous waterfowl will provide the same ecological functions for the same species as the areas that are lost. Suitable locations will first be sought close to the affected area. The cohesion of the Natura 2000 network will be maintained at all times. Insofar as necessary to ensure the cohesion of Natura 2000, the new feeding areas will be created before the measures with a negative impact are implemented. If compensation takes place outside Natura 2000, its sustainability will be guaranteed, if necessary by bringing the compensation areas within the provisions of the 1998 Nature Conservation Act.

The Basic Package of Measures includes various measures to create more room for the rivers that can neutralise the loss of feeding areas for overwintering herbivorous waterfowl. Dyke relocation, "de-poldering", and the construction of a high-water channel will add a total area of some 2000 hectares to the winter bed. A significant part of this will continue to consist of grassland. Given the purpose of the measures, the development of high vegetation will only be possible to a restricted extent.

The Noordwaard project is a measure that can certainly be implemented in good time and that provides sufficient space for compensation for the loss of feeding areas for overwintering herbivorous waterfowl. Even though this is the final measure in the stages outlined above, inclusion of the Noordwaard in the Basic Package of Measures and its designation as a "front runner project" will for the time being make certain than that the Basic Package of Measures can be implemented without endangering the cohesion of the Natura 2000 network.

The Government sees the extra overall area of feeding locations for overwintering herbivorous waterfowl that is created as a result of this PKB and that is not necessary to compensate for the negative effects of implementing the Basic Package of Measures in this PKB as a reservation to compensate for future intervention that may be necessary in the Rivers Region. The condition is, however, that the compensation concerned is aimed at the effects of spatial planning intervention that is still necessary after the implementation of this PKB so as to maintain or introduce the required level of flood protection for the Rivers Region.

Disposal of soil
This PKB includes sites for the disposal of surplus soil that is excavated during implementation of the Basic Package of Measures. Disposal of surplus class 0-2 soil that cannot be reused in the course of redevelopment measures will be carried out by partially filling in existing sand/gravel pits and lakes along the various distributaries. The sand/gravel pits and lakes included in this PKB have been the subject of a general assessment in the light of the provisions of the 1998 Nature Conservation Act. That assessment shows that using these locations to dispose of soil will not have negative effects on Natura 2000. In many cases, making existing flooded sandpits shallower will in fact have positive effects from the point of view of Natura 2000.

The basic assumption for assessment was that the sand/gravel pits should initially be filled in so as to leave a depth of 5 metres of water. When the redevelopment plans for soil deposition sites are worked out in detail, further investigation will take place of how the fill-in level can be further optimised.

Other ways of disposing of surplus class 0-2 soil in this PKB are to make sand/gravel pits shallower in combination with covering over soil remediation sites, carrying out measures to allow nature to recover and/or develop in the Haringvliet, and making an existing sand/gravel pit in the IJsselmeer shallower (Flevoput). Whether this will lead to objections on the basis of the Birds and Habitats Directives can only be determined when these options have been worked out in greater detail. This PKB includes alternatives for the event that these soil disposal sites should later turn out to be unsuitable on the basis of nature conservation legislation.

14.6 Positive effects of the Basic Package of Measures on Natura 2000

The Basic Package of Measures creates the conditions for a positive effect on the following habitat types: water soldier vegetations, pioneer vegetations on muddy banks, species-rich marsh brushwood, and species-rich hay meadows. The options for species-rich marsh brushwood will also increase. As a result of the major increase that is envisaged in the shallow-water ecotope type, the consequences for fish and the great crested newt will be positive. Extremely positive situations will be created for the beaver and the root vole.

In addition to an increase in the shallow-water ecotope type, the significant increase in the amount of natural grassland and marsh is likely to have positive effects on breeding birds and marsh-dwelling birds, and on the resting and roosting function for waterfowl. The Basic Package of Measures therefore contributes to improving and developing Natura 2000 features as specified in the Strategic Framework throughout the whole of the project area, i.e. also outside the SPA.

14.7 After the PKB

When the redevelopment plans are drawn up after the PKB, the design and method of implementing the measures will be optimised as much as possible to prevent there being significant negative effects on protected natural features. As far as relevant, the redevelopment plans will be subjected to a new and more detailed appropriate assessment.

Under the terms of the 1998 Nature Conservation Act, a permit is required to implement measures that may have negative effects on Natura 2000. In many cases, an exemption will also be required under the terms of the Flora and Fauna Act. Elaboration and implementation of the measures after the PKB procedure will attempt to ensure that they contribute to improving the Natura 2000 network. This will be co-ordinated with the objective of improving the Natura 2000 network that is set out in the Strategic Framework for the Birds and Habitats Directives.

15

Finances

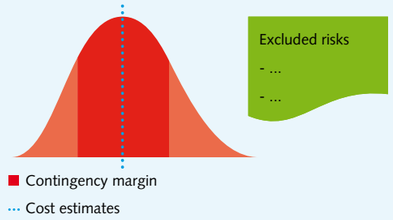
15.1 Basic Principles

The financial consequences of the Room for Rivers PKB have been clarified in accordance with the Procedure Rules for Major Projects [Procedureregeling Grote Projecten] as adopted by the Lower House of Parliament. This has been elaborated in the management model of the Directorate-General for Public Works and Water Management, which has been drawn up specifically for the Room for Rivers project within the Room for Rivers management plan.

The associated method of estimating is known in Dutch as the "PRI" system (i.e. Infrastructure Projects Estimates). This system not only produces an estimate of the costs involved but also gives an idea of the risks, together with a (partially) associated "unforeseen" budget item. The risks are quantified and included in a risks list, but as far as possible they are also quantified and allowed for in the costs. Risks that cannot be quantified – and which cannot therefore be allowed for in the costs – are included in the list of "excluded risks". An uncertainty margin is also calculated.

One specific feature is that the uncertainty margin will become ever narrower in the course of the PKB procedure. The organisers of the project are required to reduce the margin in this PKB to about 40%. This is shown in Figure 15.1.

Figure 15.1 Schematic illustration of the taxonomy of cost estimates.



This PKB works with a large number of different types of measures and alternatives. The expertise, experience, uncertainty and plans for these components differ, meaning that the level of abstraction of the various plans can also differ.

When comparing and choosing between different types of measures and alternatives, the cost estimates, uncertainty margins, and risks must all be taken into account. This is necessary because of the various different levels of abstraction involved. If one or more of the three components is not allowed for, then one is not comparing like with like. This key point greatly influences the quality of the decision-making, something that the bodies concerned must be very well aware of.

15.2 Budgets

The following amounts are included for the planning and implementation phases in the 2006 budget of the Ministry of Transport, Public Works and Water Management for the programme to implement the Room for Rivers project. Commencing with the budget for 2004, the Room for Rivers project has been included in a separate article of the Infrastructure Fund, initially IF 2.01.05 and from 2006 Article 16.02.02 (see Table 15.1).

The sum of EUR 200 million (2005 price level) was added to the total amount given in the table from the reserve in the Infrastructure Fund for emergency overflow areas. The sum of EUR 100 million (2005 price level) was also added to cover the difference with PKB Part 1. The Government then decided to allow there to be a difference of approximately EUR 100 million between the estimate and the available budget on the budget of the Ministry of Transport, Public Works and Water Management (Infrastructure Fund). The Government assumes that this difference can be removed by making use of EU subsidies and project-related proceeds. This will be expressed in the figures from 2009 on. Implementation of the proposed Basic Package of Measures will be financed from this budget item.

Table 15.1 Amounts in the 2006 budget of the Ministry of Transport, Public Works and Water Management for the Room for Rivers project

National budget (millions of euros, including VAT)	up to 2004	2005	2006	2007	2008	2009	2010	Later	Total
IF 16.02.02									
up to PKB Part 4 and current projects planning phase	41	12	4	1					57
Implementation phase (PKB + current projects)	13	50	2	26	100	207	254	1509	2162
IF 16.02.02	54	62	6	27	100	207	254	1509	2219

The "IBOI" indexing system will be used to index the budget side. This may differ from the system used to adjust the estimate, in which the development of the (more specific) market is followed.

The budget item "up to PKB Part 4 and current projects planning phase" in the 2006 budget of the Ministry of Transport, Public Works and Water Management (2005 price level) includes the costs incurred for drawing up the Room for Rivers PKB and those for the current projects at Hondsbroeksche Pleij and Zuiderklip. A project decision has already been taken on these two projects.

The PKB also includes a number of projects (primarily NURG projects) that are necessary to achieve the flood protection objective, with the principle being that, on the basis of autonomous development, these projects must certainly be carried out and be in accordance with a design that is suitable for the flood protection objective that has been set. Table 3.2 indicates the budgets that will be used to finance these projects. It should be noted that most of these projects are not financed from the budget for the Room for Rivers programme but from the budget item for the NURG projects. The locations of these projects can be found on Map C: current projects that contribute to achieving flood protection targets.

A number of alternatives have been specified within the programmatic approach. Any additional costs as compared to the costs of measures that can be exchanged for these will need to be covered by co financing from private and/or public sources other than those mentioned above. This also applies to the measures (opportunities) that are implemented at a later stage in order to improve spatial quality in the project area from the perspective of regional development.

Certain measures require public-private co-operation because the flood protection objectives are combined with urban development, nature development, etc. Amongst other things, this involves high-water channels. In the case of other components of the programme, a well-thought-out approach to the market will lead to cost-effectiveness and/or added value for the public.

15.3 Cost estimate for measures

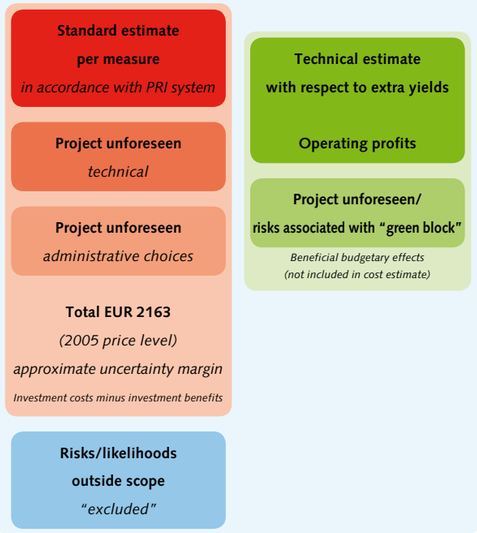
The cost estimate is made up of a number of different components (see Figure 15.2). The amounts in the cost estimate are based on the price level for 2005, with use being made of the PRI system.

In accordance with the PRI system, any beneficial budgetary effects – for example extra yields and/or "operating" profits (with the associated unforeseen budget items) – have not been allowed for.

The costs incurred for management and maintenance had not been included in the cost estimate but are indicated separately. These do play a role, however, in decisions on interchangeable measures. Benefits to the public in general have not been considered either.

A brief explanation of the various components of the cost estimate is given below.

Figure 15.2 Components of the cost estimates



15.3.1 Investment costs

The following components have been distinguished:

- Standard estimate per measure. This involves the investment costs minus the investment benefits. It includes the quantified risks at the level of particular measures. The costs involved in further implementation of the planning study phase and implementation phase have also been allowed for (this involves primarily personnel costs);
- Project unforeseen (technical);
- Project unforeseen (administrative choices).

Once the PKB procedure has been completed, planning studies will need to be carried out at project level, with a number of EIS procedures perhaps taking place before implementation of the measures can commence. The cost estimate takes account of the fact that further planning studies (at the level of particular measures or combinations of measures) will need to take place in the future.

15.3.2 Uncertainty margin

An uncertainty margin has been calculated, on the basis of the PRI system, that is appropriate for the particular phase of the Room for Rivers project. In this PKB, the uncertainty margin amounts to approximately 37% of the total amount. The uncertainty margin may turn out to be either positive or negative. It is defined as the range – with a likelihood of 68% – within which the ultimate cost of the Room for Rivers project will fall. This uncertainty margin cannot be projected onto the various different sections/components of the cost estimate but only onto the total.

15.3.3 Investment

The costs involved in implementing the measures included in the Basic Package have been estimated and add up for each section to the (rounded) sums indicated below. These investment amounts also comprise the costs allocated to the measure for further implementation of the planning study phase and implementation phase. This method conforms to the standards regarding the estimating system (PRI system) that apply within the Ministry of Transport, Public Works and Water Management.

With an uncertainty margin of 37%, the range is as follows:

uncertainty margin	lowest value	estimate	highest value
37%	€ 1.399 mln.	€ 2.220 mln.	€ 3.041 mln.

The costs involved in drawing up the PKB and those for the current projects must be added to the estimated amount. This involves the sum of EUR 57 million. The total estimate therefore comes to the sum of EUR 2220 million (2005 price level).

Table 15.2 Cost estimate for the Basic Package of Measures

Programme of coordinated measures	Cost estimate (PRI) Euros (mid-2005 price level)
Point where distributaries of Rhine diverge: Upper Rhine/Waal (down as far as Nijmegen), Pannerden Canal, and Lower Rhine (as far as Arnhem)/ Driel locks, IJssel as far as A12 Bridge (including Hondsbroekse Pleij))	€ 414 mln
Waal (from Nijmegen to A27 at Gorinchem)	€ 117 mln
Lower reaches of rivers Gorinchem and Heusden down to the Delta Works (including Zuiderklip)	€ 579 mln
Lower Rhine (from Arnhem/Driel locks) and Lek	€ 173 mln
IJssel	€ 496 mln
Sub-total	**€ 1.779 mln**
Administrative choices	€ 221 mln
Project unforeseen (technical)	€ 163 mln
Total	**€ 2.163 mln**
Planning studies up to PKB Part 4 and Current Projects	€ 57 mln
Total estimate	**€ 2.220 mln**
Uncertainty margin (approx. 37%)	+/- € 821 mln

15.3.4 Estimate compared to budget

The available budget amounts to EUR 2219 million based on the price level for 2005. The total estimate therefore comes to the sum of EUR 2220 million, including a price level adjustment of EUR 62 million (2005 price level).

As already indicated, the budget side already included a target of EUR 100 million, to which EUR 1 million is now being added (2005 price level). In order to achieve this, two routes are recognised:

~ EU Structural Funds: Water management is one of the main themes in the context of the European Structural Funds 2007–2013. The Government wishes to make use of the opportunities that future Structural Funds will offer for implementing the measures comprised by the Room for Rivers programme.

~ Further action regarding administrative choices: The Government assumes that during the further action following on from the PKB procedure the remaining administrative choices will be made where possible, so that the associated costs can be controlled or reduced. The opposite naturally applies to the positive opportunities.

15.3.5 Management and maintenance

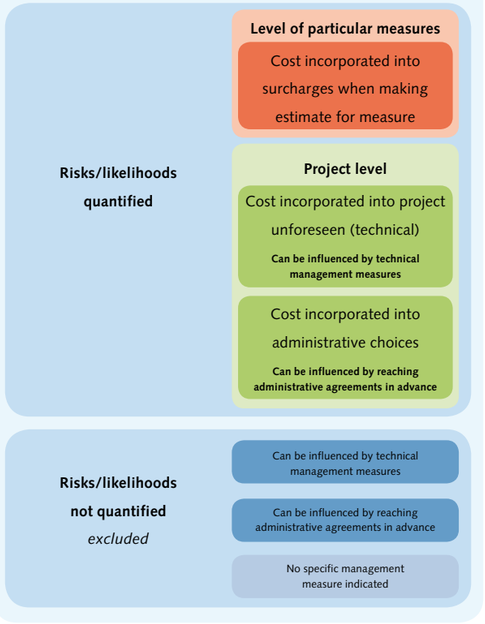
The cost of maintenance is estimated at EUR 179 million (capitalised). This involves costs that are in addition to the existing management and maintenance costs. This leads to annual costs averaging about EUR 7.3 million. Cover for these costs will need to be found after 2015. In accordance with the PRI system, no uncertainty margin has been calculated for these management and maintenance costs. Given the phase concerned, however, the uncertainty margin is still a large one, being estimated at approximately 60%. The risks regarding management and maintenance have been included (qualitatively) in the list of risks.

15.4 Risks and management measures

15.4.1 Types of risks

The risks that may become apparent during the ensuing planning study phase and implementation phase for the project have been specified (categorised) as completely and effectively as possible and included in a list of risks. In drawing up the list, use was made of the knowledge and experience gained during other infrastructure projects of comparable size. Management measures were linked to the risks so as to ensure that the likelihood of a risk occurring is as low as possible and that if it does in fact occur it can be controlled as effectively as possible (see figure below).

Figure 15.3 Diagrammatic representation of types of risk and methods of control



The risks have been quantified as far as possible. Risks that have not been quantified have therefore not been allowed for in the cost estimate but have been included in the list of "excluded risks". In the case of the risks that could be quantified, a distinction has been made between risks at the level of particular measures and at project level:

~ The risks at the level of measures [5] have been incorporated into surcharges at the level of particular measures and allowed for in the "standard estimate per measure".

~ The quantified risks at project level are at a level higher than that of particular measures and have been estimated on the basis of the principle of likelihood × consequence. For these risks, a distinction has been made between "project unforeseen (technical)" and "administrative choices":

[5] Examples of risks at the level of particular measures:

~ Erosion close to summer dykes and other dykes due to the construction of side channels. This may make it necessary to implement protective measures.

~ Coordinating measures with the existing infrastructure may make it necessary to construct additional noise-reducing structures during implementation.

~ Risks under the heading "project unforeseen (technical)" relate to technical implementation matters or to risks that can be controlled at effective (technical) project management level. These must be the object of the necessary attention on the part of the project organisation when preparing and implementing the project. These add up to the sum of EUR 163 million (likelihood × consequence) and have been incorporated into the investment costs.

~ The risks under the heading "administrative choices" are risks that affect the Room for Rivers project but for which the auditor has determined that the decision in favour of the associated management measures and implementation of those measures lies outside the sphere of influence of the project organisation, which must render an account, now and in the near future, to the Lower House of Parliament, under the responsibility of the Ministry of Transport, Public Works and Water Management. In actual practice, this means that to what extent a cost-reducing administrative choice can be made depends partly on other ministries, provinces, municipalities and water authorities. By reaching clear and effective agreement in advance on these administrative choices with the competent authorities, it will be possible to greatly reduce the risks referred to and also to control them effectively.

The category consisting of administrative choices adds up to a total of EUR 221 million. That amount has been estimated as effectively as possible and validated by the auditor, but it remains uncertain for the time being. Given that no choices can yet be made in a number of areas, it has been assumed that negative outcomes (risks) have a 100% likelihood of occurring, while the likelihood for positive outcomes is 0%. If these choices can be made in the course of the follow-up procedure, the likelihood of occurrence will be set at 0% or 100%, respectively, with the associated amount being reduced or increased.

15.4.2 Detailing of administrative choices

The following administrative choices have been recognised, together with the associated management measures and financial consequences. The amount concerned is given between brackets if no administrative choice is made and the risk actually occurs (in full):

1 Imposition of extra regional political-administrative preconditions for the order of implementation (EUR 25 million):
The competent authorities might impose requirements for the order of implementation in connection with such things as temporary negative hydraulic effects and/or temporary negative effects on nature. Not imposing these requirements can reduce the costs.

2 Transfer of completed constructions to long-term management bodies (EUR 50 million):
By reconfirming existing agreements on management and maintenance with long-term management bodies such as the State Forest Service, the water authorities, the Directorate-General for Public Works and Water Management, and owners of country estates, it will be possible to greatly reduce the risk that such bodies will not wish to take over the site concerned. This will prevent any uncertainty regarding the requirements that long-term management bodies will impose as regards the design.

3 Cost of archaeological investigation above the 1% agreement with the Ministry of Education Culture and Science (EUR 0 million):
The cost of archaeological investigation and any discoveries above the 1% agreement will not be charged to the budget of the Ministry of Transport, Public Works and Water Management (Malta Convention).

4 Utilisation of state-owned land already purchased (EUR 0 million):
It is currently unclear to what extent the land that needs to be acquired is already owned by various authorities. Making this land available for the project (free of charge, or at a reduced cost price) may bring about a cost reduction.

5 Provincial levies on soil disposal sites – "aftercare levy" (EUR 56.2 million):
The provinces impose levies on sites for disposing of soil. It is the provinces that are responsible for determining the size of the levy concerned.

6 Administrative agreements relating to Veur-Lent:
Agreements have been made with the city of Nijmegen regarding compensation as a result of adjustment of plans; this amounts to EUR 49 million.

7 Impact of EU Groundwater Directive (EUR 25.3 million):
The EU Framework Directive on Water (FDW) and the associated Groundwater Directive may require that facilities be installed at sites where soil is disposed of to prevent groundwater contamination. That risk can be managed by means of regulations drawn up by central government on the basis of the principle in the FDW that measures must contribute to the sustainable use of water and that the situation regarding quality is improved compared to the present situation.

8 Time risk (EUR 10.5 million):
The project is under considerable time pressure, something that may lead to higher costs. The pressure of time can be reduced, on the one hand, by already commencing implementation of crucial measures (for example by designating soil disposal sites, whether or not these are only intended to be temporary). On the other hand, having more time available may produce cost savings (for example because of the greater likelihood of public-private partnerships) as well as additional funds. This can be achieved by creating more time at the beginning – starting the planning phase as early as possible ("front runners") – than later on (more time for implementation). When the feasibility test was applied to the schedule, it became clear that there may be a problem from the point of view of technical implementation if compensation/mitigation in the framework of the Birds and Habitats Directives is not possible in good time. In order to prevent the schedule being exceeded after 2015, the purchase/leasing of neighbouring plots of land will be included as a management measure. The estimated cost of this amounts to EUR 10.5 million, with a likelihood of 100%. In order to reduce this risk, the Ministry of Agriculture, Nature and Food Quality is working on a SPA for migratory birds. Other hold-ups may relate to the procedures necessary for soil disposal sites, the Birds and Habitats Directives, and the acquisition of land.

15.4.3 Follow-up procedure regarding administrative choices

Binding agreements will be made in advance with administrators regarding the choices they will need to make in the course of the follow-up procedure after the PKB comes into force. Unlike other Major Projects, it has deliberately been decided that these agreements should be made beforehand and not in the course of implementation. This means that the bodies involved will commit themselves to the maximum extent to making their contribution to the Room for Rivers PKB.

The basic principle is that all choices should be "controlled" so that, in the most favourable case, the costs associated with these risks can be reduced to zero, with the potential benefits being maximised.

During the follow-up procedure after the PKB comes into force, it may be possible for the bodies concerned to specify management measures at the start of implementation in the form of binding agreements with the Government. Depending on the extent to which the bodies concerned are prepared to conclude such agreements, one can calculate what administrative risks cannot be controlled during the implementation phase and will continue to exist as a component of the cost estimate. This will also clarify which other options for "bringing things within the budget" are still necessary to keep within the task-setting budget.

It should be noted that the agreements that are to be concluded which go towards reducing the administrative choices will be the object of an audit with a view to creating maximum certainty regarding the solidity of the agreements before implementation commences.

15.4.4 Excluded risks

The following risks/likelihoods have been specified but not quantified; they therefore fall into the category of "excluded risks".

Risks at the level of administrative choices

1 Any supplementary decisions with respect to the long-term approach.

2 Additional costs for the current projects will need to be charged to the PKB budget after all.

3 The environmental protection framework regarding soil excavation has been determined with Active Soil Management. A large number of problems have, however, been identified, for example the amount of re contamination and the enforceability of the Building Materials Decree [*Bouwstoffenbesluit*]. It is expected that the framework may change greatly during implementation of the project.

4 The possibility of initiatives by third parties, subsidies, and marketing (co-financing).

5 The positive indirect influence on the costs by finding innovative implementation methods and materials. Timely availability of these sources.

6 Additional measures (not intended to reduce water levels) required as a result of environmental influences. This may be the result of public consultation procedures, or the influence of politicians, administrators, or local residents.

7 Deviation from the current discharge distribution. The current discharge distribution is one of the basic principles for the scope of the PKB. Deviating from this may have the necessary consequences.

8 Account will be taken of sufficient compensation for price rises and/or inflation.

9 No account has been taken of additional increases to the height of the dykes to anticipate long-term targets. The flood protection study carried out by the Netherlands Bureau for Economic Policy Analysis [CPB] or the water authorities' wishes for extra-robust designs may lead to higher investment efforts than are necessary to achieve the flood protection objective of this PKB.

10 Achieving implementation by 2015 is not feasible due to delays in the process of political decision-making.

11 Remediation of the whole of the localised contamination when cutting through the flood-free area at Meinerswijk.

12 The air pollution problems that are currently becoming increasingly pressing. This risk is considered as an excluded risk at both the planning and implementation levels. If necessary, however, complex measures can be separated out at the planning level, leaving only the flood protection objective. The extra cost of soot filters is not specifically allowed for. If such a measure is made compulsory, then it follows from the indexing system that is used that the associated costs must be incorporated (partly) into the budgets and estimates.

Risks as a result of amended legislation and regulations

13 New EU regulations demand additional measures.

14 Interested parties have successfully challenged a number of issued permits right up to the Council of State. There is as yet no legal clarity regarding the legal/statutory tenability of the principles of active soil management.

15 No longer being able – as a result of amended legislation and regulations – to make use of soil in the near future that is currently regarded as clean.

16 Lateral inflow is no longer allowed for as a positive likelihood in the list of risks. This is partly dependent on the legislation and regulations and the willingness of the regions.

Risks in the area of "Financial and market":

17 Influence of extreme market forces during tendering. This may cause the costs to rise or fall.

18 Unfavourable scheduling with other major projects on the market.

19 Newer and more efficient methods and/or techniques of implementation. Innovative techniques and working methods may cause costs to fall.

20 Insolvency of the contractor, consulting engineers, etc.

21 Suspension without the contractor being at fault.

15.5 Quality Assurance

The system of quality assurance for the Room for Rivers project has been the object of a great deal of attention. A management plan has been drawn up comprising the action that will be necessary to guarantee the quality of the Room for Rivers PKB. Account needs to be taken of the particular phase of the product.

In accordance with the Management Plan, the Room for Rivers Audit Committee has adopted the audit programme. This will be periodically adjusted and implemented on the basis of previous experience and results. Re-audits will be carried out to determine to what extent earlier recommendations can be followed.

A strategic planning study procedure of this extent can be tightened up on the basis of new insights and clarification. The project will, on the one hand, provide scope for these new insights and, on the other, for tightening up the current estimates.
Since the summer of 2003, an independent auditor has been monitoring compliance with the applicable standards and the correctness of the outcomes of this planning study procedure. The basic assumption here is that every change in a previously approved cost estimate (including margins and risks) must be assessed by the auditor for plausibility and correctness. This activity will continue during the forthcoming planning study phase after the PKB comes into force.

The project organisations will collect all interim changes and, after they have been approved at fixed reference points, will incorporate them into the cost estimates. This will ensure that the various different versions of the cost estimates remain clear and make possible comparisons between the various different reference points.

16

After the PKB procedure

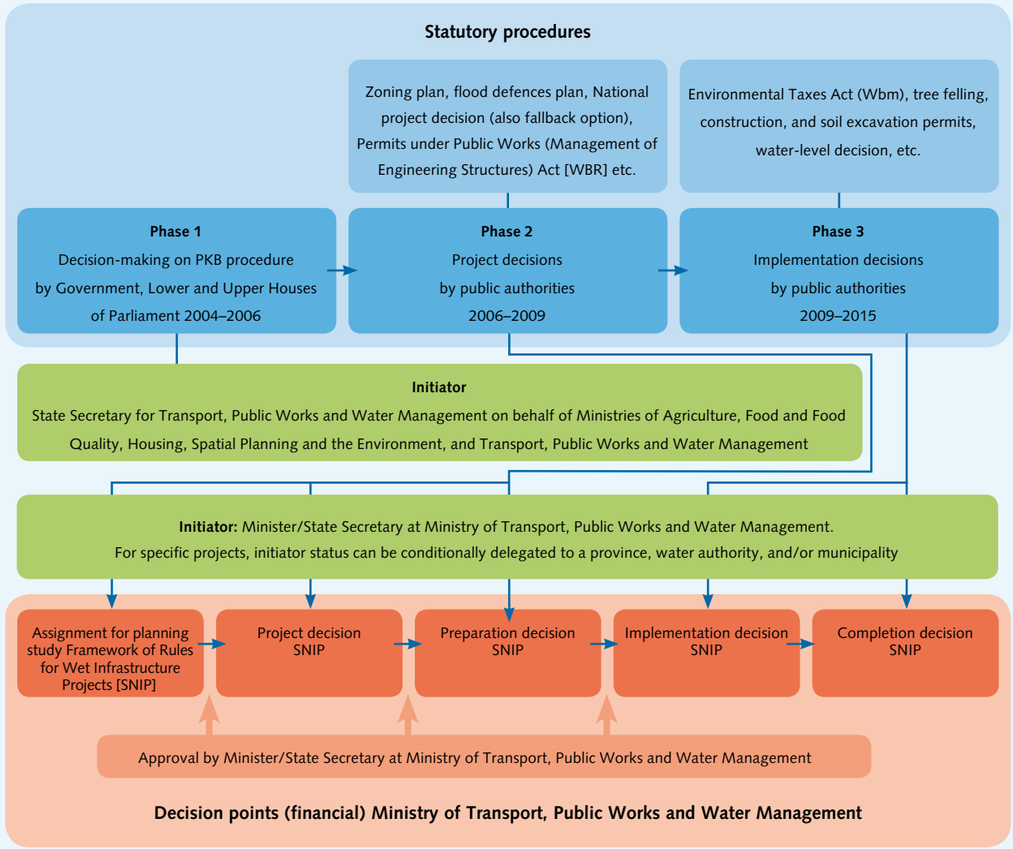
16.1 Phases of decision-making

Decision-making on the measures included in this PKB will take place in three phases. The first phase of decision-making involves the present PKB procedure. The second phase involves project decisions being taken by the relevant competent authorities. A project decision is an integrated decision regarding a specific measure or cluster of measures at a specified location. These administrative project decisions will be taken after this PKB comes into force. The third phase of decision-making involves actually taking implementation decisions. Here, the various specific decisions are concerned that are necessary to actually implement the project, for example the permits needed for excavation or construction work.

The Government has made administrative agreements with regional and local authorities to the effect that certain projects within the Basic Package of Measures should be prioritised ("front runner projects"). This means that the planning study for the measure concerned has already commenced even before the Government adopts the PKB. The intention is that during the course of a front runner project there is no change in the body managing it. Basically, once the PKB has been adopted, the project will be implemented under the responsibility of the public authority that was already responsible for the project.

Quite apart from the decisions that need to be taken within the statutory procedures required to implement the measures, decisions must also be taken regarding financing for implementing the measures. Insofar as this is done in the

Figuur 16.1 Wettelijke procedures versus (financiële) beslismomenten bij V&W



context of the Room for Rivers budget item, these decisions will be taken by the responsible Minister/State Secretary at the Ministry of Transport, Public Works and Water Management (Figure 16.1).

16.2 Administrative levels for project decisions

As mentioned already, this PKB will be followed by administrative project decisions on the measures included in the package of measures for the short term. Those decisions will be binding decisions on the main outlines of the manner in which the project will be implemented or permitted. With that in mind, this PKB designates a government body (competent authority) that will be charged with taking the project decision concerned; it also specifies the project procedure concerned by indicating the legislation in which this is provided for. The basic principle in designating government bodies is that matters that can be properly dealt with decentrally should also be dealt with by the local administrative body concerned. The scale and nature of the project are important in this regard.

This means that where reinforcing or relocating primary flood defences are concerned, the planning procedure set out in the Flood Defences Act will be followed; this will mean that the management body for the primary flood defences concerned, i.e. the relevant water authority, will adopt the plan subject to approval by the province. This may be different if relocating the primary flood defences that are concerned forms part of a larger project in which the national projects procedure must specifically be followed.

Insofar as work in the washlands is concerned, the basic principle is that the project should be carried out in the context of the relevant municipality's zoning plan, subject to approval by the province concerned. Depending on the nature of the project, a provincial regional plan (or an amended version of that plan) may proceed the zoning plan. It is conceivable that such a regional plan will include specific policy decisions that the municipality concerned must bear in mind when drawing up the zoning plan. In cases in which a relatively large number of follow-up decisions must be taken in order to implement the zoning plan, Section 3 of the statutory regulations on the national projects procedure may be declared to apply. This means that a coordinated and expeditious decision-making procedure will apply to the follow-up decisions.

If a project has already commenced for the purposes of a measure prior to the drawing up of the PKB and has already progressed to a considerable extent, it would be undesirable for there to be a change in the body managing it while it is going on. The project will then continue to be implemented under the responsibility of the administrative body that was already responsible for it.

Central government will play a role where a project is carried out subject to the Public Works (Management of Engineering Structures) Act [Wet beheer rijkswaterstaatswerken] or the Earth Removal Act [Ontgrondingenwet] (removal of earth from national water bodies). In both cases, it is after all the Minister of Transport, Public Works and Water Management who is the competent authority. The relevant authorities at local level will be involved in preparing such project decisions.

The national projects procedure provided for in the Spatial Planning Act [Wet op de ruimtelijke ordening, Wro] can be applied where measures are concerned that have a spatial dimension or spatial effects that go beyond the merely local level. The following are subject to the national projects procedure:

1 radical and complex measures that cover a relatively large area;
2 a combination of measures that are closely connected with one another from the hydraulic or spatial perspective and for which it has been decided for the sake of efficiency that a single body, namely central government, should take the project decision;
3 projects that enjoy only a low level of public and administrative support in the region concerned or projects that were initially undertaken by a local government body but for which the progress of the decision-making process is so slow that the national projects procedure must be followed after all.

The relevant local authorities will also be involved in preparing national project decisions.

On the basis of the above criteria, the Appendix with this PKB indicates for each measure which government body will be tasked with ensuring that the relevant project decision is taken and under which legislation that will be done.

16.3 Follow-up procedures

16.3.1 Selection of procedures

The measures to be implemented in the context of this PKB can be subdivided into the following categories.

Excavation of washlands
Where the excavation of washlands is concerned, the competent authority is normally the Provincial Executive of the province concerned. However, the planned measures to be implemented in the washlands with a view to creating more room for the rivers all involve more than simply excavation. A measure under the Spatial Planning Act (Wro) will therefore apply: the zoning plan, regional plan (or amended regional plan), or a national project decision..

Reinforcement or relocation of primary flood defences
Reinforcement of primary flood defences must be made subject to a plan pursuant to Section 7 of the Flood Defences Act. That plan will be adopted by the body managing the primary flood defences concerned (a water authority). The Provincial Executive of the province concerned will decide whether to approve the plan.

The same applies to relocating a dyke further away from the river as to reinforcing it. In the case of large-scale dyke relocation involving not just changes to the water management structures but also redevelopment of the area, the national projects procedure can specifically be made relevant. One is dealing here, after all, with a radical and complex project to provide more room for rivers that covers a relatively large area and for which mandatory coordination of procedures can be extremely valuable.

Changes to groynes
Reducing the height of groynes is a technical measure subject to the managerial authority of the Minister of Transport, Public Works, and Water Management. Under the Public Works (Management of Engineering Structures) Act, reducing the height of groynes requires a permit to be issued pursuant to that act by the Minister of Transport, Public Works and Water Management.

Removal of obstacles
Buildings, raised or overgrown land, ferry slipways and railway embankments are examples of obstacles that impede the flow of water. In order to remove such obstacles or allow water to flow through them, full or partial ownership needs to be acquired so that they can be removed or altered. In the zoning plan to be adopted by the municipal council (and approved by the Provincial Executive), the designated use must if necessary be changed to the new function of "water management purposes". If amicable acquisition is not possible, then compulsory purchase can take place on the basis of the zoning plan, with removal or alteration taking place after the necessary permits have been acquired.

Deepening of summer bed
Under the Earth Removal Act, the competent authority for the removal of material from rivers (i.e. from the summer bed) managed by central government is the Minister of Transport, Public Works and Water Management.

High-water channels
Construction of high-water channels involves radical and complex projects to provide more room for rivers that cover a relatively large area. Fitting such constructions into their surroundings is a radical measure requiring careful consideration, particularly if the measure is combined with other regional developments. For the national projects procedure to be declared applicable, one of the criteria referred to in Section 8.2 must be complied with. The relevant national project decisions will be taken by the Minister of Transport, Public Works and Water Management, in consultation with the minister of Housing, Spatial Planning and the Environment.

Retention of flood water
Retention of water from a high-water surge in an area with existing surface water may require changes to a sluice, reinforcement of a dyke, or changes in water-level management; the necessary decisions will need to be taken by the relevant water management bodies.

Soil disposal sites
The national projects procedure (Sections 2 and 3 of the statutory regulations) can be declared applicable to the soil disposal sites required in the context of creating more room for rivers. Such sites can also be created by amending the relevant regional plan.

16.3.2 Fallback option

The national projects procedure applies directly to the decision-making for a number of measures listed in the Appendix to the PKB. In the case of measures for which a different project decision than a national project decision has been selected in the first instance, a national project decision will be prepared after all, commencing at the point when the Minister of Transport, Public Works and Water Management, in consultation with the Minister of Housing, Spatial Planning and the Environment, has determined that the project decision was not taken in the year specified in the Appendix (column "Project decision by no later than") or that the necessary implementation decisions were not taken prior to the implementation period specified in the column "Implementation period".

If it would seem that the project decision or implementation decisions will not be taken in good time by the regional authority, the Minister of Transport, Public Works and Water Management, so as to prevent time being lost, may already commence the necessary preparations for the draft national project decision.

16.4 Planning study phase and implementation phase

16.4.1 Scheduling

The measures in the Basic Package must have achieved the flood protection objective set out in this PKB by no later than the end of 2015. The Appendix (pages 1 to 3) accompanying the main text of this PKB indicates the scheduled for this per section and per measure or cluster of related measures. The table indicates when the planning study phase is intended to finish and when actual implementation is planned. The "Schedule for carrying out the short-term measures" figure shows this in diagrammatic form. Preparation for actual implementation can commence after the project decision has been taken in the context of the statutory procedure that must be followed after completion of the planning phase. The table also indicates which body will be the administrative body issuing the assignment.

A more detailed schedule will be given for the order in which the various measures will be implemented in the planning study phase after the PKB has come into force.

After adoption of the PKB, there will be a period of some nine years in which to implement the measures. Given the extent and complexity of the package of measures, timely implementation will only be possible if the schedule presented in this PKB is strictly adhered to.

The following components will be of particular importance in determining the time scheduled as being required:

- **Objection proceedings**
  The schedule allows for two sets of objection proceedings to take place. In the first place, it will be necessary to allow for proceedings before the Council of State involving an objection to a public law decision forming the basis of actual implementation, for example the zoning plan or dyke improvement plan. The second set of proceedings will follow the issuing of the permit, possibly followed by proceedings before the Council of State. In all, this may take two and a half years. This will not be the case, however, for all the projects. In the case of projects that have been declared subject to the national projects procedure, coordination of the relevant procedures can reduce the time required.

- **Nature conservation**
  A project decision for a measure will only be taken once the associated mitigation or compensation has been guaranteed. One can ensure that the project and implementation decisions are taken in good time by making use of the option of applying the national projects procedure. Where flood defences are concerned, this can be done by using the option of having the Minister of Transport, Public Works and Water Management issue a designation as provided for in Section 6a of the Flood Defences Act. When the budget for implementing the PKB was determined, allowance was also made for the fact that for purposes of mitigation or compensation it may prove necessary to purchase land, and if necessary redevelop it, outside the areas currently specified in the PKB for implementing the measures.

- **Soil disposal sites**
  One important point in the logistics of implementation is that enough sites should be available to dispose of soil produced when excavating washlands.

- **Acquisition of land**
  Compulsory purchase procedures take up a great deal of time and, formally speaking, cannot commence until the zoning plan or dyke improvement plan has been adopted. A properly planned anticipatory purchasing policy, which proactively and amicably acquires real estate in the project area – whether or not making use of exchange instruments – can save a great deal of time. Such an approach can also help ensure that there is sufficient public support for the measure. Land acquisition can be prevented from becoming the determining factor in the critical planning path by optimising the design so as to make it unnecessary to purchase real estate and by making use of options for exchange.

Actual implementation of the greater part of the work is planned for a short period running from 2009 to 2015. This means that the procedures for the necessary project and implementation decisions must be completed before then. Strict discipline will be required in preparing the decisions, particularly when a number of partners are involved in the context of co-financing.

The logistics of earth moving – with efforts being made to "make work with work" as far as possible – will influence the order of implementation. Other important preconditions for scheduling will be hydraulic considerations and the minimising of additional management and maintenance.

16.4.2 Functions within spatial planning measures

The Appendix to the PKB indicates for each measure to create more room for rivers what the proposed future function of the area concerned – i.e. the primary function – will be once the measure has actually been implemented. The province concerned will be requested to take account of these primary functions when specifying the function/ functions in its regional plan.

Only when the follow-up decisions are being prepared after the PKB has come into force will further elaboration of the measures take place and will it become clear to what extent and where these functions will be given a place. A number of preconditions and basic principles have been applied in the overall design of measures for this PKB. The main ones are:

- ensuring optimum water flow;
- minimising the quantity of contaminated soil that needs to be excavated;
- preventing dyke instability;
- ensuring that homes and commercial operations remain accessible;
- minimising the impact on protected natural, landscape, and heritage features.

These preconditions and basic principles will again apply during the implementation phase.

One extremely important consideration when determining what is or is not possible in redeveloping an area is the extent to which redevelopment will hamper the flow of water. In more technical terms: the roughness of the area to a large extent determines the extent to which it contributes

Schedule for carrying out the short-term measures

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Upper Rhine/Waal											
1503	Removal of obstacles at Suikerdam and Zandberg polder embankment	dependent on development of discharge distribution									
1504	Excavation of washlands at Millingen dam	dependent on development of discharge distribution									
Krib-W1a	Reduction in height of groynes along bends in Waal										
Krib-W2	Reduction in height of groynes along Central Waal										
Krib-W3	Reduction in height of groynes along Waal at Fort St. Andries										
Krib-W 4	Reduction in height of groynes along Lower Waal										
W45_W48_4a	Excavation of Brakel washlands and dyke relocation in Munnikenland polder										
50009a	Dyke relocation at Lent										
Pannerden Canal, Lower Rhine/Lek											
	Excavation of washlands at Huissen										
R09_1_La	Washland excavation at Meinerswijk										
	Excavation of washlands at Doorwerth										
R22-2	Excavation of Middelwaard washlands										
R24_1a	Excavation of Tollewaard washlands										
5301b	Removal of obstacle (former school for crane drivers) at Elst										
R43-R44-R46-R49_3	Excavation of Honswijk washlands, Hagestein island (weir), Hagestein washlands and Heerenwaard washlands										
dyke ring 45, dyke compartment around km. 905-907	Dyke improvement Lower Rhine/Gelderland Valley										
dyke ring 43, dyke compartments around km 878, 879-881, 892, 904.5, 906, 907, 908-910, 910.5, 913-914, 915, 916-917, 922-924, 925-928	Dyke improvement Lower Rhine/Betuwe/Tiel and Culemborg washlands										
dyke ring 47, dyke compartment around km. 881-883	Dyke improvement Lower Rhine/Arnhemse Broek and Velpsebroek										
dyke ring 43, dyke compartments around km. 930-931, 932-936, 937-938, 939, 942	Dyke improvement Lek/Betuwe/Tiel and Culemborg washlands										
dyke ring 16, dyke compartments around km. 943-948, 949, 950-956, 958-965, 966-972, 980	Dyke improvement Lek/Alblas washlands and Vijfheerenlanden										
dyke ring 15, dyke compartments around km. 958, 959-960, 961.5, 963-964, 965-967, 968-969, 971	Dyke improvement Lek/Lopik washlands and Krimpen washlands										
IJssel											
Y31-Y33-Y34_1a	Excavation of Lake Bolwerk, Worp and Ossen washlands										
Y36_Y37_Y39_2a	Excavation of Keizer and Stobben washlands and Olster washlands										
50006c	High-water channel Veessen-Wapenveld										
Y49_2b	Excavation of Scheller and Oldeneel washlands										
20509d	Dyke relocation at Westenholte										
20505d	Dyke relocation at Voorster Klei										
50007c	Dyke relocation at Cortenoever										
ZbIJ	Summer bed deepening of Lower IJssel in combination with nature mitigation measures in washlands										

Schedule for carrying out the short-term measures

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Distributaries of Merwede, Bergsche Maas/Amer, Rhine/Meuse estuary area											
MW8_2a	Washland excavation at Avelingen industrial estate										
MW18_1	De-poldering Noordwaard (flowing with river)										
M3	De-poldering Overdiep polder (flowing with river)										
M30a	Reduction in height of embankments at Biesbosch wetlands										
dyke ring 35, dyke compartment km. 246-247	Dyke improvement Amer/Donge										
dyke ring 24, dyke compartment around km. 963, 964-966, 968-970	Dyke improvement Steurgat/Land van Altena										
dyke ring 24, dyke compartment around km. 247-249	Dyke improvement Bergsche Maas/Land van Altena										
dyke ring 21, dyke compartment around km. 993-995	Dyke improvement Oude Maas/Hoeksche Waard										
dyke ring 20, dyke compartment around km. 999.5	Dyke improvement Oude Maas/Voorne-Putten										
M40_3a	Retention of water in Volkerak-Zoommeer										
Soil disposal sites											
Oosterhout washlands											
Gouverneursche Polder											
Haringvliet pits											
Covering of Haringvliet soil remediation sites											
Kerkenwaard											
Pit at Flevo power station											
Nature development IJsselmeer area											
Scheller and Oldeneel washlands											
De Waarden											
Havik washlands											
Maneswaard											

Explanation

- Decision-making PKB "Room for Rivers" and SNIP 2a (selection of variants)
- Planning phase up to SNIP 3 (project decision)
- Procedures up to SNIP 5 (implementation decision)
- Implementation (hydraulic effect achieved)

Management measures applied:

1 In the event of two Council of State procedures, the second reduced to six months

2 Planning studies shortened in accordance with administrative agreements:
alternatives study: one year
elaboration of plan: one year

3 Implementation so as to achieve hydraulic effect on schedule.

4 No link due to Birds and Habitats Directives

to achieving the target. This is relevant, for example, if an area ceases to be used for agriculture and takes on a nature conservation function.

The overall designs produced for the purposes of this PKB assume a relatively "smooth" design. Redevelopment for nature conservation purposes will involve natural grassland with a maximum of 2.5% being allocated to brushwood. This will also have consequences for management. It will be necessary, before each winter, to ensure that the area is brought in line once more with the basic principles underlying its redevelopment. All of this will need to be set out in a management plan that forms part of the relevant permit (with the permit being issued pursuant to the Public Works (Management of Engineering Structures Act)). This will specify the future features of the area concerned – its relief and the locations where vegetation is envisaged – and the way in which these features will be maintained. Compliance will of course be monitored.

Improving spatial quality will be effectuated when elaborating the planning studies for each measure/project by means of an integrated design, with the knowledge, insights, and ideas generated during preparation of the PKB leading to effective coordination of all the relevant functions. The guiding principles will be those of cohesion and diversity that apply in the Regional Spatial Planning Framework. These principles will be given shape in specific spatial planning scenarios for each distributary. Doing so will clarify the desirability of combining measures, in the planning study phase, into a single project for those locations where cohesion will produce added value from the point of view of spatial quality. The spatial planning task in the planning study will be to use creative design of measures to further improve spatial quality at local level without this leading to greater costs or having a negative effect on the intended reduction in water level.

When the measures are determined after the PKB procedure, a definitive appropriate assessment will also be carried out as regards decision-making in the context of the 1998 Nature Conservation Act. In areas whose function changes to that of nature conservation, efforts will be made not merely to avoid harm to protected features but also to pursue the development objective set out in the Strategic Framework for the Birds and Habitats Directives to strengthen the Natura 2000 network.

Within the PKB project area, it will be possible to implement compensatory measures for natural features. This will apply not merely if the Basic Package of Measures is implemented but also in the event of implementation of the Basic Package with components being replaced by one or more of the alternative measures. The measure involving de-poldering the Noordwaard (flowing with the river) also provides for sufficient compensation for other measures.

A project decision will only be taken when the associated compensation has been guaranteed; a measure – or at least that portion that requires compensation – will only be implemented when compensation has actually been provided. In addition to its hydraulic function, the measure involving de-poldering the Noordwaard (flowing with the river) also compensates for nature conservation features. One can ensure that the regional project and implementation decisions listed in the Appendix are taken in good time by making use of the option of applying the national projects procedure. If necessary, a separate project decision will be taken in anticipation of the national project decision on the Noordwaard measure to ensure implementation in good time of the compensatory portion of that measure. For all measures relating to flood defences, timely implementation can be ensured by using the option of having the Minister of Transport, Public Works and Water Management issue a designation as provided for in Section 6a of the Flood Defences Act.

16.4.3 Guaranteeing management and maintenance

Management of washlands
Nature development projects in the washlands take place subject to government policy. For most nature development projects, a permit has been issued by the body that manages the river, with compensation being provided for the backing up of water resulting from nature development. Since 1995, nature development projects have also contributed to the objective of creating more room for the country's rivers. The choice not only of nature target types and precise locations but also management of projects will continue to be a consideration in ensuring flood protection. It will be necessary for the competent management bodies and the Directorate-General for Public Works and Water Management to intensify management and enforcement.

Compared to 1997, there is a management backlog for the Rivers Region, nationally speaking (Meuse and Rhine), amounting to an estimated several hundred hectares of spontaneous vigorous vegetation spread across various sites in the washlands and the river bank zone. Extensification of use is also increasingly producing more "rough grassland"; large areas of this have an influence on water levels. The combined effect of this vegetation along the river can be expected to amount to several centimetres. In order to prevent this backing-up effect, compensating for or removing this vegetation is a priority.

It is not the case, however, that intensification of management will make it possible to abandon measures currently included in this PKB. The water level reduction that can be achieved by intensifying management – while taking account of nature conservation legislation – is in general insufficient or cannot be achieved at the location where it is necessary from the point of view of flood protection. Effective management will, however, be an important basic principle in further elaboration of the measures, both in the PKB planning studies and in the context of NURG projects or other projects in the washlands. There will also be a focus on the effects of – and options for – intensifying management "around a measure".

It is clear that new projects in the washlands require additional management efforts on the part of both the river management body and the body managing the nature conservation areas. Before being implemented, a redevelopment programme will be assessed in respect of its whole "life cycle", i.e. including the management that it will entail. This means that explicit attention will be paid during the planning study phase to the management criteria, the management costs after completion of the project, the long-term management body, and the relevant transfer agreements.

Discharge distribution
The discharge distribution will be maintained at the level determined by the policymakers. To that end, corrective measures will be taken if necessary. Gradual changes in the river profile can lead to differences in the discharge distribution at the points where the distributaries diverge. Corrective management is therefore basically the job of the river management body. If the design of projects to create more room for rivers and the order in which those projects are carried out lead to temporary differences in discharge distribution, the project organisation will ensure that the necessary temporary corrections are implemented. This will be provided for in advance in the permit.

16.4.4 Guarantees for spatial quality

After this PKB has been adopted – in the design and implementation phase – it will be necessary to focus on guaranteeing spatial quality. Taking the division of responsibility between central government and local authorities into account, the Government – in close cooperation with other parties – will continue to assess the maintenance and improvement of spatial quality according to broad criteria.

Once this PKB has been completed, there will be close collaboration between the region and the Government to elaborate the National and Regional Spatial Planning Networks with respect to each distributary, with these frameworks being integrated with the selected measures and the reservations made for spatial planning purposes so as to create a "master plan" setting out specific spatial planning scenarios. Even though it is central government that is responsible for this, the Government intends allowing the region to take the lead. The guiding principles of the "master plan" will be cohesion and diversity. It will be concerned both with cohesion between the various measures and cohesion with other spatial planning developments in the environs (on both sides of the dykes and the regional water system). Proper coordination with currently applicable spatial plans and planning processes is of great importance. The aspect of management must also be specifically included in the design processes. The Government, in collaboration with regional authorities, will take the initiative in the context of the Space and Culture Action Programme [Actieprogramma Ruimte en Cultuur] to make a quick start with a pilot project for the IJssel so as to make it possible to draw up a "master plan" for this distributary.

The spatial planning scenarios set out in the plan can form the basis for drawing up functional programmes of requirements with spatial quality aspects and for assessing new initiatives that are proposed after the PKB takes effect. It will be possible to make use of the independent quality assurance team set up by central government to advise authorities and to guarantee contributions by specialist experts with specific expertise.

16.4.5 Organisation of planning phase and implementation

The "Room for Rivers" project falls into the category of "Major Projects" and is therefore subject to the Procedure Rules for Major Projects. These provide that the responsible Minister/State Secretary at the Ministry of Transport, Public Works and Water Management should render a half-yearly account of progress to the Lower House of Parliament. One important aspect of this will be the financial section. Based on the overall responsibility of the Ministry of Transport, Public Works and Water Management for controlled implementation of the Room for Rivers project, the necessary decisions on financing the planning study and implementation will be taken in accordance with the Rules for Wet Infrastructure Projects [Spelregels voor Natte Infrastructuurprojecten, SNIP]) that apply within that Ministry. The Ministry envisages the following decision points:

[6] Total surface area of the winter bed (Rijntakken) is approximately 30,000 ha.

- assignment for planning study;
- selection of variants;
- project decision followed by preliminary planning decision on implementation;
- implementation decision;
- completion decision.

Local authorities will play a role as regards the follow-up measures to be taken once the PKB has entered into force. Central direction and reporting to the Lower House of Parliament will be the responsibility of the relevant Minister/State Secretary. The distribution proposed below is possible, as an indication, for each measure or cluster of measures for the public authority that issues the assignment (referred to below as the "initiator".

In the case of dyke relocation work, the initiator will be the relevant water authority; for reducing the height of the groynes and for excavation in the summer or winter bed, it will be the Ministry of Transport, Public Works and Water Management. Where other measures are concerned, initiator status may be conditionally delegated by the Minister/State Secretary at the Ministry of Transport, Public Works and Water Management to a province or municipality. The initiator will be responsible for implementing the work and for preparing the decisions at the successive decision points. The decision will be taken in each case after consultation with the national Room for Rivers Steering Committee [*Stuurgroep Ruimte voor de Rivier, SRVR*] and after it has been given final approval by the Minister/State Secretary at the Ministry of Transport, Public Works and Water Management, who has final responsibility.

Agreements will be made between the responsible Minister/State Secretary at the Ministry of Transport, Public Works and Water Management and the various initiators regarding implementation of the measure or a cluster of measures. These agreements will comprise arrangements on the scope of the work that is to be carried out, the schedule, financial framework, distribution of risk and risk management, and quality assurance.

The Ministry of Transport, Public Works and Water Management will set up a project organisation to take charge of day-to-day coordination with the initiators. It will also be responsible, on behalf of the State Secretary, for ensuring the quality with which the flood protection objective is pursued, together with the associated improvement of spatial quality and the control of time and money for the whole programme.

16.4.6 Strategy for real estate

Implementation of the various different measures requires that land be freely available. It will be necessary in some cases to purchase and redevelop buildings and other structures.

The manner in which the land and buildings etc. become available depends on the nature and urgency of the measures, the extent to which they are dependent on their location, and the willingness of the current owners and users to cooperate with implementation of the measure concerned.

Support and assistance will be given to initiatives by private parties to carry out the necessary measures on private property in the context of the programmatic approach. In all cases, this will naturally take account of the applicable rules regarding the Policy Guideline on Major Rivers, the European tendering rules, nature conservation legislation, etc.

In certain situations – yet to be specified – arrangements for compensation will be agreed on with private parties rather than purchase. This applies both to the land and to buildings and other structures. In the case of buildings and structures, one important point is the frequency and extent of flooding in and around such privately-owned property. A tailor-made solution will ultimately need to be found for each particular situation.

There are likely to be numerous situations, however, in which the Government will need to acquire the necessary land and buildings/structures. In the case of dyke relocation or reinforcement measures and the removal of hydraulic obstacles, the compulsory purchase procedure will be followed to acquire the land concerned; this will be done under Title II of the Expropriation Act [*Onteigeningswet*]. This procedure will commence with an attempt to acquire the land amicably.

In the case of the other measures where land is required, an attempt will first be made to acquire the land on a voluntary basis, whether or not with the aid of extra payments on top of the free market value. If certain parcels of land are crucial to implementation of the necessary measures, consideration will be given to making use of compulsory purchase.

Where possible, an attempt will be made to link up with ongoing or future processes in the areas concerned, for example in the context of the Reconstruction Act [*Reconstructiewet*] or the Rural Areas (Planning) Act [*Wet inrichting landelijk gebied*], with use being made of land consolidation to bring about an extra improvement in quality for a number of different functions.

To be able to commence implementation of the desired measures on time, an energetic start will be made on purchasing real estate in advance of the project decisions that need to be taken. This will be the case particularly when it makes it possible to benefit from unique opportunities to acquire the necessary property in areas where measures are foreseen.

In the event that the required flood protection measures are to be implemented on land that remains the property of private parties, there will need to be guarantees regarding achievement of the objectives and timely implementation. This will be possible in part by means of the public-private agreements referred to in the section on the programmatic approach.

16.4.7 Market

The Room for Rivers PKB will involve government investment amounting to more than two billion euros. The level of investment in the Rivers Region will be even greater if public and private initiatives can reinforce one another economically in the context of the programmatic approach, or can act as "multipliers". Enterprises both large and small will need to tackle the physical planning and implementation of the measures.

The initiators, jointly with the regional authorities, already took the initiative for market consultation while the PKB was being drawn up. Consultation took place on a broad scale and involved mineral extraction companies, contractors, project developers and consultancy firms, but also municipalities in the Rivers Region with plans for promising river-related projects.

In addition to highlighting the proposed package of measures and the options that it presents for public and private parties, consultation was also intended to allow market parties to indicate what requirements they thought the PKB should comply with so that its implementation would involve the healthy operation of market forces and participation by the business community.

After the PKB has been adopted, efforts will continue to be made in collaboration with the market to discover the optimum methods of implementation, such as implementation by the parties themselves, public-private partnerships, co financing, DBFM contracts, and variants of all these. It goes without saying that in all cases the Dutch and EU rules on tendering for government projects will need to be observed.

Closer consideration and assessment of the various options

17

General

17.1 Introduction

The public consultation procedure regarding PKB Part 1 and the Environmental Impact Statement (EIS) produced 2843 submissions. As part of the EIS procedure, the Environmental Impact Statement Committee made recommendations in the light of its assessment of the EIS. The Netherlands Council on Housing, Spatial Development and the Environment and the Board of State Advisers [College van Rijksadviseurs] were asked to provide recommendations on PKB Part 1. PKB Part 2 presents the broad outlines of the public consultation procedure; it also includes the recommendations that were received. The present section outlines the general themes of the various submissions and recommendations, and gives the Government's response to them. Sections 18 to 22 deal with the public consultation procedure in the light of the measures proposed.

17.2 PKB Part 1

The various submissions and the administrative consultation showed that most authorities are satisfied with the procedure that led to the drawing up of the package of measures in PKB Part 1. The public indicate that they find the procedure complex and unclear. A number of those commenting propose that the Government's position paper (Part 3 of the PKB) should include more measures taken from the Regional Advisory Report. Some of those commenting are dissatisfied with the fact that this was not already the case. Others propose that the planning impetus announced in the Regional Advisory Report should actually be implemented.

Government response
The Government is aware that this PKB concerns an extremely extensive and complex operation, one that may be difficult to follow and understand for many people who are not directly involved. The Government assumes, however, that the fact that many authorities do express their satisfaction regarding the transparency of the procedure for selecting the measures shows that at least the administrators concerned are able to follow it. Drawing up the Regional Advisory Report by the regional authorities naturally had a positive influence in this regard. This does not affect the fact that providing the public with proper information and involving them in the procedure remains an important element. It is essential during further action regarding implementation of the planning studies for each particular measure/project to provide proper information and where possible involve the public.

The Government is in favour of the direction indicated in the Regional Advisory Report, as is shown by the large measure of agreement between the overall long-term approach proposed in both that document and the PKB. There is no difference of opinion between the region and central government regarding the fact that more room is necessary for the country's rivers and that a planning impetus is necessary for the Rivers Region. The available budget and the available time up to 2015 mean, however, that it will not be possible to already take on board all the spatial planning proposals in the Regional Advisory Report in the short term.

17.3 EIS

Only a few responses to the EIS were received. The EIS Committee states that in its view the "Reference Alternative Dyke Improvement" (RAD) has been drawn up in too broad a manner. In its view, the EIS does not make properly clear how the RAD relates to other alternatives in the targeted area the environmental effects. This means that it has not been made clear how "creating more room for the rivers" relates to "increasing the height of the dykes". The Committee states that an optimised alternative, combining increasing the height of the dykes with the basically separate measures for improving spatial quality, has not been considered. This alternative would produce a better "Most Environmentally Friendly Alternative" and possible even a different Basic Package of Measures. The Committee considers the lack of this alternative to be a basic shortcoming of the decision-making process and advises that it should be drawn up after all.

Government response
The Government does not agree with the above finding by the Committee. It shares the view that the RAD was considered from a broader perspective, but considers that that is logical where a reference alternative is concerned. The Government cannot and will not comply with the Committee's request because doing so would be contrary to the decision in favour of Room for Rivers. In accordance with the Introductory memorandum EIS, the Government has put into practice the desired new approach with a view to implementing as many measures as possible to create room for the country's rivers within the constraints of time and money. In that context, flood protection and improvement of spatial quality have been combined.

17.4 Policy Guideline "Room for Rivers"

A number of submissions during the public consultation procedure dealt with the relationship between the PKB and the Policy Guideline "Room for Rivers". Some of the submissions requested greater clarity regarding application of that policy guideline in areas not reserved for the Room for Rivers PKB. The policy guideline itself also produced various responses. It was considered not to be flexible enough and to be applied too rigidly, thus hampering regional spatial development. Some submissions argued that the policy guideline should be amended so as to make more different developments possible, including, for example, simplified changes of function or developments that contribute to creating more room for the rivers.

Government response
The Policy Guideline on Room for Rivers has now been amended and replaced by the Policy Guideline on Major Rivers, which came into force on 14 July 2006. This new policy guideline will focus more on development, but without having a negative effect on flood protection in the river bed. The policy guideline provides the assessment framework for the issuing of permits in the context of the Public Works (Management of Engineering Structures) Act (Wbr) and is intended to maintain the currently available water retention and discharge capacity and the options for future measures in the riverbed. The PKB and the policy guideline therefore have different objectives and have therefore not been integrated.

17.5 Flood protection objective

The flood protection objective enjoys general support. However, a number of comments have been made regarding the radically different approach to that objective.

Some comments show that there are doubts as to whether the new approach can in fact be achieved by means of the measures proposed by the Government. On the other hand, a number of responses express doubt as to the necessity of the new approach, saying that high discharge levels can best be dealt with by increasing the height of the dykes. These responses are based on the following arguments:

- increasing the height of the dykes is less expensive than creating more room for rivers;
- creating more room for rivers has many disadvantages as regards work, housing and recreation in the Rivers Region;
- creating more room for rivers will involve a great deal of earth moving, with negative effects on birds, habitats, heritage features, etc.;
- increasing the height of the dykes is a measure that can be more easily fitted into spatial planning.

Government response
The radical new approach is one of the reasons for the PKB. In the light of the public consultation procedure and the recommendations made, this Explanatory Memorandum includes a separate section (Section 2) giving extensive arguments for the radical new approach.

17.6 Spatial quality objective

Both the public consultation procedure and the recommendations received show that there is support for improving the spatial quality of the Rivers Region. The way in which that objective should be achieved, however, does produce various responses. Those who commented would like to see a closer definition of the term "spatial quality". They are also not always convinced that the measures concerned will in fact improve spatial quality in particular locations. Doubts have also been raised regarding guaranteeing spatial quality in the subsequent phase, with proposals being made to the effect that "master plans" should be drawn up for each distributary and that an independent quality team should be appointed.

Government response
Section 4.2 of this Explanatory Memorandum points out that spatial quality is a very wide-ranging term. Just what role the values concerned play in the consideration depends very much on the specific situation. It is obvious that the result is unlikely to entirely satisfy all those concerned. The Government has accepted the recommendations made for guaranteeing spatial quality in the post-PKB phase, for example in Sections 4 and 16.

17.7 Target

Many of those commenting say that it is unrealistic to take 18,000 m³/s at Lobith as the representative discharge for the long term. Many of them point out that if discharge reaches that level there will already be large-scale flooding in Germany, meaning that the level of 18,000 m³/s at Lobith will not be reached. A number of those commenting refer to the results of the joint Dutch-German study, saying that on the basis of that study there are no arguments in favour of taking that figure as the target. Many also say that climate change and its effects are associated with too many uncertainties to justify land being reserved. This leads a number of those commenting to argue for postponing the long-term reservation of land until there is greater certainty regarding the relevant trends and targets.

Government response
How the representative discharge will develop over the course of this century is highly uncertain. A discharge level of 18,000 m³/s has been assumed. The decision to do so is explained in Section 3 of this Explanatory Memorandum.

Given the great pressure on space in the Netherlands, the Government considers it necessary to reserve areas for the future in order to create more room for the country's rivers. Section 6 explains this in some detail.

17.8 Sectors

Nature conservation
Those who submitted comments point out, particularly as regards the IJssel, that they expect the removal of a large number of trees and bushes from the winter bed to have a highly beneficial effect. This maintenance work, which those commenting consider to be overdue, would make measures unnecessary on the landward side of the dykes or at vulnerable locations in the winter bed. Some submissions state, on the other hand, that a greater contribution could be made to the natural features of the Rivers Region.

Government response
Section 16.4.3 of this Explanatory Memorandum points out that although there is a maintenance backlog, it is still not the case that intensification of maintenance would allow measures to be dropped from the Basic Package of Measures.

Recreation
Verschillende reacties geven aan dat het vertrekpunt bij de maatregelen zou moeten zijn, dat de mogelijkheden voor de recreatie en recreatievaart versterkt moeten worden. Een aantal locaties wordt expliciet benoemd.

Government response
Given that the recreational aspects were considered when assessing the spatial quality aspect, these have been taken into account during both the drafting and assessment phases. The various planning studies that will be carried out in the ensuing phase after the PKB has been adopted will also take account of these aspects.

Shipping
A number of submissions refer specifically to the interests of shipping. They consider that creating more room for the country's rivers should not take place at the cost of the safety of shipping, the current minimum navigable depth in the waterway, or loading depths.

Government response
One of the basic assumptions for the PKB was that the interests of shipping should not be negatively affected. The EIS also notes that the shipping survey that was carried out was of an overall nature and that a more detailed study has been announced.

Agriculture
Many individual farmers and a number of farming organisations submitted comments during the public consultation procedure. A number of the submissions point out that spatial quality is due not merely to nature but also to agriculture in the project area. They state that agriculture contributes to the openness of the landscape and guarantees – by means of effective management – that that landscape will be preserved. A number of those commenting also state that any negative effects on agricultural areas will need to be compensated for. The farming organisations are specifically concerned with the possible negative effects on agriculture.

Government response
The decision on the future use of land took account of the contribution that agriculture can make to spatial quality. The various planning studies that will be carried out in the follow-up phase after the PKB has been adopted will also take account of these aspects. If measures bring about changes such as to cause an excessive fall in the economic cost-effectiveness of farms, it may perhaps be better in some cases for the land concerned to be redeveloped in order to give it a nature development function. This PKB covers more than 1000 hectares of agricultural land.

Any negative effects on agriculture will be compensated for according to the applicable rules.

Landowners
Landowners are of the opinion that private ownership of land should be respected to the maximum possible extent. The future role of landowners needs to be made clearer. This can be effectuated by consulting with landowners when the planning studies are taking place, for example as regards their role as private nature managers when land is given a function other than agriculture. Private parties should also be able to purchase land in order to redevelop and manage it.

A number of submissions suggest that more measures should be implemented on the river side of the dykes because, in their view, landowners are interested in the extraction of earth and sand. This could reduce costs. Others suggest that private landowners can also play a role in redeveloping and managing land on the landward side of the dykes.

Government response
The specification of the proposed measures in Part 1 of the PKB already pointed out that, in the case of nature development, the Government has not yet made a choice, as regards implementation of the measures, between private parties and official nature management bodies. Further discussion of this matter can take place in the phase subsequent to adoption of the PKB.

17.9 Legal aspects

Damage caused by seepage, departure of enterprises and residents, and "shadow damage"
Many of those who commented during the public consultation procedure expect that the measures will cause damage to property. They refer to the possible relocation or closing down of primarily agricultural enterprises and the necessity of residents perhaps having to move away. They also expect there to be damage as a result of increased seepage on the landward side of the dykes, leading to damage to farms (particularly fruit-growing operations), homes, and natural features. Reference is made to the discharge from streams and other watercourses, particularly in West Brabant, whose drainage will be negatively affected by the measures envisaged. Some of those commenting refer to the "shadow damage" that they say will already occur in areas where land is reserved for measures in the longer term because houses will become more difficult to sell and will command only a lower price.

Government response
Once the PKB has been adopted, the public authorities will take decisions to make the measures it envisages possible. In many cases, those authorities will be municipalities, which will need to revise their zoning plan. Public authorities will also adopt decisions for implementing PKB measures, for example in the case of a water authority that adopts a flood defences plan involving relocating a dyke. These decisions may lead to interested parties sustaining damage. The authorities will provide compensation for the damage that must be compensated for pursuant to the relevant system: in the case of zoning plans, the regulations under Section 49 of the Spatial Planning Act (loss resulting from planning decisions [planschade]), in the case of implementation decisions, the system for compensating for disadvantage as applied by the public authority concerned.

Where land or structures are necessary for water management work or where infringement of the interested party's rights is extensive, the land or structures concerned will be purchased, if necessary by means of compulsory purchase. In the event of compulsory purchase, full compensation will be paid.

The cost of compensation that must be paid as a consequence of a PKB measure being implemented will be covered by central government. The PKB itself is not a decision that can lead to compensation being paid. Compensation will be paid on the basis of the follow-up decisions that are adopted because it is only those decisions that can infringe the rights of interested parties. Damage resulting from the fact that a decision may be taken ("shadow damage") will not be compensated for. A plan must first be adopted and have taken effect before any disadvantage or loss resulting from a planning decision can occur that then needs to be compensated for.

System of land reservation
The public consultation procedure shows that there is uncertainty as to the system for reserving land for the longer term. Some submissions question whether this will not suspend the economic development of an enterprise or even of a region. Some of those commenting also wonder what the added value of such reservation is compared to that already included in regional plans.

Government response
As explained in Section 6, the PKB also reserves land in places where measures may need to be implemented in the longer term. It is undesirable for development to take place in such locations if this may hamper implementation of the PKB. Existing rights will remain in force. Regional authorities will be requested in the PKB to take account of the land that has been reserved when adopting their various plans.

The PKB takes account as regards the longer term with even higher discharge levels than those that form the basis of the package of measures for the short term. With that in mind, a package of measures has been drawn up that may perhaps need to be implemented at some point in the future. This PKB does not comprise the decision to that effect, but it does aim to prevent it becoming impossible in the future to implement measures to deal with even higher discharge levels. Reserving land for that purpose means that no large-scale and/or capital-intensive development will be permitted in areas where measures to create more room for rivers are expected to become necessary in the longer term if such development would seriously hamper the implementation of such measures.

As has already been pointed out, existing rights will remain in force in such areas. Regional authorities will be requested not to permit any large-scale and/or capital-intensive development when drawing up their plans if doing so would seriously hamper the implementation of future measures to create more room for rivers. This means, for example, that no new residential areas or industrial estates would be permitted in the areas concerned. Given that it is not yet possible to specify precisely the areas to which future decision-making on measures for the longer term will apply, this PKB restricts itself to an overall specification to the effect that whether development can take place will be considered on an area-by-area basis.

17.10 Additional studies

Soil disposal sites: detailed effects study to substantiate selection
The EIS compares a number of different sites for disposing of slightly and seriously contaminated excess soil (class 0/4) in the light of a number of environmental aspects. The criteria applied were derived from the 1992 EIS on Disposal of Dredging Spoil Gelderland [MER Baggerspecieberging Gelderland] and the 1995 supplement to that document. Only a limited nature conservation assessment was carried out in the EIS for sites that will only be used to dispose of slightly contaminated soil (class 0-2).

A supplementary study was carried out for the purposes of this PKB on the suitability of the various disposal sites. The supplementary study was necessary because of the following factors:
- the need to be able to compare all the sites – i.e. including those for only slightly contaminated soil – on the basis of a complete environmental assessment.
- the need to verify the nature conservation and environmental assessment that was carried out. To that end, additional data were collected, including by means of an on-site survey. A number of sites were re surveyed to check their potential capacity for disposing of soil.
- the somewhat amended assessment framework – partly in the light of the additional data collected – for the criteria "surface water" and "flora, fauna and ecosystem".

For each criterion group, a new order of preference was drawn up on the basis of the supplementary assessment. The new assessment is based on new data derived from the supplementary surveys carried out between PKB Part 1 and Part 3 (the Government's position document).

One can conclude on the basis of the rankings for each criterion group that the Marspolder, and the Redichem, Gravenbol, Crob, Gameren and Huissen washlands are less suitable, relatively speaking. It is striking that the small flooded sandpits along the IJssel, for example at Veenoord, Welsum washlands, Onderdijk washlands and De Waarden score relatively well for most criteria. However, the capacity of these sandpits to accommodate excess soil is only limited. This order of preference must therefore be viewed as relative. A relatively low place in the rankings does not necessarily mean that the site concerned is unsuitable for the disposal of soil. It was already established in 1995 that the ten sites described in the EIS on Disposal of Dredging Spoil Gelderland (1995) could basically all be redeveloped as soil disposal sites.

Nature conservation assessment of soil disposal sites
Assessment of the various soil disposal sites in the washlands in the light of the Birds and Habitats Directives shows that from the point of view of those directives there are no objections to making these flooded sandpits shallower. Temporary effects can be expected during implementation of the various measures but it is unlikely that there will be much disturbance of species because the soil will be disposed of in a relatively extensive manner
no on-site processing).

Two disposal sites are located outside the washlands. The nature conservation assessment (preliminary check) shows that an "appropriate assessment" is necessary because significant effects cannot be excluded:
- In the case of the Flevoput site, it would appear that the bird species concerned benefit from the water being deep.
- In the case of the Haringvliet site, the possibility cannot be excluded of soil disposal (covering over of soil remediation sites) leading to significant effects on the species concerned and other relevant species.

Further elaboration of these matters will take account of these preconditions.

Cost-effectiveness analysis
The cost-effectiveness analysis of the Basic Package of Measures shows that there are no major differences in the composition of the package along the IJssel, Waal and Meuse compared to the package of measures included in PKB Part 1. The overall assessment of the packages for the IJssel and the Waal therefore continues to be "average cost-effectiveness", while that for the package for the Meuse remains "inexpensive". The package of measures for the Lower Rhine/Lek has, however, changed considerably. Greater use of dyke reinforcement for these distributaries has made it possible to restrict the measures to create more room for rivers to those measures that also make a relatively large contribution to spatial quality. The cost estimate has therefore been much more considerably reduced than the standard costs associated with the benefits. The package of measures for the Lower Rhine/Lek has therefore now become "inexpensive".

Distribution of discharge between the various distributaries of the Rhine
A number of the submissions concerned the choices made regarding the distribution of discharge, although these submissions are not all in agreement with one another. Some of those commenting consider that the Lower Rhine/Lek should not be affected, either in the long term or the short term. Other submissions state that it should specifically be the IJssel that is unaffected. A number of submissions argue that if the Lower Rhine/Lek and IJssel remain unaffected, it will be necessary to cause more water to flow via the Waal. A decision has been taken in the PKB to maintain the distribution of discharge between the various distributaries of the Rhine as it is at the moment. An additional study looked at two options in greater detail.

The first option is based on the assumption that the entire extra discharge of 1000 m³/s (i.e. the difference between 15,000 and 16,000 m³/s) would go via the Waal. In the case of the IJssel, a target will remain due to the lateral inflow. The necessary package of measures will involve:
- Waal: dyke relocation at Lent, a large number of washland excavation projects, reduction of the height of the groynes, dyke relocation at Het Munnikenland;
- the various distributaries of the Merwede: remediation of the industrial estate at Avelingen and "de-poldering" of the Noordwaard;
- IJssel: dyke relocation at Westenholte and a number of washland excavation projects;
- Bergsche Maas, Hollandsch Diep: de-poldering of the Overdiep polder and water retention in the Volkerak-Zoommeer;
- Rhine-Meuse estuary: dyke improvement;
- Lower Rhine/Lek: only projects currently underway.

A cost estimate has been made for this package of measures. This amounts to just under EUR 2 billion. Given the large number of washland excavation projects foreseen along the Waal, the following problems can be expected:
- Large quantities of contaminated soil will be excavated and will need to be disposed of at disposal sites.
- Large quantities of clay and sand will be excavated that are in excess of market demand for these raw materials. This may lead to costs being driven up further. This aspect has not been taken into account in the cost estimate.
- The large number of washland excavation projects will not be possible without conflicting with the Birds and Habitats Directives. This will lead to a major issue of mitigation/compensation. This aspect has not been taken into account in the cost estimate.

If one wishes to prevent measures needing to be taken along the IJssel in the short term, then the discharge level of the Waal will need to be increased by another 250 m³/s. This is the second option. From the point of view of cost, this package of measures is comparable with the Basic Package of Measures in PKB Part 1, but it has the disadvantages of the package of measures described above.

It should be noted, however, that the basic principle for the longer term – i.e. taking account of a discharge level of 18,000 m³/s – is for the Lower Rhine not to be affected. The 2000 m³/s extra discharge (i.e. above the level of 16,000 m³/s) will be distributed in the same proportion as at present between only the Waal and the IJssel.

External effects on Natura 2000
In the period between the publication of PKB Part 1 and PKB Part 3, an additional study was carried out of the possible "external" effects of the proposed measures on Natura 2000. This has to do with the effects that a measure can have on a location other than the one where the measure is actually carried out. This specifically concerns deepening the summer bed of the distributaries, which may have effects on natural features on the river side of the dyke elsewhere along the same distributary as a result of changes in the frequency with which the washlands are flooded.

Measures such as deepening of the summer bed that lead to lower water levels even when the discharge level is normal will cause a reduction in the length of time during which the washlands are flooded. This may lead to existing habitat types "drying out". In addition, less frequent flooding of the washlands will also lead to less sand being deposited in the riverbank zone or on natural levees. The development and sustainability of a number of habitat types depend on regular deposition of sand. If this no longer takes place, then highly valuable natural features may be damaged.

For all Natura 2000 areas in the project area, an estimate has been made, on the basis of expert knowledge and the information contained in the EIS, of the potential occurrence of significant negative effects on protected natural features due to external effects. That study shows that negative effects cannot be excluded due to summer bed deepening of the Lower IJssel in the washlands along the IJssel (Duur washlands, Vreugderijk washlands, Zalk woods, and De Zande/Scherenwelle).

Dyke improvement: further analysis of the areas to be reinforced in the Basic Package of Measures
The dyke reinforcement projects contained in PKB Part 1 are largely based on the "Reference Alternative Dyke Improvement" study (RAD). That study does not go into any great detail and in general provides an upper limit for the necessary measure. After PKB Part 1 had been written and printed, additional detailed information became available regarding the necessary dyke improvements. In this context, the dykes were divided up into smaller dyke sections, with the recent detailed information on the present condition of the dykes being used for each section. (This data – the "test reports" – became available in 2005.) Adjustment of the package of measures for the Lower Rhine has also led to changes in the development of representative water levels; account was also taken of the implementation of projects that are currently underway.

All of this led to the draft designs for dyke reinforcement being updated. The measures concerned are in general on a smaller scale and of more restricted duration than those described in the RAD and in PKB Part 1. It also became apparent that dyke improvements will be necessary in a number of places not specified in PKB Part 1.

18

“KAN” area

18.1 Public consultation process

The public consultation procedure in the KAN area concerned primarily the dyke relocation at Lent. A total of 350 submissions were received, of which 240 were identical. Virtually all of these were to the effect that the dyke at Lent should not be relocated further away from the river. The objectors are unconvinced of the value or necessity of this measure and believe that the effects of relocating the dyke will be much too drastic. They propose that the dyke should not be moved and that the Lent washland area should be excavated instead. A restricted area of land can be reserved for measures to be implemented in the longer term. The relevant local authorities are in favour of relocating the dyke, for one thing because of the flexibility that this measure entails.

The local residents have proposed an alternative, the “*Lentse Warande*”. This area will consist of a channel excavated on the river side of the dyke (known as the “Van Ellen channel” after the person who initially proposed it), with land being reserved on the landward side with a view to relocating the dyke further away from the river at some point in the future. The dimensions of the Van Ellen channel will be such that it will give Nijmegen the required protection from flooding. The effect further upstream will be significantly less than if the dyke were to be relocated further away from the river, meaning that additional excavation of the washlands will be necessary at Gendtsche Waard. No new bridges will be necessary in the short term and most of the homes can remain also.

A long-term alternative has also been proposed involving cutting off a number of the bends in the river between Pannerdensche Kop and Nijmegen. This will be a fairly large-scale measure that would perhaps need to be carried out in stages. In the view of those commenting, it would make it possible to achieve the target between Nijmegen and Pannerdensche Kop in both the short and long term.

18.2 Additional studies

Dyke relocation at Lent
Simultaneously with this PKB procedure, a planning study/ Environmental Impact Statement procedure is already being carried out regarding a solution to the river management problem at Nijmegen. A number of alternatives have been investigated in the context of the planning study, including one proposed by local residents involving excavating the Lent Lotwaard washlands and cutting the new Van Ellen channel.

Maintaining discharge distribution
The objective of the PKB is to maintain the policy-based discharge distribution. For a number of reasons, it turned out that the Basic Package of Measures that eventually formed part of PKB Part 1 was not in accordance with that distribution, and that too much water would enter the Pannerden Canal at the point where the Rhine splits at Pannerdensche Kop. This is because the package of measures has been amended for a number of locations, meaning that the effects that the measures would have on the distribution of discharge turned out to be different to what had previously been estimated. A study has been carried out to determine what combination of available measures would be needed to correct the distribution. It turned out that it will be necessary to reduce the height of the groynes along the bends in the river between Pannerdensche Kop and Nijmegen, to reduce the height of the Suikerdam and the Zandberg polder embankment in the Gendt washlands, and to implement extra measures in the Millingen washlands. Most of these measures would be close to the point where the river splits at Pannerdensche Kop, meaning that they would be highly effective.

It became apparent that large-scale intervention at Meinerswijk would mean too much water flowing into the Lower Rhine at IJsselkop (where this distributary splits from the River Lek). The present Basic Package of Measures proposes dyke improvements in the Arnhem area. Nevertheless, a restricted intervention will still be necessary in the washlands at Meinerswijk to achieve the correct distribution of discharge at IJsselkop. A restricted amount of washland excavation at Meinerswijk has therefore been included in the Basic Package of Measures.

The system of distributaries at the points where they diverge is a complex one. During the implementation phase, all the different projects in this area will be constantly assessed and coordinated with one another.

18.3 Government assessment

Relocating the dyke at Lent, as proposed by the Government, will make an essential contribution to dealing with one of the problem locations in the country’s river system, in both the short and the long term. The situation will become clearer and it will be possible to implement definitive measures for the “Waalsprong” area. Measures will be implemented to deal with the problem of seepage that will arise if the dyke is relocated further away from the river. Deciding to postpone relocation of the dyke would mean that land would need to be reserved on the landward side. There are risks associated with this because of the permanent pressure on this area due to other spatial planning interests.

The alternative involving cutting off bends in the river was already proposed during preparation of PKB Part 1 and rejected for a number of reasons.

Cutting off the bends would have drastic spatial effects. The Regional Spatial Framework states that the Gelderland Gate area already displays so many different qualities that the desirable implementation strategy will be to preserve it and perhaps make certain changes. Cutting off the bends in the Waal would not be a matter of preservation or alteration but of innovation, with the characteristic bends disappearing. This means that this measure does not fit in with the preferred overall approach to improving the spatial quality of this area. Although it would provide opportunities for new nature areas and other developments, many valuable natural features would be lost in the Millingen washlands and the polder at Gendt. The ongoing nature development in the Gelderland Gate area would be wiped out. Valuable landscape and heritage elements and structures such as natural levees and river dunes would be cut through. A dozen homes would also be affected if this proposal were to be implemented.

18.4 Government decision

In the light of its assessment of the combined measures and the possible alternatives, the Government has decided not to alter the Basic Package of Measures regarding this point; it maintains its decision that the dyke at Lent should be relocated further away from the river.

19

Waal (from Nijmegen to Gorinchem)

19.1 Public consultation process

A number of the proposed measures along the River Waal were the object of criticism during the public consultation process.

Excavation of washlands at Heesselt
A total of 31 submissions were received during the public consultation process regarding the proposed excavation of the washlands at Heesselt, with those commenting expressing doubts about the correctness of the target for the area; they consider that the target to be achieved at this location is too onerous. The authors of the submissions oppose the proposed measures in the Heesselt washlands because they believe that they would have too many negative effects. They consider that the situation regarding this location is unclear and they demand that the effects for local residents should be clarified. A number of those commenting believe that an overall reduction in the height of the groynes along the Waal would be sufficient to guarantee flood protection.

Sand extraction
A number of sand extraction companies produced a plan for an overall approach that included a proposal for achieving the full long-term target for the central stretch of the Waal from Nijmegen to Tiel by means of measures implemented on the river side of the dyke.

"Retaining rivers" for the Rijnstrangen and Lingewaarden
In its report *Appealing River Landscape* [*Lonkend Rivierenland*], the State Forest Service proposed the idea of "retaining rivers" to store water in the Rijnstrangen area and the Lingewaarden; this proposal was also submitted as a response during the public consultation procedure. The proposal would involve creating new distributaries, one in the Rijnstrangen area and the other along the River Linge (Lingewaarden) in the municipality of Lingewaal and Overbetuwe. It is claimed that this approach would not only provide more room for the river but would also have a positive effect on the reorientation of a whole range of spatial, ecological, economic, and social developments in these areas. It has been put forward as a consistent and robust alternative for both the short term and long term along the Waal from the German border to Druten. This measure can be expected to make it possible to achieve the full long-term target for the Waal between the German border and Druten.

Waal-Meuse connection
During the public consultation process, an alternative was proposed for discharging excess water from the Waal into the Meuse via the former spillway at Heerewaarden. A number of supplementary measures were proposed to deal with the increased discharge via the Meuse, and its lower reaches, the Bergsche Maas and the Amer.

Dyke relocation in the longer term
None of the municipalities concerned (Over-Betuwe, Neder-Betuwe, and Beuningen) can agree to any dyke relocation whatsoever within their territory. Their basic principle is that none of the relocation projects will be necessary in the future if sufficient room for the river can be created on the river side of the dyke or if a discharge level of 18,000 m³/s is not in fact reached. In their submissions, some municipalities propose that the area being explored should be enlarged and that for the moment all the dyke relocation options should be included in the PKB so that a carefully considered decision can be made at a later date in the light of all the then relevant factors.

Regional initiatives
A number of initiatives were proposed in the course of the public consultation procedure. These concern the washlands at Druten, Winssen and Crob, and the disused brickworks at Vuren. A number of proposals were also made regarding the dyke relocation at Munnikenland.

19.2 Additional studies

Dyke relocation at Munnikenland
A study has been carried out regarding the proposed dyke relocation at Munnikenland to see whether cross-connections can be found with other initiatives in the region. Among the points considered was whether the requirements for the New Dutch Waterline project [Nieuwe Hollandse Waterlinie] (the historic system of defences involving inundation), nature development (NURG), recreation, and mineral extraction could be combined with this dyke relocation. It would be possible to speed up the dyke relocation by combining it with other developments in the area. Finalising coordination with the various authorities concerned and a proper area procedure are still necessary.

Excavation of washlands at Druten
Consideration was given as regards the central stretch of the Waal to whether the private initiative for the Druten washlands could be included in the Basic Package of Measures. Assessment took place on the basis of the criteria set out in PKB Part 1. Excavation of the washlands and construction of a side channel in this area could make a good contribution, as an additional measure, to creating more room for the river and to spatial quality. Sand extraction would give the river more room and allow nature development; it would also create facilities for recreation.

19.3 Government assessment

Sand extraction
The overall approach proposed by the sand extraction companies is a fairly general proposal; its primary objective is to contribute to discussion of whether more space can be allotted to businesses, civil-society organisations, and local authorities in order to develop area-oriented customised solutions on a "bottom-up" basis.

In offering this approach, the sand extraction companies show that it would be possible to achieve the full long-term target for the central stretch of the Waal by means solely of measures implemented on the river side of the dykes. The high level of abstraction of the proposed approach and the associated calculations led to the results being different to those set out in "Room for Rivers". The proposed approach offers a final scenario involving an area on the river side of the dykes that has been extensively altered, with what the sand extraction companies refer to as robust "secondary" discharge systems in the washlands.

Experience with previous plans for side channels indicates, however, that this kind of excavation would ultimately be less effective than expected on the basis of the initial general plans. This also follows from the analyses carried out in the context of "Room for Rivers". This is because implementation of plans for the washlands needs to take account, to the greatest possible extent, of the existing features as regards spatial quality, nature, and heritage. The constraints of river morphology and shipping also make the plans for the washlands less effective than is suggested in an overall general approach. The target can indeed be achieved to a great extent by means of washland excavation and other measures on the river side of the dyke along the central section of the Waal but measures will also always be necessary on the landward side. It should be noted that the conclusion that a large number of measures will be necessary on the river side of the dykes along the Waal is in accordance with the PKB.

"Retaining rivers" for the Rijnstrangen and Lingewaarden
The Government does not believe that the concept of "retaining rivers" will be an effective one. The substantive objections involve such things as the construction of the several tens of kilometres of new flood defences that would be necessary and the need for drastic measures to also be taken further down the Waal. The length of time it would take to implement it also means that the proposed alternative offers no solution for the short term. Moreover, this concept does not fit in with the long-term direction of development that the Government has decided on. The Government considers that we need to deal frugally with the area on the landward side of the dykes.

Waal-Meuse connection
Previous studies have shown that it is highly likely that peak discharge levels will occur simultaneously in both the Waal and the Meuse. Without extra measures being implemented to provide more room for the Meuse, Bergsche Maas and Amer, a connection between the Waal and the Meuse would be pointless. Construction of an area to store water (a "retention area") further upstream along the Meuse is not considered desirable. The appropriate area would be the western part of the spillway at Beers; this would be an extremely radical measure. The disadvantages, including the cost, of diverting large volumes of water from the Waal to the Meuse are so great that they outweigh the advantages. As part of emergency planning, consideration is being given to the possibility of using the former spillway at Beers as an emergency overflow area. The long-term possibility of constructing retention areas along the Meuse is also being investigated. As regards the short term, however, there is in any case no support for these measures in the region. The Government also considers it undesirable to integrate different river systems and to create new points where rivers diverge.

Dyke relocation in the longer term
A detailed study has been carried out, at the request of the regional consultation group, into which dyke relocation project needs to be included in the context of the long-term target for the central stretch of the Waal. This study involves elaborating the Regional Advisory Report [Regioadvies] and examines various different options. The hydraulic problem can be solved by relocating the dyke at Loenen or by means of part

of that relocation project combined with one of the relocation projects at Oosterhout-Slijk Ewijk or Beuningen-Winssen, or combined with parts of both the latter two projects.

19.4 Government decision

The Government has decided that the private initiatives should not be included in the Basic Package of Measures. It does consider, however, that these initiatives should be supported, certainly if they comply with the requirements and conditions set by the PKB. The PKB texts have therefore been revised in this respect. The Government does not in fact wish to make alterations to the Basic Package of Measures for this sub-area. The Druten washlands have, however, been designated as an additional measure. The washland excavations at Heesselt and Hurwenen have been deleted from the package of measures in the PKB and will be taken up as independent NURG projects.

Even though the Government decided in PKB Part 1 to reserve a single area of land for dyke relocation along the central section of the Waal, it agrees to the request expressed by the region regarding enlarging the area being explored with a view to long-term reservation of land. A number of municipalities around Nijmegen have pressed for various different areas of land to be reserved for dyke relocation along the central stretch of the Waal so that there will be greater opportunity for tailor-made measures in the future. It has therefore been decided to reserve land for the dyke relocation at Oosterhout-Slijk Ewijk in addition to reserving land for that purpose at Loenen.

20

Lower reaches of the rivers

20.1 Public consultation process

In the area of the lower reaches of the rivers, the public consultation process focused primarily on return of reclaimed land to the river ("de-poldering") at the Noordwaard and the Overdiep polder, retention of water in the Volkerak-Zoommeer, and the reservation of land at Drongelen to allow the dyke to be relocated further away from the river.

Noordwaard
The proposal to "de-polder" the Noordwaard led to 30 submissions. Some of those who commented support this measure but most are unconvinced of its value or necessity. They express doubts as to the correctness of the assumptions regarding representative discharge and say that full agricultural use of the area will be made extremely difficult, if not impossible, and that other functions of the area would be threatened.

Overdiep polder
The proposal to return the Overdiep polder to the river also produced several dozen submissions. These pointed out that the project would mean that homes and commercial premises would need to be relocated. The quality of the Overdiep polder as an agricultural area would be reduced. Residents of the polder say that an effective procedure is necessary to jointly determine the actual measures to be taken.

Retention of water in the Volkerak/Zoommeer
The proposal to store water in the Volkerak-Zoommeer led to more than twenty submissions. Although there is understanding for this measure, those who commented consider that the negative effects it will produce have not been properly clarified. They refer to potential damage to the "Waterfront" in Tholen, but also to drainage problems in the catchment areas of the Mark, Dintel, and Roosendaal/Steenbergen Vliet rivers in West Brabant. They state that they expect the Government to provide compensation.

Drongelen
The largest number of submissions (60) concerned the reservation of land in order to relocate the dyke at Drongelen. Those who commented were dissatisfied with the decision-making process that had led to this measure being decided on. They question the necessity of the measure because implementing it would depend on the Overall Survey of the Meuse [Integrale Verkenning Maas], which is not yet available. They also refer to potential negative effects that the measure would have. If land is in fact reserved to relocate the dyke at Drongelen, those commenting expect that the decision will be substantiated in detail, with the limits of the area concerned being better defined, and with an explanation being given of how "shadow damage" would be compensated for.

20.2 Additional studies

The following studies were carried out, partly in response to the public consultation procedure:

Merwede
Funds that the Ministry of Transport and Public Works has not used for unforeseen circumstances will now be applied to remove excess vegetation at the Gorinchem bottleneck on the Upper Merwede.

The planning study and Introductory Memorandum EIS for the A27 Hooijpolder-Everdingen/Lunetten – now included in the Long-Term Programme for Infrastructure and Transport [Meerjarenprogramma Infrastructuur en Transport, MIT] – is expected to be published in early 2006. This will include investigating a potential "win-win effect" of the accessibility solution and making it possible for water to flow past the sudden bridge abutment of the A27.

Bergsche Maas
A study has been carried out of the effectiveness of reducing the height of the embankment at the Biesbosch wetlands as a means of reducing water levels and also reducing the height of the dyke enclosing the Allard polder; both of these

projects form part of the measure involving reducing the height of the Biesbosch embankment. The existing excess height of the dykes along the Bergsche Maas has also been investigated, and an estimate has been made of the extent to which the dykes as far as Lith would need to be reinforced in the longer term if no spatial planning measures were to be implemented. The calculations for the longer term regarding the Bergsche Maas have been coordinated with the calculation method used for the Overall Survey of the Meuse.

Hollandsch Diep, Haringvliet, Spui
The cost estimate for the measure involving the retention of water in the Volkerak-Zoommeer has been analysed in greater detail. Compensation has been explicitly included for the risk that there will be problems with local water management, assuming that the safety of the regional system itself is entirely in order.

Alternative proposed by Platform to Preserve the Noordwaard
In collaboration with Alterra and in response to an assignment from the "Science Shop" at Wageningen University and Research Centre, the Platform to Preserve the Noordwaard [Platform Behoud Noordwaard] has drawn up a report containing arguments against the de-poldering of the Noordwaard. The report includes a discussion of the assumptions in the Room for Rivers PKB, a critical description of the process regarding the Noordwaard as the "front runner" project, a critical consideration of the Basic Package of Measures, and an initiative for a "natural" alternative. In its alternative, the Platform proposes linking the natural system of channels that already exists in the Sliedrecht Biesbosch with the various distributaries of the Merwede and combining this work with the excavation of enough deep channels through the area of the Noordwaard nature development project, the area of the Noordwaard that is on the river side of the dyke, and Kievitswaard (which is now still on the landward side of the dyke). These measures can perhaps be supplemented by extending the winter bed of the main channels in the Sliedrecht Biesbosch and those of the New Merwede. This would be done by placing Kievitswaard on the river side of the dyke and partially excavating it. This approach can also be combined with deepening the summer bed of the Upper, Lower, and New Merwede and perhaps compartmentalisation of the agricultural Noordwaard.

20.3 Government assessment

Merwede
There are a number of ways of achieving the short-term target at Gorinchem:

- combining de-poldering of the Noordwaard with excavation of the washlands at Avelingen, in accordance with the Basic Package of Measures;
- combining a whole series of measures to be implemented on the river side of the dykes with deepening of the summer bed (Basic Alternative 1 in the EIS);
- extremely drastic, lengthy deepening of the summer bed along the full length of the Upper and New Merwede (see the boxes in the Explanatory Memorandum accompanying PKB Part 1);
- a somewhat different combination of measures implemented on the river side of the dyke combined with restricted measures on the landward side (with action being taken in the Habitats Directive area of the Sliedrecht Biesbosch, in the Noordwaard nature development project, and in parts of the Noordwaard on the river side of the dyke).

As regards the longer term, all the measures on the river side of the dyke will be necessary, accompanied either by de-poldering of the Noordwaard or a "green river" through the "Land van Heusden en Altena". There is no support in the region for the green river due to a number of factors. These include the high cost it would entail; the enormous damage to the landscape and the character of the area; the drastic change it would bring about as regards water management, and the fact that new dykes would cut through the area and in many cases create a barrier.

Excluding the option of constructing a green river through the "Land van Heusden en Altena" means that for the Noordwaard either land will need to be reserved with a view to the longer term or that inclusion in the Basic Package of Measures will be necessary for the short term. The Government has decided that de-poldering of the Noordwaard combined with excavation of the washlands at Avelingen should be included in the Basic Package of Measures; this is because it makes it possible to give the farmers of the Noordwaard the clarity that they demand and because of the contribution it will make to spatial quality. These measures, taken together, will make it possible to achieve the short-term target.

Alternative proposed by Platform to Preserve the Noordwaard
Studying the alternative proposed by the Platform to Preserve the Noordwaard leads to the following considerations (these being the main ones):

- the proposed alternative would seem to comply with the short-term target, but in the longer term de-poldering will still be necessary;
- improving the Platform's alternative in such a way that the same long-term target can be achieved within the proposed area as can be achieved by de-poldering the Noordwaard would contravene the relevant nature conservation legislation (Birds and Habitats Directives).

Bergsche Maas
In order to comply with the short-term target, one can basically choose between the following options, all of which are reasonably cost-effective:

- de-poldering of the Overdiep polder in combination with reducing the height of the Biesbosch embankment (see Basic Alternative 1 in the EIS);
- deepening of the summer bed (see Basic Alternative 1 in the EIS);
- improvement of the dykes along stretches where they are not high and/or strong enough.

Other measures would be much less cost-effective.
For the Bergsche Maas, all the possible measures on the river side of the dykes (deepening of the summer bed and enlargement of the winter bed, measures in the washlands) will be necessary in the longer term, with de poldering of the Overdiep polder and dyke relocation at Drongelen also being necessary.

De-poldering of the Overdiep polder
The current users of the Overdiep polder took the initiative to draw up their own plan, which the Government supports. As in the case of the Noordwaard, the residents wish matters to be clarified as quickly as possible. Not implementing this measure in the short term will make it necessary to reserve land with a view to the long term. Given that de-poldering is a cost-effective measure, with high hydraulic effectiveness in both the short and long term, and can also be viewed as a "no regrets" measure, the managerial meeting decided in December 2004 that this measure should be designated as a "front runner" project.

Height reduction of Biesbosch embankment
Closer study of the hydraulic effectiveness of the two components of this measure led to a decision being taken not to reduce the height of the embankment at the De Gijster reservoir. The hydraulic effectiveness of this component would only be slight. Not reducing the height of the embankment means that the home and the duck trap (still operational) that are located there will not need to be removed.

Dyke relocation at Drongelen
The measure to be implemented at the Overdiep polder will not by itself be sufficient to achieve the long-term target. Additional dyke relocation projects will be necessary to the south of the Oude Maasje stream (at Drongelen and Peerenboom, jointly referred to as the Drongelen dyke relocation project). This involves the branch of the Oude Maasje located to the north of the Bergsche Maas. This area will be reserved so that future amendments to the zoning plan do not make it extra difficult or costly to implement this measure. The boundaries of the area that needs to be reserved have been worked out in greater detail in the light of the submissions received in the context of the public consultation procedure, thus making matters clearer for those concerned. With a view to hydraulic effectiveness, it has been decided to reserve an area on the north bank of the Bergsche Maas rather than on the south bank.

Further investigation has shown that removing the obstacle at Keizersveer, on the north bank, would not be very effective from the hydraulic point of view in its current form.

Relationship to Overall Survey of the Meuse
Further investigation has shown that it will not quite be possible to achieve the long-term target on the edge of this project area by means of the desired package of measures. Measures to be implemented in the context of the Overall Survey of the Meuse will have a certain hydraulic effect on the Bergsche Maas, but that effect will not be sufficient to make dyke relocation unnecessary. Decision-making regarding the measures to be implemented upstream of Hedikhuizen will take place within the framework of the Overall Survey.

Other lower reaches of the rivers
The following options are basically available to achieve the targets in the lower reaches of the rivers:

- retention of water in the Volkerak-Zoommeer (see the two Basic Alternatives in the EIS);
- dyke reinforcement;
- other management of storm surge barriers (Maeslantkering, Hartelkering, Haringvlietsluizen).

The proposed measure to store water in the Volkerak-Zoommeer will make dyke reinforcement unnecessary over a large area. The possible negative effects on regional drainage and the specific effects at the "Waterfront" in Tholen, the recreation area at Speelmansplaten, landing stages in harbours, and perhaps other areas will be considered in greater detail in the subsequent phase. During that phase, the options will be investigated for preventing these effects or compensating for them. The cost estimate for this PKB takes account of the extra measures that may be necessary to ensure the safety of the regional water system.
A different system for managing the storm surge barriers can increase the volume available in the Delta to store water from a high-water surge in the river discharge. The cost of this measure is likely to be determined to a great extent by the potential economic damage to the port area at Rotterdam. This is one of the reasons why this measure will only be included as a long-term measure.

20.4 Government decision

The views submitted during the public consultation procedure and the various additional studies have not led to the Basic Package of Measures for the lower reaches of the rivers being revised. A number of changes have, however, been made to certain measures. Only minor changes have also been made to the reservation of land for measures to be implemented in the longer term. The long-term reservation for removal of the obstacle on the north bank at Keizersveer has been dropped.

21

Lower Rhine/Lek

21.1 Public consultation process

The public consultation process for the Lower Rhine/Lek focused primarily on the dyke relocation project at Lienden and the site where surplus soil is to be disposed of in the Marspolder. A total of 800 submissions were received, of which 620 were identical.

Those who submitted comments consider the dyke relocation project at Lienden to be illogical but they commented particularly on the plans for disposing of surplus soil in the Marspolder. They were extremely concerned about pollution of groundwater and surface water as a result of leaching from the site and the potential negative effects this would have on the various functions of the area. The authors of the submissions consider that no objective analysis of the risks has been carried out. In addition to dealing with the risks posed by the disposal site, they also comment on the effects that disposal there would have on the existing features of the area. In their view, the area is one of high spatial quality which would be seriously affected by the proposed measures. Further nature development would also be seriously affected if contaminated water from the Rhine were to flow into the area in the event of flooding.

During the public consultation process, a number of private initiators presented an alternative.

21.2 Additional studies

PKB Part 1 includes instructions to the effect that the alternatives for the Arnhem-Schoonhoven stretch should be worked out in greater detail prior to PKB Part 3. Consideration was given specifically to whether, within the available options, the Basic Package of Measures can become more of a mix of spatial planning measures and dyke improvement. An attempt has been made to produce a package of measures that provides the opportunity for potential links to other projects and private initiatives, that more effectively meets the desire for improvements in spatial quality, and that is compatible with the relevant financial constraints.
A total of seven alternatives have been considered. The first three are alternatives that already exist, being included in PKB Part 1, the EIS, or the Regional Advisory Report. Alternatives 4 to 7 have been added to these. The packages of measures, broadly speaking, is as follows:

1 **Basic Package of Measures PKB Part 1:**
Spatial planning measures have been decided on for the stretch from Arnhem to Amerongen. The main focus of these measures is at Lienden, where it is proposed that the dyke should be relocated. Along the stretch from Amerongen to Schoonhoven, the Basic Package of Measures in Part 1 consisted of improving the dykes (where necessary).

2 **Regional Advisory Report:**
The regional advisory report is made up of spatial planning measures for the stretch between Arnhem and Vianen. No measures on the landward side of the dykes are included. Along some sections of this stretch, supplementary dyke improvement will be necessary. Between Vianen and Schoonhoven, a decision has been taken to implement a restricted amount of deepening of the summer bed combined with improvement of the dykes.

3 **Dyke reinforcement for the whole of the Lower Rhine and Lek (RAD)**
This is the "Reference Alternative Dyke Improvement" [Referentie Alternatief Dijkverbetering, RAD] as drawn up in the context of PKB Part 1. This involves improvements to the dykes wherever necessary between Arnhem and Schoonhoven.

4 **River side of the dyke at Rhenen 1:**
This variant is similar to the Basic Package of Measures in PKB Part 1, except that relocation of the dyke at Lienden has been replaced by more extensive excavation in the Middelwaard, work to allow water to

pass through the "Stichtse Oever" ferry slipway and Rijnstraat (both part of the river frontage of Rhenen), and two extra kilometres of dyke improvement at Lienden.

5 **River side of the dyke at Rhenen 2:**
This variant is similar to the Basic Package of Measures in PKB Part 1, except that relocation of the dyke at Lienden has been replaced by more extensive excavation in the Middelwaard and the addition of major excavation work in the washlands at Elst. This variant does not require any extra improvements to the dykes compared to the Basic Package of Measures.

6 **River side of the dyke Vianen-Arnhem:**
This variant foresees spatial planning measures on the river side of the dykes between Arnhem and Utrecht, combined with dyke improvements along the stretch from Wageningen to Schoonhoven. It includes the hydraulic effect of a private initiative that may be implemented at Maurik.

7 **Robust completion:**
The basis for this variant is dyke improvement along the stretches where the existing dykes are too weak. Spatial planning measures have been chosen for locations where the hydraulic bottlenecks are most problematical. This means locations where high discharge levels lead to local backing up of the water due to the narrowing of the winter bed of the river. Plans have been drawn up for these locations that will not only bring about the desired reduction in the water level but will also contribute to improving the spatial quality of the area. This approach will produce a robust situation from the flood protection point of view at the site of the existing hydraulic bottlenecks.

The alternative proposed by a number of private initiators in the course of the public consultation process closely resembles variant 5 (river side of the dyke at Rhenen 2), with extra excavation work being added at Palmerswaard and Maurik. This extra excavation work could probably make one or two kilometres of dyke improvement unnecessary as compared to variant 5.

21.3 Government assessment

The additional studies show that, leaving aside alternative 3 (RAD), there are two alternatives for the stretch from Arnhem to Schoonhoven that can be implemented within the budget for the PKB.

The first of these is alternative 4 (river side of the dyke at Rhenen 1), which achieves a better score as regards the aspects of cost and land required than the Basic Package of Measures; it scores lower as regards spatial quality.

The second alternative that can be implemented from the cost point of view within the PKB budget is alternative 7 (robust completion). This will not only involve improvements to the dykes but also plans to create more room for the river in various washlands, namely those at Vianen, Elster Buitenwaard, Tollewaard, Middelwaard, Doorwerth, and Meinerswijk. Efforts will be made to create a more robust hydraulic situation and to improve quality. These are consequently different and less large-scale measures than the plans that have been proposed for the washlands in these locations, for example for the Basic Package of Measures in PKB Part 1. These measures can therefore also contribute to providing the excavated material that will be used to improve the dykes. This alternative leaves the way open to private initiatives, for example in the washlands at Maurik. It achieves a better score than the Basic Package of Measures as regards the aspects of cost, land, and spatial quality. It scores lower as regards the aspect of "radically different approach" than the Basic Package of Measures (the total length of the necessary dyke improvements is greater).

Alternatives 2 (Regional Advisory Report), 5 (river side of the dyke at Rhenen 2) and 6 (river side of the dyke Vianen-Arnhem) are more expensive than the Basic Package of Measures and also less favourable as regards their hydraulic effects, the quantity of soil needing to be disposed of, and/or improvements in spatial quality.

21.4 Government decision

On the basis of the submissions received during the public consultation process and the additional studies, the Government has decided that for the stretch from Arnhem to Schoonhoven the following spatial planning projects will be implemented in the following washland areas: Vianen, Elster Buitenwaard, Tollewaard, Middelwaard, Doorwerth, and Meinerswijk. Efforts will be made to create a more robust hydraulic situation and to improve quality.

22

IJssel

22.1 Public consultation process

A number of submissions were made during the public consultation process regarding various measures along the IJssel.

High-water channel Veessen-Wapenveld
The proposed high-water channel between Veessen and Wapenveld was the subject of a very large number of submissions. A total of 950 submissions were received, of which 830 were identical. Some of those who commented were in favour of the construction of the high-water channel because other measures would have more negative effects. The great majority of the 950 submissions, however, were against this measure. Many of the persons commenting stated that they would find themselves living in a "bathtub" and feared that their safety would be at stake. Many of them also question whether construction of the high-water channel would in fact improve the spatial quality of the area. They expect there to be a negative impact on the heritage features of the area and the living environment, but also on meadow birds. Many of those who objected refer to the effects that the high-water channel would have on agriculture. They believe that the potential for farm development would be drastically restricted, while the very existence of a number of farms would be endangered.

Those who produce submissions put forward a number of alternatives to construction of the high-water channel.

Dyke relocation projects at Voorster Klei and Cortenoever
A large number of submissions were also received regarding the dyke relocation projects proposed for Voorster Klei and Cortenoever. Those commenting fear that there will be negative effects on spatial quality, but also that a number of homes will find themselves on the river side of the dyke. They also refer to the effects on agriculture. A number of the submissions make a link with the high-water channel at Zutphen. Some of them propose that this should be constructed in the short term, making it unnecessary to relocate the dykes. Others assume that all three of these measures will ultimately be necessary.

A number of residents, including some from the area where the dyke will be relocated at Cortenoever, have proposed that instead of this being done, side channels should be constructed in the following washlands: Spankerensche Waarden/Geldersche Toren/Brummensche Waarden, Bronkhorsterwaarden, Reuversweerd and Bronsbergen/Stokebrandsweerd.

Residents of the area that will be affected by the dyke relocation at Voorster Klei have proposed an alternative on the river side of the dyke. This foresees rerouting the summer bed of the river at Zutphen and constructing a high-water channel on the river side of the dyke where the existing summer bed is located. This channel would be continued upstream and downstream in the form of a side channel. This would run through the washlands at Tichelbeekse Waarden, Gelderhoofse Waarden, Zutphense Uiterwaarden, and Rammelwaard. A variant on this proposal was drawn up in consultation with the residents' group that would not involve rerouting the summer bed but would involve the construction of a large channel in the Tichelbeekse Waarden, Zutphense Uiterwaarden, and Rijsselsche Waard.

Washlands at Deventer
More than ten of the submissions concerned the plans in and around Deventer. They pointed out that constructing a channel between Ossenwaard and Bolwerksplas would mean a major intervention in the urban conservation area of Deventer, which is important from the heritage perspective; they question whether the proposed measures are compatible with the plans for the frontage along the IJssel that have recently been drawn up. They also wonder whether it would not be possible to achieve the desired reduction by further excavating the washlands.

Reduction in lateral inflow
The province of Gelderland has proposed reducing the amount of lateral inflow under representative conditions by 25%. The proposal comprises eighteen measures in various places within the region administered by the Rhine and IJssel Water Authority. The effect of the total package will be to bring about a reduction in water level of some 8 cm in the

IJssel, with 6 cm of this being accounted for by retention of water from the Oude IJssel near the village of Eldrik.

Reservation of land for dyke relocation at Welsum and Den Nul-Fortmond
A large number of submissions (about 90) were received regarding the long-term reservation of land for relocating the dyke at Welsum and Den Nul-Fortmond. All the submissions questioned the value or necessity of reserving the land concerned. Those commenting were concerned, in particular, that the demolition of homes and farms would have significant effects on the social structure and further development of the village, with ageing of the population and ultimately a loss of the current level of facilities. They are also unconvinced that the spatial quality of the area would be improved. For this land reservation project too, a number of alternatives were proposed on the river side of the dykes.

Dredging
Various submissions point out that dredging work in the IJssel is behind schedule.

22.2 Additional studies

The following additional studies were carried out, partly in response to the public consultation process:

- the alternatives proposed by local residents to the dyke relocation at Voorster Klei and Cortenoever;
- the possibility of not carrying out the dyke relocation at Cortenoever but instead reducing the amount of lateral inflow and excavating the washlands at Brummense Waard;
- a cost analysis of the high-water channel at Zutphen;
- the options on the river side of dyke between Deventer and Zwolle.

Use was also made of the most recent information generated by the development planning pilot project for the IJssel delta.

High-water channel at Kampen-Vossemeer
The high-water channel at Kampen is included in PKB Part 1 as a possible alternative to deepening the summer bed.

The Minister of Housing, Spatial Planning and the Environment has designated the IJssel delta project as a model development planning project in the framework of the National Policy Document on Spatial Planning [Nota Ruimte]. A number of more-or-less independent developments are taking place in the area to the southwest of Kampen: the construction of the Hanze railway line, the Kampen bypass, upgrading of the N50 road to motorway status (A50), and the building of 4000–6000 homes by the municipality of Kampen. One important objective of the IJssel delta project is to combine these separate developments in such a way as to produce added value as regards spatial quality and to bring about a permanent improvement in flood protection for Kampen and the surrounding area. Combining developments also creates options for "win-win" effects and makes it possible to create work with work, which can also entail cost benefits. The spatial added value and feasibility – financial, technical, legal, administrative – of the "blue bypass" is being investigated within the IJssel delta project in collaboration with a large number of different parties. As pointed out in the Regional Advisory Report, the region favours a sustainable and safe solution to the problem of flooding in the form of a "blue bypass". The focus of the IJssel delta project is to have the preferred model for the bypass completed by 2006/2007, including the financing strategy and the relevant agreement.

One thing that will in any case be necessary is a partial change in the Route Decision [Tracébesluit] for the Hanze railway line so as not to create a future obstacle to a bypass for the IJssel at Kampen. The current configuration for the railway line will certainly need to be altered. In order to create a flood-free route for the bypass at the point where the Hanze railway line crosses the N50 road and De Slaper, it will be necessary to construct an additional structure. The new railway line will also need to be raised over a longer route. Another alteration – a less drastic one – would involve increasing the height of the dyke protecting the railway and moving it a certain distance "land-inwards". This is important where the passage of the bypass close to the mouth of the tunnel is concerned. The situation will become clearer in the course of 2006/2007 as regards the possibility of implementing this measure before 2015 in accordance with the basic principles and conditions of the PKB. Should administrative agreement be necessary, particularly regarding financing for the measure, then the programmatic approach will allow the measure to be included in the Basic Package of Measures without partial revision of the PKB.

22.3 Government assessment

Dyke relocation at Cortenoever
Alternatives have been proposed on the river side of the dyke to replace dyke relocation at Cortenoever; these take the form of excavation of the washlands. From the hydraulic perspective, these measures can replace the relocation project for the short term. The proposed measures were already identified and assessed in the run-up to PKB Park 1; they were considered to be negative from the point of view of spatial quality. Parts of the measure are also covered by the Habitats Directive. The Reuvensweerd washlands are covered completely and have therefore been given "hands off" status within the Strategic Framework for the Birds and Habitats Directives. The total cost of such dyke excavation would be three to four times higher than relocating the dyke at Cortenoever.

Dyke relocation Voorster Klei
The alternative proposed by the residents will allow two-thirds of the short-term target to be achieved. The total cost of the measures would be three times higher than for relocating the dyke at Voorster Klei. Linking up the side channel through the various different washlands would produce a very large, long side channel, resulting in a relatively large build-up of sand in the summer bed and therefore negative consequences for shipping. This is not acceptable along this narrow section of the river, particularly at the point where the Twente Canal leaves the IJssel. Constructing sills in the side channel can reduce the morphological effect but then the level of the water will not be reduced to the same extent. The long side channel can be cut up into sections, but this will reduce its effect on water levels. In the variant, the water level reduction will only be very slight. This variant has not been elaborated any further. Constructing the side channels will not in fact make it possible to meet the target for the Zutphen area.

The alternative proposed by the residents covers the stretch where the high-water channel at Zutphen will also affect water levels. However, because the contribution made by the alternative to achieving the target would only be restricted, this alternative cannot replace the construction of the high-water channel. It is also not capable of ensuring that the size of the high-water channel can be substantially reduced.

High-water channel Zutphen
The high-water channel is a measure to tackle the problem where it actually occurs, namely at the bottleneck at Zutphen. Further development of the high-water channel in the short term also links up with planning for the construction of 3000 homes in the same area. This means that there is an overall spatial planning challenge for the area that goes beyond the scope of the high-water channel. The cost of constructing the channel is currently significantly higher than that for both dyke relocation projects. There is interest from a private perspective in developing the whole area, including the high-water channel. It is not clear, however, whether this will lead to additional financing, for example, or to reducing the cost of the measure so that the high-water channel then meets the conditions of the PKB.

Reduction in lateral inflow
Initial analysis shows that the current proposals for reducing lateral inflow have still not been worked out in sufficient detail to allow a final decision to be taken. The measures included in the proposal are not sufficient in themselves to replace part of the Basic Package of Measures. However, an alternative may be produced for the Cortenoever dyke relocation by combining them with the measures to be implemented in the washlands at Brummense Waard. This is in accordance with the Regional Advisory Report. With this in mind, an entirely new design has been drawn up for the measure to be implemented at Brummense Waard, with account being taken of the requirements regarding spatial quality and the Birds and Habitats Directives. The estimated costs are still unclear and there is a risk that they will ultimately turn out to be higher. There are also doubts regarding the actual availability of the water retention area near the village of Eldrik at the point when it will become necessary.

Veessen-Wapenveld
Deciding to construct a high-water channel on the landward side of the dyke does not in fact mean that there is no alternative from the hydraulic point of view on the river side of the dyke. However, so much work would need to be done on the river side that it would have a negative effect on the landscape, nature, and heritage features.

From the hydraulic perspective, it is possible to achieve the short-term target for this stretch by means of measures implemented on the river side of the dykes, whether or not these are supplemented by small-scale dyke relocation projects. Various combinations have been considered but these always involve at least two measures that significantly damage features designated in the Strategic Framework for the Birds and Habitats Directives. These options also cost more than constructing the high-water channel. The reduction in water level that these measures would jointly achieve would, however, be less than that achieved by the high-water channel. Because the hydraulic effects upstream of this stretch of river would be less extensive than those of the high-water channel, extra measures would be necessary between Veessen and Deventer as compared to the Basic Package of Measures in PKB Part 1. The washlands will need to be excavated all along the east bank of the IJssel from Deventer to Olst.

As far as the longer term is concerned, it should be noted that any further increase in representative discharge will mean that no more space will be available on the river side of the dyke and that it will then in any case be necessary to implement measures on the landward side.

The high-water channel at Veessen-Wapenveld can basically be replaced by the two large-scale dyke relocation measures at Marle and Herxen. The dyke relocation at Herxen is extremely drastic because it involves removing a large number of homes and farms; it is therefore not considered to be an acceptable measure.

Welsum and Den Nul-Fortmond
Supplementary analysis of the options for discharging extra water on the river side of the dykes shows that, within the Regional Spatial Planning Framework, more options exist along this stretch of the IJssel than assumed in PKB Part 1. This extra discharge can specifically be achieved by also creating more room in the context of the existing nature development project for the washlands at Duur in combination with the ongoing project for the washlands at Olst and Welsum. Where the longer term is concerned, the high-water channel at Veessen-Wapenveld will be decisive along this stretch of the IJssel.

Dredging
It is true that less dredging work has been carried out in recent years than was previously the case. This is because along most of the IJssel the bed of the river has been stable in the past few decades. It is therefore hardly necessary, if at all, to dredge the IJssel at the present time.

22.4 Government decision

The Government does not consider that the public consultation process or the results of the additional studies are reason enough for it to alter the Basic Package of Measures for the IJssel. The Government does, however, consider that the high-water channel at Zutphen should be included in its position paper as an alternative. The Government considers it justifiable to abandon plans for the two dyke relocation projects at Welsum and Den Nul-Fortmond as measures for the longer term and not to include reservation of the necessary land in the PKB.