

STAYING ON TRACK IN CLIMATE-PROOFING THE NETHERLANDS



Delta Programme 2021 Staying on track in climateproofing the Netherlands

Including:

Delta Plan on Flood Risk Management Delta Plan on Freshwater Supply Delta Plan on Spatial Adaptation

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Our reference IENW/BSK-2020/91211

Annex (es)

Date 15 September 2020

Subject Cabinet response to Delta Programme 2021

Dear Mr and Madam Chairperson,

It is my pleasure to present to you the Delta Programme 2021 (DP 2021). The Delta Programme is the annual proposal developed by the Delta Programme Commissioner concerning the fields of flood risk management and freshwater supply, which – as stipulated in Article 4.10 Paragraph 1 of the Water Act – is presented to you once a year. DP2021 has been developed in close collaboration between the national government, the municipalities, the district water boards, the provinces, NGOs, and the business community; it is widely supported by all the parties concerned. In the light of the current situation with the COVID-19 virus, this is a particularly great achievement, for which I would like to express my appreciation to the Delta Programme Commissioner and all the other parties involved.

With DP2021, the Delta Programme is entering a new phase. DP2021 features the outcomes of the first six-year review of the Delta Decisions and regional Preferential Strategies that were set down in 2015. Knowledge on climate change is growing, and the effects of measures are increasingly manifest. Yet at the same time, reality is continuously changing, and new insights develop. With this review, the course pursued by DP2021 has been adjusted where necessary, in order to enable us to keep flood risk management, freshwater availability, and spatial planning in the Netherlands sustainable and resilient in the long run, and to continue to accommodate the (increasing) climate extremes.

In his cover letter to Delta Programme 2021, the Delta Programme Commissioner has included the following three appeals and recommendations, based on the review of the Delta Decisions, strategies, and measures:

- An appeal to the managing authorities of flood defence systems and to other parties involved to ensure that flood protection will be up to par by 2050. In addition, a request to take full account of cyber resilience in their efforts;
- An appeal to both the national and the regional parties (including the private sector) to intensify their pursuit of the climate resilience of vital and vulnerable functions;

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3. An appeal to politicians to ensure that COVID-19 will not stagnate the work on the Delta Programme taskings, which are of existential importance for the Netherlands. In line with this appeal, he strongly advises against the option of delaying the implementation of the Flood Protection Programme, as proposed by the administrative Broad Social Review working group (Ready for Climate Change), in view of the changing climatological conditions. Furthermore, the Delta Programme Commissioner urges that the proposals regarding the intensification of climate adaptation and enhancing the resilience of the freshwater supply should be adopted, to a significant extent, in the coalition agreement of the next Cabinet. In this respect, he points out that especially in times like these, (anticyclic) investments in the existential safety, liveability, and climate adaptation of our country can bolster economic recovery and sustainable economic growth in the years ahead.

Ministry of Infrastructure and Water Management

Our reference IENW/BSK-2020/91211

Cabinet response

Below, as stipulated by Article 4.9, paragraph 7 of the Water Act, I will indicate how the Cabinet intends to accommodate the Delta Programme Commissioner's recommendations.

1. Flood risk management to be up to par by 2050

One of the goals of flood risk management policy is that by no later than 2050, every resident of the Netherlands living behind primary flood defences must be assured of a minimum protection level of 10⁻⁵, i.e., the probability of fatality due to flooding does not exceed 1:100,000 per annum. To ensure that all the primary flood defences meet this standard by 2050, current insights dictate the completion of an average of approx. 50 kilometres of dyke improvements per annum, between now and 2050. For the period 2021-2032, the Flood Protection Programme has scheduled the improvement of 698 kilometres of dykes and 171 engineering structures. This is a huge challenge which requires maximum efforts on the parts of the managing authorities of flood defence systems. Approx. 90 per cent of the primary flood defences are managed by the district water boards; the remaining 10 per cent are managed by Rijkswaterstaat.

On account of nitrogen emission issues and PFAS, but also due to the complexity and amalgamation of projects, we are currently encountering several project-level delays vis-à-vis the schedule set down by the managing bodies. The district water boards and the central government are working on measures to increase the stability of project estimates. Nitrogen emission issues call for research in order to identify the bottlenecks and options for each project. The projects currently included in the programme do not need to be representative of the entire programme up to 2050, for that matter: the current programme (2020-2025) features the most complex projects, whereas expectations are that later years will see the realisation of more predictable and less costly projects.

I agree with the Delta Programme Commissioner that, although we still have thirty years to go until 2050, there is no time to lose considering the taskings we are collectively faced with. This calls for commitment and direction at all levels of the administrative Delta Programme partners. The current COVID-19 situation makes it even more important for us to give impetus to the implementation, and to jointly identify options for progressing jobs in order to also have civil and hydraulic engineering work continue. I am currently

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exploring such options, befitting the existing financial frameworks. To this end, Ministry of Infrastructure I am calling on managing bodies and on the alliance of district water boards and Rijkswaterstaat to address this in an adequate project and programme approach. In my letter dated 15 June 2020, I informed you separately on the progress made with respect to cyber security among the managing authorities of flood defence systems.1

and Water Management

Our reference IENW/BSK-2020/91211

2. Vital and vulnerable functions to be climate-proofed

Over recent years, the Delta Plan on Spatial Adaptation has markedly raised awareness of the adaptation tasking among government authorities. As a result, significant strides have been made in recent years towards expediting and intensifying climate adaptation efforts. In order to give financial impetus to the implementation, I will make a lump sum of EUR 200 million available for local and regional governments, in the form of Delta Fund grants. This incentive scheme will take effect on 1 January 2021. The required amendment to the Water Act came into force on 1 July 2020. In anticipation of the incentive scheme, many front runners have already embarked on urgent projects. Since 2019, I have been supporting eight implementation pilots in various parts of the country.

I endorse the Delta Programme Commissioner's appeal to the parties responsible - the national parties, the grid managing authorities, and (where relevant) the regional parties (including the private sector) – to address the climate resilience of the vital and vulnerable functions in interconnection with the other environmental taskings. The potential damage will be vast if such functions are not flood-proof, which could result in prolonged failure or cause an environmental disaster.

3. COVID-19 impact on the Delta Programme and recommendations of the Ready for Climate Change Broad Social Review working group Currently, it is still premature to comment on how COVID-19 will impact public funds. As I have indicated above, in my response regarding the realisation of the flood risk management goal for 2050, having the primary flood defences meet the 2050 targets will entail a huge challenge. The taskings that are facing us in terms of freshwater supply, drought, and spatial adaptation also require significant efforts from all of us. I regard the achievement of these goals of vital importance to the safety and the liveability of the Netherlands.

It is not up to me to substantiate the Delta Programme Commissioner's recommendation to adopt the proposals regarding the intensification of climate adaptation and enhancing the resilience of the freshwater supply, as set out in the report on the Broad Social Review (Ready for Climate Change), to a significant extent in the coalition agreement of the next Cabinet.

In conclusion, I would like to inform you that the government policy ensuing from the amended Delta Decisions and Preferential Strategies will be incorporated into the National Water Programme 2022 - 2027. The draft National Water Programme will be submitted to your House in due course.

¹ Parliamentary Documents II 2019/20, 27625, 503

| Yours sincerely, | Ministry of Infrastructure and Water Management |
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| THE MINISTER OF INFRASTRUCTURE AND WATER MANAGEMENT, | Our reference |
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Our reference DC-2020/402

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Annex(es)

Date 15 June 2020

Subject Presentation of Delta Programme 2021

Your Excellency,

Delta Programme 2021, which I am presenting herewith, is a unique Delta Programme that has been established under equally unique circumstances. The world is in the grip of the COVID-19 virus (Corona), and in a spirit of unprecedented mutuality, drastic measures are being taken in order to curb the impact of this virus. A comparison with the flood disaster of 1953 has been made several times. Regardless of the vast differences between a pandemic and a flood, in many respects, they have one major impact in common: the societal and economic consequences of these catastrophes encroach deeply upon human lives and will continue to be felt for a considerable time after the initial crisis situation.

With this in mind, and with a view to the impact that the changing climate is having on our beautiful yet vulnerable delta, ten years ago the Delta Programme was launched in response to the fundamental question as to whether in the long run 10 million people can continue to live and work in safety in an area that is potentially prone to flooding, and whether, in the future, we can secure a sufficient supply of fresh water for 17 million people. Under Delta Programme 2015, directive decisions have been taken regarding our country's flood risk management, its availability of fresh water, and its spatial adaptation. Within the framework of a six-year review cycle, these measures have now been re-assessed in the Delta Programme at hand. Are we doing what is right, are we doing a good job, are we on track, and are we keeping up the pace? These questions have been answered once again within a context of undiminished climate change but also within a wider context of a world in which several major transitions are being substantiated. In interconnection with the various other taskings relating to our environment (such as housing, sustainable energy, agriculture, and nature), we will need to adapt to what we cannot prevent; the urgency of climate adaptation is and remains of existential importance in our delta.

In response to the aforementioned questions that we have asked ourselves, I conclude that we are pursuing the right track, but we need to step up our efforts, we need to accelerate and intensify. Extreme weather conditions, which in 2015 were still considered a potential long-term perspective for 2050, have already

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occurred multiple times in the past six years. Earlier than we had originally assumed, we are observing such signals indicating that the climate is changing at a more rapid pace than originally expected. Severe storms, torrential rain, heatwaves.... we are hardly taken aback anymore. Drought poses another threat which is more serious than we originally thought possible. In combination with low water levels, drought is causing major problems in parts of our country, as we experienced in 2018, in 2019, and at least during the first few weeks of the 2020 drought season.

Delta Programme Commissioner

Date 15 June 2020

Our reference DC-2020/402

The urgency of working on flood risk management, freshwater availability, and spatial adaptation is increasing: on the one hand, as a result of the aforementioned effects of climate change, but on the other hand, because such investments are especially crucial at a time like this, in order to boost our economy and enable our society to cope with the negative (economic and otherwise) impact of the ever more extreme circumstances. At the same time, we are seeing projects fall behind on account of their complexity, which this past year has even been exacerbated by nitrogen and PFAS issues. In addition, we need to rethink the substantiation of both the preparatory processes and the actual implementation of the work in a 1.5-m society. Expectations are that project adaptations, technological developments, and the measures being implemented by the governments will enable programme-level delays to be remedied. I am keeping a particularly close eye on the process. Although 2050 is still 30 years away, we have little time to lose, because the taskings are huge. I am calling on the managers of flood defence systems and other parties involved to put their shoulders to the wheel in order to have our flood protection, a precondition for the functioning of our society, up to par by 2050. In this respect, I am also requesting that cyber resilience be addressed as a fully-fledged element of the efforts. In order to attain the flood risk management goals that are fundamental to the Netherlands, it is imperative for the Delta Fund budgets to continue to cover the essential short-term and long-term investments.

More than ever before, we have experienced the importance of protecting our vital $\boldsymbol{\theta}$ sectors, such as healthcare, but also, e.g., IT provisions, utility facilities, and the drinking water supply. Within the context of the Delta Programme, the Vital and Vulnerable programme is working on the climate adaptation and water resilience of national vital and vulnerable functions in order to ensure that they are floodproof and can withstand heat, drought, and waterlogging. It is imperative for vital and vulnerable functions to be able to cope with such threats, in order for them to continue to operate in the event of such a situation arising, or, as the case may be, to minimise any negative impact. Failure of such national vital and vulnerable functions can potentially cause major damage. It is up to the Ministries responsible for each of the functions, in concert with the (grid) managers concerned, to conduct a proper analysis of the vulnerabilities, to set down the ambitions, and to implement measures wherever such are necessary. Furthermore, it is important to opt for climate-proof and water-resilient designs in the construction of any new national vital and vulnerable infrastructure, e.g., such as is being developed in the purview of the energy transition. I am requesting both the national and the regional parties (including the private sector) to intensify their efforts on the climate-proofing of vital and vulnerable functions.

Global warming is pushing up the sea level, resulting in increased salinisation and higher flood risks. This rise will definitely continue, and unfortunately this effect is accelerating across the globe. Near our country, the acceleration is expected by

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2050, for which we will need to prepare our delta. This entails far-reaching decisions in terms of flood risk management and freshwater supply, which may significantly affect the lay-out of our country. The options are being explored, carefully and with wide-scale societal commitment, under the Sea Level Rise Knowledge Programme. Potential measures will be explored and prepared with a view to the decisions to be made in the next six-year period. If need be, we will take interim decisions.

Delta Programme Commissioner

Date 15 June 2020 Our reference DC-2020/402

It is encouraging to see how, even in these turbulent times, the Delta Programme is continuing to work on keeping our delta liveable. That is exactly what the legislative bodies had in mind when setting up this programme ten years ago. It gives me great satisfaction to witness that the work is going on and that we have set a new course, which we are pursuing close to the wind.

Nonetheless, in this respect, a warning is appropriate in my opinion. That the impact of COVID-19 will also manifest itself in the National Budget is evident. Public funds have been thrown off balance, to say the least. Since the work on the Delta Programme taskings is of existential importance for the Netherlands, I call upon all politicians to ensure that their response to the Corona crisis does not allow these taskings to stagnate. The official working group on the broad "Ready for Climate Change" social review has drawn up a list of measures. In view of the aforementioned climatic changes, I strongly advise against the option of delaying implementation of the Flood Protection Programme. In my opinion, a safe, climate-proof delta constitutes perhaps the first precondition for sustainable economic recovery following the Corona crisis. The report furthermore features sensible proposals for the intensification of climate adaptation and for improving the resilience of our freshwater supply. I recommend that these proposals regarding policy intensification be adopted, to a significant extent, in the coalition agreement of the next Cabinet. Especially in times of pressure on the financial position of the national government, and that of local and regional governments, I consider it important for the State to assume – and to financialise – a powerful role in order to achieve the flood risk management, freshwater availability, and spatial adaptation targets that are of fundamental importance to the Netherlands.

Our country is going through trying times, but the many examples of how we are collectively continuing the work on our delta, with an innovative and goal-oriented approach, imbue me daily with the hope and the confidence that we will get through this. In times like these, (anticyclic) investments in the existential safety, liveability, and climate adaptation of our country can bolster economic recovery and sustainable economic growth in the years ahead.

P.C.G. Glas

Government Commissioner for the Delta Programme



We are living in a world confronting us with existential questions regarding our health, the liveability of the planet, the economic model, and our social relations. At the global, national, regional, and local levels uncertainties regarding the future are increasing. Our confidence in governments and institutions, in science, in vital sectors, and – at the most personal level – in one another is under great strain. The Corona crisis shows how dependent we, in the Netherlands, are on what is happening elsewhere in the world. Climate change also revolves around uncertainties and global dependence. Timely preparation is essential for the Netherlands. The tasking is urgent and one that can only be successfully tackled in national collaboration, extending across policy fields and administrative scale levels.

In the purview of our long-term safety and liveability, it is absolutely imperative that we continue to work energetically on our pursuit of a delta that is climate-proof and water-resilient. The Netherlands has always been vulnerable to flooding and extreme weather, and the changing climate leaves us even more vulnerable. A recent study by the World Meteorological Organization shows that the past decade was by far the warmest since records began, and that the world is not on the right track to achieve the Paris climate targets. Meanwhile, we appear to be heading for an accelerated rise in sea level, whilst experiencing increasingly extreme weather entailing torrential rain, heat, and drought. The water taskings are diverse by nature (and not limited to the aforementioned issues); moreover, they feature amidst other societal trends and transitions. All the more reason, therefore, to continually ask ourselves: are we doing what is right, are we doing a good job, are we on track, and are we keeping up the pace? Greater regulatory focus should be placed on the interconnectivity between water and spatial taskings. This also opens up opportunities. In the Netherlands, water can bring out the best in us: water as a driving force and as a guiding principle!

¹ Source: WMO (2020), WMO Statement on the State of the Global Climate in 2019, WMO No. 1248.

New phase

Ten years ago, the launch of the Delta Programme marked the beginning of a new phase in the work on our delta. With a national programme, in a powerful administrative partnership of the central and regional governments. With a focus on the societal water taskings regarding flood risk management, freshwater availability, and spatial adaptation. And in interconnection with social actors and trends in our Dutch civil society.

The core values of the Delta Programme were and still are: solidarity, flexibility, and sustainability. In Delta Programme 2015, Delta Decisions and Preferential Strategies were set down, following a joint fact-finding process and a gradual exploration of policy goals and measures. National policy regarding the Delta Decisions and Preferential Strategies was embedded in the National Water Plan 2016-2021. Among all the authorities involved in water management, some of the emphasis subsequently shifted to elaboration and programme-based policy implementation. The shovel is in the ground.

From the start, we had already planned on checking, every six years, whether the points of departure and circumstances in force at the time when earlier decisions were taken still hold good. In six-year reviews, we examine whether adjustments are in order. The Delta Programme 2021 before you sets out proposals for revised Delta Decisions, strategies, and measures aimed at an effective continuation of the work on flood risk management, on the availability of fresh water, and on having the Netherlands climate-proof and waterresilient by 2050. The outcomes of the first six-year review show that we have entered a new phase: the years ahead will involve a combination of implementation and long-term policy development, extending to 2050 and beyond. Some of the taskings are increasing in scope, some are gaining in complexity, which means that we definitely need to step up our current efforts. As we proceed, we will gain a better picture of what and where additional efforts are needed. Within the Delta Programme, we will continue our collective approach, in collaboration with all the partners. Our work will continue to be based on the best available knowledge, and we will consistently opt for adaptive strategies: "down to earth, alert, and prepared", departing from the "confident urgency" that has characterised the Delta Programme since

Both mitigation and adaptation

How global warming might affect the Netherlands is outlined in an exploratory study conducted by Deltares research institute, under the auspices of the Delta Programme Commissioner.² The potential acceleration of the rise in sea level will have a major impact on the flood risk management and the freshwater supply of our low-lying delta. More extreme weather – wetter, drier, warmer – is also facing our society with major challenges. The best strategy to deal with such issues is and remains climate mitigation: minimising global warming. However, global warming and more extreme weather cannot be prevented entirely. These phenomena are already manifesting themselves. That is why we definitely need to work on climate adaptation as well: preparing our country for the changing circumstances. For that reason, close and efficient collaboration between the district water boards, the municipalities, the provinces, and the central government on the implementation of the Delta Programme remains vitally important.

Acceleration and intensification

On the basis of the six-year review, the Delta Programme Commissioner has concluded that changes need to be made. There is every reason to implement several amendments to the Delta Decisions and Strategies. The proposed amendments primarily concern the acceleration and intensification of measures in order to attain the flood risk management, freshwater availability, and spatial adaptation targets by 2050. The associated studies also call for adjustments. The proposals are outlined in Chapter 2 of this Delta Programme 2021; more details are provided under the themes (Chapters 3 to 5) and under the various regions (Chapter 6).

Dynamic implementation

For the immediate future, nitrogen emissions and soil pollution (PFAS issues) will be causing delays in the realisation of a host of projects in the physical domain, which are exacerbated by the Corona crisis. Up until 2050, other unforeseeable complications can be expected to occur. These can put pressure on the preparations, the licensing process, and the tender procedures. It is imperative for all the parties to perform their duties sailing close to the wind, so that we will collectively manage to achieve the goals set for 2050 in time. Achieving these goals, on the basis of widely felt and factually well substantiated urgency, will put a severe strain on the administrative and social solidarity. We must continue to monitor this. Keeping an appropriate implementation capacity up to par requires the attention of us all.

Looking further ahead

By now, the urgency of looking further ahead, to the period beyond 2050, is indubitable. In many cases, the decisions and measures we are taking to realise the goals

² Source: Mogelijke gevolgen van versnelde zeespiegelstijging voor het Deltaprogramma, een verkenning [Potential consequences of an accelerated rise in sea level for the Delta Programme, an exploration].

set for 2050 need to continue to perform their functions far beyond 2050. With respect to major interventions, such as the construction of new engineering structures and dyke improvements, the Delta Programme factors in a maximum rise in sea level of 1 metre up until 2100. Recent studies have shown that the sea level rise could also turn out more drastic, especially when looking beyond 2100 as well.

In order to prepare the Netherlands in a timely manner for such potentially more extreme long-term variants, several tracks have been developed in the Delta Programme. Extremely high and low river discharges are addressed in the Integrated River Management programme. Weather extremes - excessive or insufficient water, and heat - are central in the Delta Plan on Freshwater Supply and the Delta Plan on Spatial Adaptation. In 2019, the Minister of Infrastructure and Water Management and the Delta Programme Commissioner initiated the Sea Level Rise Knowledge Programme. In the next five years government bodies, research institutes, businesses, planners, and NGOs will be joining forces within this programme in pursuit of new expertise on flood risk management and freshwater availability. With this programme, we aim to reduce uncertainties regarding the rising sea level, to map out the tenability and flexibility of the current Delta Decisions and Strategies in scenarios featuring an extreme rise in sea level and the attendant salinisation, and to explore the potential long-term action perspectives. This Knowledge Programme also covers the exploration of the spatial reservations required to keep long-term options open. The annual Delta Programme reports on the progress of the activities conducted under the Sea Level Rise Knowledge Programme. This programme will ultimately generate important decision information for the next review of the Delta Programme in 2026.

Flood risk management

Delta Programme 2015 comprised a proposal for a new system of flood protection standards. In 2017, the system and the associated standards were anchored in the Water Act. The main challenge we are facing now is to assess all the primary flood defences in accordance with these new standards, and to ensure that they comply with the standards by 2050. In Delta Programme 2015, this constituted the essence of the Delta Decision on Flood Risk Management; it still remains in full force. The timely implementation of the required measures requires huge efforts on the parts of the district water boards and Rijkswaterstaat (the executive branch of the Ministry of Infrastructure and Water Management). With a view to rapidly gaining insight into the scope of these efforts, the first national assessment of all the primary flood defences on the basis of the new standards will be conducted within a period of just six years, rather than the usual twelve year period. By no later than 31 December 2023, the Minister

of Infrastructure and Water Management will inform the House of Representatives on the outcomes. By mid-2020, 25 per cent of all the primary flood defences had been assessed. Ergo, this still leaves a lot of work to be done, which calls for priority among the managing bodies.

The dyke stretches in need of improvement are incorporated - on an urgency basis - into the Flood Protection Programme, a component of the Delta Plan on Flood Risk Management. According to current insights, achieving the goal of "all primary flood defences meeting the standard by 2050" will require the completion of an average of approx. 50 kilometres of dyke improvements per annum, between now and 2050. For the period 2021-2032, the Flood Protection Programme has scheduled the improvement of 698 kilometres of dykes and 171 engineering structures. This is quite a challenge in terms of implementation. That is why it is important for the managing bodies to give impetus to the improvement of the primary flood defences - approx. 90 per cent of which are managed by the district water boards; the remaining 10 per cent are managed by Rijkswaterstaat - and to avoid any delays on account of, e.g., nitrogen emission issues. Currently, we are encountering several project-level delays. Expectations are that project adaptations, technological developments, and the measures being implemented by the authorities will enable programme-level delays to be remedied; we still have thirty years to go. This calls for an adequate project approach on the part of managing bodies, and for an equally adequate programme approach on the part of the alliance of district water boards and Rijkswaterstaat.

In addition to strong dykes, flood protection also calls for sensible spatial choices in the areas behind the dykes. We need to factor in the consequences of a potential flood – even if the probability is slim – into environmental policies, spatial planning, and the extensive housing tasking. The point of departure is that spatial (re)development must not add to the risk of damage and casualties caused by flooding or extreme weather. This has been set down in the Delta Decision on Spatial Adaptation, and features as an explicit policy choice in the draft National Environmental Vision (NOVI)³.

The new flood protection standards already allow for considerable construction tasking in the years leading up to 2050. This inspires confidence, yet at the same time, we realise that whatever is constructed now will still be in place after 2050, whilst the water tasking is only increasing. For that reason, it is imperative that we carefully consider a) potential locations for long-term construction projects, from a flood risk management perspective, and b) strategies to address the impact of a potential flood and the other climate vulnerabilities, involving a climate-proof and water-resilient approach to the planning of building sites

³ Annex to Parliamentary Document 34683, no.27 (in Dutch).

(featuring, e.g., water storage facilities), and to the design of houses, buildings, and infrastructure.

Freshwater supply

The extremely dry summers of 2018 and 2019 and the dry spring of 2020 have once again demonstrated that our freshwater supply must be resilient against prolonged periods of drought. In December 2019, the Minister of Infrastructure and Water Management forwarded the final report of the Drought Policy Platform to the House of Representatives. The Policy Platform recommends the following: further climate-proof the main water system, improve freshwater retention – for example, through active groundwater management on the sandy soils - and make more allowances for a limited supply of fresh water in spatial planning. We can no longer take it for granted that in the future, every area will have a sufficient supply of fresh water at any given moment. Especially in areas prone to salinisation and in areas that cannot be supplied from the main water system, we must make a greater effort to explore the options for adapting land use to water availability. Such efforts are being expended within the context of the water availability process, which will be intensified, in part as a result of the findings of the Drought Policy Platform. Water levels no longer automatically follow land use. Reduction of the demand for water also plays a part here. The Cabinet has indicated its commitment to the following order of preference in (regional) water management: smart spatial planning that takes more account of water, cutting down water consumption, improved water retention, more efficient distribution of water, and acceptance of residual risks. 4 The amended Delta Decision on Freshwater Supply now sets out that by 2050, the Netherlands must be resilient against freshwater shortages.

Impetus will be given to investments in freshwater supply measures. The freshwater supply from the main water system will be climate-proofed even further. Among other things, this calls for more efficient control mechanisms to distribute fresh water from the main water system across the various parts of the Netherlands in times of drought. The Delta Programme parties are drafting a new set of investments relating to freshwater supply measures. By now, its substantiation is well on its way; it is based on administrative criteria focused on the effectiveness of measures in remedying bottlenecks, and on the costs and benefits of such measures. The investments will involve a total sum of EUR 800 million in the period 2022-2027. The investments will be funded from the Delta Fund, supplemented by funding from provinces, district water boards, municipalities, and other parties (such as drinking water companies). The proposal for the set of investments

for this second phase of the Delta Plan on Freshwater Supply will be incorporated into Delta Programme 2022. It would make sense to extend this funding to subsequent years. An important fact to note in this respect is that many measures are partially or fully funded by regional managing bodies. This means that the total scope of the investments is considerably larger than their claim on the Delta Fund.

Spatial adaptation

The interim evaluation of the Delta Decision on Spatial Adaptation in 2017 already prompted the conclusion that acceleration and intensification of the implementation efforts are essential. Only then will we manage to have the Netherlands water-resilient and climate-proof by 2050. To achieve this goal, Delta Programme 2018 comprised the first Delta Plan on Spatial Adaptation. Via the Delta Plan, the parties involved are pursuing the goal for 2050 in a seven-step process. The vast majority of the district water boards, municipalities, and provinces report completion of the stress tests that map out their vulnerabilities to extreme weather (step 1). Such tests have also been conducted for the areas managed by Rijkswaterstaat. Furthermore, several local and regional governments have embarked on risk dialogues with residents, businesses, and organisations that are directly impacted by the consequences of such vulnerabilities (step 2). The Delta Plan on Spatial Adaptation has already markedly raised awareness of the adaptation tasking among the authorities, at both the civil service and the administrative levels.

This fine result can be attributed to a wide range of parties at the local and regional levels. As the municipal scale levels have now fully joined the process, the Delta Programme has entered a new phase of dynamics and commitment befitting a regional implementation in addition to the efforts focused on the main water system. It is now a matter of embedding climate adaptation into government plans and projects at all levels, of preparing and executing projects aimed at resolving the largest bottlenecks, and of linkage with other taskings and measures being carried out. Walk the talk. We must be wary of lack of commitment. After all, failure to take measures can result in considerably more damage in urban areas: if the current climate change continues, damage may rise to a sum of between EUR 33 billion and EUR 87 billion; if climate change increases, damage may rise to a sum of between EUR 55 billion and EUR 124 billion.5

For the years ahead, the collective governments have scheduled additional investments to expedite the implementation of spatial adaptation projects. In early 2020, the House of Representatives and the Senate endorsed an amendment to the Water Act, which enables the use of Delta Fund resources to co-fund measures to combat

⁴ Letter to Parliament, Regie en keuzes in het nationaal omgevingsbeleid (NOVI) [Control and choices in national environmental policy], Parliamentary Document 34682 no. 48 (in Dutch).

⁵ Source: Climate Damage Assessor.

waterlogging. The collective governments have reached consensus regarding the Incentive Scheme that will take effect on 1 January 2021.6 This scheme focuses on measures to be implemented in the period 2021-2027. In the 2021 budget, the central government has set aside a sum of EUR 200 million. This reserve is part of the scheduled total government commitment of EUR 300 million, which has been set down in the Administrative Agreement on Climate Adaptation. Any of the 42 Working Regions, or combination of Working Regions, may submit a regional proposal based on the stress test, the risk dialogue, and the set of measures. The Ministry uses a formula, based on population count and surface area, to divide the resources across the working regions. The central government will contribute a maximum of 33 per cent. The local and regional governments in each working region will co-fund the remaining 67 per cent by mutual agreement. It should be emphasised that the overall tasking will involve a sum many times larger than this amount. The incentive scheme is intended to give impetus to the implementation.

Ergo, we need more than an initial – very welcome – impetus. Timely preparation for the changing climate requires that all the taskings and interventions in the physical domain make allowances for the new circumstances. I.e., in extensive housing projects, such changes must be taken into account when choosing locations and deciding on spatial planning, and new residential areas must be designed in a climate-proof and water-resilient manner. Furthermore, climate adaptation must be factored into other spatial taskings, and into regular management and maintenance efforts. Climate adaptation must be accommodated in all the plans and measures involving the physical environment (housing, infrastructure, vital grids, nature, agriculture, energy).

Thus, climate-proof and water-resilient will become the new standard. Ensuring that climate adaptation is a standard element of all the physical interventions in the country is the only way for the Netherlands to remain safe and liveable in the long run. In addition to a guiding principle, water interests can also be a positive driving force in this respect. Thus, the Delta Programme can be more than the sum of taskings and goals. Water can literally give momentum to the issues at stake in the regions.

In his cover letter to the previous Delta Programme, the Delta Programme Commissioner recommended that the Delta Programme goals be integrated and accommodated in the collaboration agreements of the authorities regarding the National Environmental Vision (NOVI). Upon presenting Delta Programme 2020 to the House of Representatives, the Cabinet stated its adoption of these recommendations

by the Delta Programme Commissioner and stipulated that all the authorities must adopt water as a guiding principle in their environmental policies. This has also been incorporated into the draft National Environmental Vision. In the years ahead, it is imperative that policy choices regarding the risks of flood damage, regarding freshwater availability, and regarding spatial adaptation, as set out in the National Environmental Vision, are explicitly embedded in the environmental policies of all the authorities. This requires commitment, specific efforts, and leadership on the part of administrators and planners, both among governments and among private initiators. And, as the case may be, on the part of the central government, when the decision-making processes of the local or regional governments fail to produce or are too slow in producing optimum results.

Delta Fund

Currently, the Delta Fund is providing a sound financial basis for our taskings. However, the Fund leaves hardly any room for manoeuvre, whereas several ongoing developments may have a budgetary impact in the years to come. Take, for instance, the Rijkswaterstaat maintenance taskings, whose budgetary impact is currently being charted. The climate adaptation taskings are being mapped out through stress tests risk dialogues. Furthermore, in view of the extensive drought experienced in recent years, a study has been conducted into the measures required to economise water consumption, improve water retention, and distribute water more efficiently. Such measures surpass the current investment level. Moreover, the spatial accommodation of flood risk management projects is presenting our densely populated country with an increasingly greater challenge, which also adds to the uncertainties regarding cost estimates. An effective delta approach calls for sufficient financial leeway. In the long run, this leeway will also need to cover the efforts required to keep pace with the consequences of a rising sea level.

Interconnectivity and interconnection

The Delta Programme is working on taskings in the fields of flood risk management, freshwater supply, and spatial adaptation; essential taskings to ensure that we can continue to live and work in the Netherlands, now and in the future. Thus, we are ensuring that by 2050, the whole of the Netherlands will be climate-proof and water-resilient, with dykes and dunes that meet the flood protection standards, and with a sustainable supply of fresh water. In spatial (re)developments, we seek to avoid a higher risk of damage and casualties caused by flooding or extreme weather, insofar as is reasonably feasible.

⁶ Parliamentary Document 31710 no. 77 (in Dutch).

Water as a guiding principle

The above entails that water will have to be much more of a steering factor in spatial planning: "water as a guiding principle" is the adage. Therefore, attaining the Delta Programme goals requires water to be taken into account in spatial considerations regarding other taskings in the physical domain. "Water steers" rather than "water follows". Water will be directive for increasingly more boundaries and preconditions when making choices regarding the spatial planning of the Netherlands.

It is good to realise that in addition to a water tasking, the Delta Programme also involves a vitally important spatial tasking. Measures relating to flood risk management, freshwater supply, and spatial adaptation need room, now and in the future. The taskings entail preconditions in terms of spatial planning (for example, if the availability of fresh water dictates a different use of land). Plus, the spatial planning of the entire country must become climate-proof and water-resilient, taking account of the vulnerabilities to waterlogging, drought, and heat, and of flood risks. Also evident is the interconnectivity between the Delta Programme goals and the agriculture and nature functions. Water-resilient spatial planning and a reliable freshwater supply are indispensable for future-proof agriculture and nature.

Recent years have seen several evaluations of the Delta Programme approach. A recurrent recommendation is that the interconnectivity between the three Delta Programme taskings bears improvement, and that the interconnection with other societal taskings can and must be reinforced.

Various regions are currently working on the national elaboration of the Delta Programme taskings in different ways: 7 regions are working on the Preferential Strategy for flood risk management, 7 Freshwater Supply Regions are implementing the Preferential Strategy for freshwater supply, and 42 Working Regions are elaborating the Delta Plan on Spatial Adaptation. These different approaches in the regions are underpinned by different backgrounds and considerations. Over recent years, this regional structure has evolved organically. In addition to the highly positive stimuli and the implementing power that it is generating, however, this structure has also resulted in some fragmentation of taskings and in administrative pressure on the regions. The time appears ripe for a close look in the years ahead.

Intention to reinforce the interconnectivity between the three Delta Programme taskings in the regions

The goal for the years ahead is to reinforce the interconnectivity between the three Delta Programme taskings in order to further enhance the effectiveness of the Delta Programme, and to enhance the efficiency and effectiveness of its organisation. Increased interconnectivity within the Delta Programme can also bolster the interconnection with other spatial taskings and the ambition of assigning "water" more of a steering role in spatial planning. This is essential to attain the goals of the Delta Programme, and it ties in with the tradition that throughout the ages, water (management) has defined and shaped the Netherlands.

To this end, in the years ahead, the Delta Programme partners intend to explore how the current (amended) Preferential Strategies can be developed into Regional Delta Strategies, and to assess whether this process can be expanded to cover the entire country. It goes without saying that there will be room for a tailored approach, geared to each specific region, and that other proposals are welcomed. In this process, it is important – wherever such is relevant in terms of content – to consider the three Delta Programme themes (flood risk management, freshwater availability, and spatial adaptation) in interconnection, to retain positive elements, and to look for connections with added social value. The process must also link up with the national level. On account of the interaction between the rivers, Lake IJsselmeer, the tidal rivers area, and the delta, a coherent national approach (system approach) remains important.

In the years ahead, we will be exploring and elaborating the intention to reinforce the interconnection between the three Delta Programme taskings and the connection with other spatial taskings, along with all the partners. This may lead to adjustments in the governance and the regional structure in order to enhance the effectiveness of the collaboration even further.

ABDTopconsult (2016) Op peil – Wettelijke ex-post evaluatie Deltawet Waterveiligheid en Zoetwatervoorziening [Up to par – Statutory ex-post evaluation of the Delta Act on Flood Risk Management and Freshwater Supply], Parliamentary Document 34513 no. A. (in Dutch); and Erasmus University (2019), Eb en vloed van het Deltaprogramma – De Deltacommunity anno 2019 in beeld gebracht [The turning tides of the Delta Programme – Picture of the 2019 Delta Community].



The Delta Programme pursues an adaptive approach: the Delta Decisions and Preferential Strategies are adapted when new developments and insights dictate so. This is effected in a systematic manner. Every six years, the Decisions and Strategies are reviewed. This Delta Programme presents the results of the first six-year review.

2.1 Results outlined

General conclusion

The first six-year review of the Delta Programme prompts the following general conclusion:

- For the period up to 2050, the Delta Decisions and Preferential Strategies are still indicating the right course; the Delta Decision on Freshwater Supply requires some fine-tuning.
- 2. With respect to all the taskings, additional attention needs to be focused on the energetic implementation of measures, aimed at the realisation of the targets by 2050.
- 3. After 2050, an acceleration in the rise in sea level may add considerably to the flood risk management and freshwater supply taskings; this must already be taken into account by the parties collaborating within the Delta Programme when taking decisions in the years ahead, and they already need to prepare for the major choices that may be required after 2050.

Proposed amendments to the Delta Decisions and Preferential Strategies

The Delta Programme Commissioner proposes as follows:

The <u>Delta Decision on Flood Risk Management</u> remains in full force. Its main objective stands: by no later than 2050, every Dutch resident living behind a primary dyke or dam will have a minimum protection level of 10-5 (the probability of fatality due to flooding does not exceed 1:100,000 per annum).

The <u>Delta Decision on Freshwater Supply</u> will be expanded with a freshwater supply target for 2050: by 2050, the Netherlands will be resilient against freshwater shortages. The Water Availability process is providing a definition of water shortage and exploring measures to enhance our resilience. The order of preference for the measures — 1. economising; 2. improved retention; and 3. more efficient distribution — has been expanded with a fourth step: accepting damage. The point of departure is that spatial planning efforts must take more account of freshwater availability, and that water consumers must cut back on their water consumption. The national strategy has been supplemented with more efficient water retention and distribution in the main water system (Climate-proof Main Water System Freshwater Supply), and with a transition to

active groundwater supply management at the Elevated Sandy Soils.

The Delta Decision on Spatial Adaptation will be supplemented with specific interim targets, in the pursuit of a climate-proof and water-resilient country by 2050, in order to enable more control to be exercised over the implementation, and to facilitate the embedding of spatial adaptation in environmental visions. The efforts relating to vital and vulnerable functions will be expanded: by 2050, these must not only be flood-proof, but also capable of coping with waterlogging, heat, and drought.

The <u>Delta Decisions on the Rhine-Meuse Delta</u>, the <u>Delta Decision on the IJsselmeer Region</u>, and the <u>Preferential Strategies</u> will have several new emphases. With respect to the IJsselmeer Region, the option of having the average winter water level keep pace, to a limited extent, with the sea level after 2050 will now cover Lake Markermeer as well as Lake IJsselmeer. A new insight is that the rising sea level will result in higher peak water levels in the lakes. Minor, recurrent peak levels can be offset through a combination of discharge by gravity and pumping. Major peak levels, occurring less frequently, will be accommodated in dyke improvements.

With respect to the Rhine Estuary-Drechtsteden Region, a significant addition is that the study into the replacement of the Maeslant storm surge barrier will have the nature of a comprehensive supra-regional system analysis, exploring both closable open variants and closed variants.

The rivers Rhine and Meuse are covered by the Integrated River Management programme (IRM). A reviewed strategy for the rivers will be drafted in 2021; the amended strategy will be finalised and endorsed in 2022, on the basis of the IRM preferential alternative.

In the Southwest Delta, more room will be created for the recovery of estuarian nature, such as the restoration of the natural (tidal) dynamics. Within the framework of future-proofing the Oosterschelde storm surge barrier management, structural shoal and shore-face nourishments and (innovative) dyke improvements will be scheduled to combat the erosion of the intertidal area.

In the Preferential Strategy for the Coast, the Coastal Pearls approach has been replaced by a standard strategy for linking flood risk management and spatial ambitions, which will cover the entire coast.

The Preferential Strategy for the Wadden Region focuses on intensification of the study into the impact of the rising sea level on the sandy system, taking account of sand replenishments and sediment collecting organisms – to expedite sedimentation – and the utilisation of forelands for wave reduction.

At the Elevated Sandy Soils, the transition to active groundwater management will be given impetus at the local and regional levels. The water availability and spatial adaptation taskings will be tackled in an interconnected manner.

The proposals for the amended Delta Decisions and Preferential Strategies, and further details regarding the amendments, are presented in Chapter 3 up to and including Chapter 6.

Additional attention to implementation and target attainment

Within thirty years, a large number of measures will need to have been implemented in order to achieve the goals relating to flood risk management, freshwater supply, and spatial adaptation. This calls for diligent efforts, especially on the part of all the authorities. For example, between now

and 2050, an average of 50 kilometres of dyke improvements must be completed annually. That is why it is vitally important for the Flood Protection Programme partners to do all they can to avoid delays. In the fields of freshwater supply and spatial adaptation, a wide range of major and minor measures are scheduled, involving the water system, rural areas, and urban environments. In order to be able to properly steer towards progress, the qualitative ultimate goals need to be translated into specific interim targets.

Looking ahead to major choices beyond 2050

Serious signs indicate that over the course of this century, the sea level may be rising at a faster pace. If this happens, it will have a major impact on the measures required, in terms of flood risk management obviously, but also on measures involving the freshwater supply, water discharge, and spatial adaptation. It is imperative for the partners collaborating in the Delta Programme to already focus on such long-term taskings and the preparation of potential major choices, with the involvement of other parties. This ties in with the adaptive Delta Programme approach. The expertise required to this end will be generated by the Sea Level Rise Knowledge Programme (cf. Paragraph 2.4).

Review process in short

The first six-year review (May 2018 until May 2020) has been conducted in four phases:

Phase 1 Assessment

This phase involved a survey of the new developments and – possibly – obsolete assumptions that could dictate the amendment of Delta Decisions or Preferential Strategies. The Delta Programme Signal Group has subjected this survey to a mild review. This has generated separate "review agendas" for each Delta Decision and Preferential Strategy.

Phase 2 Identifying amendments and developing options

The second step involved a study of the consequences of the new developments and obsolete assumptions, followed by the identification of the components of the Delta Decisions or Preferential Strategies that needed fine-tuning or amending. Subsequently, wherever necessary, options for amendments have been developed.

Phase 3 Elaboration and substantiation of amendments

In phase 3, the amendments and options have been elaborated further, and the effects (pros and cons, including the environmental impact¹⁰) of the amendments have been mapped out. This has resulted in proposals for the

- ⁹ The recommendations presented by the Delta Programme Signal Group in 2018 and 2019 are listed in <u>Background Document A</u> (in Dutch).
- Delta Programme 2021 Environmental Impact Assessment Report, 16 January 2020. An Environmental Impact Assessment is not required for Delta Programme 2021. The proposals in Delta Programme 2021 that are adopted and that concern national policy will be included in the National Water Programme, for which an Environmental Impact Assessment is required. In order to be able to take full account of any environmental impact when making choices regarding amended Delta Decisions and Preferential Strategies in the Delta Programme, the environmental impact has been assessed concurrently with the compilation of synthesis documents, and recorded in the Delta Programme Environmental Impact Assessment Report. This report has been submitted to the review committee. In the purview of consistency in the Environmental Impact Assessment Report for the National Water Programme, the Delta Programme 2021 Environmental Impact Assessment Report has been drawn up in accordance with the (draft) Memorandum on the Scope and Level of Detail for the National Water Programme.

Source: IPCC (2019) IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC), September 2019.

fine-tuning or amendment of each Delta Decision and Preferential Strategy, in synthesis documents setting out the substantiation of the amendments, and in the Delta Programme 2021 Environmental Impact Assessment report.

Phase 4 Decision-making

The last phase involved the decision-making by the national Delta Programme Steering Group on proposals for the amendment of Delta Decisions and Preferential Strategies. The synthesis documents have been reviewed by an independent committee of scientists and have been supplemented wherever necessary." Preparations for the decisions to be made regarding the amendments have been made by the theme and regional steering groups.

The end result of the six-year review is the proposal for amended Delta Decisions and Delta Strategies, as contained in Delta Programme 2021 before you. The Delta Programme Commissioner proposes that the central government and the regional governments anchor the amended decisions and strategies in the pending National Water Programme 2022-2027 and regional policy plans, respectively. In accordance with the Water Act, the annual Delta Programmes will provide insight into how the Delta Programme is contributing to the objectives of the National Water Programme.

Background Document C (in Dutch) contains a more detailed description of the review process.

¹¹ The advisory report of the review committee and the response from the Delta Programme Commissioner are contained in <u>Background Document B</u> (in Dutch).

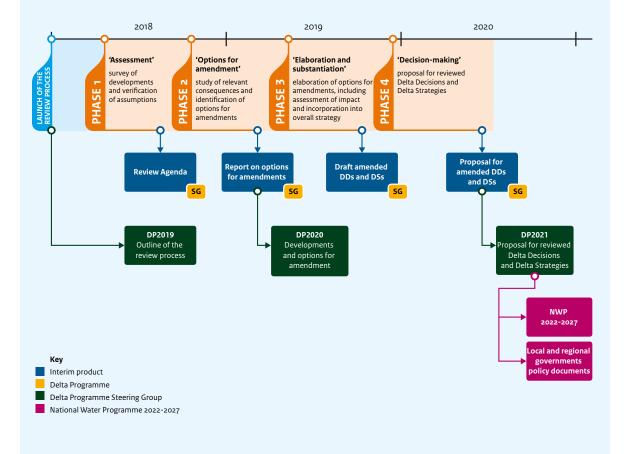


Figure 1 The four phases of the first six-year review

2.2 Further development of Preferential Strategies and connection with national transitions

Integrated Delta Programme approach

Spatial issues account for a significant proportion of the Delta Programme taskings. By now, this is widely acknowledged. Nearly all of the flood risk management, freshwater supply, and spatial adaptation measures feature a spatial component. The required measures are not limited to the water system; urban and rural areas also need adaptation in terms of spatial planning. In order to foster the efficient use of space, capitalising on linkage opportunities has been an ambition since Delta Programme 2015. Since then, several evaluations have emphasised that an integrated approach demands even more attention. This is also reflected in the recent advisory report produced by the Drought Policy Platform (2019). That is why, in the immediate future, the Delta Programme will be reinforcing its integrated approach along three routes:

- Connection with environmental policy: there is a strong connection between the Delta Programme taskings and environmental policy. The draft National Environmental Vision sets out goals in the fields of flood risk management, freshwater supply, and spatial adaptation, including the policy choice that the whole of the Netherlands must be climate-proof and water-resilient by 2050. It is imperative for the Delta Programme goals to be firmly embedded in the provincial and municipal environmental visions. This calls for an effort on the part of all the Delta Programme partners.
- Reinforcement of the interconnectivity between the three
 Delta Programme taskings, and of the connection with
 other regional spatial taskings: in the years ahead, the
 Delta Programme partners intend to explore the further
 development of the current (amended) Preferential
 Strategies into regional Delta Strategies, and assess
 whether this process can be expanded to cover the entire
 country. There is room for a tailored approach, geared to
 each specific region, and for other proposals regarding
 such connections. Further development can lead to
 adaptations in the governance and the regional structure,
 aimed at enhancing the effectiveness of the collaboration
 even further and at reducing the administrative pressure.
- Connection between freshwater supply and spatial adaptation: the Delta Plans on Freshwater Supply and on Spatial Adaptation will be linked more closely. The approaches adopted regarding the two taskings are highly similar (stress tests and risk dialogues for spatial adaptation, dialogue on water availability in the purview of freshwater supply), whilst many of the measures are closely intertwined. The parties working on spatial adaptation and on freshwater supply have

already designed a common drought stress test. The subsequent step is to join forces in the implementation of this stress test and in the Water Availability Process, and to embed the collective result into the risk dialogues, (policy) agreements, and implementation agendas. In this process, the individual freshwater supply and spatial adaptation goals will be preserved.

Interconnection with other programmes and development

The Delta Programme measures require room, e.g., for dyke improvements, river widening or the construction of water storage facilities. In all spatial taskings, an integrated approach is a precondition to enable the accommodation of all the measures required. This means that wherever possible, the design and implementation of measures must be geared to other taskings at issue in the area concerned. For example, the Delta Programme measures can foster the resolution of taskings in the fields of nature, the economy, and spatial quality. Conversely, the Delta Programme taskings entail requirements or preconditions for other spatial developments, such as curbing damage and the number of casualties caused by flooding and extreme weather, the transition to a different use of farmland in order to reduce its vulnerability to drought and salinisation, and paying serious attention to the reduction of flood risks in choosing locations for housing and other physical investments.

Spatial interconnectivity is a particular issue in the following visions, programmes, and transitions:

Environment Act and National Environmental Vision (NOVI)

The essence of the Environment Act is an interconnected approach to the physical environment. One of the topics is water, in addition to, e.g., spatial planning, living, infrastructure, cultural heritage, the environment, and nature. When the Act comes into force on 1 January 2022, the National Environmental Vision must also have been completed. In this document, the central government presents its long-term views on the environment up to 2050, as the basis for integrated choices¹². Key principles in this respect are taking rather than evading responsibilities and combining functions in an area. The Vision sets out the strategic outlines of national water policy. In addition, the Vision continues the process that has been rolled out under

¹² See <u>Draft National Environmental Vision; Parliamentary Document</u> 34683, no. 27 (in Dutch) and Letter to Parliament: Control and choices in national environmental policy; <u>Parliamentary Document</u> 34682, no. 48 (in Dutch).

the Subsoil Framework Vision and the (updated) Policy Memorandum of Drinking Water, one of whose aims is the designation of supplementary strategic water supplies and national groundwater reserves, in order to be able to meet the future demand for drinking water.

National Water Programme 2022-2027 (NWP)

The National Water Programme 2022-2027 holds the further elaboration and implementation of the National Environmental Vision with respect to national water policy and the management of the national waters. The programme will thus set out the outlines, principles, and course for dealing with challenges relating to, e.g., water quality, the freshwater supply, the shipping trade, and flood risk management, including cyber security. In this document, the central government is anchoring the national policy and management ensuing from the amended Delta Decisions and Preferential Strategies.

Major Waters Programme Strategy

By 2050, the central government aims to have the major waters future-proof, featuring high-quality nature that complements a powerful economy. This goal will be achieved through the Major Waters Programme Strategy. The intention is to implement approx. 33 measures in an adaptive, area-specific, and efficient manner until 2050. This will generate a stable and coherent ecological network comprising the major waters and the natural environment between them. The measures will be incorporated into ongoing area developments, such as those being carried out under the Delta Programme. The Major Waters Programme Strategy measures can be combined with other projects, such as dyke improvements, water collection measures, and measures to expand groundwater supplies.

Energy transition

One of the ambitions set out in the National Environmental Vision is a sustainable power supply in the Netherlands by 2050. In several respects, this ambition has ground in common with the Delta Programme. It is imperative for the energy production by windmills out at sea or in other bodies of water to continue to operate in the event of rising water levels or flooding. Electricity and gas are vital functions. The grid managers are required by law (Energy Act) to protect their grids from outside influences (such as flooding) in order to meet their duty to deliver. This means that in the future, vital electricity and gas entities (power plants, high-voltage grids, distribution stations, gas extraction, and gas production) must be water-resilient. When exploring regional Delta Strategies, it is important to link up with the Regional Energy Strategies that are being developed by the thirty RES Regions. With respect to the transition to natural gas-free residential areas, capitalising on the opportunity concurrently to render neighbourhoods climate-proof and water-resilient is essential.

Nitrogen emissions and PFAS issues

The central government is working on a structural strategy to reduce the nitrogen load on Natura 2000 areas, in line with the European Bird and Habitat Directive. This strategy combines the restoration and reinforcement of nature with a reduction in nitrogen emissions. The nature restoration efforts open up opportunities to link up with Delta Programme taskings relating to the combating of waterlogging and to the reinforcement of the freshwater supply. Efforts to reduce nitrogen emissions may put pressure on the preparations, licensing, and tendering procedures of projects. This may cause delays or dictate a shift to other methods in the implementation of measures under the Delta Programme. PFAS strategies may also impact the scheduling of Delta Programme measures, in particular measures requiring soil transport. All this is exacerbated by the consequences of the Corona crisis.

Vision on Agriculture, Nature, and Food: valuable and interconnected

The Minister of Agriculture, Nature and Food Quality is opting for a changeover to circular farming by 2030. This is necessary to give the agriculture, horticulture, and fishery sectors new perspectives. It involves a shift from lowering cost prices to cutting back the consumption of raw materials and to careful soil, water, and nature management. A healthy and well-functioning soil and water system constitutes the basis for circular farming. Soil fertility, which is determined by chemical, physical, and biological factors qualities, is important for both the agricultural production function and biodiversity. Without a fertile soil, the continued production of sufficient food is impossible. A proper water supply, including in periods of drought, is essential for the optimum growth of crops. Farmers are expected to cut back on water consumption in their food production. Farmlands with a healthy soil structure and sufficient organic matter act like sponges: during wet periods, they absorb large volumes of water which they gradually release during dry periods. Circular farming thus bolsters climate-adaptive agriculture. The Climateadaptive Agriculture Action Programme has elaborated the four action options for entrepreneurs, chain parties, and authorities in coping with the four trends – wetter, drier, warmer, and rising water levels – and weather extremes. Attention is focused on farmers and the perspective for the future of their farms in relation to climate adaptation.

2.3 Participation in the Delta Programme

The participation-oriented approach of the Environment Act is also the standard approach pursued for the Delta Programme programmes and projects. Participation is essential in the Delta Programme: capitalising on the expertise, ideas, experience, and creativity of all those involved produces more efficient solutions. In the Delta Programme, participation is effected at three different levels:

- at the national level: national choices are discussed in the Physical Environment Consultative Body¹³;
- at the sub-programme / regional level: regional choices are discussed in the regional consultative groups and at regional meetings;
- at the project level: actual projects capitalise on societal brainpower and energy in several ways, in order to enhance their effectiveness and arrive at good choices.

At the national level, after the publication of Delta Programme 2015, the focus within the Physical Environment Consultative Body shifted from the preparation of national policy choices to implementation issues. The first six-year review shows that implementation remains vitally important in order to achieve the goals

¹³ Background Document D (in Dutch), Advisory report of the Physical Environment Consultative Body regarding Delta Programme 2021 and response by the Delta Programme Commissioner. set for 2050, but also demonstrates the urgency of already looking farther ahead and discussing national choices for the period beyond. National choices are required for issues such as coping with the impact of a potential acceleration in sea level rise after 2050, the Integrated River Management programme, and the recommendations of the Drought Policy Platform.

In order to arrive at good national choices, the Delta Programme Commissioner and the Physical Environment Consultative Body have agreed to confer more frequently on the Delta Programme in the years ahead, and to pursue an approach featuring active participation from NGOs, by sharing knowledge, exchanging ideas, and providing advice.

At all levels, the Delta Programme continues to encourage authorities to invite other (potential) stakeholders and interested parties to present their views at an early stage, and to provide room for new solutions befitting the tasking and the phase of the programme or project. Setting up a joint fact-finding process enables parties to collectively look for the best solutions and corresponding sources of funding for an area or region.

2.4 Agenda for the next six years

This paragraph outlines the Delta Programme-wide knowledge and research programmes to be carried out in the next six years. The knowledge projects and activities specific to each Delta Decision and Preferential Strategy are outlined in Chapter 3 up to and including Chapter 6; they have been compiled into the updated Delta Programme 2021 Knowledge Agenda (Background Document E (in Dutch)).

Sea Level Rise Knowledge Programme

An acceleration in the rise in sea level, which could manifest itself in the second half of this century, poses a potentially existential threat to our delta. This is the key point of focus for the second six-year review of the Delta Programme in the period 2021-2026. With a view to enabling well-considered proposals to be drawn up in 2026, regarding the amendment or otherwise of Delta Decisions and Preferential Strategies, in 2019 the Minister of Infrastructure and Water Management and the Delta Programme Commissioner initiated the Sea Level Rise Knowledge Programme. The implementation and outcomes of this knowledge programme are largely decisive for the Delta

Programme agenda for the next six years.

The programme comprises several working tracks, elements of the Delta Programme that follow the standard Delta Programme approach: in a joint fact-finding process, the Delta Programme partners formulate the water taskings in concert with research institutes, businesses, and NGOs. Subsequently, they explore potential and promising solutions and preferential solutions for the short and long terms. Progress is reflected in the annual Delta Programmes.

Meanwhile, several activities have been rolled out, including consultations with Flanders and the system explorations. In 2019, an exploratory study was conducted into existing plans and ideas for long-term solutions. The study shows that four solution strategies will be feasible in the event of a sharp rise in sea level: continuation of the current flood protection strategy (featuring open or closed river estuaries), a seaward strategy, and a strategy involving gradually keeping pace with the rise in sea level (horizontally or vertically). These four potential solution strategies generate strategic choices for the preservation

of the current coastline, river water discharge by gravity or otherwise, and the need to combat salinisation. The study constitutes a key building block for the next steps in the Sea Level Rise Knowledge Programme, with regard to both the region-specific meetings on long-term options (Track IV) and the Knowledge Agenda.

5 March 2020 saw the first annual Sea Level Rise Knowledge Programme Day. Approx. 140 attendees were informed about the set-up, organisation, and scheduling of the activities. The conclusion was that collaboration needed to be expanded to other sectors and transitions (agriculture, housing, energy, nature, cultural heritage). It was also agreed that the regions and collaborating Delta Programme partners will be involved in the system explorations (Track II) and the long-term options (Track IV). In 2020, the efforts being expended on the various tracks are still preparatory in nature. Track IV is focused on the exploration of the synergy and friction involved in linkage with other spatial developments and societal transitions, on the definition of the physical space and instruments required to keep future options open, and on mapping out the required studies.

Freshwater supply

Climate change and the resultant increase in water consumption have added considerably to the freshwater taskings, as has been demonstrated by studies into freshwater supply (see Paragraph 4.3). Furthermore, the dry summers of recent years have produced new insights, e.g., on the management of groundwater supplies at the Elevated Sandy Soils and on salinisation in Lake IJsselmeer. In December 2019, the Drought Policy Platform came up with agendising recommendations, such as a study into an extreme drought scenario and the development of spatial planning perspectives, an exploratory study into the enforcement of drinking water restrictions in crisis situations, and an exploration of the opportunities for reuse of (waste water) purification plant effluent. These taskings and recommendations are largely decisive for the (research) agenda of the Delta Plan on Freshwater Supply in the period leading up to the next review.

Review of "Monitoring, Analysing, Acting" system and Adaptive Delta Management

The years ahead will see a review of two key Delta Programme methods: "Monitoring, Analysing, Acting" ("finger on the pulse" enabling timely course adjustment based on the answers to the four administrative questions¹4) and adaptive delta management (to cope with an uncertain future). In the Delta Programme, these methods are used in the purview of the substantive underpinning of decisions¹5. The results of the first six-year review of Delta Decisions and Strategies, and internal evaluations conducted earlier indicate that it would be advisable to review, and wherever necessary adjust, these methods.

A system level consideration is whether the results of the substantive review — or other developments — dictate adjustment of the methods (system learning). Figure 2 illustrates the interconnectivity between the three types of learning distinguished within the Delta Programme.

To support the decision-making process, a connection between the knowledge domain and the administrative domain is essential. "System learning" is fed by regular critical reflection on the Delta Programme methods to connect the knowledge domain with the administrative domain. It is checked whether the current methods and institutional setting are still adequate for this connection and the substantive underpinning of the decision-making process. The method reviews are based on six-year intervals, as are the substantive reviews.

The issues addressed in the method reviews are mapped out in consultation with the programme offices of the Delta Programme themes and regions, and with the research institutes involved in the Delta Programme.

¹⁴ The four administrative questions are: 1) Are we on schedule: are we implementing the measures as scheduled ("output"); 2) Are we on track: can we assume that the scheduled measures will enable us to achieve the goals in time ("outcome"); 3) Are we taking account of other interests and ambitions in other policy fields ("integration"); 4) Are we involving the business community, NGOs, and residents in our efforts ("participation").

This method is described in more detail in Background Document F to Delta Programme 2017, "Monitoring, Analysing, Acting. initial elaboration".

Some examples of issues that have come to the fore in the preparation for Delta Programme 2021:

- How can we keep sight of and a grip on developments that reduce or add to the Delta Programme taskings?
- Which indicators can be used to map out changes in the capacity to anticipate (in an administrative, institutional, substantive sense) expected developments, and to respond to unexpected developments?
- What are the options for mapping out, with a limited number of administratively relevant criteria, the extent to which the measures scheduled under the Delta Plans on Freshwater Supply and Spatial Adaptation contribute to achieving the goals for 2050 ("By 2050, the Netherlands must be resilient against freshwater shortages" and "By 2050, the Netherlands must be climate-proof and waterresilient", respectively)?
- The adaptation paths in Delta Programme 2015 show the moments of choice for flood risk management and freshwater supply under different circumstances. What are the options for expanding these largely sectoral adaptation paths to include developments in other domains, such as the shipping sector, and to include the management, maintenance, and replacement of hydraulic structures?

Background Document C (in Dutch) outlines how the first review of Delta Decisions and Strategies has been conducted, and how it relates to the method review that will be launched upon the endorsement of DP2021.

Three types of learning

Technicosubstantive learning Continuous

Gathering knowledge (Knowledge Network, National Water and Climate Knowledge and Innovation Programme) and sharing experience (Strategy and Implementation CoP, Consultation Programme) to expand knowledge basis to underpin choices in elaboration and implementation of Delta Decisions and Preferential Strategies.

Strategic learning Every 6 years if possible, annually if need be

Discussion of progress in elaboration and implementation of Delta Decisions, Preferential Strategies, Delta Plans ("blue line") in the light of new developments ("green line") with a view to fine-tuning Preferential Strategies and Delta Plans if necessary.

System learning Every 6 years

Reflection on approach of past years and institutional setting in knowledge domain (timely availability of knowledge) and politico-administrative domain (timely decision-making) to **expand learning capacity**.

Interconnectivity



Figure 2 Three types of learning in the Delta Programme



In our low-lying country, flood protection is of vital importance. On account of climate change and the rising sea level, we will be faced with extremely high water levels more frequently. The essence of the Delta Decision on Flood Risk Management is that by no later than 2050, the probability of fatality due to flooding will be reduced to 1 in 100,000 per annum (10-5 or 0.001 per cent) for every resident living behind the dykes.

3.1 Proposed amendments to the Delta Decision on Flood Risk Management and Decision on Sand

Components anchored in law and policy

The following components of the Delta Decision on Flood Risk Management, set out in DP2015, have by now been anchored in law or policy, and remain in full force:

- Protection levels are determined on the basis of the flood probability approach;
- Every resident of the Netherlands living behind a primary dyke or dam will have a minimum protection level of 10-5 (probability of fatality due to flooding not exceeding 1:100,000 per annum), whilst more protection will be provided at locations prone to:
 - large groups of casualties and/or
 - major economic damage and/or
 - serious damage due to failure of vital and vulnerable infrastructure of national significance;
- This protection level has been translated into standards and expressed in a specific probability of flooding for each dyke stretch;
- The aim is for all the primary flood defences to meet the standards by 2050;
- Every twelve years, the Senate and the House of Representatives are informed about the efficiency and the effects of the new flood risk management policy. In the context of this report, the standards are reviewed every twelve years to examine whether substantial changes in the underlying assumptions dictate amendment;
- Prevention is key in attaining the protection levels: through dykes, dunes, sand replenishments in the coastal foundations, storm surge barriers, or river-widening measures:
- In specific situations, where dyke improvement would be extremely costly or encroach deeply on society, the required protection level may be attained through "smart combinations" with spatial planning and/or disaster management (multi-layer flood risk management);
- Such a "smart combination" requires approval from the Minister, as the protection level is achieved through a combination of measures rather than exclusively through prevention;
- In each "smart combination", tailormade agreements

must be made regarding tasks, responsibilities, and funding; in terms of funding, the point of departure is that the resources made available must be comparable to the savings generated in the Flood Protection Programme budget, because of the reduced number of measures qualifying for grants from said budget.

Delta Decision on Flood Risk Management

The Delta Programme Commissioner proposes the following amendments to the Delta Decision on Flood Risk Management:

- By no later than 2050, every resident of the Netherlands living behind a primary dyke or dam must have a minimum protection level of 10-5 (probability of fatality due to flooding not exceeding 1:100,000 per annum);
- The aim is for all the primary flood defences to meet the standards by 2050;
- The measures set out in the Delta Plan on Flood Risk Management will be scheduled in consultation with the authorities concerned and prioritised on the basis of the flood risk involved;
- Wherever possible, the flood risk management measures will be implemented in an integrated manner, taking account of area developments, whereby timely addressing of the flood risk will always be a precondition.

Flood risk management

The Netherlands is prone to flooding. Without flood defences, sixty per cent of our country would be inundated on a regular basis. This area accommodates approx. nine million people, whilst approx. seventy per cent of our Gross National Product is earned here. In recent years, the Netherlands has switched to a flood probability approach in its flood risk management policy. This enables more targeted investment in flood protection, e.g., at locations featuring vulnerable dyke stretches or where flooding would have a major impact. In 2017, the proposal for new standards as set out in Delta Programme 2015 was incorporated

into the Water Act. Under the Environment Act, the standards are incorporated into the Environmental Quality Decree, in the form of environmental values.

Decision on Sand

The Delta Programme Commissioner proposes the following amendments to the Decision on Sand:

- "Flexible where possible, solid where needed" remains the point of departure in keeping flood protection up to par, through sand replenishments in the coastal foundations;
- The sand budget of the sandy system must remain up to par, and the coastal foundations must sustainably keep pace with the rise in sea level by expanding sand replenishment volumes if need be. Sand replenishments

- bolster the preservation of the coastline, and foster local and regional goals regarding an economically strong and attractive coast, on the basis of the funding principle from the National Framework for the Coast;
- The follow-up to Coastal Genesis 2.0 (additional monitoring, research, and pilot projects) will be carried out under the Sea Level Rise Knowledge Programme. The aim is to enable more efficient anticipation of future developments that affect the sandy system, and to enhance the effectiveness and cost-efficiency of replenishment (learning by doing). The second review will provide clarity regarding the need for adjusting the scope of sand replenishments. As yet, the current volume of 12 million m³ per annum is sufficient.

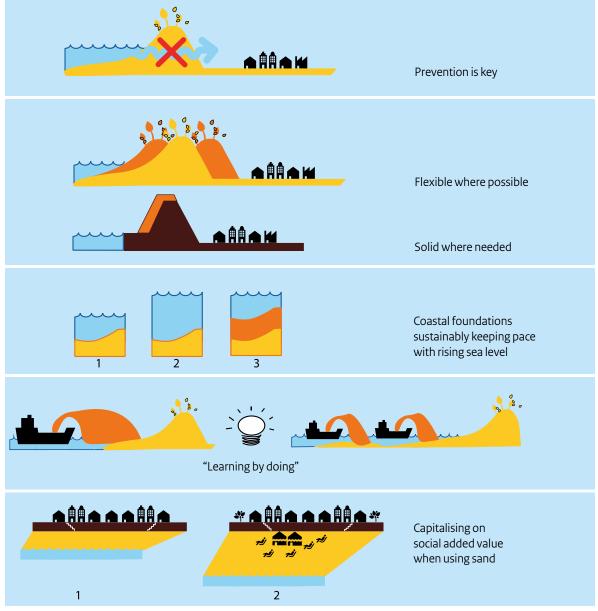


Figure 3 Decision on Sand

3.2 Explanatory notes to the review

The review has shown that the Delta Decision on Flood Risk Management has been anchored in legislation, regulations, and policy. Amendment of the Delta Decision is currently not necessary. Climate change and the socio-economic developments that are taking place according to the latest insights fall within the bandwidth of the developments underpinning the statutory standards. Nonetheless, attaining the goal for 2050 is a major challenge. There is every reason to continue the flood risk management commitments.

On the recommendation of the Delta Programme Signal Group, a study has been conducted to analyse whether a housing tasking involving 1 million houses up to 2040 will affect the standards for primary flood defences. ¹⁶ The sensitivity analysis shows that the planned increase in the number of houses falls within the bandwidth of the socio-economic growth scenarios that underpin the current standards. Ergo, the housing tasking does not dictate amendment of the standards for flood defence systems. In the realisation of the required housing projects, however, additional attention to flood impact reduction is required when selecting locations, designing new residential

locations, and planning crisis control (see Chapter 1).

The first evaluation of the standards in 2024 will reveal whether the standards need to be amended on account of substantial changes in the underlying assumptions regarding the definition of the standards, and on account of the results of the first National Round of Assessments.

The strategic Decision on Sand remains in force. Sand replenishment, as the basis for management and maintenance, continues to be necessary to keep coastal safety up to par. After 2050, replenishment volumes may increase, depending on the pace at which the sea level will be rising. According to the analyses conducted on behalf of the review, expectations are that in the six years ahead, no new (sandy) coastal improvements will be needed. To combat structural erosion, Rijkswaterstaat carries out annual sand replenishments along the entire sandy coast of the Netherlands (Coastline Maintenance Programme). The Ciara storm in February 2020 prompted accelerated sand replenishment at the Dishoek location on the island of Walcheren, in order to safeguard its flood protection for the 2020-2021 storm season. The design of new improvement projects already factors in a potential sea level rise of 1 metre by 2100.

3.3 Looking back: the milestones of the past six years

These are some of the milestones achieved with the implementation of the Delta Decision on Flood Risk Management and the Decision on Sand over the past six years:

- 1. In 2017, the new flood protection standards for primary flood defences were anchored in the Water Act. The new standards enable more cost-effective flood risk management investment: if all the flood defence systems meet the standards by 2050, the flood-related group risk¹7 will be approx. 45 times lower vis-à-vis 2015, whilst the economic risk will be approx. 20 times lower;¹8
- 2. The first National Round of Assessments of primary flood defences based on the new standards commenced in 2017, employing the new set of assessment tools. The progress is reflected on the Flood Risk Management portal. By now, 25 per cent¹⁹ of the primary flood defence

at once.

- system kilometres have been assessed.
- The Flood Protection Programme has gained momentum. Many dyke improvements scheduled under the programme have been rolled out in recent years and are entering the implementation phase (see Paragraph 3.5.1);
- 4. Over recent years, the General Explorations (GEs) scheduled under the Flood Protection Programme have generated a great deal of new know-how for the assessment of flood defences and the design of dyke improvements (cf. Delta Plan on Flood Risk Management). Examples include the General Explorations on Piping, Macro-stability, and Forelands;
- 5. Since the end of 2019, all data collected under Coastal Genesis 2.0 is public and available for download via waterinfo-extra.rws.nl. This provides scientists from all over the world with a wide range of marine data that can lead to new insights and innovations;

¹⁶ Based on recent Statistics Netherlands figures, the prognosis is that by 2035, 1.1 million additional houses will be needed. Expectations are that this growth still falls within the scenarios underpinning the standards. This will be verified in the period ahead.

⁷⁷ Group risk is the annual probability of a large number of fatalities all

¹⁸ Source: Delta Programme 2015, Paragraph 2.2.

¹⁹ State of affairs on 1 July 2020.

- 6. In addition to adequate flood protection, the Delta Programme also focuses on curbing damage and casualties during a flood. Although the probability of flooding is very slim, its impact is huge. Such an impact can be contained by making smart spatial planning choices and by disaster control. The Working Group on Flood Impact Reduction produced an advisory report on the matter in 2018 (DP2020). Flood impact reduction must be incorporated into new spatial developments, restructuring projects, management and maintenance, (business) investments, and the formulation of contingency plans. Flood impact reduction through spatial planning is addressed in the Delta Plan on Spatial Adaptation (see Paragraph 5.5);
- 7. In its strategic agenda for 2016-2020, the Steering
 Group on Water Crises and Flooding Management has implemented improvements in disaster management during water crises. In 2016, the Large-Scale Flooding Evacuation Module was published, comprising the app and the overstroomik.nl website. That same year saw the launch of the National Water and Flooding Information Centre, which provides up-to-date flooding information to all the managing authorities of water bodies, road networks, and vital and vulnerable functions. The Water & Evacuation project (2015-2017) has given impetus to the formulation of more specific flood contingency plans.

3.4 Agenda for the six years ahead

Projects, activities, and milestones

The next six years will see the roll-out of projects and activities aimed at substantiating the Delta Decision on Flood Risk Management and the Decision on Sand.

Some noteworthy milestones:

By no later than 31 December 2023, the Minister of Infrastructure and Water Management will report to the Senate and the House of Representatives on the condition of the primary flood defences, on the basis of the first National Round of Assessments.

By 2023, the new set of assessment tools for the second National Round of Assessments will be completed. This round will commence in 2023 and is scheduled to be completed by 2034.

By no later than 31 December 2024, the minister of Infrastructure and Water Management will report to the Senate and the House of Representatives on the efficiency and the effects of the new flood risk management policy, as stipulated in the Water Act.

In the years ahead, the Sea Level Rise Knowledge Programme will produce information on the future need for sand deposits and on effective, efficient, and sustainable coastline maintenance.

The ambition is to complete an average of 50 kilometres of dyke improvements per annum in the period up to 2050, in order to achieve the target of having all the primary flood defences meet the standards by 2050. Until 2024, the realisation of dyke improvements will not come up to this average, because many projects are still in the preparatory stage. After 2024, the improvements are expected to cover more than 50 kilometres annually.

In the years ahead, the Security Regions and their partners will be completing the impact analyses and action perspectives relating to (imminent) flooding and serious waterlogging. Under the WAVE2020 (2023) programme, the results will be translated into a national plan. Furthermore, guidelines will be published regarding such topics as "saving people" and "recovery following flooding". In 2021, the Steering Group on Water Crises and Flooding Management will draw up a new joint vision on water crisis management, featuring a perspective for 2030.

A full overview of the projects and activities scheduled for the next six years is provided in the Delta Plan on Flood Risk Management (see Paragraph 3.5). The initiators of the projects and activities are capitalising on as many opportunities as possible in the pursuit of future-proof water systems, by tackling the three Delta Programme taskings in an interconnected manner and, wherever possible, by tying in with other area developments in the physical domain, such as climate mitigation, the circular economy, and other transitions.

Expertise and research

The knowledge issues pertaining to flood risk management are set out in the Delta Programme Knowledge Agenda (see Background Document E (in Dutch)). Key knowledge issues concern the rising sea level. The final results of the Sea Level Rise Knowledge Programme will be available by 2026. The studies involve the pace at which the sea level will be rising from the second half of this century onwards. The studies will also map out the tenability of the current flood risk management strategies, and the alternatives to keep the Netherlands safe and liveable in the distant future.

Flood risk management policy in the Netherlands is largely based on (scientific) knowledge and data. This leaves the Ministry of Infrastructure and Water Management with the responsibility to continue to develop such knowledge. The Flood Risk Management Knowledge Agenda can be regarded as a multi-year planning framework for the required knowledge development. The knowledge themes – system, technology, and the environment – are addressed in an interconnected manner. The Flood Risk Management Knowledge Agenda constitutes the basis for the (multi-year) planning of knowledge development within the Ministry, and for setting down agreements regarding collaboration with partners. Knowledge issues that are relevant to the Delta Programme also feature in the Delta Programme Knowledge Agenda.

The Ministry of Infrastructure and Water Management continues to improve the tools for the assessment and design of primary flood defences on the basis of new insights into the hydraulic load on and the strength of dykes and dams, in collaboration with the flood defence system managing authorities.

The Delta Plan on Flood Risk Management contains an overview of the General Explorations that will be completed in the years ahead (see Table 7 in Paragraph 3.5). The knowledge and research investments relating to the Flood Protection Programme are outlined in the Knowledge and Innovation Agenda (see 3.5.1).

By the end of 2020, the Coastal Genesis 2.0 research programme will submit policy recommendations regarding the sand replenishment strategy. The recommendations will address the current and future sand requirements, the optimum moment and the optimum replenishment method for the sustainable management and maintenance of the coast, and the required additional studies to further optimise the replenishment strategy (cf. Paragraph 6.6.4, Coast).

The Steering Group on Water Crises and Flooding Management is expanding layer 3 (disaster control) expertise by promoting knowledge exchange between the organisations involved and by conducting pilot projects. The crisis partners are sharing their expertise in the Netherlands Water Management Centre. Experience from abroad (UK, US) is gathered through an exchange programme. The choices regarding the standards for primary flood defences are underpinned by assumptions regarding the evacuation fractions: the percentage of the population able to timely reach a safe location in the event of imminent flooding. The Steering Group on Water Crises and Flooding Management will examine the percentages envisaged in the evacuation strategies that the Security Regions have selected for the various regions. The study will initially focus on the area around the major rivers, as this is where the evacuation fractions have the largest impact on the standards.

3.5 Delta Plan on Flood Risk Management

The Delta Plan on Flood Risk Management comprises all the Delta Programme studies, measures and provisions, scheduled or to be scheduled, pertaining to flood risk management. The measures are funded from the Delta Fund; the district water boards bear 50 per cent of the costs of dyke improvements implemented under the Flood Protection Programme. In some cases, projects are co-funded by regional parties; a few are funded from the Ministry of Infrastructure and Water Management budget. Where appropriate, the Delta Plan on Flood Risk Management also features regional measures not subsidised by the central government

Every year, the Delta Programme Commissioner submits a proposal for the Delta Programme, which includes three Delta Plans. The Delta Plans comprise studies, measures, and provisions in the fields of flood risk management, spatial adaptation, and freshwater supply in the Netherlands. The proposal contains a detailed schedule for the first six years and an indicative schedule for the subsequent six years. It looks ahead to 2050 (in accordance with Art. 4.9 paragraph 5 of the Water Act). Chapter 7 provides an overview of the Delta Fund resources available for the implementation of the measures, provisions, and studies.

The Delta Plan on Flood Risk Management, as outlined below, features diagrams and tables reflecting the progress, scheduling, planning, and phasing of the flood risk management projects. Sand replenishments along the coast fall under management and maintenance; consequently, they do not feature in the Delta Plan on Flood Risk Management. The scheduled replenishment projects are listed in the Coastline Maintenance Implementation Programme.

3.5.1 Implementation programmes Flood Protection Programme

Evolving programme

The Flood Protection Programme is an ongoing programme; the measures are scheduled for a period of six years, with a tentative schedule for the following six years. The programme is aimed at having all primary flood defence systems meet the new standards by 2050. This will ensure a minimum protection level of 1 in 100,000 (10-5 or 0.001%) per annum for every resident of the Netherlands living behind a primary dyke or dam by no later than 2050. The Flood Protection Programme is drawn up collectively by the implementation alliance of the district water boards and Rijkswaterstaat. Dyke improvements are carried out by the managing authorities of the dyke sections concerned, to which end the district water boards receive a grant from the Flood Protection Programme covering 90% of the cost, based on an efficient, plain and simple design. Rijkswaterstaat projects are financed entirely from the Delta Fund. Every year, the alliance will propose a new schedule, that builds on the preceding year's schedule (evolving programme). The Minister of Infrastructure and Water Management endorses the schedule once a year within the context of the Delta Plan on Flood Risk Management.

The Flood Protection Programme is gaining momentum. Many of its dyke improvements have been rolled out in recent years; following completion of the exploration phase, they are entering the plan elaboration or realisation phases. The first round of assessments of primary flood defences based on the new standards will run until 2023. In the years ahead, its results will generate an increasingly better picture of scope of the entire programme until 2050. Dyke improvements impact the environment. That is why stakeholders and local residents are being involved in planning and decision-making processes at the earliest possible stage. Local and regional governments play a formal role in this respect, on account of their responsibility for local spatial planning (municipalities) and the environment, regional area developments, and nature (provinces). Water Act Project Plans for dyke improvements are drawn up by the district water boards. The Project Plans require approval from the Provincial Executive.

In addition, it is incumbent upon the municipalities and provinces to capitalise on opportunities for linkage with other taskings and ambitions in an area. To this end, DP2015 stipulates that the district water boards will present the draft Flood Protection Programme schedule to the Delta Programme regional consultation committees during their

annual meetings. This enables the consultative bodies to identify linkage opportunities, and review whether the longer run will open up opportunities for combined solutions. With effect from 2019, the draft schedule proposal and the final schedule proposal are produced earlier in the year. This affords the regional consultative bodies more time to identify such opportunities. Actual practice sees continuous administrative coordination regarding the dyke improvement projects and the associated spatial developments. Ergo, linkage opportunities are identified throughout the year. Model dyke improvement projects in which cultural history plays a part include Strong Lek Dykes (Amerongen-Wijk bij Duurstede), Dyke with Foreland (Wadden Sea Dykes General Exploration), and the restoration of the Hornwork near Rhenen to its original height, within the framework of the Grebbe Dyke improvement (co-funded by the Heritage Deal and the province of Utrecht).

New projects in the programme

New projects will only be incorporated into the Flood Protection Programme if the assessment shows that the dyke stretch in question does not meet the indication standard on the reference date.20 The schedule for 2021-2026 features new projects ensuing from the first (partial) assessment of flood defences21. These projects will be given priority, which is why they have been accommodated in the programme amidst the projects scheduled earlier. The schedule features a mix of dyke improvements ensuing from the previous round of assessments based on the old standards (the extended third round of assessments; most of the resultant measures are being implemented) and increasingly more dyke improvements ensuing from the first round of assessments under the new standards. All the dyke improvements are dimensioned in accordance with the new standards.

River widening projects resulting in lower dyke improvement costs qualify for a so-called exchange grant from the Flood Protection Programme (the dyke improvement costs that have been avoided). Such projects resolve a proportion of the flood risk management tasking. In addition, in almost all cases, dyke improvements are needed nonetheless. The exchange grants for the river widening projects have been incorporated into the planning since Delta Programme 2020. Table 4 lists the projects receiving an exchange grant. Some river widening projects anticipate the official rejection of the dykes whose improvement tasking is reduced by the river widening

²⁰ The flood protection standard features an indication value (value indicating an imminent improvement tasking) and a lower limit (minimum value to be met by a primary dyke or dam).

²¹ Dyke stretches that fail to meet the indication value in the year of assessment can be accommodated in the Flood Protection Programme.

measures. In such cases, the current temporary scheme does not cover an exchange grant from the Flood Protection Programme for the dyke stretches in question. The temporary scheme will be evaluated and adjusted in 2023.

Dyke improvement in kilometres per annum

By 2050, all flood defence systems must meet the flood protection standards. Out of the established flood risk management tasking of 1,274 dyke kilometres and 470 engineering structures, the Flood Protection Programme has scheduled the improvement of 698 dyke kilometres and 171 engineering structures for the period 2021-2032. In the years ahead, the schedule will be supplemented on the basis of newly completed assessments.

The majority of the Flood Protection Programme projects are still in the exploration and plan elaboration stages. Consequently, their scope and scheduling have not fully crystallised. In the years ahead, increasingly more projects will be entering the realisation stage. The goal of the Flood Protection Programme is to grow towards an average realisation volume of 50 kilometres of "safe dykes" per annum. The programme will run until 2050; the ambition is to have attained the goal of "all primary flood defences in the Netherlands meeting the (new) protection standards" by that year, as stipulated by the Water Act.

Figure 4 contains a forecast for the completion of dyke improvements. This shows that from 2020 up to and including 2024, an average of approx. 40 per cent of the annually required 50 kilometres will be completed. After 2024, the target of an average of 50 kilometres is expected

to be exceeded, which will compensate for the lower completion rate of the years before.

The current nitrogen emission issue is impacting the Flood Protection Programme. Approx. ten projects that are nearing their implementation stage are at risk of delay. There is no clarity as regards to which measures and solutions are appropriate. Consequently, it is uncertain whether the permits for these projects will be issued in time and whether they will continue to hold good. This lack of clarity may also affect projects in the exploration stage. As yet, the effects of the PFAS regulations are less problematic.

The Flood Protection Programme has developed a new monitoring instrument for forecasts of completed improvements to engineering structures. The instrument was first used in 2020. The monitoring results will be available with effect from Delta Programme 2022.

Flood Protection Programme schedule

The Flood Protection Programme schedule for the period 2021-2026 is reflected in Tables 1 up to and including 6.

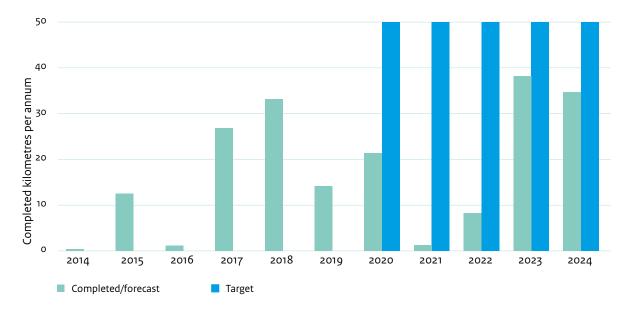


Figure 4 Forecast of completion of dyke improvements under the Flood Protection Programme in kilometres. State of affairs on 31 December 2019.



 $\textbf{Figure 5} \ \ \textbf{Dyke improvements scheduled under the Flood Protection Programme; source:} \\ \underline{\textbf{Landelijk veiligheidsbeeld/versterking}} \\ \star \\ \underline{\textbf{Monthly Flood Protection Programme}} \\ \textbf{Monthly Flood Protection Programme} \\ \textbf{Monthly Flood Protection Programme} \\ \underline{\textbf{Monthly Flood Protection Programme}} \\ \textbf{Monthly Flood Protection Programme} \\ \textbf{Monthly Flood Protection Protection Protection Programme} \\ \textbf{Monthly Flood Protection Protecti$

^{*} In 2021, the 2021-2026 programme will be available for consultation on the Flood Risk Management Portal; cf. picture of national security.

Table 1 Schedule of Flood Protection Programme measures, 2021-2026/2032

| | Programme hudget series | | | 441 | | | 2026 | 2021 | 2020 | 2023 | 2000 | 2031 | |
|-------------------|--|-----|-----|-----|-----|-----|------|------|------|------|------|------|--|
| 2020-2033 | Programme budget series | 358 | 458 | 441 | 493 | 556 | 448 | | | | | | |
| Project number | Project name | | | | | | | | | | | | |
| 030 | Den Oever-Den Helder DODH | | | | | | | | | | | | |
| 031 | North Sea Canal (D31-D37) | | | | | | | | | | | | |
| 03E | Wieringermeer Category C dyke | | | | | | | | | | | | |
| 03F | Engineering structures strategy | | | | | | | | | | | | |
| 02B | Gouda Waaier lock | | | | | | | | | | | | |
| 2F | Culemborgse Veer-Beatrix Lock (CUB) | | | | | | | | | | | | |
| 21 | Irene Locks-Culemborgs Veer | | | | | | | | | | | | |
| 2D | Wijk bij Duurstede Amerongen (WAM) | | | | | | | | | | | | |
| 2E | Salmsteke | | | | | | | | | | | | |
| 2G | Salmsteke Schoonhoven (SAS) | | | | | | | | | | | | |
| 2H/2J | Vreeswijk (formerly Klaphek)-Jaarsveld | | | | | | | | | | | | |
| 02C | Improvement of former HDSR C dyke (GHIJ) | | | | | | | | | | | | |
| 05E | Gouda IJssel dyke (VIJG) track 2 | | | | | | | | | | | | |
| 05C | Gouda IJssel dyke track 3 (phase 2) | | | | | | | | | | | | |
| 05G | Gouda IJssel dyke (VIJG) track 4 (GHIJ) | | | | | | | | | | | | |
| 05F | Spaarndammer dyke engineering structures | | П | | | | | | | | | | |
| 06K | Krimpenerwaard Strong IJssel Dykes (KIJK) | | | | | | | | | | | | |
| 13D | Ravenstein-Lith | | | | | | | | | | | | |
| 13K | Cuijk-Ravenstein | | | | | | | | | | | | |
| 13H | Boxmeer-Cuijk (section) | | | | | | | | | | | | |
| 14E | 34-2 Moerdijk | | | | | | | | | | | | |
| 34U | Zwolle-Olst | | | | | | | | | | | | |
| 34R | Zwolle guard lock | | | | | | | | | | | | |
| 34M | Zwolle urban dykes | | | | | | | | | | | | |
| 150 | Vecht-North | | | | | | | | | | | | |
| 34AL,AM | Vecht Zwartewaterland | | | | | | | | | | | | |
| 34AR,AS | Vecht-East | | | | | | | | | | | | |
| 34AK | Vecht-Stenendijk Hasselt | | | | | | | , | | | | | |
| 340 | Mastenbroek IJssel | | | | | | | | | | | | |
| | Mastenbroek Dissel Mastenbroek Zwarte Water | | | | | | | | | | | | |
| 34Q | | | | | | | - | - | | | | | |
| 34L | Genemuiden-Hasselt | | | | | | | | | | | | |
| 34P | Mastenbroek Zwarte Meer | | | | | | | | | | | | |
| 15P | Vecht Dalfsen Zwolle | | | | | | | | | | | | |
| 34AN | Vecht-South | | | | | | | | | | | | |
| 28E | Zurich-Koehool | | | | | | | | | | | | |
| 28F/28G | Koehool-Lauwersmeer | | | | | | | | | | | | |
| 280 | Lauwersmeer dyke | | | | | | | | | | | | |
| | Linde dyke (formerly category C dyke) | | | | | | | | | | | | |
| 16M | Geervliet-Hekelingen 20-3 | | | | | | | | | | | | |

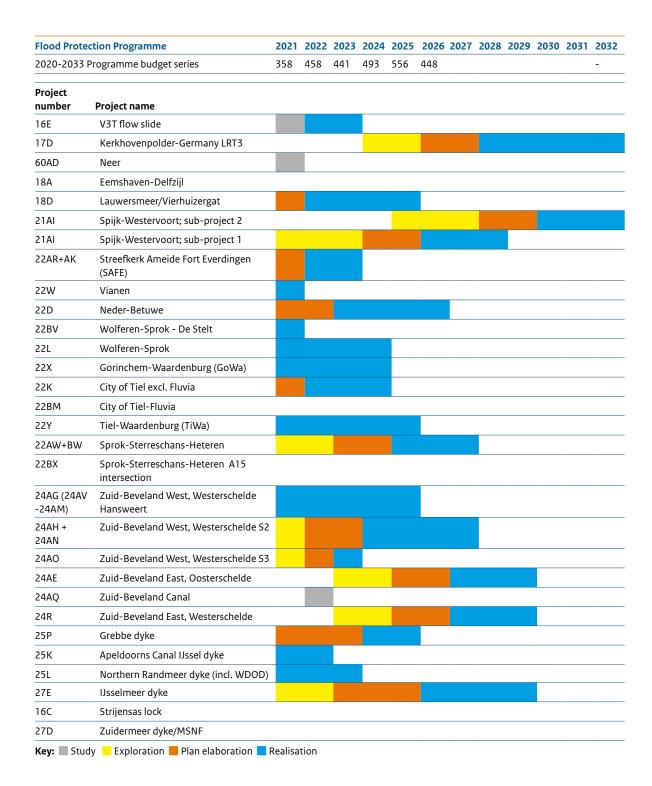
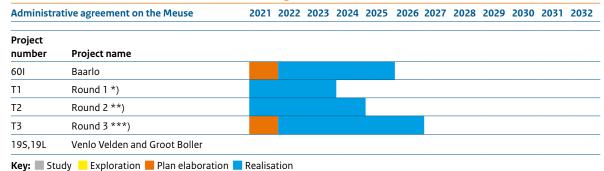


Table 2 Measures set out in the Administrative Agreement on the Meuse



The acceleration in the projects being conducted under the Administrative Agreement on the Meuse revolves around the combined completion of the exploration, plan elaboration, and realisation phases of the dyke improvements. With the exception of the dyke improvements scheduled for Blerick, near the old foundry (19C) and Steyl-Maashoek (19D), the dyke improvements are now being elaborated in a single comprehensive exploration. Separate timeframes and cost estimates will be drawn up for the realisation of each of the projects.

- *The first round involves the following dyke sections: 60J Nieuw Bergen, 60M Belfeld, 60L Beesel, and 60E Heel. The realisation phase will be divided across 2020 and 2021.
- **The second round involves the following dyke sections: 60T Alexanderhaven (the budget for stretches 23A and B of this section has been allocated in full), 60B Steyl-Maashoek, and 60K Buggenum (the amount for Alexanderhaven plan elaboration covers the exploration and plan elaboration).
- ***The third round involves the following dyke sections: 60G Well, 60F Arcen, and 60D Thorn. Part of the realisation phase will be settled after completion, as the budget for 2021-2023 is insufficient. Payment has now been scheduled for the years after 2024. The central government and the region still need to set down agreements regarding the commencement of the Venlo Velden exploration.

Table 3 Pre-financing

| Pre-financ | ing | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|-------------------|--|--------|-------|------|------|------|------|------|------|------|------|------|------|
| Project number | Project name | | | | | | | | | | | | |
| 03R | Gouwzee & Buiten IJ | | | | | | | | | | | | |
| 03Y | Durgerdam dyke connection | | | | | | | | | | | | |
| 035 | Markermeer dyke connection | | | | | | | | | | | | |
| 04A | Spuihaven Schiedam | | | | | | | | | | | | |
| 06H | Stolwijk lock | | | | | | | | | | | | |
| 13H | Sasse pumping station | | | | | | | | | | | | |
| 131 | Cuijk Meuse boulevard | | | | | | | | | | | | |
| 14A | Geertruidenberg/ Amertak | | | | | | | | | | | | |
| 14D | Willemstad-Noordschans | | | | | | | | | | | | |
| 17D | Kerkhovenpolder-Germany-LRT3 | | | | | | | | | | | | |
| 60AE | Lob van Gennep | | | | | | | | | | | | |
| 21A | Arnhem Rhine Quay | | | | | | | | | | | | |
| 21F | Twente Canal-regular part-LBO1 | | | | | | | | | | | | |
| 211 | IJssel pavilion | | | | | | | | | | | | |
| 21AK | RIDS IJssel Quay Phase 1 | | | | | | | | | | | | |
| 21F | Twente Canal-regular part-LRT3 | | | | | | | | | | | | |
| 21E | Grutbroek industrial estate | | | | | | | | | | | | |
| 27C | Noordoostpolder engineering structures | | | | | | | | | | | | |
| 24AK | Sint Annaland | | | | | | | | | | | | |
| 24AJ,24AR | Kop van Ossenisse | | | | | | | | | | | | |
| Kev: Stu | ıdy Exploration Plan elaboration | Realis | ation | | | | | | | | | | |

Table 4 River widening-dyke improvement exchange grants

Projectnaam

MIRT Oeffelt (Boxmeer-Cuijk dyke improvement) €

MIRT Oeffelt (dyke improvement round 3) €

MIRT Meandering Meuse (Boxmeer-Cuijk dyke improvement)

€

River widening-dyke improvement exchange grants 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032

improvement)

MIRT Meandering Meuse (Cuijk-Ravenstein dyke improvement)

MIRT Meandering Meuse (Ravenstein-Lith dyke improvement)

MIRT Meandering Meuse (dyke improvement round 3) €

MIRT Lob van Gennep

€

Meuse Bank Park MIRT Study €

MIRT IJsselpoort

Table 5: Rijkswaterstaat

This Table presents the improvement measures for flood defences managed by Rijkswaterstaat.

| Improvement measures for flood defences | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|--|---------|------|------|------|------|------|------|------|------|------|------|------|
| Project name | | | | | | | | | | | | |
| National Flood Protection Programme projects | | | | | | | | | | | | |
| Hollandse IJssel storm surge barrier (gate) | | | | | | | | | | | | |
| IJmuiden Dyke | | | | | | | | | | | | |
| IJmuiden engineering structures | | | | | | | | | | | | |
| Vlieland | | | | | | | | | | | | |
| Drongelen Canal (P52) | | | | | | | | | | | | |
| Bosscherveld lock | | | | | | | | | | | | |
| Marken Flood Protection Programme | | | | | | | | | | | | |
| Key: Study Exploration Plan elaboration | Realisa | tion | | | | | | | | | | |

Tentative schedule

In addition to proposing a schedule the Flood Protection Programme also draws up a tentative schedule (see Table 6). This is the working stock of projects that have been submitted but have not been scheduled. These projects may be incorporated in the schedule provided they meet the subsidy requirements and provided there is room in the schedule. Projects listed in the tentative schedule do not have a status yet.

This procedure provides stakeholders with early information on dyke improvements, enabling them to contact the water management bodies at an early stage to discuss an integrated approach. In many cases, an integrated approach takes time, whilst also opening up options to capitalise on opportunities for (co-)funding.

€

Table 6 Tentative schedule of dyke improvements

| Tentative s | -hadula | | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2020 | 2030 | 2031 | 2032 |
|---------------|--|------|------|------|------|------|------|------|------|------|------|------|------|
| Terreactive S | inedule | 2021 | 2022 | 2023 | 2024 | 2023 | 2020 | 2021 | 2028 | 2029 | 2030 | 2031 | 2032 |
| Project | | | | | | | | | | | | | |
| number | Project name | | | | | | | | | | | | |
| 03J | Texel | | | | | | | | | | | | |
| 03Z | Nieuwe Diep (Den Helder) | | | | | | | | | | | | |
| 03L | Den Helder Sea Wall | | | | | | | | | | | | |
| 030 | WAB dyke connections | | | | | | | | | | | | |
| 03P | Markermeer dyke section (D18) | | | | | | | | | | | | |
| 03Q | Markermeer dyke section (D22) Schardam | | | | | | | | | | | | |
| 03G | Markermeer engineering structures (D18-D22) | | | | | | | | | | | - | |
| 03H | Markermeer engineering structures (D27) | | | | | | | | | | | | |
| 03W | Markermeer engineering structures (Dam lock D27K3) | | | | | | | | | | | | |
| 03X | Markermeer engineering structures (Poelsluis pumping station D27K6) | | | | | | | | | | | | |
| 03D | Vier Noorderkoggen engineering structures, eastern dyke | | | | | | | | | | | | |
| 03A | Texel engineering structures | | | | | | | | | | | | |
| 06D | Capelle-Zuidplas | | | | | | | | | | | | |
| | Section 14-2 | | | | | | | | | | | | |
| 06F | Residual tasking Hollandse IJssel | | | | | | | | | | | | |
| 135 | Den Bosch-Heusden | | | | | | | | | | | | |
| 13P | Lith-'s-Hertogenbosch | | | | | | | | | | | | |
| | 36.0 dyke connection to highland | | | | | | | | | | | | |
| | Section 36 a Keent | | | | | | | | | | | | |
| 34N+34AC | Deventer | | | | | | | | | | | | |
| 34K+34Z | Around Kampen | | | | | | | | | | | | |
| | Schiemonnikoog dyke | | | | | | | | | | | | |
| | Lemmer-Stavoren dyke | | | | | | | | | | | | |
| | Terschelling dyke | | | | | | | | | | | | |
| | Stavoren-IJsselmeer Closure Dam dyke | | | | | | | | | | | | |
| | Schiermonnikoog dunes | | | | | | | | | | | | |
| | Wadden Sea and IJsselmeer engineering structures (3rd round of assessments) | | | | | | | | | | | | |
| 17E | Kerkhovenpolder-Germany-LBO1 | | | | | | | | | | | | |
| 17B | Chemical park-Punt van Reide | | | | | | | | | | | | |
| 17A | Delfzijl-Chemical park | | | | | | | | | | | | |
| 17C | Punt van Reide-Kerkhovenpolder | | | | | | | | | | | | |
| | Gennep | | | | | | | | | | | | |
| | Afferden up to and including Neer | | | | | | | | | | | | |
| | Venlo | | | | | | | | | | | | |
| 60AF | Venlo 't Bat | | | | | | | | | | | | |
| | Blerick (excl. Groot Boller) | | | | | | | | | | | | |
| | Roermond | | | | | | | | | | | | |
| | Claus plant up to and including Voulwames | | | | | | | | | | | | |
| | Northern sector (Ohé and Laak-Stevensweert, Aasterberg, Nattehoven-Roosteren) | | | | | | | | | | | | |
| | Meers | | | | | | | | | | | | |
| | | _ | | | | | | | | | | | |

| Tentative | scnedule | 2021 | 2022 | 2023 2 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 203 |
|-------------------|--|------|------|--------|------|------|------|------|------|------|------|------|-----|
| Project number | Project name | | | | | | | | | | | | |
| | Southern Meuse Valley (Maasticht) | | | | | | | | | | | | |
| | Southern Meuse Valley (Itteren and Borgharen) | | | | | | | | | | | | |
| | Southern Meuse Valley (Eisden and Sint Pieter) | | | | | | | | | | | | |
| | Spijk-Westervoort; sub-project 3 | | | | | | | | | | | | |
| | Hackfort channel-Zutphen | | | | | | | | | | | | |
| | Doesburg-Hackfort channel sub-project 1 | | | | | | | | - | | | | |
| | Doesburg-Hackfort channel sub-project 2 | | | | | | | | | | | | |
| | Doesburg-Doetinchem (zz OIJ) | | | | | | | | | | | | |
| | Westervoort-Doesburg | | | | | | | | | | | | |
| | Arnhem-Rheden | | | | | | | | | | | | |
| | Zutphen-Twente Canal lock | | | | | | | | | | | | |
| | Twente Canal lock-Deventer | | | | | | | | | | | | |
| | Ameide-Everdingen | | | | | | | | | | | | |
| | Aplhen-Nifrik | | | | | | | | | | | | |
| | Streefkerk Ameide | | | | | | | | | | | | |
| 2BJ | Everdingen-Ravenswaaij | | | | | | | | | | | | |
| 2BI | Gorichem-Sliedrecht | | | | | | | | | | | | |
| | Hank-Werkendam | | | | | | | | | | | | |
| 22BK | Heerewaarden Closure Dyke | | | | | | | | | | | | |
| LDIK | Heerewaarden Meuse Dyke | | | | | | | | | | | | |
| | Kinderdijk-Streefkerk | | | | | | | | | | | | |
| | Kromme Nol-Hank | | | | | | | | | | | | |
| | Ewijk-Dreumel | - | - | | | | | | | | | | |
| | Millingen aan de Rijn | | | | | | | | | | | | |
| | Ravenswaai-Heteren | | | | | | | | | | | | |
| | Bern Polder | | | | | | | | | | | | |
| | Rossum Wilhelmina lock | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | Werkendam-Wilhelmina lock | | | | | | - | | - | | | | |
| | Alem | | | | | | | | | | | | |
| | Rossum-Weil | | | | | | | | | | | | |
| 2BL | Sliedrecht-Kinderdijk | | | | | | | | | | | | |
| | Nifrik-Molenhoek | | | | | | | | | | | | |
| | Nijmegen-Ewijk | , | | | | | | | | | | | |
| 4AT | Sloehaven up to outer port | | | | | | | | | | | | |
| 4AY | Koopmanshaven Vlissingen | | | | | | | | | | | | |
| | Section 52-2 (new standard) | | | | | | | | | | | | |
| | Section 52-1 (new standard) | | | | | | | | | | | | |
| | Section 11-1 (new standard) | | | | | | | | | | | | |
| | Section 52a-1 (new standard) | | | | | | | | | | | | |
| 27F | IJmeer dyke-Almere Poort | | | | | | | | | | | | |

Knowledge development and innovation vitally important

New knowledge and innovations remain indispensable to attain the programme goals for 2050 in a timely and affordable manner. The flood probability approach opens up opportunities for more efficient and cheaper dyke improvements, but this requires new technologies. For example, innovations are needed to curb the effect of dyke reinforcements for residents and to protect cultural heritage along the dykes. The long lead time of the Flood Protection Programme offers room for devising, exploring, and testing new technologies in projects, and to collect and re-apply knowledge on historic technologies in the area. The Programme fosters this through Communities of Practice, its Knowledge and Innovation Agenda, and Administrative Ambassadors who propagate the importance of innovations.

Knowledge and Innovation Agenda

Right from the start, the Flood Protection Programme has focused ample attention on innovations. Over recent years, the Programme has fostered innovations in several ways, such as through the General Explorations. Alliance partners have collectively evaluated which aspects of dyke improvement are capable of optimisation and which must be preserved. In 2019, this resulted in the new Knowledge and Innovation Agenda (K&I Agenda), utilising the experience gained in the General Explorations.

Output of the General Explorations

Over recent years, the Flood Protection Programme has invested EUR 100 million in knowledge and innovations through the General Explorations. A random selection of results:

- The Eem Dyke Pilot has cut the sheet piling strength and depth requirements by 30 per cent, and reduced the bandwidth regarding distortions;
- Tests with cast-in Norwegian Stone have yielded savings of EUR 25 million for the Eemshaven-Delfzijl dyke improvement project;
- The "current strength" method has shown dykes to be stronger than calculated earlier;
- Product innovations have been furthered within
 the General Explorations by linking them to
 reference projects. For example, the Dyke
 Monitoring and Conditioning system has been
 field-tested in the Piping General Exploration, as
 has Vertical and Sand-tight Geotextile; within the
 Macro-stability General Exploration, field-tests
 have been conducted with technologies such as
 vacuum consolidation, the JLD dyke stabiliser, and
 dyke nailing.

Thus, the General Explorations are fostering the quicker and cheaper implementation of the Flood Protection Programme. More of this type of innovations and optimisations are required to control the substantial increase in the number of Flood Protection Programme implementation projects in terms of time and money.

The K&I Agenda is an evolving agenda, indicating how the Flood Protection Programme will be funding innovations in the next five years, and how the integrated application of innovations will be pursued. The agenda is directive in the prioritisation of innovations, by focusing on three themes: Integrated design and implementation technologies (covering topics such as piping and macro-stability); Project strategies and approaches (seeking optimisation of project approaches²²); and Utilisation of the scope that flood probability standards offer for combining different types of measures to manage flood risks.

For the duration of the Programme, an average sum of EUR 10 million will be available annually to fund innovations targeting these themes. In 2019, the first project was endorsed: Grass on Sand, initiated by the Drents Overijsselse Delta district water board. The locations where the results of this project will be applied have been identified at an early stage.

In the years ahead, the Flood Protection Programme will also be committed to the return of innovations that have already been developed. In the pursuit of the large-scale application of innovations, insights, and optimisations in dyke improvement projects, the Flood Protection Programme has introduced the "apply or explain" programme guideline. Managing authorities are free to decide whether or not to apply a new technology but must provide an explanation if they choose not to.

Initiatives

At least seven new initiatives are scheduled for 2020. One such initiative is the Engineering Structures General Collaboration which will be launched. This will address urgent points of attention for risk containment (planning and funding) in engineering structures improvement projects. Many managing authorities are faced with such issues. Another K&I project is aimed at the introduction, improvement, and standardisation of Systems Engineering (SE) Flood Protection Programme projects. SE is a system that helps to realise complex projects as scheduled and under the available budget.

²² Examples of topics ranging under this theme are: Sustainability; Integrated Processes and the Environment Act; (Innovative) Contract Formation; LCC; Natura 2000; and Building with Nature.

Communities of Practice

Communities are intended to foster collaboration and knowledge exchange between alliance partners. They have been active for several years, and by now their membership totals more than 850. In 2020, efforts were launched to further professionalise some ten communities that make a significant contribution to the realisation of the Flood Protection Programme goals. Each community has its own community manager, who supports the professionalisation process. Overall control of the process is vested with the programme management of the Flood Protection Programme. Several tools are being developed to support the communities. An evaluation scheduled for 2021 will monitor how the efforts and professionalisation of the communities has bolstered the ambitions of the Flood Protection Programme.

Administrative Ambassadors

In early 2020, a group of Administrative Ambassadors has been propagating the importance of successful innovations and promoting their application. ²³ This group will also be giving impetus to new innovations. The Ambassadors — representatives of several district water boards — provide the Flood Protection Programme with solicited and unsolicited advice regarding the progress and substantiation of the K&I Agenda.

Second Flood Protection Programme

The Second Flood Protection Programme mainly comprises projects ensuing from the first assessment (2001) and the second assessment (2007) of the primary flood defences. The last projects under this programme are under way. More information is provided in the 17th progress report²⁴ on the Second Flood Protection Programme.

From the launch of Flood Protection Programme II up to and including 2019, a total of 266 kilometres of dykes have been found to meet the standards. Improvement of the remaining 96 kilometres is still in progress within the following four projects:

- Improvement of Eem Dyke and Southern Randmeren Dykes;
- Improvement of Houtrib Dyke (to be completed in 2020);
- Improvement of Texel Wadden Sea Dyke (to be completed in 2020);
- Improvement of Hoorn-Edam-Amsterdam Markermeer Dyke.

Table 8 does not feature a schedule for the Houtrib Dyke and Texel Wadden Sea Dyke projects, as these will be completed in 2020.

Expectations are that 43 kilometres of dyke improvement will be completed in 2020. By 2021, 22 kilometres will be completed, and the remaining 31 kilometres will follow by 2023.

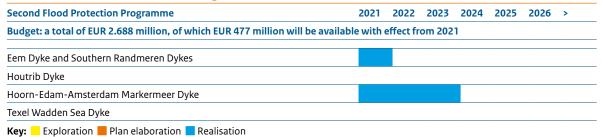
Table 7 Knowledge and Innovation Programme

| Knowledg | Knowledge and Innovation Programme | | | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|-------------------|--|--|--|------|------|------|------|------|------|------|------|------|------|
| Project number | Project name | | | | | | | | | | | | |
| 33M | JLD Dyke Stabiliser (Macrostability GE) | | | , | | | | | | | | | |
| 331 | Grass and Clay Study, Wadden Sea GE phase C | | | | | | | | | | | | |
| 17D | Kerkhovenpolder-Germany pilot (Wide Green Dyke) | | | | | | | | | | | | |
| 33L | Dyke Improvement Using Local Soil GE | | | | | | | | | | | | |
| 18A | Eemshaven-Delfzijl-MJVM | | | | | | | | | | | | |
| 22L | Wolferen-Sprok | | | | | | | | | | | | |
| | Engineering structures GE | | | | | | | | | | | | |
| | Innovation reservation | | | | | | | | | | | | |

²³ The group comprises representatives of district water boards, a Rijkswaterstaat Director, and Directors and staff of the programme office of the Flood Protection Programme.

²⁴ Parliamentary Document 32698 no. 51 (in Dutch).

Table 8 Second Flood Protection Programme



Zeeland Shore Face Deposits

The Foreshores Deposits programme (stone deposits at 27 locations in the province of Zeeland) commenced in late 2019. The deposits are intended to reinforce the foreshores and thus combat flow slide. Rijkswaterstaat is working on deposits at 16 locations (cost: EUR 62.8 million). These deposits will be completed by 2023. The Scheldestromen district water board will be tackling the other 11 locations in the period up to 2026 (cost: EUR 10.6 million). The latter projects are in the preparatory stage.

IJsselmeer Closure Dam

The IJsselmeer Closure Dam (*Afsluitdijk*) project comprises dyke improvements and provisions for the expansion of the discharge capacity. It entered the implementation stage in early 2018. The full length of the dam will be improved in an innovative manner, floodgates will be constructed in the navigation locks, and the sluices will be reinforced.

Pumping stations and new sluices will expand the capacity to discharge water from Lake IJsselmeer to the Wadden Sea. The water taskings are being addressed in interconnection with projects implemented by regional partners, who have joined forces in the Nieuwe Afsluitdijk programme. For more information, see www.deafsluitdijk.nl.

River widening: IJssel Delta phase 2, Pannerdensch Canal groyne lowering, Ooijen-Wanssum area development

Along the rivers Rhine and Meuse, three projects are being implemented to lower the river water level. The IJssel Delta phase 2 and Ooijen-Wanssum projects also encompass dyke improvements; the Ooijen-Wanssum dyke improvement has been designed on the basis of a preliminary exploration in order to preserve archaeological Mesolithic remains. For more information, see www.mirtoverzicht.nl.

Table 9 IJsselmeer Closure Dam measures



3.5.2 River widening in interconnection with dyke improvement

In order to meet the flood protection standards, the rivers Rhine and the Meuse must have sufficient capacity to discharge river water to the sea. This is crucial for all the stakeholders and activities in the area around the major rivers. As a result of climate change, water volumes to be discharged during severe rain and high water levels are increasing. Consequently, the discharge capacities must be expanded. This tasking is being substantiated through a powerful interaction of dyke improvement and river widening measures, as set down in the Rivers Strategy and the National Water Plan 2016–2021. In order to see river widening off to a meaningful start the central government has set aside Delta Fund resources as its share in the additional cost of river widening measures: EUR 200 million up to 2028. Based on regional proposals for the Rhine and Meuse, the Minister of Infrastructure and Water Management has agreed to the MIRT Studies and MIRT Explorations listed in Table 11. Under the Integrated River Management programme, a more integrated approach has been adopted to tackle the taskings at issue in the area around the major rivers. In addition to flood risk management, the programme addresses navigability, nature, ecological water quality, freshwater availability, and regional economic developments. For the period 2028-2032, EUR 375 million has been allocated to Integrated River Management; from 2033 onwards, a structural sum of EUR 80 million will be available annually.

River Meuse

With respect to the river Meuse, the following ongoing projects involve river widening in interconnection with dyke improvement:

 Meandering Meuse (including Flood Protection Programme - Ravenstein-Lith project): at the end of 2019, the Steering Group endorsed the preferential

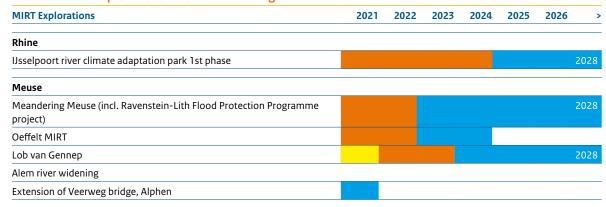
- alternative; by mid-2020, the administrative agreement will be signed, whereupon the project will enter the plan elaboration phase;
- MIRT Oeffelt: plan elaboration has commenced;
- Alem study (ensuing from the Meuse Bank Park MIRT Study): exploration will commence once sufficient funding will have been secured;
- "Alphen Veerweg Bridge Extension" project (element of the Across the Meuse project): project has entered the realisation phase. The central government and the region have co-funded the realisation of additional water level reduction:
- Lob van Gennep: the Memorandum on Scope and Level of Detail regarding the exploration phase has been available for perusal in 2020; this phase involves the further elaboration of three alternatives;
- Southern Meuse Valley: the MIRT Study regarding the Maastricht Southern Meuse Valley has been completed; the partners (Maastricht, Eijsden-Margraten, Rijkswaterstaat, and Limburg district water board) are considering the next steps.

In 2019, the authorities decided on a course for the preferential alternatives to four measures aimed at counterbalancing the rise in water level caused by dyke improvements elsewhere along the Meuse (Well, Arcen, Baarlo-Hout-Blerick, Thorn-Wessem). The preferential alternatives were finalised and endorsed in 2020, whereupon plan elaboration commenced.²⁵

Rhine

As regards the river Rhine, the preferential decision rounding off the IJsselpoort MIRT Exploration is expected by the fourth quarter of 2020.

Table 11 MIRT Explorations into river widening



²⁵ Parliamentary Document 27625, no. 504 (in Dutch).

3.5.3 State Flood Defences Programme

Rijkswaterstaat is in charge of 530 kilometres of regional state flood defences and 211 kilometres of primary flood defences, including the six Dutch storm surge barriers.

The central government has requested Rijkswaterstaat, in its capacity as managing authority of flood defence systems, to draw up a strategy for the improvement of its primary and regional flood defences, wherever the assessments dictate the necessity thereof. Under the Delta Fund, a sum of more than EUR 800 million is available for such improvements. In 2019, a programme approach was elaborated. In the pursuit of this approach, the seven Rijkswaterstaat regions are supported by the National State Flood Defences Programme Team.

The programme approach enables Rijkswaterstaat as the managing authority:

- to complete the assessments of the regional and primary state flood defences by 2020 and 2022, respectively;
- to substantiate the follow-up processes for primary and regional dykes and dams (management & maintenance, replacement & renovation, and construction);
- to prioritise and schedule measures within the progress, funding, and capacity frameworks;
- to give account to the Ministry of Infrastructure and Water Management regarding the progress of the assessments and the ensuing measures;
- to use the facilities of the Flood Protection Programme, such as its Knowledge and Innovation Agenda;
- to support the central government budget preparations;
- to reinforce the link with the comprehensive duty of care²⁶ regarding the flood defences.

Several improvement projects involving flood defences managed by Rijkswaterstaat have entered the realisation phase, following the third round of assessments (see Table 5). The State Flood Defences Programme is now focusing on the completion of the assessments. In the years ahead, these assessments can lead to new preliminary explorations. These preliminary explorations can result in a management tasking, a replacement and renovation tasking, a construction tasking, or a tasking in relation to the comprehensive duty of care. In 2020, preliminary studies will commence for the Prinses Marijke locks and the engineering structures near IJmuiden.

The state flood defences managed by Rijkswaterstaat are covered by specific agreements with the Ministry of Infrastructure and Water Management regarding commissioning, funding, control, and accountability. Within the Delta Fund, separate budget series have been established for the flood defences managed by Rijkswaterstaat.

²⁶ The duty of care regarding primary flood defences entails that the managing body is required by law to ensure that the primary dyke or dam meets the safety requirements, and to provide the required preventative management and maintenance.



A sufficient supply of fresh water is crucial in our country, with a view to, e.g., the stability of dykes, nature, the provision of drinking water, and power supply. Several sectors depend on fresh water for their production, such as the agriculture sector, the shipping sector, and many industries. These sectors account for some 16 per cent of our national economy. A sufficient supply of fresh water is also important to combat subsidence of areas prone to compaction, to keep urban environments liveable, and to sustain public health.

Freshwater supplies are not always sufficient to meet the demand. This became manifest during the prolonged periods of drought in 2018, 2019, and the dry spring of 2020. Salinisation — caused by, e.g., the rising sea level — also jeopardises the availability of fresh water in the Netherlands. The essence of the Delta Decision on Freshwater Supply is to ensure the Netherlands' future resilience against water shortages.

4.1 Proposed amendments to the Delta Decision on Freshwater Supply and the National Freshwater Supply Strategy

Delta Decision on Freshwater Supply

The following element of the Delta Decision on Freshwater Supply set out in Delta Programme 2015 has been completed in recent years:

 In 2018, an interim evaluation was conducted, covering the process, the guidelines, the tools available to embed the agreements, and the ambition level regarding water availability.

The Delta Programme Commissioner proposes the following amendments to the Delta Decision on Freshwater Supply:

Main goal in terms of freshwater supply

• By 2050, the Netherlands must be resilient against freshwater shortages. This is the overarching goal in the five national targets set down in DP2015 (see Figure 6).

Water availability

 In consultation with stakeholders, the authorities involved provide clarity regarding the availability of fresh water in an area - under both normal and dry conditions and regarding efforts and responsibilities, supplementary to the <u>National Prioritisation Scheme</u>. Such insights are generated via the Water Availability process.

- In this process, authorities and stakeholders pass through three steps: transparency (mapping out freshwater supply and demand), optimisation (discussing options for the optimisation of supply and demand), and setting down agreements (on measures to be taken).
- By 2021, the urgent areas and the main water system
 will have completed the regional processes and the
 Water Availability Process. The authorities involved
 will continue their efforts on the elaboration of the
 Water Availability instrument. During its annual review
 meetings, the Freshwater Administrative Platform
 discusses the state of affairs regarding the water
 availability issue, and looks ahead to identify new urgent
 areas.
- The measures and actions required to achieve the goal may change on account of new circumstances, regional customisation, and different societal preferences. For that reason, water availability must be re-considered following major adjustments to (climate and socioeconomic) scenarios, major regional changes in water demand (e.g., in the purview of the energy transition and data centres), major water system changes (e.g., the combating of soil subsidence), and changes in societal preferences. This is addressed, in any case, during the systematic six-year review.

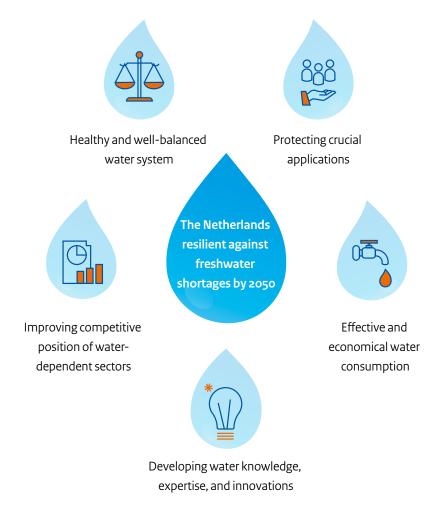


Figure 6 National freshwater supply targets

Linkage with spatial planning

- A future-proof freshwater supply demands climate-proof land use and water consumption. A sufficient supply of good-quality fresh water for every user and for every sector cannot be guaranteed anytime and anywhere.
- The point of departure is that water demand will be geared to the availability of water, by taking local water availability into account in the allocation of waterconsuming functions to an area, and to pursue the economical use of water by water-consuming functions.
 The prevention of waterlogging and water shortages is pursued by adopting the following order of preference in an area:
 - more efficient water retention to prevent waterlogging and ensure availability;
 - the next steps in the prevention of waterlogging are storage and drainage; the next step to prevent water shortages is a more efficient distribution of water among the water-consuming functions in an area;
 - should these efforts prove insufficient nonetheless, we must accept and prepare for any (residual) damage.

Gradual improvement

- Through several targeted investments in the main water system and the regional water systems, the central government and the district water boards are enhancing the resilience of the freshwater supply. The investments are aimed at more efficient water retention, expanding groundwater supplies, and improving the supply of fresh water through efficient buffering and distribution of the available water, and through combating salinisation. In addition, dedicated innovations will target the economical use and reuse of water.
- In early 2021, the central government and the regions will endorse the freshwater supply measures for Phase 2 of the Delta Plan on Freshwater Supply (2022-2027), based on the Delta Fund resources and co-funding by provinces, district water boards, municipalities, drinking water companies, and water consumers. These measures will be incorporated into the Delta Plan on Freshwater Supply in Delta Programme 2022.
- The schedule will be established on the basis of criteria set down at the administrative level: effectiveness, order of preference, scale level, water availability, cost, co-funding, integrated approach (interconnectivity),

- innovative power, and the overall Delta Programme criteria (solidarity, flexibility, sustainability).
- Wherever possible, freshwater supply measures must serve other purposes, and wherever possible they must be combined with measures scheduled under the Delta Plan on Spatial Adaptation, as recommended by the <u>Drought</u> <u>Policy Platform</u>. Knowledge development and regional processes are also coordinated between the Delta Plans.

National Freshwater Supply Strategy

The Delta Programme Commissioner proposes to fine-tune the National Freshwater Supply Strategy as follows:

- The freshwater supply and spatial adaptation taskings will be interlinked more closely in the dialogues on the stress tests and on water availability, in the knowledge agendas, and in the control exerted over the expenditures for the implementation programmes.
- By the end of 2020, the Freshwater Administrative
 Platform will endorse the Climate-proof Main Water
 System Freshwater Supply Strategy. The Strategy will be
 elaborated further through learning-by-implementation
 and through multi-stage decision-making. The aim is to
 reduce the probability of water shortages by pursuing

- "Smart Water Management", involving a flexible use of freshwater buffers based on a national overview and realtime data (see box).
- In areas without water supply or with a limited water supply (in particular, the Elevated Sandy Soils), regional authorities and water consumers must commit to active groundwater supply management and area-specific customisation. The preservation and improvement of water availability requires exhaustive (local and regional) measures, to be coordinated with measures to combat waterlogging.
- "Smart Water Management" by the collective water managing bodies Rijkswaterstaat and the district water boards will be expanded and given additional impetus. This will generate a better overview and more insight into the distribution of water, thus providing the water managing bodies with a greater action perspective during periods of (imminent) drought. Furthermore, this knowledge will bolster the "learning-by-implementation" approach of the Climate-proof Main Water System Freshwater Supply Strategy, in order to substantiate the decision-making process step by step.

Climate-proof Main Water System Freshwater Supply Strategy

During the dry summer of 2018, the smarter water management approach enabled Rijkswaterstaat and the district water boards to retain and distribute the available water more efficiently. In 2019, their approach was translated into the Climate-proof Main Water System Freshwater Supply Strategy. With this strategy, the increasing probability of water shortages resulting from salinisation in the tidal rivers area and depletion of the IJsselmeer buffer can largely be remedied without the need for major interventions in the main water system. The strategy features both proven elements and elements that still involve some uncertainty. It encompasses existing freshwater buffers set down at the administrative level (such as Lake IJsselmeer and the Haringvliet/Hollandsch Diep) and ongoing agreements (such as the IJsselmeer water level ordinance), and makes proposals for new freshwater buffers on which no agreements have yet been made.

The strategy marks a point on the horizon, to be attained through learning-by-implementation and multi-stage decision-making. This multi-stage decision-making process will be elaborated further in 2020. The principles underpinning the strategic freshwater buffers and the corresponding supply routes will be substantiated in 2020 (with the exception of the route via the Amsterdam-Rijn Canal, on account of the advisability and feasibility studies), whereupon decisions will be taken in 2021.

Between 2022 and 2027, the principles will be elaborated in more detail; the final decisions will be made by the end of 2027.

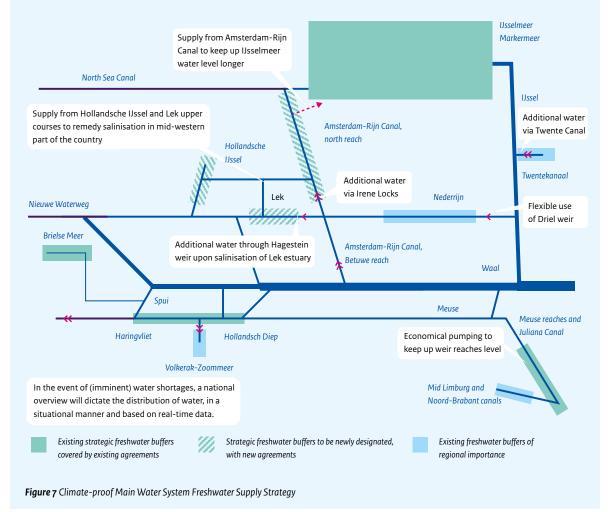
The strategy as currently envisaged is as follows. With regard to (imminent) water shortages, attention will be focused on preserving the quality of those sections of the tidal rivers area that can efficiently be kept fresh, and from which the freshwater supply can be facilitated. These sections involve the upper courses of the River Lek, the Hollandsche IJssel, and the Amsterdam-Rijn Canal. The process is controlled on the basis of up-todate information regarding the salinisation situation and the demand for water. The weir near Hagestein will be used to keep the upper course of the River Lek fresh, whilst the Amsterdam-Rijn Canal is kept fresh via the Irene Locks. The upper course of the Hollandsche IJssel will be kept fresh via the canalised Hollandsche IJssel and the Waaier Locks, possibly in combination with the Krimpenerwaard route. The freshwater supply to the region and for drinking water purposes will thus be safeguarded in the best possible way. In the sections of the Rhine-Meuse estuary which are already prone to salinisation, preserving water freshness for as long as possible is no longer a point of departure. This will "save" water that is currently still used to combat salt intrusion via the Nieuwe Waterweg. However, it also adds to the salinisation burden in this region. In 2020, the consequences in terms of water availability will

be studied further in the purview of the multi-stage decision-making.

The IJsselmeer, Brielse Meer, and Haringvliet/
Hollandsch Diep lakes are existing freshwater stocks.
The Hollandsch Diep/Haringvliet is kept sufficiently
fresh by Haringvliet sluice operations. Rijkswaterstaat
is gradually implementing the Decision on Opening
the Haringvliet Sluices; this Decision falls outside the
scope of the Freshwater Supply Strategy. Lake IJsselmeer
is covered by the existing agreements on flexible water
level management. As a result of climate change, the
current buffer in Lake IJsselmeer will prove insufficient
increasingly frequently. A study is being conducted to
explore how, in dry years, a proportion of the shortage

can be prevented by supplying water from the River Waal to Lake IJsselmeer via the Amsterdam-Rijn Canal. A more flexible use of the Driel weir may also help to achieve this. The possibilities and advisability of these supply routes will be elaborated further in the next phase of the Delta Programme.

In the River Meuse, water discharge is controlled by several weirs. More economical locking may help to retain more water during periods of drought, meaning that more water will be available for consumption. The weir sections of the Neder-Rijn and Lek rivers, the Twente Canals, the Midden-Limburg and Noord-Brabant Canals, and Lake Volkerak-Zoommeer also play a significant part in the regional water supply.





Freshwater availability

Taskings

- Subsoil salinisation (combined with other taskings)
 Falling groundwater levels and no freshwater
- supply Falling groundwater levels and limited freshwater
- supply Inlet salinisation
- IJsselmeer water buffer volume
- Low water levels and discharge volumes
- No freshwater supply

Strategic choices with corresponding nationwide measures

- Preferential order: adapting land use to water availability; cutting down water consumption; improved water retention; more efficient distribution of water; and acceptance of (residual) damage
- ▲ Climate-proof freshwater supply from main water system in combination with smart water management. (Key distribution points in and from the main water system)
- Freshwater section of main water system
- **I** Groundwater supplementation

Essential strategic long-term decisions

- Replacement of Maeslant storm surge barrier
- Usselmeer Closure Dam drainage by gravity / pumping
- Rhine discharge distribution at high and low water levels

Measures at specific locations

- 1 Expansion of IJsselmeer water stock
- Expansion of West-Netherlands Climate-proof Water Supply
- Optimisation of Brielse Meer buffer
- Enhancing freshwater/saltwater separation at sluices
- ↑ Expansion of Noordervaart supply
- Meuse lockage water-saving measures

Map 1 Freshwater Supply Preferential Strategy

4.2 Explanatory notes to the review

The <u>analyses</u> conducted for the review show that several elements of the 2015 Delta Decision on Freshwater Supply need adjustment. The course of the 2015 Delta Decision on Freshwater Supply will be maintained; the adjustments serve to intensify and expedite the efforts. The main reasons are the incorporation of the new Delta Scenarios, and of the bottlenecks identified in the 2018 and 2019 droughts. The Water Availability process will be intensified on the basis of the findings of the <u>Drought Policy Platform</u>. A freshwater supply goal for 2050 has been formulated: by 2050, the Netherlands must be resilient against freshwater shortages.

Freshwater supply goal for 2050

Key phrases in terms of the freshwater supply goal are "resilient" and "freshwater shortage". The definitions of resilient and of water shortage differ from one region or area to the next. Some areas command external water supply, whilst in other areas, supplying water is (virtually) impossible. The demand for fresh water also differs from area to area, as do potential measures and the costs involved. Ergo, the resilience against freshwater shortages is determined at the local and regional levels, by water managing bodies and water consumers (drinking water companies and such sectors as agriculture, shipping, nature, industry). Coping capacity and a sense of urgency among freshwater consumers are important in this respect.

Local and regional resilience against freshwater shortages is determined by going through the Water Availability process. The parties involved thus develop a shared ambition and well-supported measures that are justified from societal and economic perspectives, in both normal and dry situations. In areas with an external water supply, an additional goal is to prevent having to resort to the prioritisation scheme.

Water Availability

The interim evaluation of 2018 shows that all the regions have embarked on the Water Availability process, and that their approach is bearing fruit. As the target demands intensification of the efforts being expended by the authorities concerned, Phase 1 of the Delta Plan on Freshwater Supply will be focused on the elaboration of the water availability issue in urgent areas.

DP2020 sets out the urgent areas in which the first step of the Water Availability process must have been completed by 2021 (see Figure 8). In its annual review, the Freshwater Administrative Platform looks ahead to identify new urgent areas. The years ahead will see a decision on the areas for which water availability will be mapped out in the period 2022-2027. This cycle constitutes the basis for the Delta Plan on Freshwater Supply, in which the investments agreed

upon are set down.

A 2016 report recommended that the transport of water from the Meuse to the Waal in times of drought should be designated as a short-term contingency measure. Converting this into a structural measure has turned out to be impractical in terms of both water quality and water quantity, on account of uncertainties regarding climate developments, the required interconnectivity with other measures, and the impact on the shipping sector. The option of conversion to a structural measure will be left open in the adaptation path; the comparative assessment between structural and non-structural can be reviewed at a later date.

Linkage to spatial planning

The Drought Policy Platform has established that a sufficient supply of good-quality fresh water for every water consumer and for every sector cannot be guaranteed anytime and anywhere. For that reason, the existing order of preference (economising, more efficient retention, and more efficient distribution) has been expanded to include "accepting damage", whilst the following points of departure have been set down: "taking more account of freshwater availability in spatial planning" and "economising water consumption". In the establishment process of the National Environmental Vision, the House of Representatives has requested that an order of preference be developed to sharpen up the control exerted under the Vision. The order of preference set down in the reviewed Delta Decision on Freshwater Supply corresponds to the contents of the memorandum on the National Environmental Vision dated 23 April 2020.27 The order of preference does not need to be rigidly enforced. For each area, a combination of measures can be generated, based on regional considerations. It is, however, important to properly substantiate how water availability can be taken into account in the event of changes in spatial planning or in water demand. Accommodating every water demand through water system measures and expanding the water supply is no longer an option. The National Environmental Vision sets out that the enforcement of the orders of preference will be elaborated further in relevant collaborative agreements with the regional authorities.

Gradual improvement

Ensuring resilience against freshwater shortages by 2050 requires gradual improvement. The measures scheduled in Phase 1 of the Delta Plan on Freshwater Supply foster such an improvement, whilst the central government and

²⁷ Parliamentary Document 34682, no. 48 (in Dutch).

the regions are concurrently scheduling measures under Phase 2 of this Delta Plan. The schedule is underpinned by considerations based on criteria set down by the Freshwater Administrative Platform.

It is becoming increasingly clear that future-proof freshwater supply demands climate-proof land use and water consumption. A sufficient supply of good-quality fresh water for every water consumer and for every sector cannot be guaranteed anytime and anywhere. This applies to, e.g., parts of the Netherlands in which water supply is impossible, and to several areas that are prone to salinisation. Taking more account of freshwater availability in spatial planning is imperative. That is one of the reasons why the Delta Plan on Freshwater Supply is collaborating increasingly closely with the Delta Plan on Spatial Adaptation. These two programmes particularly have much ground in common in coping with drought issues. Following the evaluation of the Water Availability process, a clear connection has been established between the risk dialogues involved in stress tests - which are conducted

under the Delta Plan on Spatial Adaptation – and the risk dialogues relating to water availability. The outcomes of the stress tests and the Water Availability process will help to further climate-proof the areas. The connection between the two Delta Plans will also be reinforced in terms of knowledge development.

To ensure and enhance our future resilience against freshwater shortages, it is essential to economise water consumption, to retain more water for longer periods of time, and to distribute water more efficiently. Not only in the regional water systems but also in the main water system. Existing infrastructure can be utilised more efficiently and more flexibly in the purview of freshwater supply from the main water system, according to experience gained during the drought of 2018 and in the "Smart Water Management" programme. This experience has resulted in a draft strategy for a climate-proof freshwater supply from the main water system, based on the existing infrastructure situation and tying in with the adaptive delta management approach.

4.3 Looking back: the milestones of the past six years

Over the past six years, significant strides have been taken in the implementation of the Delta Decision on Freshwater Supply, at the national level and in the Freshwater Supply Regions. This has resulted in such milestones as:

- Implementation of the measures set out in the Delta Plan on Freshwater Supply 2015-2021 commenced in 2015. The central government and regional parties are collectively investing a total sum of more than EUR 430 million in the enhancement of water availability.
- 2. During the drought of 2018, "smart water management" proved its value. The lines of reasoning, guidelines, and information screens have made a vital contribution to reducing the (impact of) water shortages.
- 3. In December 2019, the Drought Policy Platform produced its final report, "The Netherlands more resilient against drought". The conclusion is that enhancing the Netherlands' resilience against drought demands change: the water retention capacity of the water system must be improved at all levels. In some areas, land use must be adapted to water availability.
- 4. Over recent years, the freshwater supply and spatial adaptation strategies have become increasingly intertwined, inter alia, as a result of linking the risk dialogues on stress tests to the dialogues on water availability. For example, the provinces of Limburg and Noord-Brabant will be setting down a collective strategy and approach in 2020 (South Netherlands Climate Adaptation Implementation Programme).

- 5. Over recent years, several Water Availability processes in urgent areas have been completed. Authorities, consumers, and other stakeholders have collectively explored current and future bottlenecks in freshwater supply and water demand for various sectors. This has generated an interconnected set of measures and made water consumers aware of potential water shortages and their own options for cutting back on their water consumption.
- 6. Insight into freshwater supply bottlenecks and potential measures has increased sharply over recent years. Knowledge and experience have been gained in mapping out the freshwater supply tasking and in determining the (cost) effectiveness of measures. The work on (water) system expertise, hydrological tools, and economic instruments continues. The hydrological and economic effectiveness of measures has been examined in the light of the continuously changing insights into climate and socio-economic trends, and into how such trends impact the Freshwater Supply Strategy. Table 12 provides an overview of studies that have been conducted in the lead-up to Delta Plan on Freshwater Supply Phase 2, including an analysis of current and future bottlenecks in freshwater supply in the Netherlands based on updated Delta Scenarios for 2050 and 2100. Further details regarding the studies are provided in the review synthesis document.28

²⁸ See <u>Background Document H2 Freshwater Supply</u> (in Dutch).



Figure 8 Urgent areas in terms of water availability



Step 1: Bottleneck analysis

- Regional freshwater supply bottleneck analyses (2012-2019)
- Updating Delta Scenarios (2017)
- Analysis of 100-year series in the purview of the freshwater supply bottleneck analysis 2017
- Hotspot analyses for Delta Plan on Freshwater Supply (2018)
- Updated bottleneck analysis for Delta Plan on Freshwater Supply Phase 2 (2019)
- Updated bottleneck analysis for Delta Plan on Freshwater Supply – Impact of Paris measures and looking ahead to reference year 2100 (2019)

Step 2: Potential strategies

- Regional scan of freshwater supply measures, exploration of prospects of small-scale freshwater supply measures for the regional freshwater supply tasking (2018)
- Exploration of measures for Delta Plan on Freshwater Supply (2018)
- Economic analysis regarding freshwater supply (2019)

Step 3: Promising strategies

- Distribution options for main water system, exploratory study into controllable buffer network (2019)
- Water availability in main water system (2019)
- Exploration of promising measures for Meuse water availability (2019)

Figure 9 Overview of studies conducted in the lead-up to Delta Plan on Freshwater Supply Phase 2

4.4 Agenda for the six years ahead

Projects, activities, and milestones

The next six years will see the roll-out of projects and activities aimed at the further realisation of the Delta Decision on Freshwater Supply. This will generate such milestones as:

- In early 2021, decisions will be taken regarding the measures to be scheduled in the second phase of the Delta Plan on Freshwater Supply. The measures will be incorporated into Delta Programme 2022 and implemented in the period 2022-2027;
- The final Phase 1 measures will be completed by 2023;
- In the years ahead, the Water Availability Process will continue, and the measures for the period 2022-2027 will be substantiated;
- The Climate-proof Main Water System Freshwater Supply Strategy will be gradually elaborated further in the years ahead:
- Collaboration with the Delta Plan on Spatial Adaptation
 will be intensified in several respects, such as knowledge
 development and regional processes. The outcomes will
 foster climate-proof land use and water consumption,
 which in turn will boost the future resilience of the
 freshwater supply;
- The agreements on drought made by the International Commission for the Protection of the Rhine on 13

- February 2020 (see Paragraph 8.1) will be elaborated. The International Commission for the Meuse is working on an action plan to tackle extremely low water levels. This will cover issues such as water quantity, water quality, and navigability in order to enhance future resilience against water shortages;
- In 2026, the Sea Level Rise Knowledge Programme will
 provide clarity regarding the tenability and flexibility
 of the Freshwater Supply Strategies. In addition, it will
 explore which long-term options must be kept open,
 taking into account other transitions relating to, e.g.,
 agriculture, horticulture, nature, sustainable energy,
 housing, and transport (Track IV).

A full overview of freshwater supply measures is provided in the Delta Plan on Freshwater Supply (see 4.5).

Expertise and research

The Delta Programme Knowledge Agenda (in Dutch) keeps the knowledge on freshwater supply up to date. Key knowledge issues pertain to the impact of the rising sea level on the freshwater supply.

The Sea Level Rise Knowledge Programme is mapping out, inter alia, what the different sea level rise scenarios entail in terms of freshwater availability and the use of space (such as for farming and nature). In 2021, the Royal Netherlands Meteorological Institute KNMI will publish its Climate Signal report on issues such as weather extremes, and in 2023 the new KNMI scenarios will be presented. These are significant steps towards the second review, because the freshwater supply bottlenecks are expected to increase.

In the purview of the decisions to be made regarding the measures to be implemented in Phase 2 of the Delta Plan on Freshwater Supply, the financial consequences of the preferential measures will be calculated from a hydrological and economic perspective in 2020. The results are expected by the autumn of 2020 and will constitute input for the considerations.

During Phase 2 of the Delta Plan on Freshwater Supply, several follow-up studies will be conducted to underpin the Climate-proof Main Water System Freshwater Supply Strategy. The Strategy will be elaborated further in Phase 2 through, e.g., dialogues and collective knowledge development.

A recommendation of the Drought Policy Platform concerns the development of perspectives for the future based on the driest KNMI scenario. This ties in with the Nederland Later project initiated by the Netherlands Environmental Assessment Agency (Spatial Exploration 2022). This spatial scenario study explores the interaction between climate adaptation / freshwater supply and other transitions and sectors in the Netherlands (in such fields as energy, agriculture, and nature).

Within the context of the review of the "Monitoring, Analysing, Acting" monitoring system (see Paragraph 2.4), options are being explored to map out, by reference to a limited number of administratively relevant criteria, how the Delta Plan on Freshwater Supply measures are fostering the enhancement of the resilience against freshwater shortages.

4.5 Delta Plan on Freshwater Supply

The Delta Plan on Freshwater Supply comprises all the measures, studies, and knowledge issues relating to a sustainable freshwater supply that have been scheduled and agendised, and that are funded – in whole or in part – from the Delta Fund.

Phase 1 measures

The regions, the central government, and stakeholders are going full steam ahead with the implementation of the measures set out in Phase 1 of the Delta Plan on Freshwater Supply (2015-2021). In the period up to and including 2023, the overall expenditure scheduled for the freshwater supply measures contained in the Delta Plan totals more than EUR 430 million, of which a sum of EUR 169 million will be funded from the Delta Fund. Nearly all the measures will have been completed by 2021. On 14 March 2019, the Freshwater Administrative Platform endorsed the extension of several measures until 2023.

Table 12 presents an overview of scheduled and agendised studies and measures to substantiate the Delta Decision and the Preferential Strategies for the freshwater supply. These studies and measures ensue from the Freshwater Supply Investment Programme 2015-2021, as contained in Delta Programme 2015. The investment programme has been compiled on the basis of a national investment agenda, the regional implementation programmes of the Freshwater Supply Regions, and a number of implementation programmes of the user functions.

Table 13 specifies the Delta Fund – regional funding ratio for each measure.

The progress report 2019 (Background Document F (in Dutch)) features both a review of the year 2019 and an update of the schedule of freshwater supply measures, as endorsed by the Freshwater Administrative Platform. Furthermore, it contains a perspective for the period 2020/2021.

Table 12 Schedule of Delta Plan on Freshwater Supply measures 2021-2023

| | | 2021 | 2022 | 2023 |
|--------|---|------|------|------|
| Jsselm | neer Region | | | |
| 171 | Flexibilisation of IJsselmeer lake water level, involving: | | | |
| 171a | MWS: new IJsselmeer water level ordinance (2017) | | | |
| 171b | MWS: operationalisation of flexible water level management | | | |
| 171c | MWS: measures pertaining to Frisian IJsselmeer lake shores | | | |
| 171d | MWS: Building with Nature on the Hoeckelings dam | | | |
| 171e | MWS: Implementation of IJsselmeer water level ordinance | | | |
| 172 | Northern region elevated grounds project programme, involving: | | | |
| 172a | Natural design of Dwarsdiep area | | | |
| 172b | Climate-proofing Drentse Aa basin | | | |
| 172c | Optimisation of farmland intakes, Northern Netherlands elevated (sandy) soils | | | |
| 172d | De Dulf-Mersken and vicinity area development | | | |
| 173 | IJsselmeer Region testing ground, involving: | | | |
| 173a | Spaarwater | | | |
| 173b | Gouden gronden | | | |
| 173c | Hunze en Aa's testing ground | | | |
| 173d | Wetterskip Fryslân testing ground | | | |
| Elevat | ed Sandy Soils | | | |
| 174 | Implementation programme for Elevated Sandy Soils Delta Plan, Southern Region | | | |
| 175 | Implementation programme for Elevated Sandy Soils Delta Plan, Eastern Region | | | |
| 176 | Innovative climate adaptation pilot South: sub-irrigation | | | |
| 177 | Innovative climate adaptation pilot East 1: effluent sub-infiltration | | | |
| 178 | Innovative climate adaptation pilot East 2: smart weir | | | |
| 179 | Innovative climate adaptation pilot East 3: Zutphen water distribution | | | |
| West- | Netherlands | | | |
| 180 | MWS: Irene locks (KWA+ in MWS) | | | |
| 181 | Climate-proof Water Supply West Netherlands (KWA) | | | |
| 182 | Optimisation of Brielse Meer lake water supply, step 1 | | | |
| 183 | Innovative climate adaptation pilot De Groote Lucht freshwater plant | | | |
| South | west Delta | | | |
| 184a | Roode Vaart transfer to West-Brabant and Zeeland | | | |
| 184b | Resilient regional water system measures | | | |
| 185 | Climate adaptation pilot Zeeland freshwater supply testing ground, involving: | | | |
| 185a | E1 - FRESHEM freshwater-saltwater mapping | | | |
| 185b | E2 - GO-FRESH II subsoil water preservation | | | |
| 185c | E4 - Wetland - Mild Desalinisation Environmental approach & pilot study | | | |
| 185d | E5 - DeltaDrip | | | |
| | E6 - Salt management in the pursuit of salt-tolerant potato | | | |
| 185e | FD - Sali Hallagellielli III ille Dilistili Ol Sali-Tolerani Dorato | | | |

| | | 2021 | 2022 | 2023 |
|---------|---|------|------|------|
| 185f | E7 - More fruit with less water | | | |
| 185g | E10 - Area Freshmaker exploration | | | |
| 185h | E11 - Waterhouderij Walcheren Exploration | | | |
| 185i | E12 - Drainstore | | | |
| 185j | POP3 scheme for physical water measures | | | |
| 185k | Additional resources for the Freshwater Supply testing ground | | | |
| Area a | round the major rivers | | | |
| 186 | MWS: study into longitudinal erosion control dams | | | |
| 187 | Launch of measures in area south of the major rivers | | | |
| 188 | Innovative climate adaptation pilot regarding sustainable use of shallow groundwater | _ | | |
| Main v | vater system (cf. paragraphs on the regions) | | | |
| 189 | Water availability in the Main Water System (MWS) | | | |
| 190 | Smart Water Management (SWM) | | | |
| 191 | Noordervaart | | | |
| Additio | onal Drought Policy Platform measures | | | |
| 192 | Expectations regarding water depth of Rhine branches | | | |
| 193 | Salt monitoring and model development, Amsterdam-Rijn Canal / North Sea Canal | | | |
| 194 | Salt monitoring and model development in Lake IJsselmeer | | | |
| 195 | lJsselmeer joint fact-finding | | | |
| 196 | West-Netherlands South salt regulation, three additional RMM measuring points | | | |
| 197 | Neder-Rijn Lek discharge meters in the purview of West-Netherlands freshwater buffers | | | |
| 198 | Support of regional elaboration of IJsselmeer Region prioritisation scheme | | | |
| 199 | Salt mapping 1st phase | | | |
| 200 | Eastern Region additional measures | | | |
| 201 | Southern Region additional measures | | | |
| 202 | COASTAR | | | |

Tabel 13 Investeringsprogramma Zoetwater 2020-2023

| | | Delta Fund 2020-2021 | Delta Fund 2021-2023 | Regional contributions* 2021-2023 | 2020-2023 totals | Total contribution from Delta Fund 2015-2023 |
|---------|--|-------------------------|-------------------------|---|---------------------|--|
| IJsselm | neer Region | | | | | |
| 171 | Flexibilisation of IJsselmeer lake water level, involving: | | | | | |
| 171a | MWS: new IJsselmeer water level ordinance (2017) | €0 | €0 | €0 | €0 | € 1.300.000 |
| 171b | MWS: operationalisation of flexible water level management | € 387.000 | €0 | €0 | € 387.000 | € 1.137.000 |
| 171c | MWS: measures pertaining to Frisian IJsselmeer lake shores | € 5.662.462 | € 5.662.462 | € 4.612.076 | € 15.937.000 | € 12.000.000 |
| 171d | MWS: Building with Nature on the Hoeckelings dam | € 1.222.000 | € 1.022.000 | €0 | € 2.244.000 | € 2.304.452 |
| 171e | MWS: Implementation of IJsselmeer water level ordinance | € 4.900.000 | € 2.200.000 | €0 | € 7.100.000 | € 13.200.000 |
| 172 | Northern region elevated grounds project programme, involving: | | | | | |
| 172a | Natural design of Dwarsdiep area | € 264.000 | €131.000 | € 963.000 | € 1.358.000 | € 570.000 |
| 172b | Climate-proofing Drentse Aa basin | €113.000 | €0 | € 2.937.000 | € 3.050.000 | € 200.000 |
| 172c | Optimisation of farmland intakes, Northern Netherlands elevated (sandy) soils | € 1.255 | €0 | € 12.440 | € 13.695 | € 15.000 |
| 172d | De Dulf-Mersken and vicinity area development | € 35.350 | €0 | €0 | € 35.350 | €212.100 |
| 173 | IJsselmeer Region testing ground, involving: | | | | | |
| 173a | Spaarwater | €0 | €0 | €0 | €0 | € 700.000 |
| 173b | Gouden gronden | € 31.974 | €0 | € 619.834 | € 651.808 | € 91.000 |
| 173c | Hunze en Aa's testing ground | € 82.000 | €0 | €0 | € 82.000 | € 200.000 |
| 173d | Wetterskip Fryslân testing ground | € 40.000 | €0 | €73.000 | € 113.000 | € 210.000 |
| Elevat | ed Sandy Soils | | | | | |
| 174 | Implementation programme for Elevated Sandy Soils Delta Plan, Southern Region | € 13.160.000 | €0 | € 42.520.000 | € 55.680.000 | € 32.900.000 |
| 175 | Implementation programme for Elevated Sandy Soils Delta Plan, Eastern Region | € 10.800.000 | €0 | € 36.520.000 | € 47.320.000 | € 27.100.000 |
| 176 | Innovative climate adaptation pilot South: sub-irrigation | €0 | €0 | €0 | €0 | € 50.000 |
| 177 | Innovative climate adaptation pilot East 1: effluent sub-infiltration | €0 | €0 | €0 | €0 | € 22.500 |
| 178 | Innovative climate adaptation pilot East 2: smart weir | €0 | €0 | €0 | €0 | € 10.500 |
| 179 | Innovative climate adaptation pilot East 3: Zutphen water distribution | €0 | €0 | €0 | €0 | € 17.500 |
| West- | Netherlands | | | | | |
| 180 | MWS: Irene locks (KWA+ in MWS) | €0 | €0 | €0 | €0 | € 300.000 |
| 181 | Climate-proof Water Supply West Netherlands (KWA) | € 12.300.000 | € 20.100.000 | €0 | € 32.400.000 | € 37.300.000 |
| 182 | Optimisation of Brielse Meer lake water supply, step 1 | € 2.520.000 | €0 | € 1.880.000 | € 4.400.000 | € 2.520.000 |
| 183 | Innovative climate adaptation pilot De Groote Lucht freshwater plant | €0 | €0 | €0 | €0 | € 500.000 |
| | Other measures involving the regional water system | €0 | €0 | € 7.000.000 | € 7.000.000 | €0 |
| South | west Delta | | | | | |
| 184a | Roode Vaart transfer to West-Brabant and Zeeland | € 4.793.671 € | 0 € | 6.242.271 + | €11.035.943 + | € 8.918.671 |
| 184b | Resilient regional water system measures | € 1.496.079 € | | 4.308.579 | € 5.804.659 + | € 1.496.079 |

| | | Delta Fund 2020-2021 | Delta Fund 2021-2023 | Regional contributions* 2021-2023 | 2020-2023 totals | Total contribution from Delta Fund 2015-2023 |
|------------|---|--------------------------|-------------------------|---|----------------------------|--|
| 185 | Climate adaptation pilot Zeeland freshwater supply testing ground, involving: | | | | | |
| 185a | E1 - FRESHEM freshwater-saltwater mapping | €0 | €0 | €0 | €0 | € 738.100 |
| 185b | E2 - GO-FRESH II subsoil water preservation | €0 | €0 | €0 | €0 | € 229.900 |
| 185c | E4 - Wetland - Mild Desalinisation Environmental approach & pilot study | € 759.457 | €0 | €110.418 | € 869.875 | €819.957 |
| 185d | E5 - DeltaDrip | € 25.000 | €0 | € 125.000 | € 150.000 | € 100.000 |
| 185e | E6 - Salt management in the pursuit of salt-tolerant potato | €0 | €0 | €0 | €0 | € 139.150 |
| 185f | E7 - More fruit with less water | €31.417 | €0 | € 107.514 | € 138.931 | € 94.250 |
| 185g | E10 - Area Freshmaker exploration | €0 | €0 | €0 | €0 | € 30.250 |
| 185h | E11 - Waterhouderij Walcheren Exploration | € 25.000 | €0 | € 220.000 | € 245.000 | € 75.000 |
| 185i | E12 - Drainstore | €61.938 | €0 | € 61.938 | €123.875 | € 123.875 |
| 185j | POP3 scheme for physical water measures | €0 | €0 | € 300.000 | € 300.000 | € 200.000 |
| 185k | Additional resources for the Freshwater Supply testing ground | € 549.518 | €0 | € 549.518 | € 1.099.036 | € 549.518 |
| Area a | round the major rivers | | | | | |
| 186 | MWS: study into longitudinal erosion control dams | €100.000 | €0 | €0 | € 100.000 | € 100.000 |
| 187 | Launch of measures in area south of the major rivers | € 421.970 | €0 | € 843.940 | € 1.265.910 | € 500.000 |
| 188 | Innovative climate adaptation pilot regarding sustainable use of shallow groundwater | € 50.000 | €0 | € 100.000 | € 150.000 | € 100.000 |
| Main v | water system (cf. paragraphs on the regions) | | | | | |
| 189 | Water availability in the Main Water System (MWS) | €210.000 | €0 | €0 | € 210.000 | € 1.315.000 |
| 190 | Smart Water Management (SWM) | € 1.995.000 | €0 | €0 | € 1.995.000 | € 4.967.000 |
| 191 | Noordervaart | € 3.879.000 | € 3.960.000 | € 8.736.000 | € 16.575.000 | € 9.000.000 |
| Additic | onal Drought Policy Platform measures | | | | | |
| 192 | Expectations regarding water depth of Rhine branches | € 105.000 | €0 | €0 | € 105.000 | € 105.000 |
| 193 | Salt monitoring and model development, Amsterdam-Rijn Canal / North Sea Canal | €115.000 | €0 | € 255.000 | € 370.000 | € 230.000 |
| 194 | Salt monitoring and model development in Lake IJsselmeer | € 529.500 | €0 | € 250.000 | €779.500 | € 1.059.000 |
| 195 | IJsselmeer joint fact-finding | € 30.000 | €0 | €0 | € 30.000 | € 30.000 |
| 196 | West-Netherlands South salt regulation, three additional RMM measuring points | € 200.000 | €0 | €0 | € 200.000 | € 200.000 |
| 197 | Neder-Rijn Lek discharge meters in the purview of West- Netherlands freshwater buffers | € 180.000 | €0 | € 220.000 | € 400.000 | € 180.000 |
| 198 | Support of regional elaboration of IJsselmeer Region prioritisation scheme | € 40.000 | €0 | €0 | € 40.000 | € 40.000 |
| 199 | Salt mapping 1st phase | € 700.000 | €0 | € 700.000 | € 1.400.000 | € 700.000 |
| | Eastern Region additional measures | € 2.000.000 | €0 | € 2.000.000 | € 4.000.000 | € 2.000.000 |
| 200 | | | | | 6.4.000.000 | |
| 200 201 | Southern Region additional measures | € 2.000.000 | €0 | € 2.000.000 | € 4.000.000 | € 2.000.000 |
| | Southern Region additional measures COASTAR | € 2.000.000 € 150.000 | €0 | € 856.000 | € 4.000.000 € 1.006.000 | € 2.000.000 € 300.000 |

^{*} The aggregate contributions from sources other than the Delta Fund. Arrangements pertaining to, e.g., funding have been set down in the administrative agreements on freshwater supply.

Phase 2 measures

In early 2021, decisions will be made regarding the measures to be scheduled under Phase 2 of the Delta Plan on Freshwater Supply. The six Freshwater Supply Regions and Rijkswaterstaat have prioritised and prepared some 150 promising measures. The promising measures can be divided into various types that complement and sometimes even necessitate one another:

- changes to the infrastructure of engineering structures;
- innovative projects;
- adaptations to the water system in rural and urban areas (water retention in local and regional water systems), adaptations to water consumption (economisation by users), and spatial adaptations of land use;
- use of alternative freshwater sources;
- improvements in the information provision, such as monitoring programmes and modelling.

The measures to be implemented in phase 2 (2022-2027) of the Delta Plan on Freshwater Supply are classed in three categories:

- Round 1: measures for which substantiation and co-funding have been arranged before the end of 2020.
 These measures may be incorporated into the final set of Phase 2 measures, if so decided;
- Round 2: measures for which reserves have been made in the Delta Fund, but whose substantiation and co-funding require additional time to complete. Before the end of 2021, a decision will be made as to whether to incorporate these measures in the final set of Phase 2 measures, to categorise them as "additional ambition", or to drop them:
- "Additional ambition": potential measures supplementary to the Phase 2 set of measures, if additional Delta Fund resources are made available for Phase 2 of the Delta Plan on Freshwater Supply.

The total set of measures will be funded by the central government (Delta Fund), the district water boards, the provinces, and the drinking water companies. The regions will fund 75 per cent of the regional measures; (a maximum of) 25 per cent of the cost will be reimbursed from the Delta Fund. Rijkswaterstaat measures are paid entirely from the Delta Fund. Supra-regional measures and innovations will receive a Delta Fund grant covering a maximum of 50 per cent of the cost.

In the Delta Fund, a sum of EUR 150 million has been set aside for Phase 2 of the Delta Plan on Freshwater Supply (2022-2027). The Minister of Infrastructure and Water Management intends to make an additional EUR 100 million available from the Delta Fund²⁹. Along with additional regional co-funding, bringing total co-funding by the regions to approx. EUR 540 million, Phase 2 will have an aggregate scope of more than EUR 800 million for the measures to be implemented.

²⁹ Parliamentary Document 27625, no. 500 (in Dutch).



As a densely populated and largely low-lying country, the Netherlands is vulnerable to the consequences of extreme weather and climate change: waterlogging, heat, drought, and urban flooding. More so than in the past, urban and rural areas are prone to extensive damage. The essence of the Delta Decision on Spatial Adaptation is that by 2050, the Netherlands must be water-resilient and climate-proof.

5.1 Proposed amendments to the Delta Decision on Spatial Adaptation

Delta Decision on Spatial Adaptation

The Delta Programme Commissioner proposes the following amendments to the Delta Decision on Spatial Adaptation:

- The central government, provinces, municipalities, and district water boards re-acknowledge the collective ambition of having the Netherlands climate-proof and water-resilient by 2050. Spatial (re)development must not add to the risk of damage and casualties caused by flooding or extreme weather. Wherever possible, management and maintenance must be conducive to reducing the risk of damage and casualties;
- Interim goals (cf. box in Paragraph 5.2: Explanatory notes to the interim goals) mark the first steps towards attaining the ambition of rendering the Netherlands climate-proof and water-resilient by 2050:
 - Interim goal 1: with effect from 2020, climate-proof and water-resilient planning must be a standard element of all the policies and actions of the parties;
 - Interim goal 2: authorities must analyse the vulnerability of their own areas by conducting a stress test ("Analysis"), conduct a risk dialogue with all the relevant (regional) partners to translate the results of such an analysis into an adaptation strategy featuring specific goals ("Ambition"), and embed the policy and legal implications of this ambition ("Action") in an implementation agenda, other programmes, frameworks, legislation, and regulations. This cycle is not a one-off process but must be completed periodically. The cycle must be repeated once every six years or earlier, if developments so dictate;
 - Interim goal 3: climate-proof and water-resilient planning must be embedded in all the government policies and actions, i.e., become standard practice in all spatial planning efforts. By no later than 2022, the provinces must have embedded this practice in their provincial environmental visions. By no later than 2024, the municipalities must have embedded this practice in municipal environmental visions;

- Interim goal 4: by no later than the end of 2021, stress tests must have been conducted for the national vital and vulnerable functions. By the end of 2023, a realistic ambition must have been formulated and set down in policy and supervision, or in another appropriate format:
- The terms climate-proof and water-resilient are specifically defined in the Delta Decision (cf. box in Paragraph 5.2: Climate-proof and water-resilient).
- The parties involved must substantiate the ambition agreed upon on the basis of their own responsibilities, powers, and options;
- The authorities must promote and facilitate spatial adaptation by collectively developing and sharing knowledge, by collaborating at the local, regional, national, and international levels, and by capitalising on linkage opportunities;
- The authorities must prevent any disruption of society by ensuring, in collaboration with the providers and managers of vital and vulnerable infrastructure, that by 2050 such functions will be more resilient against the impact of flooding and – if relevant – against the impact of waterlogging, heat, and drought;
- The authorities must be prepared to take action in the event of calamities;
- The six-year reviews of the Delta Decision must be used to evaluate its progress in terms of process and content, and wherever necessary to adjust its implementation or the strategy.

Spatial adaptation

The taskings of the Delta Plan on Spatial Adaptation are increasing as a result of such developments as more extreme weather, the potential acceleration in sea level rise, and soil subsidence in parts of the country. In addition, they are affected by land use, societal developments, and economic trends. Failure to take measures could result in considerably more damage in urban areas before 2050: if the current climate change continues, damage may rise to a sum of between EUR 33 billion and EUR 87 billion; if climate change increases, damage may rise to a sum of between EUR 55 billion and EUR 124 billion30. As regards vital and vulnerable functions, such as power grids and hospitals, enhancing their ability to cope with waterlogging, heat, drought, and flooding is even more important. Such functions are prone to incurring not only direct damage, but - on account of inter-dependencies - also extensive consequential damage.

regarding land use, the selection of locations, and construction methods, insufficient account is taken of the impact of waterlogging, heat, drought, and flooding. Flood protection is not only achieved through the construction and maintenance of dykes and dams; it may be expanded by factoring potential flooding into the spatial planning of the areas behind the dykes. Climate-proof and waterresilient planning must become "the new normal". This entails a major challenge, which differs from one location to the next. Improving environmental resilience against climate change and extreme weather situations will reduce risks and potential damage. The construction, utilisation, maintenance, renovation, and management of public and private spaces fall under the responsibility of a wide range of parties. Consequently, close collaboration between government authorities, NGOs, residents, and companies is imperative with a view to rendering the country climate-proof and water-resilient.

In many cases involving spatial planning, choices

5.2 Explanatory notes to the review

Since the previous Delta Decision on Spatial Adaptation (in Delta Programme 2015), the urgency of climate adaptation has grown. Aware of the scope of the tasking, the central government, provinces, municipalities, and district water boards have re-acknowledged the collective ambition of having the Netherlands climate-proof and water-resilient by 2050. Over recent years, they have been substantiating this ambition by launching a multitude of actions. For example, the National Housing Agenda now stipulates a climate-proof design for any new housing projects.

Across the Netherlands, many local initiatives have been rolled out, aimed at climate-proof and water-resilient planning. Following an interim evaluation in 2017 of the progress regarding the Delta Decision on Spatial Adaptation, the Delta Plan on Spatial Adaptation was developed. This sets out the acceleration, concretisation, and intensification required to achieve the goals of the Delta Decision on Spatial Adaptation. The Delta Plan identifies seven ambitions and several specific actions. Its methodical approach comprises the performance of a stress test (to map out vulnerabilities), the performance of a risk dialogue (to discuss the results of the stress test and set down the ambition), and the formulation of an implementation agenda (identifying measures). A nationwide structure encompassing 42 Working Regions has been set up in pursuit of the goals. The efforts on gaining expertise through research, pilot projects, and knowledge

sharing have been intensified. All the information on this topic is published and shared via the <u>Spatial Adaptation</u> <u>Knowledge Portal</u>. In the Administrative Agreement on Climate Adaptation of 2018, the central government, provinces, municipalities, and district water boards re-acknowledged the agreements set down in the Delta Plan, and expressed their intention to provide financial resources in order to expedite the spatial adaptation efforts.

Climate-proof and water-resilient

An area is considered climate-proof and water-resilient upon completion of the following steps:

- The vulnerabilities to extreme conditions in an area, including the vital and vulnerable functions, have been identified;
- On the basis of the vulnerabilities identified, the authorities, NGOs, companies, managing bodies, and residents involved have collectively set down an ambition, with an eye for local and regional action perspectives, founded on a shared picture of the costs and benefits;
- The actions ensuing from this ambition have been carried out;
- The "climate-proof and water-resilient" adage is embedded in daily and strategic actions. In the development of spatial plans, climate-proof and water-resilient design is covered in the Water Review process;

³⁰ Source: Climate Damage Assessor.

- Not all the vulnerabilities can be remedied; some residual risk will remain in respect of all the themes. The aim is for the authorities, companies, NGOs, and residents to be aware of and understand this residual risk;
- Calamity aid and the recovery capacity have been adapted to the residual risks; residents and companies are aware of their personal action perspectives in the event of a calamity;
- The vulnerability of an area is reviewed and, if need be, adjusted if climate trends or spatial developments so dictate. As a minimum, it is reviewed every six years.

Explanatory notes to the interim goals

The interim goals provide a perspective for action in the period up to 2050, the year in which the Netherlands must have been rendered climate-proof and water-resilient.

Interim goal 1: the previous Delta Decision stipulates that with effect from 2020, climate-proof and water-resilient planning must be embedded in all the policies and actions of the parties. This goal has been achieved nearly everywhere. In the years ahead, it will be substantiated and concretised further (see Interim goal 3).

Interim goal 2: repetition of the cycle may be prompted by developments and new insights relating to the climate or to spatial planning. Examples include the new KNMI climate scenarios and such developments as the energy transition, the housing tasking and area transformations, the mobility transition, and circular farming. If such prompting has not occurred within six years, the cycle will be repeated.

Interim goal 3: climate-proof and water-resilient planning must be embedded in the policies and actions of all the government bodies. The climate adaptation implementation agendas must be incorporated into all the government efforts, such as new and existing visions, agendas, frameworks, plans, guidelines, legislation, environmental programmes, water (management) programmes, regulations, spatial projects, and plans for management, maintenance, replacement, or renovation. In such plans, preconditions may be set with respect to spatial planning, for example, relating to the selection of locations for new housing projects or to construction or planning methods. In the realisation and coordination of schedules and plans, the identification of opportunities for linkage

with other spatial developments is important. By no later than 2022, the provinces must have embedded climate adaptation in the provincial environmental visions. By no later than 2024, the municipalities must have embedded climate adaptation in the municipal environmental visions, (sectoral) programmes, and environmental plans.

Interim goal 4: the national vital and vulnerable functions are also covered by all the steps of the Delta Plan on Spatial Adaptation. The central government bears system responsibility for the national vital and vulnerable functions. As yet, the efforts have focused on these functions' vulnerability to flooding. The vulnerability analyses for the national vital and vulnerable functions will be expanded to include waterlogging, drought, and heat. The stress tests addressing the four climate risks must have been completed by no later than the end of 2021. By the end of 2023, an ambition and the corresponding measures must have been formulated – based on the risk dialogue conducted – and set down in an implementation agenda.

Vital and vulnerable functions

The vital and vulnerable functions play an important part in climate-proof and water-resilient spatial planning. At the national level, such functions involve those that are crucial in terms of disaster control or whose failure could cause serious damage to the population, the environment, or the economy. In addition to direct damage, there is also a possibility of extensive consequential damage, due to their interdependencies. Enhancing the resilience of such functions against the impact of flooding, waterlogging, drought, and heat will contribute to reducing societal disruption, as failure of national vital and vulnerable functions has a radiating effect that extends across local and regional borders.

Close collaboration between all the government bodies and providers (managers) of vital and vulnerable functions is important. The aim is to conduct an efficient analysis of the vulnerability, to develop an action perspective, and to set down a realistic ambition regarding the climate-proofing capability and water resilience of the function in question. Responsibility for the 13 national vital and vulnerable functions³¹ remains vested with the central government. Local and regional governments may identify additional vital or vulnerable functions for which to set down ambitions and implement measures.

³¹ The 13 vital and vulnerable functions are: electricity, natural gas, oil, basic telecom facilities, public telecom facilities, drinking water, wastewater, health, pumping stations, main infrastructure, chemical industry, nuclear industry, infectious substances.

Delta Decision on Spatial Adaptation



Ambitions regarding national vital and vulnerable functions



- Close collaboration between government authorities and providers
- The central government bears final responsibility for the national vital and vulnerable functions. With respect to the construction of new vital infrastructure, local and regional governments play a key role in terms of spatial planning.

By 2050, the Netherlands will be more resilient against









Steps to render an area climate-proof and water-resilient

- Gaining a clear picture of vulnerabilities to extreme weather
- Drawing up a collective ambition
- Implementing ensuing actions
- Ensuring that daily and strategic actions are climate-proof and water-resilient (spatial planning, Water Review process)
- Ensuring that everyone is aware of and understands the residual risks
- Adapting calamity aid to residual risks; residents and businesses know what to do in the event of a calamity
- Reviewing vulnerabilities every 6 years, as a minimum, and adapting as dictated by climate and spatial planning developments



A rough analysis of flood risks has not produced detailed insight into such network-oriented functions as electricity and telecom, nor has the analysis generated the required insight into the cascade effects among the functions. However, the analysis has revealed that the focus must be on the full range of flood scenarios rather than on the most extreme scenarios only. Furthermore, it has raised awareness among the providers. Background Document G (in Dutch) contains a detailed overview of the state of affairs regarding the vital and vulnerable functions.

Each vital and vulnerable function calls for a tailormade approach. For that reason, in 2020 a core team will be formed for each function, comprising representatives of the Ministries responsible, grid managers, local governments, and regional governments. The core teams will be coordinating and organising the provision of information regarding stress tests and risk dialogues. Collaboration with the Security Regions is essential in this respect. The Security Regions are conducting "'impact analyses" within the framework of the WAVE2020 project, in order to map out vulnerabilities to flooding and severe waterlogging, and to elaborate action perspectives to reduce damage, casualties, and disruption.

5.3 Looking back: the milestones of the past six years

Over the past six years, a range of results and milestones has been achieved in the implementation of the Delta Decision on Spatial Adaptation. Some examples:

- In 2017, the Delta Plan on Spatial Adaptation was introduced, and in 2018 the authorities signed the Administrative Agreement on Climate Adaptation.
 This Administrative Agreement re-acknowledges the agreements set down in the Delta Plan and expresses the intention to provide additional financial resources;
- 2. Awareness of spatial adaptation is gaining momentum; the extreme weather of recent years has been conducive in this respect. Across the whole of the Netherlands, spatial adaptation features on increasingly more agendas of government bodies, corporations, residents, companies, and such sectors as construction;
- 3. A structure has been set up. The Netherlands comprises 42 Working Regions, each collaborating with various parties on spatial adaptation in their own areas. The Working Regions collectively cover the entire country. At a higher scale level, seven Regional Consultative Bodies are facilitating and supporting the annual progress reports by the Working Regions. In some cases, e.g., in the southern and eastern parts of the Netherlands, the Working Regions are joining forces at this higher scale level in addressing spatial adaptation;
- 4. Impact projects have been carried out, co-funded by the Incentive Programme, to amass practical know-how and share best practices. "Pilot implementation projects" have given impetus to the implementation by pioneers and enabled the addressing of urgent issues. A sum of EUR 6.7 million was available for process support in the implementation of the first three steps of the cycle. The knowledge gathered on practical aspects, the process, and the effectiveness of measures can be applied by other government bodies;
- 5. The <u>Knowledge Portal</u> features nearly a hundred different tools to facilitate and support parties engaged in climate adaptation. Some of these tools have been developed by the Delta Plan on Spatial Adaptation and the National Water and Climate Knowledge and Innovation Programme, such as the stress tests, the Climate Impact Atlas, the Climate Damage Assessor, and the Climate-proof Cities Toolbox.

- 6. In 2019, stress tests were conducted by municipalities, district water boards, and provinces. Rijkswaterstaat and ProRail conducted a first version of the stress tests for the main road network and the railway network in 2019. The stress tests have charted the vulnerabilities to waterlogging, drought, and heat, and generated insight into flood impact reduction. In 2020 and 2021, the authorities will discuss these vulnerability analyses with a wide range of parties to identify the risks and decide whether or not such risks will be accepted (risk dialogue). This approach will raise general awareness, foster commitment, and encourage ownership. In the purview of the risk dialogues, the Delta Plan on Spatial Adaptation developed the Roadmap in 2019. As the Corona measures will impact the risk dialogues, the Delta Plan on Spatial Adaptation parties will explore how they are impacting the progress of the ambitions set down in the Delta Plan. They expect to have a better picture by the second half of
- 7. In February 2020, the Senate and the House of Representatives endorsed³² an amendment to the Water Act enabling the provision of Delta Fund grants to local and regional governments in support of waterlogging measures. The amendment underpins the temporary incentive scheme that will come into force on 1 January 2021.

³² Government Gazette 2020, 73 (in Dutch).

5.4 Agenda for the six years ahead

Measures and milestones

The next six years will see the roll-out of projects and activities aimed at the realisation of the Delta Decision on Spatial Adaptation. A full overview of the measures, geared to the seven ambitions, is contained in the Delta Plan on Spatial Adaptation; see Paragraph 5.2.

Some remarkable milestones:

- In 2020 and 2021, the governments will draw up concrete implementation agendas, featuring measures they will be taking in the pursuit of climate-proof and water-resilient planning;
- In 2021, the central government will launch a temporary incentive scheme to provide local and regional governments with financial support to expedite their spatial adaptation efforts. Via coordination in the Working Regions, local and regional governments may apply for grants to expedite the implementation of measures;
- The authorities are not the only actors to move on from awakening to action. Such parties as housing corporations, NGOs, and (construction) companies are also encouraged to regard "climate-proof and water-resilient construction and planning" as the "new normal". The same goes for residents, who can contribute their mites by, e.g., greening their gardens and roofs, and by collecting rainwater;
- With effect from 2020, spatial adaptation will be anchored in all the policies and actions specifically including all the environmental visions of the central government (2020), provinces (2022), and municipalities (2024) and coordinated with the district water boards. Rather than a separate theme, this involves an integral element of a comprehensive, iterative approach. It expressly ties in with other spatial taskings, such as housing, the energy transition, circular farming, soil subsidence, biodiversity, and the mobility transition;
- Support and knowledge sharing via the Spatial Adaptation Knowledge Portal and the Climate Impact Atlas will be continued;
- The water taskings of the Delta Plan on Spatial Adaptation, the Delta Plan on Freshwater Supply, and the Delta Plan on Flood Risk Management will be coordinated more efficiently. Many of the actual measures and solutions being considered regionally serve multiple purposes. For example, water buffering at the Elevated Sandy Soils helps to cope with drought, combats waterlogging, and enhances water quality. Collectively developed research, knowledge sharing, and tools generate linkage opportunities in the implementation of measures. The financial and administrative coordination between the Delta Plan on Freshwater Supply and the

Delta Plan on Spatial Adaptation is also being enhanced. The collaboration between the Delta Plan on Spatial Adaptation and the Delta Plan on Flood Risk Management is mainly substantiated in the multi-layer flood risk management approach and the smart combination option. Each measure calls for a consideration as to the layer (flood prevention, damage reduction, crisis control) in which it will be most effective. Impact-reducing spatial planning measures must reduce damage and casualties during a flood and prevent flood risks behind the primary flood defences from exceeding the standards in the event of additional investments, which would dictate improvement of the flood defences.³³

Iterative approach

The Delta Plan on Spatial Adaptation pursues an iterative approach. The first round of stress tests, risk dialogues, and drawing up implementation agendas in the period 2018-2020 has generated a great deal of knowledge and insight into the risks, action perspectives, and measures. It has also raised awareness and consideration for interdependencies and interconnectivity between sectors and developments. There is a growing awareness that spatial adaptation is an issue that affects everyone. Permanent attention to raising awareness is imperative. The definitions of "climateproof" and "water-resilient" give government bodies, organisations, companies, and residents something to hold on to when taking measures. However, considering the developments related to the climate and spatial planning, the scope of the tasking to have the Netherlands climate-proof and water-resilient by 2050 continues to demand attention. Consequently, the definition of the Ambition - Analysis - Action targets involves a continuous process.

³³ Source: Final advisory report by the Flood Impact Reduction Working Group, Delta Programme 2020 p. 59.

Working on spatial taskings in an integrated manner

In addition to an implementation programme, comprising measures to resolve specific bottlenecks, attention needs to be paid to climate adaptation in all the daily and future activities in the physical environment. Climate adaptation will thus become "the new normal". Linkage with existing or new taskings, wherever possible, will gradually create a new situation. Explicitly seeking a relation with other spatial developments – such as the housing tasking, the energy transition, circular farming, and the mobility transition – will enable the adoption of an integrated regional approach. Coordination of the realisation schedule and planning is important in this respect.

Expertise and research

Knowledge on spatial adaptation is kept up to date through the Delta Programme Knowledge Agenda. The research efforts of the Delta Plan on Spatial Adaptation, the National Climate Adaptation Strategy, and the Delta Plan on Freshwater Supply will be accommodated in the Climate Adaptation Knowledge Programme. This will link up with other relevant knowledge programmes, such as the Sea Level Rise Knowledge Programme, the National

Water and Climate Knowledge and Innovation Programme, the climate adaptation knowledge programmes initiated by other Ministries (e.g., the Ministry of Agriculture, Nature and Food Quality and the Ministry of Public Health, Welfare, and Sport) and by other organisations, such as the Agriculture, Water, and Food Knowledge and Innovation Agenda set down under the Top Sectors policy. Furthermore, there are ties with the implementation agenda of the Ministry of Education, Culture and Science, relating to cultural heritage, climate adaptation, flood risk management, and soil subsidence.

The Southern Regional Consultative Body (RBOM/Platform Delta Plan on Spatial Adaptation South) is considering supporting its working units by monitoring spatial adaptation efforts and progress.

Urban Genesis

The Urban Genesis project involves a method to visualise the development of a city and how the subsoil has played a part in this development. The method uses 3D images to analyse the subsoil and the soil hydrology, inter alia, by the inter-comparison of reference years. The information can be used, for example, to climate-proof the water system, befitting the soil, the subsoil, and the buildings.

5.5 Delta Plan on Spatial Adaptation

The Delta Plan on Spatial Adaptation is a collective plan of the municipalities, district water boards, provinces, and the central government, aimed at rendering the Netherlands climate-proof and water-resilient. The Delta Plan expedites and intensifies the efforts to combat waterlogging, heat stress, and drought, and fosters flood impact reduction through spatial planning measures. It comprises seven ambitions. The annual Delta Programme reflects the progress made with respect to the ambitions. In part, the progress is based on the actions taken by the Spatial Adaptation Programme Team and in part on the outcomes of the monitoring processes in the 42 Working Regions.

5.5.1 Mapping out vulnerabilities

Insight into our nation's vulnerability to weather extremes and climate change constitutes the basis for spatial adaptation. Consequently, the municipalities, provinces, district water boards, and the central government have set down, in the Delta Plan on Spatial Adaptation, that by no later than 2019, the vulnerabilities in their area will be mapped out by conducting a stress test, in collaboration with local stakeholders. The stress tests also address soil subsidence. Thus, they provide insight into the impact of soil subsidence on waterlogging and flooding, and into the

impact of drought and heat on soil subsidence at the local and regional levels. According to the <u>progress report</u>, the Working Regions have achieved that ambition.

The Climate Impact Atlas is an important tool which provides customised data free of charge. The Atlas will be updated in 2020. In 2020, a start was made on collecting the results of the stress tests in order to be publicised at a central location. The results are reflected on a map which is available on www.ruimtelijkeadaptatie.nl.

In 2019, Rijkswaterstaat and ProRail conducted a first version of the stress tests for the main road network and the railway network. The stress tests regarding the main waterway network and the main water system are scheduled for 2020 and 2021.

Maps of impact reduction opportunities

In 2019, two maps were developed indicating the opportunities for flood impact reduction. The maps enable regional parties to identify the areas for which impact-reducing measures show promise, and to discuss such areas during the risk dialogue. The one map shows the promising locations for "damage containment through spatial planning"; the other shows promising locations for "casualty containment through spatial planning". The maps feature in the Climate Impact Atlas.

The stress test (Analysis), risk dialogue (Ambition), and implementation agenda (Action) cycle is repeated every six years as a minimum, or at an earlier date if developments related to, e.g., the climate or spatial planning so dictate.

An element of the Delta Programme is the national Vital and Vulnerable strategy. Over recent years, the flood vulnerabilities of the 13 functions have been charted (see Background Document G (in Dutch)). By the end of 2021, similar analyses must have been completed with respect to heat, drought, and waterlogging.

5.5.2 Conducting risk dialogues and drawing up strategies

The risk dialogue constitutes the step between the stress test and the formulation of an implementation agenda. A risk dialogue addresses an area's vulnerabilities to waterlogging, heat stress, drought, and flood risks. The participants make well-considered choices and develop ambitions that may be specified in a climate adaptation strategy. This is a tailormade process, comprising several meetings with a range of parties. There are no national guidelines for risk dialogues; each area calls for a tailored approach.

The Delta Plan on Spatial Adaptation sets out that the risk dialogues must be completed by no later than 2020 and be repeated every six years as a minimum. In the progress report, more than 75 per cent of the municipalities, district water boards, and provinces indicate that the risk dialogues will have been conducted before the end of 2020. Many risk dialogues involve a range of representatives of various organisations. Understandably, the Corona crisis has put pressure on such meetings. The Delta Programme parties are exploring how this will impact the progress of the ambitions set out in the Delta Plan on Spatial Adaptation. A better picture of such progress is expected by the second half of 2020.

In support of the authorities, the <u>Risk Dialogue Roadmap</u> was launched at the end of 2019. This helps to define a course based on the three steps of the dialogue: preparations, conducting interviews, and completion. The instrument is neither a blueprint nor a manual; it answers commonly asked questions and features practical examples

and tips. The Roadmap is the result of many meetings and the active application of the expertise and experience of municipalities, district water boards, provinces, and other parties. Input has been provided by a group of active users and by participants of the Delta Plan on Spatial Adaptation Working Region meetings, of the National Climate Adaptation Conference, of the National Delta Congress, and of many meetings across the country. The Roadmap evolves along with the developments and new insights. Several updates have been implemented in the first half of 2020. Knowledge of and experience with the risk dialogue is shared through "organised learning", e.g., in webinars and working sessions.

In 2020 and 2021, the Ministry of Infrastructure and Water Management will be conducting risk dialogues for the main road network, the railway network, the main waterways network, and the main water system. In 2020, the emphasis will be on the risk dialogue within the Ministry and in 2021 on the dialogue with national environmental parties. The Ministry of Infrastructure and Water Management is working on a first version of an implementation agenda, which is to be completed by the end of 2020; the agenda will be elaborated further in 2021.

In addition to the outcomes of the stress tests, the risk dialogues also address the physical and social domains. Furthermore, it is important to link up with other societal taskings and transitions in such fields as housing, energy, nature, agriculture, culture, and cultural heritage. The Ministry of Agriculture, Nature and Food Quality has identified the measures that are needed to render nature climate-adaptive and explored how nature can foster climate adaptation. Rather than setting up a separate action programme for the implementation of such measures, it was decided to link up with existing tracks and programmes. Including such measures in the risk dialogues will help to climate-proof the natural environment. The Spatial Adaptation Programme Team is supporting the formation of learning networks, enabling organisations to share knowledge of and experience with risk dialogues.

Risk dialogue in Borsele

On the initiative of the municipal council, the municipality of Borsele has conducted a risk dialogue on freshwater supply. In collaboration with a range of (local) stakeholders, expert officials elaborated the options for freshwater retention in six cases. In individual working sessions, problem definitions, potential solution strategies, parties involved, funding, and responsibilities were discussed. The meeting was well attended, which indicates that the topic of freshwater supply is garnering broad interest. The strength of this risk dialogue was that it has been initiated by local residents, among whom fruit growers.

Risk dialogues in Rhenen

Ever since 2014, the municipality of Rhenen has been experiencing waterlogging, heat stress, and drought on an annual basis. The impact of weather extremes has literally been mapped. In climate workshops, the opportunities and bottlenecks in each neighbourhood were discussed with residents gathered around the maps, which also generated valuable knowledge on the area. This has garnered more understanding and support, whilst it has also boosted residents' sense of responsibility. Several committed residents will be informing and encouraging others in their vicinity. A debate has also been initiated at the administrative level. Lines between officials within and beyond the municipality and in the various policy fields have been shortened; the climate is now regarded as part of their work. In 2019, a risk dialogue was conducted with administrators of local and regional governments and of such organisations as the community health service, housing corporations, and the Utrechtse Heuvelrug National Park. With respect to ten themes - e.g., health, safety, and leisure activities - this has generated an ambition for the municipality of Rhenen that constitutes the basis for its integrated climate policy.

5.5.3 Drawing up implementation agendas

Implementation agendas set out – local-level or more expansive – agreements for each region regarding what will be implemented, when and by whom, in the period from 2021. The agreements pertain to, e.g., specific measures, actions aimed at activating other stakeholders, embedding in policy and organisation, raising awareness, and further research. Nearly 20 per cent of the municipalities, district water boards, and provinces indicate that they have set down an implementation agenda for waterlogging issues. With respect to heat, drought, and urban flooding,

10 per cent of the municipalities have set down such agendas. The Corona measures are impacting the risk dialogues and thus the establishment of the implementation agendas.

Climate-proof Groningen 2020-2024 Implementation Agenda

On the basis of the results of the stress tests conducted in 2018, in 2019 the municipality of Groningen worked on an implementation agenda for climate adaptation. In addition to projects, the agenda reflects the direction, priorities, and an ambition. The municipal priorities have been charted using a risk-based approach. The role of the local government in several situations has been mapped out and assessed. Strategic partners of the municipality, such as the district water boards, the province, community health service, and the Security Region have been involved in drawing up the agenda. In February 2020, the Municipal Executive endorsed the implementation agenda.

5.5.4 Capitalising on linkage opportunities

Within the framework of the monitoring process, the Working Regions were requested to score the extent to which the impact of climate change is being taken into account when drawing up plans. On a scale of 1 to 10, the respondents awarded an average score of more than 7. With respect to taking account of the impact of climate change in drawing up management plans, the respondents awarded a score of 7.5.

Smart Linkage - Climate Adaptation for Municipalities

The Guidelines for Smart Linkage - Climate
Adaptation for Municipalities (published by
the National Water and Climate Knowledge and
Innovation Programme, Climate-proof Cities focus
area) sets out options for linking climate adaptation
efforts and processes with three major taskings: the
energy transition, the extensive new construction
tasking, and the regular cycle of maintenance and
renovation of buildings and the public space. Major
repairs and renovation appear to offer the best
opportunities for linkage with climate adaptation.

Climate-adaptive urbanisation: Amsterdam Metropolitan Area and Southern Randstad Conurbation

The central government and the two regions are developing a collective urbanisation strategy for the Amsterdam Metropolitan Area for the period up to 2050. An urbanisation agreement has been set down covering house construction in the Southern Randstad Conurbation. In both developments, climate adaptation has been expressly factored in as one of the spatial taskings, in addition to taskings relating to housing, working, mobility, the landscape, sustainability, and socio-societal liveability. Through climate adaptation, water has been accommodated on the spatial-economic agenda for an internationally competitive and liveable region.

Bicycle parking facilities as water storage in Zwolle

The construction of a new underground bicycle parking facility (5,500 bicycles) near Zwolle railway station can be utilised to expand the city's water storage capacity. A water-resilient design will enable its use as a temporary water storage facility, preventing water from flowing into the houses and office buildings in the nearby pre-war, paved-up neighbourhood of Assendorp during torrential rain.

Linkage with the energy transition

In 2020, capitalising on opportunities for linkage with the energy transition received wide attention. The province of Zuid-Holland published a brochure on linking the energy transition with climate adaptation, intended for professionals working on the Regional Energy Strategies. One of the recommendations of the brochure is to factor in cooling when selecting heat systems, and to consider multi-functional use of rooftops prior to fitting solar panels. Furthermore, the brochure offers practical tips for utilising information from the stress tests (such as the heat stress maps) when making choices in respect of the energy transition. Among other things, the brochure has resulted in attention being paid to cooling issues at a Provincial Executive meeting on the Regional Energy Strategies.

5.5.5 Promotion and facilitation

In 2019 and 2020, the Minister of Infrastructure and Water Management allocated EUR 20 million to the promotion and facilitation of climate adaptation. Of this sum, EUR 10 million has been spent on pilot projects; EUR 5.7 million has been spent on process support. For both components, local and regional governments have contributed a

minimum of half of the costs. Pilot studies on "Financial incentives for climate adaptation on private premises" have also been supported. After 2020, additional resources will become available under a temporary incentive scheme. In addition, several local and regional governments have been fostering the promotion and facilitation of climate adaptation.

Pilot implementation projects

Of the EUR 20 million available, a sum of EUR 10 million has been set aside to support pilot implementation projects. In 2019, three pilots were selected: in Meerssen, the Utrecht region, and Groningen. In 2020, five more were added:

- Climate-resilient Clausplein in Eindhoven;
- Gasthoes climate square and vicinity in Horst aan de Maas;
- Urban park as a natural climate buffer in Dordrecht;
- Climate adaptation measures with impact monitoring for five locations in Gelderland;
- · Construction of an urban brook in Enschede.
- The pilots will generate practical know-how, which will be shared through knowledge meetings, guidelines, and tools.

Impact projects

The Spatial Adaptation Incentive Programme has been providing grants to impact projects since 2015. An impact project sets the tone in terms of spatial adaptation when an area is climate-proofed or with respect to a relevant theme. Impact projects bolster the development of practicable methods and useful tools. In 2019 and 2020, the results of the fourth round of impact projects were disseminated in the Spatial Adaptation newsletter and on the Knowledge Portal. The projects have generated valuable knowledge, e.g., regarding fruitful, close collaboration with stakeholders. Examples are the "Design Thinking and Spatial Adaptation" project in the province of Noord-Brabant, "Risk Dialogue for a Climate-proof Historic City" in Gouda, and "Risk Dialogue on Individual Heat Measurements" in Amersfoort.

Other projects show how a design for the urban environment can garner sufficient support. Examples are the "Climatesmart Urbanisation" projects in Rotterdam, Zwolle, and Tilburg, the "Climate-proof and Sustainable Development Instrument" project in Gooise Meren, and the "Nieuwdorp Climate Street" project in Borsele. Two projects have produced instruments that are helpful in discussions on climate adaptation: "Assessment system for water risks in the spatial domain", employed in such cities as Rotterdam, Tilburg, and Zwolle; and the "Neighbourhood climate and greenery monitor", developed in Groningen.

The <u>Dordrecht Climate Adaptation Living Lab</u> shows how the results of pilot studies can be applied on a wider scale. Experience shows that the "organisation of learning" is a key element in this respect.

Temporary incentive scheme

The central government is working on a temporary incentive scheme to support local and regional governments in expediting spatial adaptation. An amendment to the Water Act was needed in order to enable the provision of Delta Fund grants to local and regional governments in the purview of measures to combat waterlogging, in addition to the measures aimed at combating urban flooding and drought. Parliament approved this amendment in February 2020³⁴. The amendment provides the foundation for the temporary incentive scheme that will come into effect on 1 January 2021. The Minister of Infrastructure and Water Management has set aside a sum of EUR 200 million to this end. Criteria have been agreed with the local and regional governments, on whose basis these governments can apply for grants via the Working Regions in the period of 2021-2023. The criteria and preconditions are: effectiveness and efficiency, co-funding, integrated approach (preferably), urgency, feasibility, and legitimacy (i.e., falling within the frameworks of the Delta Plan on Spatial Adaptation and the Delta Fund). Furthermore, applicants must substantiate the acceleration to be achieved with the government grant. The Working Regions will submit a schedule of measures for the period up to and including 2027 in order to qualify for grants.

Financial incentives for climate adaptation on private premises

Four pilot projects are underway aimed at encouraging residents and companies to take green-blue measures at their own premises. The municipality of Son and Breugel is experimenting with financial incentives (grants and discount on sewage charges) and with behavioural interventions in the municipal tax letters in order to persuade residents to disconnect their downspouts from the sewer system. The number of downspout disconnections rose from 15 in 2018 to 140 in 2019. The municipality of Rucphen is offering grants in an attempt to encourage its residents to green gardens and install rain barrels. A behavioural analysis shows that the financial incentive is important, yet comfort and support for the underlying goal also constitute significant incentives to take action. The municipality of Dordrecht is conducting a pilot at industrial estates and has studied the motivation of entrepreneurs. The city of Rotterdam and the Delfland district water control board have conducted interviews with banks, insurance companies, real estate investors, and health insurers regarding climate adaptation. This has produced new insights but not the "golden solution".

In 2020, three new pilots were rolled out: Amsterdam-West district, municipality of Nissewaard, and the Noord-Veluwe region.

The results of the pilots will be compiled by the Financial Incentives for Climate Adaptation at Private Premises Alliance³⁵. In this learning environment, considerable attention is focused on enhancing the effectiveness of financial incentives through smart behavioural interventions. The Alliance is also working on a method to support the preparations for political decisions on financial incentives. Finally, attention is being paid to the assessment and monitoring of green-blue measures in neighbourhoods and lots (see box, Greening of cities and villages).

Climate-proof Together

Over the past year, the Climate-proof Together Platform has actively contributed to the exchange of experiential expertise between local and regional governments, private parties, and Delta Programme participants. This has produced new questions and signals from those engaged in climate adaptation. The platform has organised specific actions to encourage housing corporations (field trips), the horticulture sector (coping with a growing demand), and industrial estates (dissemination of best practices) to embark on climate adaptation. Such actions provide local and regional governments with opportunities to expedite their efforts. Climate-proof learning environments have been set up addressing several themes, enabling the exchange of (practical) knowledge and the development of new insights. This fosters the dissemination of the expertise amassed by pioneers to actual practice. The Ministry of Infrastructure and Water Management has commissioned an evaluation of the Climate-proof Together Platform, to be conducted in 2020. The outcomes will underpin a decision on its format and funding after 2020.

Greening of cities and villages

Many municipalities and district water boards are pursuing a policy of greening gardens. Analysis of satellite and aerial photos, in combination with other data sources, has mapped out the proportion of paved-up gardens in neighbourhoods. The information is available on the www.waarstaatjegemeente.nl website, and can be used to assess the effectiveness of policies.

³⁴ Government Gazette 2020, 73 (in Dutch).

³⁵ The Alliance partners: Amsterdam-West, Delft, Dordrecht, Emmeloord, Enschede, Harderwijk, Nissewaard, Rotterdam, Rucphen, Son en Breugel, Noord-Veluwe region, Delfland District Water Control Board, Aa and Maas District Water Board, De Dommel District Water Board, Association of Netherlands Municipalities VNG, Ministry of Infrastructure and Water Management, Bureau Binnentuinen. Process supervision: Stroom en Onderstroom, NextGreen.

5.5.6 Regulating and embedding

The regulation and embedding of spatial adaptation will be expedited in 2021, by anchoring the governmental strategies and implementation agendas in individual policies, regulations, and the standards that are used in actual practice to implement the measures. Proper embedding up to the implementation level fosters climate-adaptive action and promotes the adoption of climate-proof planning as "the new normal". Every government authority must ensure that spatial planning is embedded in its policy plans. Subsequently, such plans must be translated into designs and tenders. In the monitoring survey, respondents award an average score of 6 – on a scale of 1 to 10 – to the question of whether spatial adaptation has been anchored in policy. The new Environment Act gives impetus to the regulation and embedding of climate adaptation. The central government, municipalities, provinces, and district water boards will be setting down their views and policies regarding climate adaptation in their environmental visions, environmental plans, and implementation agendas. The Environment Act demands the comprehensive consideration of climate adaptation in interconnectivity with other taskings in the spatial domain. Taking the goals to be achieved through climate adaptation as the point of departure will ensure the selection of the most appropriate and best available resources. Such goals are anchored in a wide range of (public-private) agreements and working processes. A good example is the Climateproof Construction Covenant, set down by sixty parties in the province of Zuid-Holland. The Amsterdam Metropolitan Area has embedded climate-proofing by drawing up an assessment framework pertaining to climate-proof planning in new developments.

The actual embedding in the implementation practice of government and private parties is effected through standards. "Standards" are understood to mean: best practices, guidelines, manuals, practical directives, protocols, and practical norms regulating design, construction, and management practices. In many cases, such standards are definitive in the formulation of contracts. Authorities and private parties are eager to have properly inter-coordinated climate adaptation standards. Ongoing and new implementation pilots are important to gain experience, to inspire other projects, and as a basis for standards.

The Delta Plan on Spatial Adaptation supports authorities and private parties in their ambition to embed the goals effectively and efficiently. This support is provided in several ways:

supporting the Climate Adaptation Standards
 Consultation Committee (OSKA) in climate-proofing the
 standards. OSKA is a network of public and private parties
 and standardisation organisations. In 2020/2021, they will

- map out which standards need adjustment and what new standards need to be developed. The parties involved are encouraged to develop such standards in concert;
- sharing guidelines for the embedding of climate adaptation in environmental visions, plans, and implementation agendas;
- sharing best practices, preferably linked to plans regarding, e.g., public space, the energy transition, construction, and the vitality of rural areas;
- sharing know-how on implementation projects, aimed at improving standards and assessment tools. Such projects, which will be carried out in 2020 and 2021, can help to improve the standards, thus making it easier for everyone to put climate adaptation into practice.

The guidelines, examples, and implementation pilots can be found on <u>ruimelijkeadaptatie.nl</u>.

Guidelines for local and regional governments Last year, the working group on the Exploration of (Construction) Regulations for Climate-proof Planning presented an advisory report under the auspices of the Ministry of the Interior and Kingdom Relations. This shows that the current legal system offers a wide range of options for the legal embedding of climate-adaptive construction and planning. However, in actual practice, a lack of knowledge on what is legally possible and what is not turns out to hamper the utilisation of such options. The working group has produced guidelines to remedy this. The guidelines set out how various measures to reduce waterlogging, heat stress, drought, and the impact of urban flooding can be embedded in local and regional regulations.

5.5.7 Responding to calamities

There will always be a risk of damage and nuisance caused by severe precipitation, drought, heat or urban flooding (100 per cent flood protection cannot be guaranteed). This is referred to as the "residual risk". The risk dialogue also defines what the authorities and residents/companies must do in terms of this residual risk, i.e., what their action perspectives are in the event of a calamity. Injured parties will attempt to have their damage compensated by the government or an insurance company. Legally speaking and in the perception of injured parties, it is insufficiently clear who is accountable for what damage in which cases. Coping with residual risks is another tricky issue. Residents and companies have their own responsibilities of which they are not always aware, or they lack the know-how on measures to reduce such risks. In 2020, within the framework of the risk dialogues, clarity will be provided regarding who is accountable for what damage. Furthermore, recommendations will be provided on coping with residual risks.

Climate Adaptation City Deal – flood impact reduction

Climate adaptation is receiving increasingly more attention in new construction projects. Flood impact reduction, on the other hand, is lagging behind although the housing tasking and other transitions offer sufficient opportunities to address this issue. The Flood Impact Reduction working group of the Climate Adaptation City Deal is working on a specific assessment framework to determine which measures will be effective when, and what will reasonably be feasible in new construction projects.

At locations prone to more shallow flood depths, measures could be focused on the prevention of damage to buildings and infrastructure. At locations prone to high flood depths, the prevention of casualties is paramount, for example, by creating sufficient shelters and evacuation routes; the second most important goal is reducing damage to vital and vulnerable functions. The energy transition is opening up a major opportunity to realise new vital grids in a resilient manner, thus reducing the vulnerability of cities.

Soil subsidence

Soil subsidence is adding to the Delta Programme taskings. Some low-lying parts of the Netherlands are experiencing an annual local soil subsidence of up to 2 cm. This is mainly caused by the combination of peat degradation, increasing pressure on weak soils, and (increasingly) lower groundwater levels. In addition, gas extraction, salt extraction, and riverbed erosion are causing other forms of soil subsidence. The subsiding soil could aggravate flood risks, especially considering that the sea level is rising, and river discharge volumes are increasing. In addition, the gravity-driven drainage of excess water into the sea or polder outlets is going to require larger pumps. Locations at which differences in soil structure and soil load are causing uneven soil subsidence may suffer visible and invisible damage to the foundations of buildings, engineering structures, roads, and dykes, as well as to underground infrastructure such as cables, pipes, and sewer systems. Moreover, soil subsidence increases the risk of waterlogging and fosters seepage, which could result in the salinisation of groundwater and surface water in polders and the coastal strip. Measures aimed at reducing soil subsidence, such as adapted weir management, may cause (ground) waterlogging and have a negative impact on the availability of fresh water. In addition,

subsidence in weak soils, due to peat degradation, is resulting in CO₂ emissions and water quality issues.

The importance of subsidence to the Delta Programme goals dictates a further analysis of its causes and effects. In the Inter-Ministerial Programme (February 2018), therefore, the parties working on the Delta Programme have set down their commitment to taking account of soil subsidence in the stress tests and risk dialogues that they are conducting within the framework of the Delta Plan on Spatial Adaptation. They also agreed to join forces on developing peat soil visions. At the end of 2019, eight government authorities in the Green Heart area signed the Green Heart Soil Subsidence Region Deal with the central government, under the Inter-Ministerial Programme. Collectively, they will be investing EUR 20 million in the Region Deal. This will be used to launch twenty experiments to produce solutions to specific situation and new knowledge. Such knowledge can also be applied at other locations in the Netherlands and abroad.

The Ministry of Infrastructure and Water Management is making the existing information and know-how on soil subsidence processes available in the purview of the stress tests, and is developing, in concert with the regional authorities, an action plan for improving information provision and the knowledge infrastructure pertaining to soil subsidence. Furthermore, the Delta Programme is seeking active collaboration with the National Soil Subsidence Knowledge Programme.

Tackling soil subsidence in urban and rural areas is one of the priorities of the draft National Environmental Vision. By no later than 2050, subsidence of weak soils must have been reduced substantially. Specific attention is required for soil subsidence in peat grassland areas. In collaboration with those who live and work in these areas, the authorities will increasingly opt for "function follows level" as the point of departure, rather than "level follows function". Along with district water boards, provinces, and local stakeholders, the central government will be steering towards this principle. If need be, the advisability and feasibility of measures will be reviewed for each individual polder. For certain areas, this will entail further water saturation.³⁶

³⁶ Cf. Memorandum by the Minister of the Interior and Kingdom Relations to the House of Representatives: Regie en keuzes in het nationaal omgevingsbeleid (NOVI) [Control and choices in national environmental policy], 23 April 2020. Parliamentary Document 34682 no. 48 (in Dutch).



In Delta Programme 2015, the flood risk management, freshwater supply, and spatial adaptation taskings were elaborated into regional Preferential Strategies. These strategies have now been reviewed; this chapter reflects the outcomes.

6.1 Introduction

The following paragraphs outline the reviewed strategies, region by region, and provide more details on the amendments. The paragraphs also look back on the milestones of the past six years and look ahead to the milestones scheduled for the next six years.

Virtually all the strategies have been adjusted to some extent, based on new knowledge or new developments. Incorporating the knowledge that we have now, the amended strategies provide the optimum course for tackling flood risk management, spatial adaptation, and the freshwater supply in the various parts of the Netherlands. The adjustments are mainly dictated by the new insights into a potential acceleration in sea level rise after 2050 and experience gained during the droughts of 2018 and 2019.

Chapter 2 provides a summarising picture of the amendments to the Delta Decisions and Preferential Strategies ensuing from the review.

Development of current Preferential Strategies into Regional Delta Strategies

In the years ahead, the Delta Programme partners will be exploring the development of the current (amended) Preferential Strategies into Regional Delta Strategies. The aim is to reinforce the interconnectivity between the three Delta Programme taskings (flood risk management, freshwater availability, and spatial adaptation) and the interconnection with other spatial taskings. The exploration may also produce other proposals for achieving this goal.

The current Preferential Strategies are largely founded on flood risk management and freshwater supply considerations; in some cases, the Preferential Strategies for flood risk management have already been expanded to freshwater supply. The exploration ties in with the aim of reinforcing the interconnectivity between the Delta Programme taskings. Furthermore, the Regional Delta Strategies will facilitate combination with other regional taskings in the physical domain, such as the regional energy strategies, location choices in spatial planning, and the regional adaptation strategies. The

exploration will commence upon the publication of Delta Programme 2021. The intention is to preserve what is good and to seek connections with added social value.

From now on, the Delta Programme will also address the developments regarding the Future-proof Amsterdam-Rijn Canal/North Sea Canal Water System. In this cross-regional process, water authorities and provinces have been collaborating - in interconnection with the Delta Programme - since early 2019 on future-proofing the water system for the Amsterdam-Rijn Canal/North Sea Canal area.

Future-proof Amsterdam-Rijn Canal/North Sea Canal Water System

The Amsterdam-Rijn Canal/North Sea Canal water system plays an important part in the freshwater supply and the reduction of waterlogging in West-Netherlands. Water-related issues are already posing major challenges (combating waterlogging, salinisation, and drought), which are exacerbated by climate change, sea level rise, and spatial and socioeconomic developments. In order to continue to work and live in safety in this area it is imperative that we look far ahead and anticipate such developments.

For that reason, water authorities and provinces have launched a cross-regional process to future-proof the water system. The process involves an interconnected approach to combat waterlogging, salinisation, and drought, and to pursue spatial adaptation. It is aimed at rendering the entire water system resilient, in interconnection with the functions and spatial developments. The authorities are connecting the taskings – from the local to the national levels – and are seeking solutions to this end in close collaboration with the other stakeholders.

It is already clear that water infrastructure measures alone will not be sufficient to resolve the bottlenecks. It will also be necessary to reduce the regional functions' dependence on the water system and to plan new urbanisation areas in a climate-adaptive manner. The preconditions for water management will be increasingly directive in terms of spatial planning.

The future-proofing process will successively address the following questions:

- What water infrastructure is needed in the Amsterdam-Rijn Canal/North Sea Canal area? This will involve the optimisation of the discharge near IJmuiden and potential new supply and discharge routes between the Amsterdam-Rijn Canal/North Sea Canal system and surrounding water systems, such as Lake Markermeer and the River Lek. As
- a result, the area will be less dependent on the IJmuiden discharge.
- What preconditions for water management must be taken into account in regional spatial planning?

What functions will be under pressure in the long run, and what adjustments may be required then? This will result in a roadmap and a step-by-step plan to future-proof the water system in this area.

6.2 IJsselmeer Region

6.2.1 Proposed amendments to the Delta Decision and Preferential Strategy for the IJsselmeer Region

Delta Decision on the IJsselmeer Region

The Delta Programme Commissioner proposes the following amendments to the Delta Decision on the IJsselmeer Region.

Water discharge under rising sea level

- The central government will continue its policy to discharge water from Lake IJsselmeer to the Wadden Sea via a combination of gravity-driven drainage and pumping in the IJsselmeer Closure Dam (Afsluitdijk).
- The central government will conduct a timely study into the replacement tasking for the gravity-driven drainage complexes in the IJsselmeer Closure Dam, which according to current insights need to be replaced by 2050.

Water level management

- The central government will maintain the average winter water level of Lake IJsselmeer and Lake Markermeer, in accordance with the new water level ordinance that came into effect in 2018.
- After 2050, the average winter water level of Lake
 IJsselmeer and Lake Markermeer can rise along with the
 sea level to a maximum of 30 cm, in order to adaptively
 respond to unexpected developments if need be.
- For both lakes, the elevation of the average winter water level will commence no sooner than 25 years after the decision has been taken, and will be implemented gradually, unless there is an urgent need for earlier introduction.

Lake peak water level control

- After 2050, the relatively frequent peak water levels in Lake IJsselmeer (probability of exceedance 1:10 per annum) will no longer increase in height as a result of gravity-driven drainage and pumping.
- Dyke improvements will take account of the gradual increase in less frequent peak water levels in Lake IJsselmeer, in connection with the pumping capacity

provided (probability of exceedance less than 1:10 per annum).

Freshwater supply

- Rijkswaterstaat will use the options of flexible water level management in Lake IJsselmeer and Lake Markermeer to secure the freshwater supply.
- The option of expanding the bandwidth for flexible water levels in Lake IJsselmeer and Lake Markermeer from 20 cm presently to 50 cm after 2050 will be kept open.
- Rijkswaterstaat, the district water boards, and the
 provinces will set down at the administrative level
 how water is to be distributed among the consumer
 functions in the event of water shortages, including the
 associated margins and the interconnection with water
 level management (Update of North Netherlands Water
 Distribution 2020).
- In the event of changes in the Rhine tributaries discharge distribution (after 2050), the central government will explicitly factor in the pros and cons for the IJsselmeer Region (freshwater supply and flood risk management).

Significance of the IJsselmeer Region

The IJsselmeer Region³⁷ constitutes the water management hub for the northern part of the Netherlands. The construction of the IJsselmeer Closure Dam has greatly enhanced its flood protection. The huge freshwater supply it has created is essential for the agriculture, industry, and nature in a large part of the Netherlands and for the drinking water supply in the province of Noord-Holland. In addition, society is making the most of the lakes and shores in other ways, such as for leisure activities and for shipping. The region harbours extraordinary

³⁷ The IJsselmeer Region comprises Lake IJsselmeer (including Ketelmeer, Zwarte Meer, and Vossemeer), Lake Markermeer, the Southern Randmeren (Gooimeer, Eemmeer, and Nijkerkernauw in open connection with Lake Markermeer), and the Veluwe Randmeren lakes (Nuldernauw, Wolderwijd, Veluwemeer, and Drontermeer between Nijkerkersluis and Roggebotsluis).

natural values. Its long development history and the wide diversity in landscape, subsoils, and manifestations are reflected in the cultural history that is still present.

Preferential Strategy for the IJsselmeer Region

The Delta Programme Commissioner proposes the following amendments to the Preferential Strategy for the IJsselmeer Region.

Flood risk management

By 2050, the primary flood defences must meet the standards that came into force on 1 January 2017. The IJsselmeer winter water level has a major impact on the flood defences. The level is regulated by sluices and pumps in the IJsselmeer Closure Dam. The flood risk management strategy is committed to "drainage by gravity if possible, and pumping if need be".

The point of departure of the strategy is that up to 2050, the average winter water level in the IJsselmeer Region will not keep pace with the sea level. After 2050, a limited rise along with the sea level would be an option for Lake IJsselmeer and Lake Markermeer in order to enable an adaptive response to unexpected developments. The strategy takes account of a maximum rise of 30 cm in winter water levels after 2050, in order to curb negative effects on flood defences, areas outside the dykes, and regional water management.

Dyke improvements and the use of pumps in the IJsselmeer Closure Dam are the main solutions in the IJsselmeer Region to continue to meet the flood protection standards.

Freshwater supply³⁸

The freshwater supply strategy pursues a resilient freshwater supply by securing the freshwater supply in the IJsselmeer Region and by combating salinisation (main water system), by retaining water in the regional system, by cutting back on water consumption, and by combating salinisation (North Netherlands Freshwater Supply Region).

In the IJsselmeer Region, flexible water level management is pursued to create a maximum freshwater supply. If the probability of low river discharges should increase in the future, a solution could be to raise the River IJssel discharge volumes to Lake IJsselmeer through flexible management of the weir near Driel. Should river discharges drop even further, supplying water via the Amsterdam-Rijn Canal could be an option. This will be explored in the purview of the next review in 2026, via the Climate-proof Main Water System Freshwater Supply Strategy (see box 4.1).

The regional parties around the IJsselmeer Region are committed to optimise water retention and to reduce water consumption through water saving and smart water management.

A prerequisite for a resilient freshwater supply is minimisation of the saltwater volumes entering Lake IJsselmeer via the sluices and locks in the IJsselmeer Closure Dam. Rijkswaterstaat is exploring several options to this end, including saltwater collection in deep pits behind the sluices (salt traps).

Taking spatial adaptation into account in regional water availability processes will generate measures that serve multiple purposes. This fosters interconnection between system measures and climate-resilient planning in ongoing and future area developments. The aim is to develop regional development programmes.

6.2.2 Explanatory notes to the review

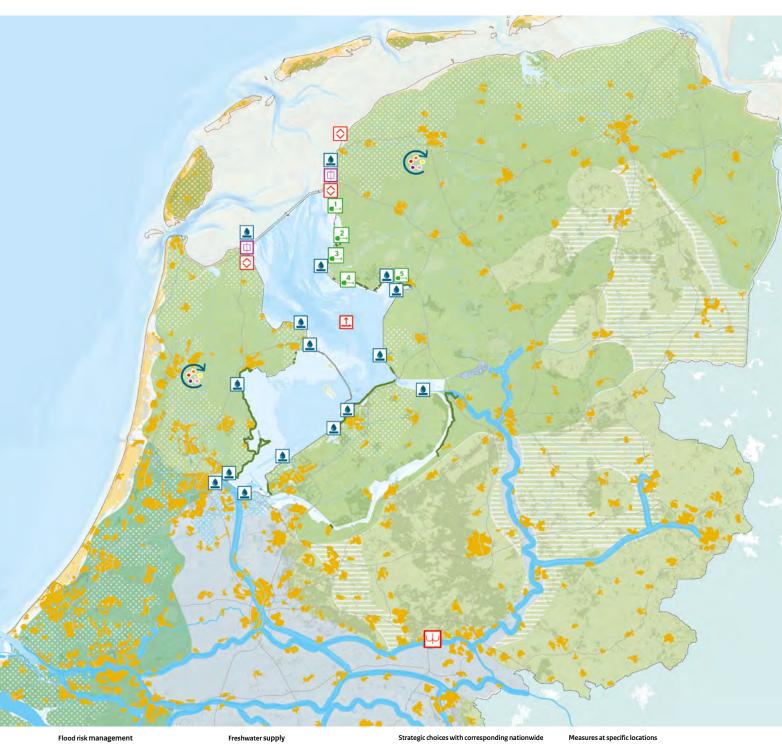
Delta Decision

A new consideration in the amended Delta Decision on the IJsselmeer Region is that after 2050, the average winter water level of both Lake IJsselmeer and Lake Markermeer will be keeping pace, to a limited extent, with the sea level.39 The option of a rising water level in Lake Markermeer has been added because here, too, some rise may be advisable in order to enable accommodation of unexpected developments. Higher winter levels entail social and spatial consequences for the surrounding area. With a view to giving all the stakeholders room and to encouraging them to factor in potential future developments, the Delta Decision stipulates that any water level rise will only take effect 25 years after the decision has been taken, and will be implemented gradually. Every six years – or earlier as needed – the necessity of a decision on a linked rise will be assessed within the framework of the review. A potential rise of winter levels will also have consequences (advantages or disadvantages) for dyke improvements, agriculture, and nature. After 2050, gravity-driven drainage of water from Lake Markermeer to Lake IJsselmeer will continue. In the Veluwe Randmeren lakes, the average winter and summer levels will remain constant, even after 2050.

The regulation of peak water levels in the lakes has been added to the Delta Decision. An <u>integrated study into</u> <u>flood risk management and water level management</u> has shown that peak winter levels are gradually rising as a result of climate change. The peak levels occur when adverse winds blow the IJsselmeer, Markermeer, and Wadden Sea water askew (whipping up), which prohibits sufficient discharge by gravity. In the years ahead, the gravity-driven

³⁸ Three Freshwater Supply Regions depend on Lake IJsselmeer: North Netherlands (see Paragraph 6.2), West Netherlands (see Paragraph 6.3), and Elevated Sandy Soils East (see Paragraph 6.8).

³⁹ Source: Integrated study on flood risk management and level management.



- Dyke improvement
- Improvement of Friesland IJsselmeer coast
 - 1. Makkumer Wadden
 - 2. Workum Stoenckherne
 - 3. Bocht van Molkwar
 - 4. Mokkebank Laaxum
 - 5. Tacoziji
- IJsselmeer Closure Dam drainage by gravity / pumping: "drainage by gravity if possible, and pumping if need be"

Freshwater supply

Taskings

- Subsoil salinisation (combined with other taskings) Falling groundwater levels and no freshwater supply
- Falling groundwater levels and limited freshwater supply
- IJsselmeer water buffer volume
- No freshwater supply

Inlet salinisation

Low water levels and discharge volumes

OVI preferential order: adapting land use to water availability; cutting down water consumption; improved water retention; more efficient distribution of water; acceptance of (residual)

▲ Climate-proof freshwater supply from main water system in combination with smart water management. (Key distribution points in and from the main water system)

- 1 Expansion of IJsselmeer water stock
- Enhancing freshwater/saltwater separation at
- Option of flexible management of weir near Driel to increase water flow via IJssel river to Lake IJsselmeer

Participation in Sea Level Rise Knowledge Programme

Map 2 Preferential Strategy for the IJsselmeer Region

drainage capacity via the IJsselmeer Closure Dam will be expanded and the first pumps will be installed. This will ensure adequate regulation of the peak water levels in the lakes until 2050. After 2050, the pumping capacity will be gradually expanded, depending on the rise in sea level and changes in river discharge volumes, in order to prevent peak levels with a probability of exceedance of once every 10 years from rising any further. More extreme peak levels (probability less than 1:10 per annum) will, however, gradually increase in height: preventing this would require an extremely large pumping capacity. This must be taken into account in the preparation of dyke improvements.

The River IJssel accounts for 75 per cent of the water supply to Lake IJsselmeer; the other 25 per cent is provided by the Overijsselse Vecht, other regional waters, and precipitation. The amended Delta Decision on the Rhine-Meuse Delta offers scope for changing the Rhine tributaries discharge distribution (see 6.3.1). The point of departure in the amended Delta Decision and Preferential Strategy for the IJsselmeer Region is that a change in the discharge distribution must not have a significant impact on flood risk management in the IJsselmeer Region.

Flood risk management

For the island of Marken and the IJssel-Vecht delta, the Preferential Strategy contained in Delta Programme 2015 featured the option of achieving the desired protection level through a "smart combination" of dyke improvements and spatial solutions to contain the impact of flooding. In recent years, research has shown that such a combination will not produce sufficient effect in either area. Consequently, priority will now be given to dyke improvements⁴⁰.

Freshwater supply

The freshwater supply bottleneck analysis⁴¹ has revealed that in the most extreme climate scenario, water shortages may occur six times per century. For that reason, the amended Freshwater Supply Strategy continues to focus on water retention, on securing Lake IJsselmeer as a freshwater buffer, on economical and efficient use of IJsselmeer water, and on enhancing the region's capacity to cope with periods of minimal IJsselmeer water. This ties in with the regional ambition of preventing new developments – e.g., climate change, developments in agriculture, controlling soil subsidence, combating heat stress, and the advent

of hydrogen plants and data centres – from creating an additional demand for water.

Another element of the North Netherlands Freshwater Supply Strategy is combating salinisation. During the droughts of 2018-2019, several regional locks (Den Helder, Harlingen, Delfzijl) were found to be prone to salinisation, whose impact exceeded the original assumptions. Lockage restrictions were enforced to prevent salinisation, and in addition, potential salinisation reducing measures are being explored. Over recent years, a substantial part of Lake IJsselmeer has also been found to be salinised. Salt traps near the IJsselmeer Closure Dam (pits in the lake bed behind the sluice structures) appear to offer good opportunities if sufficient water is discharged and the salt traps are emptied regularly. Otherwise, saline water could spread over Lake IJsselmeer in the turbulence created by strong winds.

6.2.3 Looking back: the milestones of the past six years

These are some of the results and milestones achieved with the implementation of the Delta Programme in the IJsselmeer Region over the past six years:

- Since 2018, Rijkswaterstaat has been enforcing a flexible summer water level in Lake IJsselmeer and Lake Markermeer. This enables the creation of an additional freshwater supply of 400 million m³.
- 2. In 2018, work on the IJsselmeer Closure Dam commenced. The dam will be improved along its entire length, and storm surge barriers will be constructed in the two lock complexes. The lock complex near Den Oever will be fitted with additional sluices and two large pumping stations to enable increased discharge into the Wadden Sea.
- 3. On 18 June 2019, the report on the integrated study into flood risk management and water level management in the IJsselmeer Region was presented to the House of Representatives. The study has mapped out scenarios for long-term water level management (2050-2175). The results provide guidelines for water discharge, flood protection, and water level management after 2050.
- 4. The Houtrib dyke between Enkhuizen and Lelystad has met the new flood protection standards since 2020. The dyke contributes to the flood protection of a large area around Lake IJsselmeer and Lake Markermeer.
- 5. In 2020, important building blocks were completed in the purview of administrative agreements on freshwater distribution: the IJsselmeer Region Joint Fact-Finding Process, the updating of the North Netherlands Water Distribution, and the Water Demand Forecast Tool. The IJsselmeer Region Administrative Platform has thus substantiated several important recommendations of the Drought Policy Platform.

⁴⁰ Source: Impact of sea level rise on flood risk management |
Backgrounds to advisory report by the Expertise Network for Flood
Protection. Expert judgement on the tenability of the Delta
Programme Preferential Strategies in the event of acceleration in sea
level rise. Presented to the Minister on 21 November 2019.

⁴¹ Source: Deltares dated 30 July 2019. Updated bottleneck analysis for the Delta Plan on Freshwater Supply: Impact of Paris measures and prospects for the reference year 2100.

- 6. Sixty parties have signed the IJsselmeer Region Agenda 2050. Under this Agenda, the parties aim to prepare the IJsselmeer Region for the future. In addition to water-related issues, the Agenda addresses spatial quality and cultural history, the energy transition, leisure activities, tourism, and urbanisation. The IJsselmeer Region Administrative Platform is coordinating the implementation of both the Delta Programme and the Agenda for the IJsselmeer Region.
- 7. The province of Noord-Holland has conducted a climate stress test regarding agriculture and nature, and a stress test regarding its roads. In the Noorderkwartier Climate Adaptation Collaboration Working Region, all 28 municipalities have conducted climate stress tests. The Hollands Noorderkwartier district water control board is conducting a water system analysis to gain accurate insight into the potential vulnerabilities of the water system and methods to minimise waterlogging damage. The initial results show that severe precipitation can cause major local damage. In collaboration with municipalities, the province of Noord-Holland, and other stakeholders, the district water control board has launched projects to climate-proof the water systems in the first eleven areas.
- 8. The Flevoland Climate Adaptation Partnership has conducted climate stress tests for urban and rural areas. Knowledge cafés have been set up to raise awareness among entrepreneurs in the horticulture sector.

6.2.4 Agenda for the six years ahead

Projects, activities, and milestones

The next six years will see the roll-out of projects and activities aimed at the realisation of the Delta Decision and the Delta Strategy for the IJsselmeer Region. Noteworthy milestones for the period 2021 up to and including 2026 include:

In a few years' time, improvement of the IJsselmeer Closure Dam will be completed. The improved dam will have a larger gravity-driven discharge capacity and additional pumping capacity. In April 2020, the Council of State ruled in the proceedings regarding the appeals lodged against the Markermeer dykes project. The ruling gives the go-ahead to commence dyke improvement and to bring flood risk management in the area up to par.

In 2026, a study will be conducted to identify the additional freshwater supply measures – including measures aimed at spatial aspects – required to keep the IJsselmeer Region climate-proof in the long run (flood protection measures have already been elaborated in the integrated study into flood risk management and water level management of the IJsselmeer Region). As a result of climate change and socio-economic developments, the system is approaching

its limits in terms of flood risk management and freshwater supply. The study will be completed in time for the second review in 2026.

By the next review, an exploratory study will be completed into the options for climate-proofing the freshwater supply of the IJsselmeer Region. This study will also identify promising options to be elaborated for a new strategy.

By the next review, options will be mapped out for ensuring sufficient water supply to Lake Markermeer in times of extreme drought, through flexible weir management near Driel and through supplying water via the Amsterdam-Rijn Canal. By 2026, the North Netherlands Water Distribution document from 2009 will be updated and linked to the Water Demand Forecast Tool.

Optimisation of the regional water system will continue in the six years ahead, among other ways by setting up comprehensive regional programmes for brook restoration, sandy soils strategies, and flexible water level management. The measures will be aimed at preventing water shortages, combating waterlogging, and enhancing water quality. Information on historic brook systems will be used in the process, as will model projects on country estates.

In the years ahead, a regional agent (Zoet-Zout Knooppunt [Fresh-Saline Hub]) will be informing stakeholders on the knowledge available, e.g., to cut back water consumption.

Furthermore, the region will continue to advocate water awareness and water savings among consumers. The authorities will capitalise on the greater sense of urgency that the drought of 2018 has brought about among stakeholders. Water-saving measures will see large-scale application on the island of Texel (Fresh Future pilot) and near Lake Lauwersmeer (Fresh on Saline pilot).

Under the Major Waters Programme Strategy, planning measures will be implemented to restore or develop ecological values, in coordination with the Delta Programme measures. MIRT Explorations for the Wieringerhoek and Oostvaarder shores are scheduled for completion in the years ahead (rolled out in 2020). An Exploration for the Frisian coast will be launched. The aim is for the coast of Noord-Holland to tie in with a coastal development programme initiated by the province of Noord-Holland.

A full overview of projects and activities is provided in the Delta Plan on Flood Risk Management (3.5), the Delta Plan on Freshwater Supply (4.5), and the Delta Plan on Spatial Adaptation (5.5). The initiators of the projects and activities are maximising the opportunities for future-proofing the water system by tackling the three Delta Programme

taskings in an interconnected manner and, wherever possible, by tying in with climate mitigation, the circular economy, and other transitions, as agreed upon in the IJsselmeer Region Agenda 2050.

Expertise and research

The study into the IJsselmeer Region in the period 2021-2026 is featured in the <u>Knowledge Agenda</u> of the Delta Programme. The main issue involves the impact of the rising sea level. That is why the IJsselmeer Region is

participating in the Sea Level Rise Knowledge Programme, specifically on the system explorations regarding flood risk management and freshwater supply (Track 2). Other key issues involve methods to combat salinisation and pollutants, lessons to be learned from experiences with different types of water level management, the use of pumps in extreme situations, adaptive designs for water discharge facilities to enable periodic fast and efficient expansion of the pumping capacity, and options to reduce the probability of failure of water discharge facilities.

6.3 Rhine Estuary-Drechtsteden Region/West-Netherlands Freshwater Supply Region

6.3.1 Proposed amendments to the Delta Decision on the Rhine-Meuse Delta and the Preferential Strategy for the Rhine Estuary-Drechtsteden Region

Delta Decision on the Rhine-Meuse Delta

The Delta Decision on the Rhine-Meuse Delta pertains to choices in the main water system that affect the entire Rhine-Meuse Delta: the dyked River Meuse, the Rhine branches, the tidal rivers area up to the coastal river estuaries, and the northern basins of the Southwest Delta. The Delta Programme Commissioner proposes the following amendments to the Delta Decision on the Rhine-Meuse Delta:

- For the long run (up to 2100), normative discharges of 18,000 m³/s for the Rhine and 4,600 m³/s for the Meuse will remain the point of departure in terms of flood risk management. 42
- The existing agreements on the discharge distribution across the Rhine tributaries in times of high water will remain in force until 2050; an option will be kept open to re-assess, in the light of new points of departure, whether future changes in the discharge distribution would be
- No additional river water storage will be created in Lake Grevelingen. Flood protection around Haringvliet, Hollandsch Diep, and Merwedes will be secured by keeping the dykes surrounding these bodies of water up to par.
- In the decades ahead, the current system of closable open storm surge barriers will remain the basis for protection against higher sea water levels.
- In the years ahead, hinterland studies will be conducted in respect of the storm surge barriers, and a supraregional system study will be conducted within the framework of the Sea Level Rise Knowledge Programme.

- Around 2040, a comprehensive, broad-based supraregional system analysis will be rolled out, specifically
 focused on the replacement of the Maeslant storm
 surge barrier. This analysis will map out the impact
 of several policy options on all the relevant themes:
 dykes and areas outside the dykes, port access, erosion,
 spatial developments, nature, agriculture, horticulture,
 shipping, and freshwater supply. The replacement of
 the other storm surge barriers will also be reviewed. The
 system analysis may commence at an earlier or later date,
 if this were dictated by new insights into the impact of
 climate change, for example, based on the findings of the
 Sea Level Rise Knowledge Programme.
- The policy options covered by this comprehensive supraregional long-term system analysis (2070-2100) include both closable open variants and closed variants (such as locks to close off the Nieuwe Waterweg). Changes in the discharge distribution, storage in the Southwest Delta, and freshwater supply measures may also be addressed, as may the adjustment or replacement of other storm surge barriers and potential new measures ensuing from new knowledge.

The Delta Decision on the Rhine-Meuse Delta does not pronounce upon a different management of the Haringvliet sluices. These sluices were set "ajar" in early 2019, following the learning-by-implementation method. A further rise in sea level after 2050 may necessitate adjustment or replacement of the Haringvliet sluices. For that reason, Haringvliet, Hollands Diep, and the surrounding rural areas are taken into account in the comprehensive supra-regional system analysis.

⁴² These are the discharge volumes that constituted the basis for the standards up to 2017 (the current standards are based on a set of standard-dependent discharge volumes for each dyke stretch).

Significance of the Delta Programme in the Rhine Estuary-Drechtsteden Region

The Rhine Estuary-Drechtsteden Region owes its prosperity to its advantageous location in the delta, where the North Sea and the rivers Rhine and Meuse converge. It is a region of extremes, featuring densely populated urban areas surrounded by cultural landscapes and nature reserves. Most areas in the region are located at such a low elevation that they would be inundated very rapidly and deeply during a flood. Socio-economic and spatial developments in the Rhine Estuary-Drechtsteden Region demand good access to the sea and the rivers, as well as proper protection from these bodies of water. The area is developing rapidly and needs to address issues such as sea level rise and soil subsidence.

Preferential Strategy for the Rhine Estuary-Drechtsteden Region

The proposals for the Delta Decisions on Flood risk management, on the Rhine-Meuse Delta, on Spatial Adaptation, and on Freshwater Supply constitute the framework for the Preferential Strategy for the Rhine Estuary-Drechtsteden Region. The Preferential Strategy for the Rhine Estuary-Drechtsteden Region primarily pertains to flood risk management and additionally to spatial adaptation (covering flood impact reduction through spatial planning and crisis control) and to freshwater supply. The Delta Programme Commissioner proposes the following amendments to the Preferential Strategy for the Rhine Estuary-Drechtsteden Region:

Flood risk management

1. Prevention as the basis

Flood prevention constitutes the basis for the flood risk management strategy in the Rhine Estuary-Drechtsteden Region. The current system of dykes and open closable storm surge barriers provides a sound foundation for the decades ahead. An optimum combination of storm surge barriers and dyke improvements is the point of departure when it comes to choosing measures; in the eastern part of the area, river widening is also an option. The storm surge barriers in the region will be due for replacement by the second half of the century; for the Maeslant storm surge barrier, expectations are that this will not be the case until 2070. At that time, both closable and closed options will be conceivable (see Delta Decision on the Rhine-Meuse Delta). This means that the Hollandsche IJssel and Nieuwe Waterweg will remain open rivers, at least for the decades ahead, with closable storm surge barriers. Tidal movement and the freshwater tidal nature will be preserved.

The challenge is keeping the option of future dyke improvements open, whilst urbanisation continues in this densely built-up area. This is achieved through early coordination and integration of the taskings relating to dykes and spatial developments. The first step involves drawing up collective spatial development frameworks for each dyke stretch. These will address such issues as the utilisation of forelands and areas outside the dykes in the purview of flood risk management, the prevention or adaptive design of new construction projects on dykes, and coping with existing buildings in (future) dyke improvements.

2. Impact reduction

As flooding can never be ruled out entirely, flood impact reduction and flood-conscious planning of areas inside and outside the dykes are covered in the flood risk management strategy. The aim is to prevent damage, casualties, and disruption to the maximum extent possible. In the years ahead, specific attention will be focused on the flood-conscious planning of new residential areas and on provisions for (new) vital and vulnerable functions. In the choice of locations and the design, explicit attention will be paid to situations in which flooding occurs nonetheless.

The authorities will be drawing up area-specific flood risk management strategies for flood impact reduction, based on the impact analyses conducted by the Security Regions and the stress tests conducted by the municipalities. The strategies will comprise evacuation strategies and risk communications strategies, which will be coordinated at the supra-regional level.

West-Netherlands Freshwater Supply Region

In this region, the national freshwater supply goal – having the Netherlands resilient against freshwater shortages by 2050 – is being substantiated as follows:

- Resilience against situations involving a limited supply
 of freshwater, as occurred in 2018 (the current probability
 of occurrence is 1:30; towards 2050 the probability might
 increase) will be achieved by boosting the resilience
 and efficiency of the water supply. According to current
 insights, additional measures such as the further
 development of Smart Water Management and resilient
 inlets in the Krimpenerwaard and Kromme Rijn within
 the process of climate-proofing the main water system –
 will obviate the need for major infrastructure measures
 in the decades ahead (such as locks in the Nieuwe
 Waterweg).
- The additional water demand ensuing from climate change and societal developments will be accommodated by the region in which such is most effective, for example, to reduce soil subsidence, to reduce CO₂ emissions, to combat damage to foundations, to foster greening, and to restore nature. Furthermore, the region

- will anticipate the additional demand for high-quality water that will arise when the option of discharging saline water (brine discharge) is dropped.
- Adaptation measures and the utilisation of new sources of water, such as effluent and brackish seepage, will raise water consumers' ability to cope with freshwater shortages. This will require technological changes and new business models. The region will strive to reduce its dependency on water supply and flushing.
- Water consumers will receive transparent information
 on the risk of freshwater shortages, on the action
 perspective for coping with such a risk, and on the time
 at which damage will be unavoidable. Through the Water
 Availability process and the stress tests, the region will
 seek to link up with other transitions and developments
 (regarding, e.g., spatial adaptation, the agricultural
 transition, urbanisation, and environmental visions).

Spatial adaptation in West-Netherlands

This past year, the cities of Amsterdam, Delft, and Gouda completed a climate adaptation strategy which was set down at the administrative level. The province of Utrecht is incorporating climate adaptation into the provincial Environmental Vision and decrees, and is working on a provincial climate adaptation programme. This programme links up explicitly with the Regional Adaptation Strategies and other processes, such as the Regional Energy Strategy. The provinces of Noord- and Zuid-Holland are incorporating climate adaptation into their environmental policy; both provinces have already embedded climate adaptation in their Visions. Furthermore, processes have been set in motion in both provinces to incorporate climate adaptation into the decrees. The aim is for climateproofing measures to be considered in every (large-scale) new development. In the Amsterdam Metropolitan Area, the theme of climate adaptation is playing an increasingly larger part in the Spatial Planning platform. Draft points of departure for climate-proof new construction projects are being field-tested in key areas spread across the region. In parallel, climate adaptation is being incorporated into the urbanisation strategy.

6.3.2 Explanatory notes to the review

Flood risk management

A significant element of the Delta Decision on the Rhine-Meuse Delta has been amended. The point of departure for the original Delta Decision was that the replacement of the Maeslant storm surge barrier would once again involve a closable open barrier. In 2016, it was decided to additionally elaborate the Sluices Plan option as a fully-fledged alternative (Geurts motion). A recent Deltares study into the impact of sea level rise shows that the manner in which the replacement of the Maeslant storm surge barrier is substantiated will be crucial to a range of taskings in

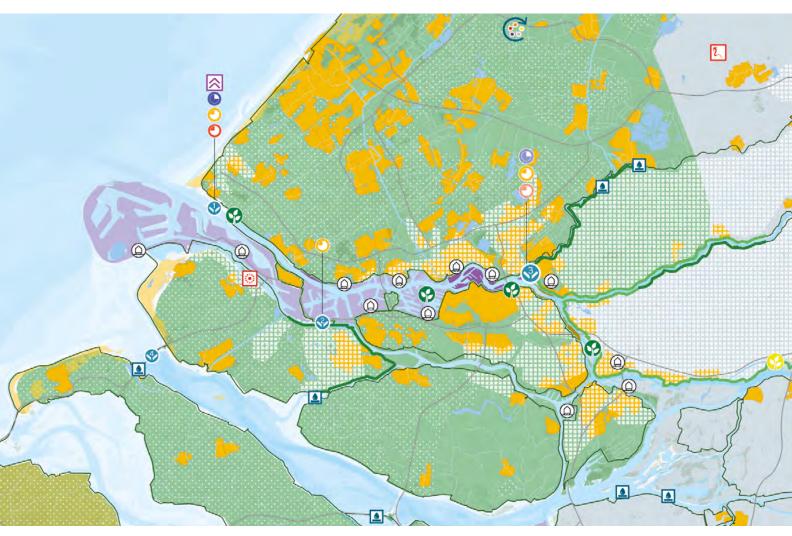
the entire Rhine-Meuse Delta. Consequently, under this amended Delta Decision, the replacement study will be set up as a supra-regional system analysis, exploring several policy options.

The rising sea level has a major impact on this region. The supra-regional exploration to be conducted over the next few years is intended to enable proper choices on the potential adjustment of the Delta Decision and the Preferential Strategy during the second six-year review.

Recent studies have shown that under the current points of departure, modifying the Rhine branches discharge distribution after 2050 would not be cost-effective. In the future, however, another exploration of such a modification could be worthwhile, if the points of departure have changed.⁴³ This has been added to the Delta Decision. Another study – recently conducted in the purview of the development of assessment and design instruments for the primary flood defences – has mapped out how the current agreements on the discharge distribution must be interpreted in the context of the new flood risk management system. In 2020, it will be assessed how this will impact the points of departure for the discharge distribution. Delta Programme 2022 will set out the results of these studies and the ensuing decisions. In the original Delta Decision, water storage in Lake Grevelingen was an option to keep flood protection around the Haringvliet, Hollandsch Diep, and Merwedes up to par. However, research has shown that improvement of the flood defences surrounding these bodies of water in the tidal rivers area would be more effective. Recent studies have shown that a potentially accelerating rise in sea level after 2050 may affect the flood protection of the Rhine-Meuse Delta. Consequently, in the long run, this option might be re-considered, also within the framework of the research into the replacement of the Maeslant storm surge barrier.

Prevention remains the basis of the Preferential Strategy for the Rhine Estuary-Drechtsteden Region. The point of departure that the Nieuwe Waterweg and the Hollandsche IJssel will remain open rivers after replacement of the storm surge barriers has been dropped, in line with the aforementioned amendment to the Delta Decision on this topic. Up to 2050, the strategy does not anticipate river widening. These types of measures are only considered at the east side, where flood risk management is dominated by river discharges. The Steenenhoek Canal measure has been dropped for technical-substantive reasons. This only leaves the river-widening measure near Avelingen, which is scheduled after 2050. The incorporation of dyke improvements requires tailored spatial planning in the Rhine Estuary-Drechtsteden Region. The previous

⁴³ Source: https://www.rijksoverheid.nl/documenten rapporten/2018/05/14/afvoerverdeling-rijntakken-na-2050. (in Dutch).



Layer 1 Prevention as the basis for flood protection

Storm surge barriers

- Maeslant storm surge barrier
- Hartel storm surge barrier
- Hollandsche IJssel storm surge barrier
- Haringvliet sluices

Short-term measures

- ♠ Follow-up study into measures to improve Maeslant storm surge barrier
- Further elaboration of comprehensive strategy regarding Hollandsche IJssel storm surge barrier

Long-term measures

- Comprehensive supra-regional system analysis regarding replacement of storm surge barriers
- Replacement of Hollandsche IJssel storm surge barrier
- Replacement of Maeslant storm surge barrier

Dykes

Phased implementation of dyke improvements (Planning for 2020)(HWBP) == Schedule

- Tentative schedule
- Other
 - Drawing up collective spatial development framework for each
 - Embedding forelands in standards
 - Exploration of uniform procedure in spatial reservations

- River as a tidal park
- 🤥 River widening

Layer 2 Spatial planning

Outside the dykes

- Port
- City
- Other

Within the dykes

- Flood-conscious substantiation of urbanisation tasking
- Setting up regional Vital and Vulnerable exploration group, focusing on flood risks, drought, heat, and waterlogging

Layer 3 Disaster control

- Drawing up impact analyses
- Supra-regional coordination of evacuation strategies
- Drawing up evacuation strategies, action perspectives, and operational $\,$ plans

- Participation in Sea Level Rise Knowledge Programme
- Study into combination of DP measures with other taskings such as the energy transition, housing, and soil subsidence

Subsoil information

Areas that would be inundated very rapidly and deeply during a flood

Freshwater supply

Taskings

- Subsoil salinisation (combined with other taskings)
- Low water levels and discharge volumes
- No freshwater supply

Essential strategic long-term decisions

Replacement of Maeslant storm surge barrier

Strategic choices with corresponding nationwide measures

- NOVI preferential order: adapting land use to water availability; cutting down water consumption; improved water retention; more efficient distribution of water; acceptance of (residual) damage
- $\underline{ \color{red} \blacktriangle} \ {\sf Climate-proof freshwater supply from main water system in}$ $combination\ with\ smart\ water\ management.\ (Key\ distribution\ points\ in$ and from the main water system)

Measures at specific locations

- Expansion of West-Netherlands Climate-proof Water Supply
 - Optimisation of Brielse Meer buffer

Source: basic information provided by Defacto

Map 3 Preferential Strategy for Rhine Estuary-Drechtsteden

Preferential Strategy provided area-specific action perspectives to this end, but these proved ineffective. In the amended Preferential Strategy, they have been replaced by spatial development frameworks, offering more room for local customisation.

The commitment to flood impact reduction continues to be relevant, within and outside the dykes.

Freshwater supply

The 2018 drought has served as a type of stress test for the Freshwater Supply Strategy. Measures such as the Capacity Expansion of the Climate-proof Water Supply and collaboration under the Smart Water Management programme have proven their worth. At the same time, new taskings have turned up, such as salinisation in the Amsterdam-Rijn Canal and water demand to curb soil subsidence and damage to foundations. In addition, the Drought Policy Platform has provided recommendations. New prospects have emerged, among which are the use of freshwater buffers in the Hollandse IJssel and Lek rivers, and the use of alternative sources of water such as brackish seepage and reuse of effluent. These developments have been taken into account in the review of the regional Freshwater Supply Strategy.

The amended regional Freshwater Supply Strategy ties in with the national freshwater supply goal: having the Netherlands resilient against freshwater shortages by 2050. To this end, the regional strategy focuses on three key elements: boosting the resilience of the water supply, transition to the use of alternative sources, and boosting the resilience of the region. In periods of extreme drought with low Rhine river discharges, supply remains essential for the western part of the Netherlands. 2018 has proven that effective collaboration can be quite profitable. The prospect of further optimisation within the existing water system will obviate the need for major (infra)structural interventions, such as a sluice in the Nieuwe Waterweg, in the decades ahead, according to current insights. However, this will require additional regional measures, which are envisaged in, inter alia, Phase 2 of the Delta Plan on Freshwater Supply. An efficient use of alternative sources fosters the resilience of the region. This requires a transition in terms of technology and business model, aimed at, e.g., the subsoil as a supplementary source of fresh water (extraction of brackish water, rainwater storage) and the reuse of purified effluent for high-grade applications or to supplement surface water. Wherever possible, the region intends to increase its resilience and reduce its dependency on supply and flushing. This goal is primarily achieved via the Water Availability and risk dialogue processes.

6.3.3 Looking back: the milestones of the past six years

These are some of the results and milestones achieved with the implementation of the Delta Programme in Rhine Estuary-Drechtsteden Region:

- In 2018, the Kinderdijk-Schoonhovenseveer dyke improvement was completed. The project has seized several linkage opportunities, such as the construction of a separate bicycle path. The main linkage opportunity involved the construction of the Climate Dyke in Streefkerk. This dyke is sufficiently high and robust to warrant combination with, e.g., housing.
- For several projects, area-specific collaboration has produced broadly supported and highly effective solutions, at minimal cost to society. Examples include the Eiland van Dordrecht, Spatial Planning Tools for Dykes, Voorne-Putten, Alblasserwaard-Vijfheerenlanden, and Mercon Kloos.
- 3. In collaboration with government authorities and companies, the Rotterdam Port Authority has developed <u>adaptation strategies</u> for several port areas outside the dykes: Botlekplaat, Vondelingenplaat, Waalhaven, Eemhaven, Merwe-Vierhavens, and Europoort.
- 4. In 2019, the municipality of Dordrecht and the Zuid-Holland South Security Region published guidelines for the design of flood shelters in existing or new buildings. The new Huis van de Stad en Regio building in Dordrecht will be constructed in this manner.
- 5. In 2019, Deltares completed its study on the impact of high sea level rise scenarios on the Rhine-Meuse Delta, involving a review of the Preferential Strategy for the Rhine Estuary-Drechtsteden Region and the Delta Decision on the Rhine-Meuse Delta. The study provides insight into a wide range of effects, including the impact of a 2-3 m rise in sea level on dykes and areas outside the dykes, and on port access. Such insights have constituted a key basis for the review.
- 6. Several measures have boosted resilience against freshwater shortages. Examples include the completion of the Freshwater Plant (innovation pilot), the formulation and implementation of information screens and lines of reasoning regarding Smart Water Management, and the completion of the first elements of the Climate-proof Water Supply (KWA+). In addition, several areas have completed the Water Availability process.
- 7. Virtually all the municipalities in West-Netherlands have conducted comprehensive stress tests for waterlogging, heat, drought, and flood risks. In 2019, the province of Noord-Holland commissioned a stress test of its provincial roads and waterways, addressing the four themes of the Delta Plan on Spatial Adaptation and the theme of storm. The majority of the Working Regions in West-Netherlands expect to have completed the risk dialogues by the end of 2020, and to have developed a strategy or implementation agenda by then.

- 8. In 2018, the capacity of the water inlet system near the Irene locks was expanded. This means that more fresh water will be available in times of drought, whilst keeping waiting times for the shipping trade to a minimum.
- 9. The period 2018-2020 saw the completion of several (sub) studies into future freshwater supply routes to West-Netherlands. The studies were substantiated on the basis of a joint fact-finding process.

6.3.4 Agenda for the six years ahead

Projects, activities, and milestones

The next six years will see the roll-out of projects and activities aimed at the realisation of the Delta Decision and the Preferential Strategy for the Rhine Estuary-Drechtsteden Region and West-Netherlands Freshwater Supply Region. Some noteworthy milestones:

The Schieland and Krimpenerwaard district water control board and Rijkswaterstaat are jointly finalising a remarkable solution to the flood risk management tasking along the Hollandsche IJssel river: by investing in the reliability of the Hollandsche IJssel storm surge barrier (reducing the probability of failure from 1:200 to 1:1000), less radical dyke improvements along the river will suffice. Minor dyke improvements will be easier to accommodate in terms of spatial planning, whilst overall costs will be lower. The intention is to set down this choice in the form of an exchange grant (cf. Paragraph 3.4). A decision on this item is expected by the end of 2020 or early 2021.

In the years ahead, the Strategic Adaptation Agenda for Areas Outside the Dykes will be elaborated in concrete terms for the Maasvlakte and the Dordrecht port area (2021), for residential locations in Rotterdam and Dordrecht (2021), and for areas in other municipalities. This will make a significant contribution to the (multi-layer) flood risk management of the extensive parts of the Rhine Estuary-Drechtsteden Region that are located outside the dykes. The challenge for the port areas is to devise measures that enhance their business climate.

The Security Regions will be drawing up evacuation strategies in the years ahead, to be coordinated at the supra-regional level. The Rhine Estuary-Drechtsteden Region offers few options for evacuation (from the area or to high elevations within an area). Consequently, proper preparation is crucial to save lives during a flood.

The municipality of Dordrecht and the International Architecture Biennale Rotterdam (IABR) are exploring the option of combining new houses on the Staart – which is located outside the dykes – with a large-scale flood shelter for the residents of Dordrecht. The study commenced in 2019.

The Cultural Heritage Agency of the Netherlands has developed a method for the protection of heritage during flooding and severe precipitation. Under the EU Shelter project, IHE Delft and the municipality of Dordrecht are conducting a case study and an open lab for the historic buildings in the city centre of Dordrecht.

In the years ahead, the regional Vital & Vulnerable exploration group – comprising representatives of the province, the Security Regions, and several municipalities – will expedite the risk dialogue with public and private parties regarding the vital and vulnerable functions. In the Rhine Estuary-Drechtsteden Region, such facilities are located both behind and outside the dykes. Disruption of such facilities as a result of flooding will impact a large area, which is why a supra-regional approach is needed. Attention will also be paid to the vulnerability to drought, heat, and waterlogging.

The municipality of Rotterdam is expected to embark on spatial development frameworks for dykes by 2021. The frameworks will help to set down agreements on spatial issues relating to dykes, in interconnection with the flood risk management tasking. Such issues could involve construction projects, use of forelands, co-use, and the perception value of dykes.

By 2026, the KIJK dyke improvement project along the Hollandsche IJssel river will have reached sufficient completion to have this section meet the standards and thus be regarded as "dyke safe". Full completion and delivery are scheduled for 2028.

The delivery of several freshwater supply measures in the next six years will enable smart water distribution in times of drought. Examples are the capacity expansion of the Central Netherlands Climate-proof Water Supply, to be delivered by 2023; the optimisation of Lake Brielse Meer in 2021; supply routes to the Krimpenerwaard, Kromme Rijn, and Bergsluis; agreements on controllable buffers in the IJssel and Lek rivers; and transitions towards reuse of effluent and brackish seepage.

A full overview of projects and activities is provided in the Delta Plan on Flood Risk Management (3.5), the Delta Plan on Freshwater Supply (4.5), and the Delta Plan on Spatial Adaptation (5.5). The initiators of the projects and activities are maximising the opportunities for future-proofing the water system and spatial planning, by tackling the three Delta Programme taskings in an interconnected manner and wherever possible, by tying in with climate mitigation, the circular economy, and other transitions.

Expertise and research

The studies on the Rhine Estuary-Drechtsteden Region in the period 2021-2026 are featured in the Delta Programme Knowledge Agenda. The main knowledge issues relate to the impact of the rising sea level on flood risk management and to the salinisation in this region. For that reason, the Rhine Estuary-Drechtsteden Region Delta Programme is actively participating in the national Sea Level Rise Knowledge Programme. The supra-regional system exploration is mapping out the current system's capacity for coping with sea level rise, and options for expanding this capacity or making it more flexible. Long-term alternatives are also being explored.

Another key knowledge issue is how future decisions – in particular, regarding the replacement of the Maeslant storm surge barrier – will impact current investments (e.g., in dyke improvements, in areas outside the dykes, and in the freshwater supply). Furthermore, studies are underway to explore the options for combining the implementation of Delta Programme measures with other social taskings in the region, such as the energy transition, the housing tasking, and soil subsidence.

6.4 Rhine and Meuse

The review of the Rhine and Meuse strategies has a different set-up. For these rivers, the central government and the regional parties draw up a Programme under the Environment Act: the Integrated River Management programme (IRM). The preferential alternative for this programme is, in fact, the amended and enhanced Preferential Strategy for the Rivers Rhine and Meuse, which is to be set down in 2021. This virtually coincides with the official endorsement of the amended Delta Decisions and other Preferential Strategies of the Delta Programme in the National Water Programme; henceforth, the Rhine and Meuse will be keeping step with the rest of the Delta Programme.

The significance of the Delta Programme in the area around the major rivers

The Rivers Rhine and Meuse play a key part in terms of water discharge and water availability, and additionally for the economy, ecology, and leisure facilities. The river dykes protect large parts of the Netherlands against flooding. Use of the rivers is expected to increase even further.

Climate change is putting pressure on the river system. The rising sea level, larger river discharge volumes, more extreme rainfall, and longer periods of drought and heat are causing great changes. In the future, the rivers must be capable of discharging more water. Furthermore, parts of the riverbed are out of balance: in several river stretches, the main channel is eroding whilst the floodplains are silting up. Riverbed erosion is lowering the water level even further in times of smaller discharge volumes. This is impacting shipping, the freshwater supply, and nature. The shipping trade is hampered by the bars that have developed in the summer bed; freshwater inlet into the regional water system is impeded; and the natural floodplains environment is dehydrating.

This also affects the Dutch economy. These developments call for a system-oriented strategy regarding the Rhine tributaries and the Meuse, covering the entire area around the major rivers.

IRM

Under the Integrated River Management programme (IRM), the central government and the region are addressing the taskings and opportunities in the area around the major rivers up to 2050, looking ahead to 2100. The taskings ensue from such developments as the new flood protection standards, low water level issues, facilitation of the shipping trade, and the goals regarding sustainable freshwater supply, good ecological water quality, and nature (including in prolonged periods of drought). Such taskings may impact one another in either a positive or a negative sense. An interconnected approach to the taskings will enable well-considered choices regarding measures in the area around the major rivers.

To this end, the IRM programme is developing an integrated perspective of the area around the major rivers. This encompasses an integrated analysis of the river system, taking account of discharge capacities and the riverbed level. Attention is also paid to functions in and along the rivers, such as shipping, nature and ecological water quality, freshwater availability, and spatial-economic developments. The analysis is aimed at developing a future-proof river system that serves multiple purposes and functions well as a system. Future measures must not be taken in isolation, but rather be geared to the river behaviour and do justice to the various river functions. They must form part of a logical whole and fit within the ultimate image of the river.

In early 2020, the Memorandum on Scope and Level of Detail regarding the exploration phase was available for perusal. In the course of 2020, policy goals for river stretches and cohesive sets of measures will be drawn up (the so-called promising alternatives).

"Rivers in Focus", the vision document of the IRM programme, outlines the prospects for the rivers Rhine and Meuse for 2050, and looks ahead to 2100. "Rivers in Focus" is a key building block for the Memorandum on Promising Alternatives, which will feature broad sets of measures in addition to promising alternatives. The Environmental Impact Assessment report compares the various alternatives. The comparison will underpin the selection of a preferential alternative to be set down in a Programme under the Environment Act. The IRM implementation programme will feature measures, locations, and a recommendation regarding the implementation and funding methods.

History

Over recent years, it has become increasingly clear that the Preferential Strategy for the rivers, dating from 2014, was no longer adequate on account of the multitude of taskings facing the Rhine and Meuse area, and the limited space available to accommodate measures. The Preferential Strategy was focused on flood risk management, and committed to dyke improvement, dyke raising, and flood level reduction (river widening).

River widening has turned out to be rather cumbersome for lack of a clear policy framework and a lack of clarity regarding the funding parties. Determination of the savings generated by reducing the need for dyke improvement was difficult, and the period in which funding was available did not always match the pace and order of the implementation.

Furthermore, the low river discharge volumes of 2018 and 2019 demonstrated that in addition to flood risk management, attention was also needed for freshwater supply, drought, navigability, riverbed erosion, and nature goals. This has prompted the central government and the region to embark on Integrated River Management.

6.4.1 Building blocks for the Preferential Strategy for the River Rhine

The following building blocks are of significance to the amended strategy for the River Rhine (the preferential alternative of the Integrated River Management programme):

The new strategy is a continuation of the Preferential Strategy from Delta Programme 2015. The essence is an integrated approach to the river system and the river-related functions, aimed at securing the safety, vitality, and appeal of the river for the near and distant future. The strategy is founded on solutions to problems relating to high and low

water levels. The new Preferential Strategy for the Rhine covers a wider area than the old Preferential Strategy: it now also includes the Zwarte Water and the Vecht.

The integrated set-up of the new Preferential Strategy entails that the Water Framework Directive programme, the Major Waters Programme Strategy, and the ambitions for the shipping trade also constitute important building blocks.

The various measures contained in the Delta Plans, such as the Flood Protection Programme dyke improvements, also provide building blocks for IRM and the Preferential Strategy. The aim is to seize all the opportunities for an integrated approach, by tackling the flood risk management tasking in interconnection with the other national and regional taskings in the area.

Another building block for the new strategy is the policy to be developed for the riverbed level and the discharge capacity. The continuous riverbed erosion, specifically in the Boven-Waal, Boven-IJssel, and Pannerdensch Canal, is hampering the shipping trade in times of drought and is dehydrating floodplains and the natural environment. Measures to remedy riverbed erosion may affect the discharge capacity. Other interventions may also have a negative impact on the discharge capacity. For that reason, a new policy is being prepared to combat riverbed erosion and for the discharge capacity.

The Netherlands and North Rhine-Westphalia have jointly studied the flood risks in the border area. The results serve as building blocks for further study and for a new strategy for border area measures. The working group recommends further study into the piping failure mechanism for the dykes in the border area, into the feasibility of a higher evacuation fraction (the percentage of the population able to leave the area in time, during an imminent flood), and into the impact of developments in the Rhine discharge volumes.

Finally, specific building blocks have been identified for each river branch:

River Waal

The dykes along the north side of the River Waal will be improved in the years ahead, along a continuous 80-km section between Gorinchem and Nijmegen. Linkage opportunities for these projects have been explored at an early stage and where possible, such opportunities have been factored in. A key building block is the Waal Panorama, a perspective for the future spatial planning of the area around the major rivers, which was developed in 2019 on the initiative of the province of Gelderland and the Rivierenland district water board. It shows how

today's major social issues can be the key to a future-proof area in which climate adaptation, the energy transition, accessibility, biodiversity, an economic business climate, living climate, and the circular economy go hand in hand.

River Hssel

Important building blocks for the IJssel strategy are Gelders Dijk DNA (parts 1 and 2), the Overijssel Dykes Spatial Perspective, and the Boven-IJssel initial analysis. The IJssel strategy is being substantiated in the dyke improvement projects, in the IJsselpoort River Climate Adaptation Park MIRT Exploration, in the Havikerwaard, Fraterwaard and Olburgerwaard MIRT Studies, and in the Hoenwaard and Paddenpol projects.

Rivers Nederrijn and Lek

The building blocks for the Nederrijn-Lek strategy are the dyke improvement projects, such as Arnhem Rhine Quay, Strong Lek Dykes, and Grebbe Dyke. The Grebbe Dyke project has been scaled up to a regional process, in which participation is substantiated in accordance with the (draft) Environment Act. Implementation of the dyke improvements on the south side of the river will commence after 2030, based on the ongoing assessments. A survey conducted under the IRM programme has shown flood risk management, nature development, and shipping to be the main taskings along the Nederrijn-Lek.

Freshwater supply (Rivers Area Freshwater Supply Region)

The area around the major rivers aims to tackle urgent freshwater supply issues in an integrated manner. Bottlenecks and solutions will be elaborated specifically for each area. In phase 2, the measures explored in the previous phase will be implemented at appropriate locations. Considerable attention is being paid to raising awareness of individual action perspectives.

6.4.2 Building blocks for the Preferential Strategy for the River Meuse

The following building blocks are relevant to the amended Meuse strategy (the preferential alternative of the Integrated River Management programme):

The new strategy for the Meuse is a continuation of the Preferential Strategy for flood risk management set down in Delta Programme 2015. The essence is a safe and appealing River Meuse, to be achieved through a powerful interaction of dyke improvements, river widening, and integrated area development. The point of departure is the realisation of a sustainably safe river, as the basis for a flourishing regional economy, whilst retaining or enhancing the region's specific landscape and natural values.

An important starting point for the implementation of the Preferential Strategy for the Meuse was the endorsement

of the Regional Proposal for the Meuse (2016). This proposal is the result of close collaboration between a wide range of national and regional parties. It comprises eight explorations and three <u>studies</u> into actual projects.

Another building block is the <u>Meuse Spatial Perspective</u> (2018). This report identifies the main spatial and economic taskings along the River Meuse up to 2050, at several scale levels (international, national, and regional), as well as goals for various functions (including nature, shipping, leisure activities, and tourism). The report also addresses the options for incorporating flood protection measures.

Over recent years, the region and the central government have also explored other locations in the purview of river widening, and have assessed the effectiveness, costs, and public support of measures. In 2019, the results were set down in the Meuse Adaptive Implementation Strategy. This Strategy features several sets of potential river-widening measures based on the know-how amassed over recent years. The potential measures are aimed at reducing the height requirements for dyke improvements, at enhancing natural and landscape values, and at strengthening economic functions. The Integrated River Management programme is exploring how flood level reduction can be utilised to serve a wider range of purposes, for example, to compensate for flood level elevation caused by sediment suppletion, nature development, or the improvement of floodplain dykes. The Meuse Adaptive Implementation Strategy is an appropriate building block to this end.

The <u>Story of the River Meuse</u> (2019) constitutes another building block. This expert advisory report is intended for all the parties engaged in the management and planning of the River Meuse. The experts provide recommendations and guiding principles for policy, management, and planning. The report alerts, agendises, and helps to make choices.

Freshwater supply (Rivers Area Freshwater Supply Region) See Paragraph 6.4.1. for the amended freshwater supply strategy.

6.4.3 Looking back: the milestones of the past six years

These are some of the results and milestones achieved with the implementation of the Delta Programme in the area around the major rivers:

River Rhine

 In 2019, the first phase of the Reevediep project was completed. In times of extremely large discharge volumes, the new flood channel will reduce IJssel flood levels. In addition, the project has generated nearly 400 hectares of new delta nature and more than 20 kilometres of new footpaths and bicycle routes.



Map 4 IRM Rhine and Meuse inspiration map

- 2. In 2019, the last implementation projects of the WaalWeelde, Stadswaard Nijmegen, Fluvia Tiel, and Loenen polder programme were completed. The WaalWeelde project involved collaboration between regional parties, the central government, companies, and residents, under the direction of the province of Gelderland, aimed at enhancing the safety, natural beauty, and economic strength of the River Waal. The projects implemented are conducive to nature, leisure activities, and flood protection.
- 3. In 2020, the IJsselpoort River Climate Adaptation Park MIRT Exploration generated the draft preferential alternative for the IJssel floodplains between Arnhem and Giesbeek. The alternative encompasses measures in the fields of river widening, shipping, nature, water quality, leisure activities, agriculture, and sustainable energy production. The municipalities have translated the preferential alternative into an inter-municipal framework vision which is expected to be endorsed by the end of 2020.
- 4. In the past six years, the Pannerden Loo and Zutphen IJssel Quay dyke improvement projects were delivered. The Zutphen project chimes with the historic context of the <u>quay area</u>. Furthermore, the innovative Twente Canal measure has been implemented. Preferential alternatives have been set down for several dyke improvements: the Waal stretches of Gorinchem-Waardenburg, Tiel-Waardenburg, Wolferen-Sprok, City of Tiel, and Nederbetuwe; the IJssel stretches of Zwolle-Olst, Apeldoorns Canal, and Zwolle Urban Areas; and the Nederrijn-Lek stretches of Rhine Quay, Salmsteke (Strong Lek Dyke sub-project), and Vianen Hazelaarsplein. The preferential alternatives for the Grebbe Dyke area project and the Amerongen-Wijk bij Duurstede stretch (Strong Lek Dyke sub-project) are expected to be endorsed by 2020. The Grebbe Dyke plan envisages a safe dyke, perceivable cultural history through restoration of the Horn Work (an ancient defence), and a new nature
- 5. Between 2015 and 2018, a MIRT Exploration has been conducted to investigate flood risk management measures around Varik and Heesselt; one of the options was a flood channel in combination with dyke improvement. In 2018, the Minister of Infrastructure and Water Management decided against the flood channel. The Rivierenland district water board is currently carrying out dyke improvement.
- 6. The 2018 MIRT Study into IJsselkop, Stadsblokken Meinerswijk, and the Huisschense Waarden has generated significant information for the elaboration of measures pertaining to the IJssel and Nederrijn-Lek bifurcation point. The Study provides insight into the options for and phasing of river-widening measures in this area.
- 7. In terms of freshwater supply, the incentive scheme for water-saving measures among farmers has raised

- awareness among consumers regarding the availability of water and their own action perspectives.
- 8. Virtually all the municipalities in the province of Gelderland have conducted comprehensive stress tests at the regional level (Spatial Adaptation Working Regions structure) regarding waterlogging, heat, drought, and flood risks.

River Meuse

- At the end of 2019, the collaborating parties endorsed the preferential alternative for the Meandering Meuse.
 This alternative encompasses improvement of the Meuse dykes along a 26-km stretch between Ravenstein and Lith, river widening, and nature development. A low-dynamic river nature measure from the Major Waters Programme Strategy has also been envisaged for the project area.
- 2. At the end of 2019, the go-ahead was given to the plan elaboration phase of three measures aimed at counterbalancing the rise in flood level caused by dyke improvements elsewhere along the Meuse: Baarlo-Hout-Blerick, Arcen, and Well. Both dyke improvements and dyke relocations are envisaged for all three locations. These measures are needed to reduce the loss of space in the winter bed and thus compensate for the resulting increase in flood level.
- 3. In the spring of 2019, the Lob van Gennep Exploration commenced. The Exploration serves three aims: improved water retention (downstream water level reduction), improved flood protection in the area, and enhancing spatial quality with opportunities for leisure activities, tourism, cultural heritage, and the landscape.
- 4. On 27 June 2019, the city of Eindhoven hosted a conference on climate adaptation in South Netherlands. The motto of the conference was TOGETHER. During the conference, the new administrators of district water boards and provinces emphasized that an integrated approach to the spatial adaptation, freshwater supply, and flood risk management taskings is imperative in order to be able to cope with the problems.
- 5. In 2020[PM check overleg juni], the central government and the region seized an opportunity to achieve additional water level reduction in the Alphen Veerweg Bridge Extension project (under the ongoing Across the Meuse project). An administrative agreement was signed in February 2020; the project will be completed by 2021.
- 6. In the province of Limburg, eight dyke improvement projects from the Flood Protection Programme are underway. The district water board is actively involving the surrounding area in the potential alternatives. Plan elaborations are underway for the Nieuw Bergen, Belfeld, Beesel, Willem-Alexanderhaven Roermond, Steyl-Maashoek, Buggenum, and Heel projects. The preferential alternative for the Kessel dyke stretch has involved the removal of the flood defence system (from the Water Act). The Blerick project, near the old foundry,

has been completed. In the province of Noord-Brabant, the Aa en Maas district water board embarked on preliminary explorations for the Cuijk-Ravenstein dyke stretch (Brabant side) in 2018. These will generate the scope for the actual exploration: dyke improvement following the existing outlines or expansion of the dyke stretch.

Limburg Administrative Order

In October 2018, the province of Limburg set down an Administrative Order stipulating a study into the establishment of, the points of departure for, and the scope of the flood protection standards. On 17 December 2019, the Provincial Executive endorsed the final report on the Administrative Order. This report encompassed an HKV Consultancy report concluding that according to the Water Act system, the current standards exceed the actual requirements for 22 of the 45 dyke stretches in Limburg. This report has not prompted any administrative or policy conclusions. The partners will be exploring together how they will follow up the outcomes of the Administrative Order.

The Meuse Delta Programme Steering Group has requested the Delta Programme Commissioner to provide an authoritative advisory report on the standards for the Meuse Valley dyke stretches. This advisory report will constitute a building block for the evaluation of the flood protection standards in 2024. The collaborating governments along the Meuse have agreed to continue the current Flood Protection Programme projects, taking their compliance with the current statutory standards as their point of departure. Within the scope of the current design instruments, the option of less elevated dyke reconstruction has been explored for each of these projects.

At the international level, significant strides have been taken in the Rhine and Meuse taskings. Great progress was made during the Rhine Conference in February 2020 (see Paragraph 8.2).

6.4.4 Agenda for the six years ahead

Projects, activities, and milestones

During the development of the Integrated River Management programme, the central government and the region will continue their work on flood risk management, freshwater supply, and spatial adaptation in the area around the major rivers. The next six years will see the launch of projects and activities aimed at substantiating the Delta Decision and strategy for this area. Some noteworthy milestones:

River Rhine

In the years ahead, the dykes along the Waal, IJssel and Nederrijn-Lek rivers will see improvement over a total length of more than 120 kilometres. The preferential decision for the Paddenpol (Zwolle-Olst) dyke stretch is expected by the autumn of 2020. The authorities have requested the elaboration of a dyke relocation for this stretch, with a view to an integrated realisation of the flood risk management taskings, the Major Waters Programme Strategy, and the Water Framework Directive.

The Reevediep connection will be ready for use by 2022. The second phase of the project will have been completed by then. The years ahead will see work on the construction of the Reeve sluice, on improvement of the Drontermeer dyke, on the removal of the Roggebot sluice, on a new bridge, and on adjustments to the N307 motorway.

The Werkendam MIRT Study will be completed by 2021. The Study addresses the options for combining the Werkendam port development with other taskings along the Merwede river and their added value for the collaborating partners.

The odds are that the Minister of Infrastructure and Water Management will take the preferential decision on the River Climate Adaptation Park in 2020. Subsequently, the plan elaboration can commence. Once the first phase has been completed (before 2028), the plan will generate a flood level reduction of 10 cm.

The Havikerwaard-Fraterwaard-Olburgerwaard MIRT Study will be conducted in 2020. The Study will map out taskings and opportunities, taking account of their interconnectivity, and present proposals for the realisation.

Supply studies for all the sub-areas of the Rivers Area Freshwater Supply Region will be completed shortly. This will generate a wealth of knowledge on the functioning of the water system in supply situations, and on the bottlenecks expected for the future. The studies constitute the basis for a more efficient distribution or retention of water, and for local and regional collaboration on the Water Availability process. With respect to spatial adaptation, this collaboration will tie in with the regions.

The Rivierenland Freshwater Supply Region will continue to advocate water savings among consumers, through incentive measures and project-based collaboration. In 2020, the "Sustainable Use of Shallow Groundwater" climate pilot will generate insight, for various sectors, into options for reducing their dependency on the main water system.

In the years ahead, the Pannerling inlet will be future-proofed. This inlet supplies water from the Linge river to a large area with high-grade crops. A study is being conducted into the possibility of moving the Alblasserwaard inlet (from Kinderdijk to Groot-Ammers) upstream. This will reduce the vulnerability of the freshwater supply if salinity increases and will enhance the effectiveness of the water distribution within the area.

River Meuse

Over the six years ahead, major steps will be taken in the eleven projects from the Regional Proposal for the Meuse, set down in 2016 (eight explorations and three studies):

The Alphen Veerweg Bridge Extension project will be completed by 2021. The project will generate an additional flood level reduction of 2 cm, which will bring the total level reduction achieved to 15 cm. By 2024, the Oeffelt bottleneck will have been removed by creating discharge capacity in the earth body of the crossing road. This project will reduce the flood level by 21 cm. By 2024 and 2025, the Thorn-Wessem, Baarlo-Hout-Blerick, Arcen and Well measures will have been completed. These measures will compensate for the space lost as a result of the dyke improvement and the raising of the dyke, in combination with the departure from the overtopping requirement. Furthermore, the projects will foster the flood protection and spatial quality of the area. In all probability, the integrated Lob van Gennep and Meandering Meuse projects will have entered the realisation phase by 2027. Subject to supplementary funding options and fine-tuning of the scopes, the Southern Meuse Valley, the Venlo-Velden transmission effects measure, and Alem projects will be entering a new phase.

Supplementary to these projects from the Regional Proposal for the Meuse, flood levels near Roermond may be reduced by lowering the Lateraal Canal dam. Clarity regarding the funding of this project is expected by 2020.

By 2022, the IRM programme will be endorsed. This will generate new insights into the taskings and opportunities for integrated projects along the River Meuse.

A full overview of activities and projects in the Rhine and Meuse area is provided in the Delta Plan on Flood Risk Management (3.5), Delta Plan on Freshwater Supply (4.5), and Delta Plan on Spatial Adaptation (5.5). The initiators of the projects and activities are maximising the opportunities for future-proofing the water system, by tackling the three Delta Programme taskings in an interconnected manner and wherever possible, by tying in with climate mitigation, the circular economy, and other transitions.

Expertise and research

The studies into the area around the major rivers in the period 2021-2026 are featured in the Delta Programme Knowledge Agenda.

River Rhine

The main knowledge issues regarding the River Rhine pertain to the riverbed morphology, the long-term discharge distribution during high and low water levels, and the flood level effects of dyke reconstruction works along the River IJssel. Furthermore, the need for additional research into the "valve effect" in flooded cross-border dyke rings will be mapped out: following a dyke failure in Germany, water would flow inland to the Netherlands and vice versa.

With respect to the development of assessment and design instruments for the flood defences, a recent study has charted how the current agreements on the discharge distribution must be interpreted in the context of the new flood risk management system. In 2020, it will be assessed how this will impact the points of departure for the discharge distribution. Delta Programme 2022 will set out the results of these studies and the ensuing decisions.

River Meuse

The main knowledge issues regarding the River Meuse pertain to room for discharge into the River Meuse, riverbed morphology, and sediment management. Further research into these topics will constitute the basis for new policy in the Integrated River Management programme. Further research will also be conducted into a more detailed interpretation of the river characteristics. The results will be presented in the report entitled Beeld op de Rivier [River in Focus]. A key organisational knowledge issue pertains to the boundaries of integrality: how many themes, stakeholders, and flows of funds can be combined without compromising the efficiency of the implementation? Pilots are being set up to explore this. The results provide input for the IRM programme. The Meuse Delta Programme Steering Group has requested the Delta Programme Commissioner to provide an authoritative advisory report on the standards for the Meuse Valley dyke stretches in Limburg, as a building block for the statutory evaluation of the flood protection standards in 2024. The advisory report will be completed by

The national Sea Level Rise Knowledge Programme (specifically Track 2) is also relevant to the area around the major rivers. In the downstream part of the rivers, the impact of sea level rise will be manifest. One of the effects of a higher sea level is fewer opportunities for river widening and decreasing discharge capacity of the regional water system (e.g., around Den Bosch).

6.5 Southwest Delta

6.5.1 Proposed amendments to the Preferential Strategy for the Southwest Delta

Preferential Strategy for the Southwest Delta

The Preferential Strategy for the Southwest Delta is structured on the proposed amendments to the Delta Decisions on Flood Risk Management, the Rhine-Meuse Delta, Freshwater Supply, and Spatial Adaptation. In addition to climate-proof flood protection and freshwater supply, the pursuit of a resilient ecology constitutes the basis for a vital economy and a sustainable environment in the Southwest Delta. Working on a resilient ecology is essential in order to curb the adverse effects of human interventions – such as the Delta Works carried out in the previous century – on the ecology and water quality. The Delta Programme Commissioner proposes the following amendment to the Preferential Strategy for the Southwest Delta:

Flood risk management

1. Flood defences

Based on current insights and the prevailing standards, the current system of flood defences will be up to par until 2050. Under the "duty of care", management and maintenance of the flood defences will be maintained at the current level, even if dykes turn out to be over-dimensioned. Coastal protection is based on the principle of "soft (using sand) where possible, hard (using stone) where necessary". Room is provided for a tailored approach to the restoration of estuarine nature (limited tidal movements, flow, freshwater-saltwater mixing zones, sand replenishment).

In every dyke improvement project, options for innovative dykes are explored. These are dykes that offer short-term opportunities for nature, leisure activities, cultural heritage, cultural landscapes, spatial quality, living, aqua culture, or saline crops, and that foster long-term climate-proofing. In collaboration with the managing authorities of flood defence systems, the regional parties can initiate spatial planning projects and consider opportunities for enhancing long-term flood protection – for example, within the framework of the ongoing "Doing More With Dykes" process and the multi-layer flood risk management approach.

2. Grevelingen and Volkerak-Zoommeer lakes, including Binnenschelde and Markiezaatsmeer The Preferential Strategy for the Grevelingen and Volkerak-Zoommeer lakes is aimed at interconnecting flood risk management and freshwater supply with ecology and the economy. The ambition of the regional parties is – with a view to climate change – finding permanent and resilient solutions to flood risk management and the issues relating to water quality and underwater nature in the Grevelingen and Volkerak-Zoommeer lakes. For both lakes, research will be conducted into the impact of an accelerated rise in sea level and into potential measures or alternatives. Sustainable restoration of the water quality in the Binnenschelde and Markiezaatsmeer delta border lakes is essential to foster regional economic development and enhance the ecological interconnection of the Delta waters.

3. Oosterschelde estuary and Veerse Meer lake
The Preferential Strategy for the Oosterschelde is aimed
at future-proof optimisation of the current closable open
storm surge barrier. The approach adopted to the flood
risk management tasking helps to combat erosion of
the intertidal area as a result of sand deficits and of the
economic use of the Oosterschelde estuary. A combination
of three measures is envisaged: adapted management of the
Oosterschelde storm surge barrier (adapted closure regime,
physical adaptations), structural shoal and foreshore
nourishments in the Oosterschelde, and (innovative) dyke
improvements.

In order to be prepared, further flood risk management analysis will be conducted in 2023, based on the results of the Sea Level Rise Knowledge Programme and the assessment of the primary flood defences.

Water level management in the Veerse Meer lake – a closed basin featuring a virtually constant water level – is closely related to the Oosterschelde water level management. A 35 cm rise in sea level can be accommodated through management measures in the Katse Heule sluice. If the sea level should rise by more than 50 cm, maintaining the Veerse Meer water level would be more difficult, which would impact the built-up floodplains, floodplains nature, and polder water drainage. For that reason, a future-proof flood risk management strategy is being elaborated for the Veerse Meer, in interconnection with the development of the Veerse Meer Regional Vision and the choices pertaining to the Oosterschelde estuary.

4. Westerschelde

The Preferential Strategy for the Westerschelde is aimed at (innovative) dyke improvements in combination with optimisation of the dredging and deposit strategies. Local deposits are used to replenish shoals and dyke foreshores with sediment. This concurrently helps waveabating forelands to keep pace with the rising sea level and contributes to the preservation and reinforcement of ecologically valuable areas. In this respect, the Westerschelde and the estuary area must be considered

in interconnection. In 2019, the Flemish-Dutch Scheldt Commission set down, in collaboration with the Scheldt Council, a "roadmap" to follow up the Agenda for the Future (period 2019-2023). This sets out the collective agreements on the second round of studies, long-term Nature and Access perspectives, scheduling, participation, communication, and periodic evaluation.

5. Coast and Foredelta

The Preferential Strategy for the Coast is outlined in Paragraph 6.6. The point of departure is that the coastal foundation must be in balance with the rise in sea level. The tidal waters in open connection with the sea - the Oosterschelde and Westerschelde – must also be in balance with the rising sea level. Considering the probability of an accelerated rise in sea level and the uncertainties, it is important to explore alternative flood risk management measures and to assess their potential. Within the framework of the Sea Level Rise Knowledge Programme, studies are being conducted into the combination of hard measures (such as foreshore deposits) and soft measures aimed at creating more room for sand deposits on the beaches bordering a channel. In addition, a sediment strategy will be required, not only for the coast but for all the delta waters. The additional spatial reservations potentially required for future deposits will impact the spatial planning of beach and dune areas, as will any seaward or landward reinforcements. Such spatial reservations will also impact the room available for, e.g., leisure activities and nature conservation. Studies will have to show what the effects will be and when thresholds44 will occur. In this respect, it is important to take such reinforcements into account at an early stage of plans for the spatial design of beaches, dune areas, and the hinterland.

Freshwater supply

The Freshwater Supply Strategy in the Southwest Delta is aimed at the preservation – and, wherever possible, the optimisation – of the existing freshwater supply in areas with and without supply options. Concurrently, the strategy focuses on improvement of the ecology with freshwater-saltwater mixing zones. The supply option via Biesbosch-Hollandsch Diep-Haringvliet plays a crucial part in this respect and provides the region with an advantageous competitive position in terms of agriculture and industry. The realisation of the ambition requires some inlets to be relocated eastward, the resilience of the regional system to be enhanced (creek system), and water consumers to optimise freshwater consumption in their operational management.

A key development for the region is that at the end of 2019, the Minister of Infrastructure and Water Management and the Minister of Agriculture, Nature and Food Quality decided against scheduling measures to salinise lake Volkerak-Zoommeer in the Major Waters Programme Strategy up to 2032. The ambition of the central government and the region regarding a climate-resilient freshwater supply around lake Volkerak-Zoommeer stands. In 2020, Deltares will conduct a study into the climate resilience of lake Volkerak-Zoommeer. The results will underpin decisions on the launch of a regional process and on the relevant frameworks. The outcomes of the Deltares study will also constitute input for the regional freshwater supply measures for the planning period ahead.

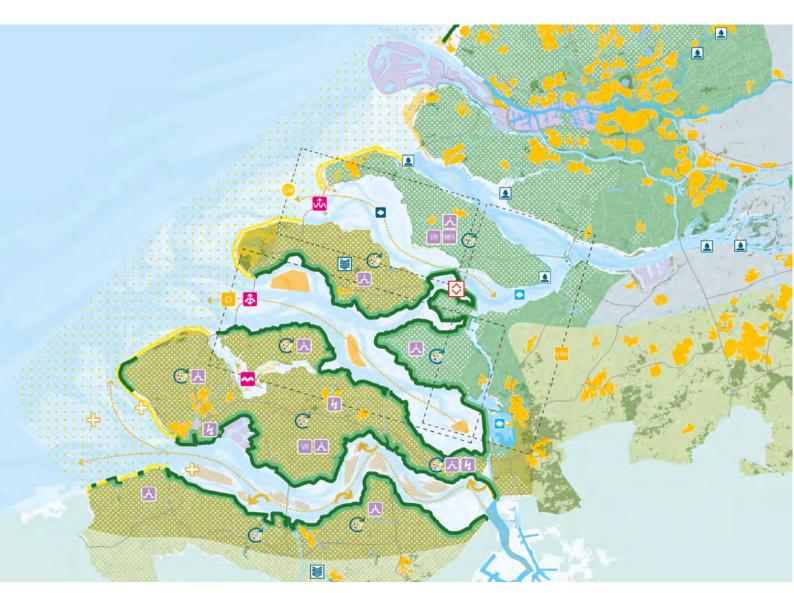
Particularly in areas in Zeeland without supply options, the region is committed to innovative measures to enhance freshwater retention and storage. Such measures include freshwater buffering in the soil and the reduction of freshwater demand (Zeeland Freshwater Supply Testing Ground).

The existing strategy is sufficiently robust for the decades ahead; in the planning period up to and including 2021, the strategy will constitute the basis for the implementation of no-regret measures. For the planning period 2022-2027, additional research will be conducted aimed at, e.g., reducing uncertainties. In addition, the region-wide rollout of successful Testing Ground measures requires more attention. The province of Zeeland has embarked on the preparation of a Zeeland Freshwater Supply Delta Plan 2021. This plan encompasses a widely supported strategy with guiding principles aimed at ensuring that by 2050, Zeeland will be resilient against freshwater shortages.

Spatial adaptation

The Southwest Delta comprises two Spatial Adaptation Working Regions: Zeeland and Goeree-Overflakkee. The Noord-Brabant West area is located in the Southwest Delta but reports separately to the Delta Programme Commissioner through the "Elevated Sandy Soils South" area (the provinces of Noord-Brabant and Limburg).

⁴⁴ A threshold is the time at which the desired usage is no longer possible.



Flood Risk Management

Flood defences up to 2050

- Maintenance of current primary dykes, dams, and underwater banks
- Floodplain port

Lake Grevelingen up to 2050

- Lake Grevelingen
- Enhancement of water quality and underwater nature
- Limited tidal movement in Lake Grevelingen through construction of Brouwersdam sluice and Falkkeese sluice
- Optimisation of dredging and deposit strategies

Lake Volkerak Zoommeer up to 2050

- Lake Volkerak Zoommeer
- Enhancement of water quality and development perspective for climate-resilient freshwater supply regional process

Oosterschelde and Veerse Meer up to 2050

- Study into impact of sand deficit/sea level rise on Oosterschelde, phase 2
- (Innovative) dyke improvement
- Structural sand replenishment to combat sand deficit
- Optimisation of Oosterschelde closure regime
- Optimisation of Veerse Meer water level management
- Optimisation of dredging and deposit strategies

Westerschelde up to 2050

- (Innovative) dyke improvement such as Hansweert dyke improvement
- Optimisation of dredging and deposit strategies

Coast and en delta coast up to 2050

- 2020: continuation of sand replenishment programme; 2020>: if need be, gradual adjustment of sand replenishments in accordance with sea level rise
- Potential sand replenishment pilot

Map 5 Preferential Strategy for the Southwest Delta

Knowledge and research

Knowledge and research focused on medium range (2050) and long range (2100). Research and exploration aimed at development of adaptive strategies to accommodate continued sea level rise (2-3 m) Where relevant, tying in with Sea Level Rise Knowledge Programme.

Grevelingen

 Climate resilience study (intervention points) after 2050 regarding water management and user functions.

Lake Volkerak Zoommeer

- Climate resilience study regarding water management and user functions

Oosterschelde and Veerse Meer

- Flood risk management and salinisation, system exploration addressing intervention points for user functions
- Exploration of Veerse Meer water level management addressing intervention points for user functions

Westerschelde

- (Knowledge) development for sediment strategy and management regarding the coast and estuary, and implementation of large-scale pilot projects.
- Mapping out intervention points for utility functions ensuing from sea level rise

Coast and delta coast

- Research into combinations of increased sand volumes and solid measures, and into ways to link user functions (e.g., leisure activities and nature) and ambitions.
- Mapping out intervention points for utility functions ensuing from sea

Spatial adaptation

- A Standards for regional flood defences (Element of multi-layer flood risk management)
- 4 Vital and vulnerable functions
- Active collaboration between Security Regions and regional governments
- RES Heat Transition Vision Regional Energy Strategy

Freshwater supply

Taskings

- Subsoil salinisation (combined with other taskings)
- Falling groundwater levels and no freshwater supply
- Inlet calinication
- Low water levels and discharge volumes
- No freshwater supply

Strategic choices with corresponding nationwide measures

- Preferential order: adapting land use to water availability; cutting down water consumption; improved water retention; more efficient distribution of water; acceptance of (residual) damage.
- ▲ Climate-proof freshwater supply from main water system in combination with smart water management. (Key distribution points in and from the main water system)
- Freshwater section of main water system
- Groundwater supplementation

Measures at specific locations

Enhancing freshwater/saltwater separation at sluices

The Zeeland approach

In view of the comprehensive and complex tasking that faces the province of Zeeland, collaboration is crucial. The provincial parties have drawn up a Zeeland Climate Adaptation Strategy Action Plan and signed a covenant. The action plan substantiates the ambitions set out in the Delta Plan on Spatial Adaptation and describes how a collective climate adaptation strategy will be established. Its outlines

- Local and regional climate stress tests constitute the basis for gaining insight into the taskings.
- The risk dialogues in Zeeland take account of vulnerabilities; they strive to garner support and raise awareness among residents, authorities, politicians, NGOs, and companies. Local dialogues are linked to natural events such as restructuring, specific developments, or local policy formation.
- The Zeeland Climate Adaptation Strategy and the associated implementation programme are key building blocks for the Environmental Vision and the corresponding implementation plans and programmes. The strategy comprises the provincial strategy, the local strategies, and recommendations regarding further research or future follow-up efforts.
- During the climate adaptation strategy development process, the individual organisations will embed the results of the climate stress tests in policy plans, and actively seize linkage opportunities.

The Zeeland approach addresses spatial adaptation in close interconnection with freshwater supply and multi-layer flood risk management. Key taskings in terms of freshwater supply are the balancing of precipitation shortages and precipitation surpluses, coping with drought, and the associated spatial planning issues. For that reason, a Zeeland Delta Plan on Freshwater Supply is being drawn up, which provides input for the Zeeland Climate Adaptation Strategy. Within the framework of the urban flooding theme, explicit attention is being paid to multi-layer flood risk management. Layer 2 (impact-reducing spatial planning measures) will be substantiated through, e.g., the standards for regional flood defences and the formulation of an assessment framework for location choices and the planning of vital and vulnerable functions. With respect to layer 3 (disaster control), the provincial authorities and the Zeeland Security Region are collaborating on disaster and evacuation plans.

Goeree-Overflakkee approach

The island of Goeree-Overflakkee conducted a stress test in 2018. The risk dialogue with stakeholders was conducted in 2019. By 2020, an adaptation strategy will be set down, including the corresponding set of measures. Subsequently, the measures will be anchored in such underlying plans as the Urban Water Programme. Residents were consulted in

the autumn of 2019. This process has been combined with participation regarding the Heat Transition Vision and the Regional Energy Strategy. Thus, in a single process, the municipality aims to advise and support its residents in the range of sustainability ambitions. Apart from that, the agriculture sector, for example, is anticipating the impact of drought via concrete actions.

The significance of the Delta Programme in the Southwest Delta

In the Southwest Delta, the Rhine, Meuse, and Scheldt rivers flow into the sea. Following the 1953 flood disaster, the Delta Works have restored flood protection in this area, among other ways by sharply shortening the coastline. This has created several water basins: fresh and saline, with and without tidal movement. The Delta Works have also caused new issues, such as (blue-green) algal growth in lake Veerse Meer⁴⁵, lake Volkerak-Zoommeer, and the delta border lakes (Binnenschelde and Markiezaat); sand deficit in the Oosterschelde; and oxygen deprivation of the Grevelingen lake bed. These issues have an adverse impact on the sustainable development of the regional economy. The administrators in the Southwest Delta are committed to climate-proofing, safety, ecological resilience, and economic vitality in future developments. The expected acceleration in sea level rise impacts the tenability of the current flood protection strategy. This has been considered in the first six-year review of the strategy. The review has demonstrated the urgency of launching a knowledge programme to map out the thresholds and potential adaptation tracks for the Southwest Delta.

6.5.2 Explanatory notes to the review

The current strategy will hold good until 2050 and there is sufficient time to develop new policy geared to future uncertainties ensuing from climate change. Knowledge development is urgent, however, specifically in the field of sea level rise. An accelerated rise in sea level (up to 2 or 3 metres by 2100) may dictate decisions regarding amendment of the strategy to be taken earlier than envisaged, even before 2050. A new Southwest Delta Knowledge Programme is mapping out the long-term alternatives for the entire Southwest Delta. The programme addresses the entire region in an interconnected and integrated manner and considers the need for and options of larger interventions between 2050 and 2100.

⁴⁵ The water quality of lake Veerse Meer has improved after the construction of the Katse Heule sluice (2004) enabling the exchange of water with the Oosterschelde.

The current strategy will largely hold good up to a 1 metre rise in sea level by 2100. However, several measures will need to be intensified by then, such as dyke improvements, sand replenishment, and freshwater supply measures. A sea level rise of between 1 and 2 metres will entail several thresholds, in particular as a result of the impact on nature, the economy, and water management.

The pace at which the sea level is rising is decisive for the moment at which the strategy needs to be adjusted. Between 2050 and 2100, larger interventions may be required. For example, a 1.25 metre rise in sea level will require nearly 100 closures of the Oosterschelde storm surge barrier per annum, which will have consequences for nature, the landscape, the use of space, and the economy.

The elaboration of the Delta Plan on Spatial Adaptation is a new component of this revised strategy.

6.5.3 Looking back: the milestones of the past six years

These are some of the results and milestones achieved with the implementation of the Delta Programme in the Southwest Delta:

- The comprehensive <u>Waterdunen</u> project, intertwining coastal reinforcement, nature development, and leisure activities, has been completed. Waterdunen substantiates the dual goal of the Weak Links project – reinforcing the coast and enhancing spatial quality – in an appealing manner. It also fosters the (national) goals for nature restoration in the Westerschelde.
- The <u>Roggenplaat sand replenishment</u> project in the Oosterschelde, aimed at enhancing both nature and safety (reduced wave attack on the south coast of Schouwen), has been completed.
- 3. The projects of the Freshwater Testing Ground involve close collaboration between entrepreneurs, experts, and authorities. The actual results of the field tests mainly involve different methods for freshwater storage in the soil. The projects have garnered more commitment among farmers. Implementation of the Roode Vaart project commenced in 2019.
- 4. The "Kop van Schouwen Smart Sand Use" pilot has produced such results as new dynamics and enhanced ecological and landscape values of the dunes, and sand replenishment on the Brouwersdam beach, which is pivotal to the regional economy. Within the context of this pilot, a proportion of the Kop van Schouwen deposit was used for the Brouwersdam in 2017. This "once only" step has not jeopardised the safety of the area.
- 5. Within the framework of the Zeeland Climate Adaptation approach, the climate stress tests have been completed and a provincial risk dialogue has been conducted. The result is the Memorandum on Climate Adaptation: Zeeland risks mapped out.

6.5.4 Agenda for the six years ahead

Projects, activities, and milestones

The next six years will see the roll-out of projects and activities aimed at the further realisation of the Delta Decisions and the Preferential Strategy for the Southwest Delta. The initiators of the projects and activities are capitalising on as many opportunities as possible in the pursuit of future-proof water systems, by tackling the three Delta Programme taskings in an interconnected manner and, wherever possible, by tying in with climate mitigation, the circular economy, and other transitions. In the Southwest Delta Regional Agenda 2050 process, images for the future will be developed in 2020, along with corresponding potential action perspectives.

Some noteworthy milestones and results:

- In the period ahead, the Flood Risk Management Project Organisation involving collaboration between the Scheldestromen district water board and the Rijkswaterstaat Sea and Delta division will be working on the Hansweert dyke improvement. The dyke is more than five kilometres in length and protects the residents against a superstorm. This is the first project in Zeeland to be carried out under the latest safety standards, in both a sustainable and circular manner. The ultimate goal is the realisation of a zero-emissions building site, thus creating a blueprint for future similar projects.
- The Zeeland Delta Plan on Freshwater Supply will be substantiated. This will generate the strategy for Zeeland's future resilience against freshwater shortages. In the purview of the areas of Zeeland without supply options, the Testing Ground and its pilots will be continued. In the current planning period, the focus is on the exploration of methods for temporary subsoil freshwater storage. In the planning period ahead, the focus will shift to a region-wide roll-out. In the areas open to supply from the main water system, planning and management measures will expand the water preservation capacities. Thus, their dependency on the main water system will not increase any further. Under the commitment to enhance the coping capacity of these areas, pilots will be conducted aimed at the large-scale upgrading and reuse of effluent.
- The Restoration of Grevelingen Tidal Movement project is working on the restoration of limited tidal movement in lake Grevelingen, in order to enhance water quality and underwater nature, which have been affected by the developments ensuing from the construction of the Delta Works. In the long run, sea level rise will complicate preservation of the desired tidal dynamics. In the plan elaboration phase, the project team will be elaborating two sluice variants that take this into account.

A full overview of projects and activities is contained in the Delta Plan on Flood Risk Management (3.5), the Delta Plan on Freshwater Supply (4.5), and the Delta Plan on Spatial Adaptation (5.5).

Expertise and research

The studies and knowledge processes conducted over recent years have generated new knowledge and knowledge issues regarding the functioning of the water systems. With respect to the issues involving the impact of an accelerated rise in sea level and the future freshwater supply, the national Sea Level Rise Knowledge Programme will map out the impact on the Southwest Delta in knowledge track 2, "system explorations", departing from the national choices

regarding the main water systems (sea level rise, river discharge volumes, and water distribution).

Key research questions for the Southwest Delta pertain to the identification of thresholds for the user functions resulting from sea level rise. Another question involves potential action perspectives and measures. Area-specific knowledge issues regarding freshwater supply are addressed in the Delta Plan on Freshwater Supply. The knowledge issues relating to more integrated regional taskings will be incorporated into the Southwest Delta Knowledge Programme that will be set up, by way of a regional elaboration of and input in the Sea Level Rise Knowledge Programme.

6.6 The Coast

6.6.1 Proposed amendments to the Preferential Strategy for the Coast

Preferential Strategy for the Coast

The Preferential Strategy for the Coast is structured on the proposed amendments to the Delta Decision on Flood Risk Management and to the Decision on Sand. The Delta Programme Commissioner proposes to largely uphold the Preferential Strategy for the Coast.

Flood risk management

The adaptive flood risk management strategy - "soft where possible (using sand replenishments), hard where necessary" will be maintained. The coast can thus easily keep pace with the rising sea level. Sand replenishments also enhance the appeal of the coast, featuring opportunities for leisure activities and tourism.

The point of departure remains the integrated tasking set out in the National Coastal Vision (2013): achieving a safe, attractive, and economically viable coast by interconnecting the flood protection tasking with spatial ambitions.

The strategy features a new method for interconnecting the flood risk management tasking and spatial developments, involving a customised approach for each location. If a location will be faced with an interrelated spatial development and flood protection tasking within fifty years, the parties will jointly explore the options: seaward, landward, or consolidation. The result will be set down in a "linked growth concept". Opting for the linked growth concept will enable the elaboration of measures to achieve the spatial ambitions (which tend to emerge earlier), taking account of the long-term flood protection requirements.

The significance of the Delta Programme in the coastal zone

The coastal zone comprises beaches, dunes, dykes, and seaside resorts harbouring a wide range of functions. The coastal flood defences are currently up to par, but tidal dynamics and the rising sea level are causing structural erosion along the coastline. Without regular sand replenishment, the Netherlands would lose an average of one metre of land per year along the entire coastline. The focus is, therefore, on preserving the coastal zone surface area. In addition, sand replenishment ensures structural balance in the sand volumes in the coastal foundations. If the sea level should rise more rapidly in the future, more sand replenishments will be needed. In the long run, dykes or dunes may need to be improved. The challenge entailed in such developments is to keep the coastal zone safe, attractive, and economically viable. New concepts, such as dynamic coastal and dune management, offer good prospects for both flood risk management and other functions. A case in point is the "Sand Engine" off the Zuid-Holland coast.

6.6.2 Explanatory notes to the review

For the most part, the strategy for the Coast will remain unchanged. In the long run (after 2050), however, a potential acceleration in sea level rise will dictate amendments (cf. Decision on Sand in Chapter 3).

The connection between flood risk management and spatial ambitions is and will remain important in the coastal zone. The previous Delta Decision aimed to establish such a connection in seventeen "coastal pearls". Recent years have shown that the coastal pearl approach is not effective, because the flood risk management taskings and the spatial ambitions are too far apart in time. As coastal flood



Sand replenishment

(Coastline Maintenance implementation programme 2020-2023)

- Beach replenishment
- Shore-face nourishment

Coastal Genesis 2.0 study

- Research into tidal inlet morphology Ecological research at several locations Amelander Zeegat Study into deeper foreshores in three areas:
 - Terschelling research area
 - Amelander inlet research area
 - Noordwijk research area
- 1 Evaluation of Sand Engine 2021

Participation in Sea Level Rise Knowledge Programme

Taskings

- Subsoil salinisation (combined with other taskings)
- Falling groundwater levels and no freshwater supply
- Falling groundwater levels and limited freshwater supply
 Inlet salinisation
- IJsselmeer water buffer volume
- Low water levels and discharge volumes No freshwater supply

protection is up to par, there is no reason for connecting flood risk management measures with spatial taskings. The ambitions regarding housing and leisure activities were not sufficiently robust to effect the intended integrated development. Consequently, the amended strategy features a slightly modified method of operation, whereby the connection becomes a standard element of all the spatial developments in the coastal zone. The "coastal pearls" concept is dropped. Instead, the option of incorporating coastal flood risk management as an integral element of the process will be explored for every coastal location featuring spatial developments. Representatives of the Coastal Pact and the Delta Programme for the Coast are reviewing how coastal municipalities can automatically link their spatial ambitions to their flood risk management tasking, for example, through the provincial and municipal environmental visions.

6.6.3 Looking back: the milestones of the past six years

These are some of the results and milestones achieved with the implementation of the Delta Programme for the Coast:

- At the end of 2016, the Weak Links on the Coast programme was completed. This year saw the official delivery of the last section of the West-Zeeuws-Vlaanderen weak link (cf. Southwest Delta).
- 2. In 2015, the Hondsbossche storm surge barrier between Petten and Camperduin was improved with sand dunes and a beach in front of the dyke.
- 3. In 2018 and 2019, Rijkswaterstaat conducted a pilot replenishment on the ebb-tide delta between the islands of Ameland and Terschelling, by depositing 5 million m³ of sand on the seabed of the Ameland tidal inlet. Here, Rijkswaterstaat is exploring sustainable ways to have the Dutch coast keep pace with the rising sea level.
- 4. In 2017 and 2018, the provinces have drawn up a zoning plan for the coastal zone, under the Coastal Pact⁴⁶. This plan sets out where there is room for new (recreational) construction, where there is no such room, and where such construction is permitted under certain conditions.
- 5. In 2017, the Ministry of Infrastructure and Water Management evaluated the enforcement of the Ordnance Coastline. On the basis of this evaluation, the Ordnance Coastline was revised in 2018 and adapted at several locations along the coast.

6.6.4 Agenda for the six years ahead

Projects, activities, and milestones

The next six years will see the roll-out of projects and activities aimed at the realisation of the Preferential Strategy for the Coast.

⁴⁶ Parliamentary Document 29383 no. 278(in Dutch).

Some noteworthy milestones:

By the end of 2020, the Coastal Genesis 2.0 programme will produce policy recommendations regarding the sand replenishment strategy. The advisory report will address issues such as the sand volumes required in the long run, where and when this sand will be needed, the best methods for depositing sand on the coast, and what additional research will be needed to further improve the sand replenishment strategy. The advisory report will be based on interim results of studies into long-term coastal development, the Ameland Tidal Inlet Ebb-tide Delta pilot replenishment, and ecological monitoring.

In 2021, the Sand Engine will be evaluated. The Sand Engine involves an innovative sand replenishment project off the Zuid-Holland coast. The results may be of use in the optimisation of the sand replenishment strategy. In the period 2021-2027, the coastline will be maintained through sand replenishment. For the time being, deposits are expected to total an annual 12 million m³ over this period.

By 2024, the Innovations in Coastline Maintenance project will be completed. This Rijkswaterstaat project is aimed at developing new technologies for more sustainable coastline maintenance. The project is expected to generate useful innovations that can subsequently be field tested. The Delta Fund has set aside EUR 18 million for the development of the innovations. The ambition is that by no later than 2030, coastal maintenance will no longer emit greenhouse gases.

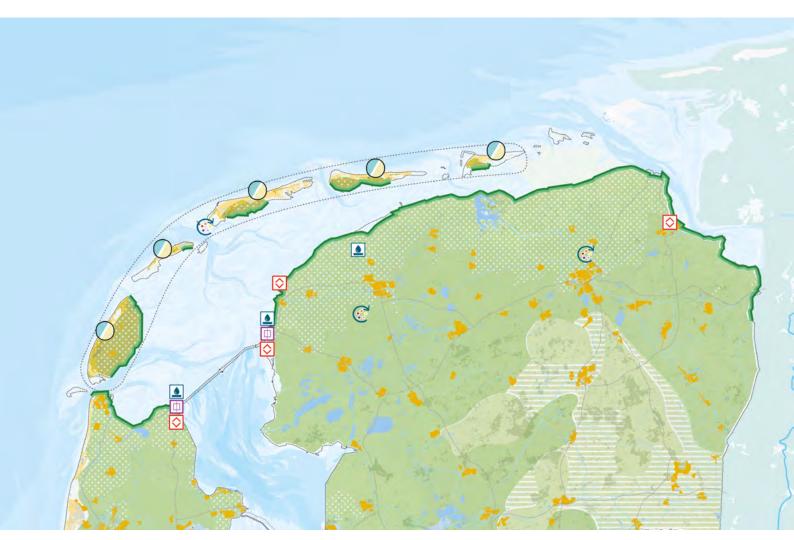
A full overview of the scheduled sand replenishments is provided in the <u>Coastline Maintenance Implementation</u> <u>Programme</u>.

Expertise and research

The research regarding the Coast in the period 2021-2026 is featured in the Delta Programme Knowledge Agenda.⁴⁷ Key knowledge issues pertain to the uncertainties surrounding the expected (accelerated) sea level rise. The Sea Level Rise Knowledge Programme is investigating how such uncertainties can be reduced. The melting Antarctic ice plays a dominant part in this respect. The research results are important to determine for how long the current sand nourishment strategy will hold good. Current expectations are that a potential acceleration in sea level rise will not occur before 2050, and that the sand nourishment strategy will hold good until at least 2050.⁴⁸

⁴⁷ See <u>Background Document E, Delta Programme Knowledge Agenda</u> (in Dutch).

⁴⁸ See: Parliamentary Document 27625 no. 503 (in Dutch), www. enwinfo.nl/images/pdf/adviezen-2019/ENW-19-08-Advies-aanminister-van-lenW-inzake-Houdbaarheid-Nederlandse-waterveiligheidsstrategien-bij-versnelde-zeespiegelstijging-november-2019. pdf and www.enwinfo.nl/images/pdf/adviezen-2019/ENW-19-08. Achtergrondrapport-Impact-zeespiegelstijging-op-hoogwaterveiligheid-dv.pdf



Flood risk management

Intertidal area: keeping pace with the rise in sea level

Ordnance coastline

Maintaining coastal foundations and maintenance of ordnance coastline Coastal foundations in balance with rise in sea level; sand replenishments to supplement sand volumes; potential future expansion with system replenishments (sand engines, ebb-tide deltas)

Primary flood defence systems: innovative and integrated

Innovative dyke improvement, such as wide green dykes, multifunctional dykes, and overtopping dykes (including Lauwersmeer-Vierhuizergat and Koehool-Lauwersmeer dyke improvements) (HWBP)

Integrated flood protection strategy for each Wadden island
Integrated flood protection strategy for each Wadden island, in
combination with choices regarding long-term coastal management
(including study into impact of drought and salinisation on integrated
flood protection strategy)

Participation in Sea Level Rise Knowledge Programme

Freshwater

- Taskings

 Subsoil salinisation (combined with other tasking)
 - Falling groundwater levels and no freshwater supply
- Falling groundwater levels and limited freshwater supply
- IJsselmeer water buffer volume
 No freshwater supply

Strategic choices with corresponding nationwide measures

- NOVI preferential order: adapting land use to water availability; cutting down water consumption; improved water retention; more efficient distribution of water; acceptance of (residual) damage
- ▲ Climate-proof freshwater supply from main water system in combination with smart water management. (Key distribution points in and from the main water system)

Essential strategic long-term decisions

IJsselmeer Closure Dam drainage by gravity / pumping

Measures at specific locations

Enhancing freshwater/saltwater separation at sluices

6.7 Wadden Region

6.7.1 Proposed amendments to the Preferential Strategy for the Wadden Region

Preferential Strategy for the Wadden Region

The Preferential Strategy for the Wadden Region is structured on the proposed amendments to the Delta Decision on Flood Risk Management and to the Decision on Sand. The Delta Programme Commissioner proposes to uphold the current strategy:

- preservation of the buffering function of the islands, ebb-tide deltas, and intertidal areas;
- preservation of the coastal sand system, including pilots, monitoring, and system knowledge development;
- prevention through innovative, multi-functional dykes, including the mudflats;
- an integrated flood risk management strategy for each Wadden island.

However, some intensification is required:

- boosting research into the functioning of the Wadden Sea system: mapping out the impact of the rising sea level on the sand system, and charting action perspectives for the area (such as sand replenishments, expediting sedimentation through ecosystem engineers, and wave reduction through forelands), among other ways, via the Sea Level Rise Knowledge Programme;
- further development and design of the zone around the primary flood defences of the Wadden Region mainland;
- drawing up integrated flood risk management strategies in interconnection with choices for long-term coastal management⁴⁹;
- research into how drought and salinisation on the Wadden islands will impact the integrated flood risk management strategies for each Wadden island.

Significance of the Delta Programme in the Wadden Region

The Wadden Region comprises the Noord-Holland, Friesland, and Groningen mainland along the Wadden Sea, the Wadden islands, the Wadden Sea, and the Eems-Dollard. The North Sea coastal zone comprises the coastal foundations and the ebb-tide deltas of the tidal inlets, and falls under the Coast Region. The two regions are interconnected in terms of morphology and ecology; consequently, the programmes are geared to one another.

The intertidal area – encompassing the Wadden islands, the sand shoals, and the mud-flats –

constitutes a buffer against the high North Sea waves. Preservation of this buffering function through natural solutions is essential. The Wadden Sea, the dune areas on the islands, and the North Sea coastal zone have been designated as Natura 2000 areas. On account of its geological, ecological, and cultural-historical value, the Wadden Sea is listed as a UNESCO World Heritage Site.

Along the Wadden Sea mainland and on the islands, flood defences provide protection against the sea. Currently, some one hundred kilometres of these flood defences fail to meet the statutory standards. Some of the dykes protect the "gas roundabout" infrastructure. This dyke stretch is covered by more stringent protection standards.

The tasking involves keeping the Wadden Region sustainably safe whilst preserving its social, ecological, and other values. Climate change may add

6.7.2 Explanatory notes to the review

to the challenge posed by this tasking.

In the decades ahead, the current strategy and measures enable accommodation of the consequences of the sea level rise as predicted now. However, some intensification is required, as explained below.

Additional impetus will be given to the development of Wadden Sea system knowledge. The Wadden Sea and Eems-Dollard are keeping pace with the rising sea level by, inter alia, sediment transport and the development of sediment collecting organisms such as shell deposits, fields of sea grass, and mudflats. Thus, the two areas retain their buffering function. According to current insights, up to 2050 the preservation of this buffering function will not require any additional measures. More system knowledge is needed to verify whether the Wadden Sea and Eems-Dollard can continue to keep pace in the longer run, if the rise in sea level should accelerate. Knowledge issues have been submitted to the Wadden Academy and to the Sea Level Rise Knowledge Programme.

The integrated approach to mainland dyke improvements through innovative dykes will be developed further. Wherever possible, innovative dykes tie in with area developments, creating added value in terms of nature, leisure activities, the landscape, cultural heritage, and the regional economy. The intention is to also explore this via the Trilateral Research Agenda. In the Wadden Sea Dykes General Exploration (2015-2019), several innovative and historical dyke improvements have been explored. Examples include the use of local matured clay in a wide green dyke

⁴⁹ Long-term coastal management involves efforts such as sand replenishment, dynamic dune management, et cetera, that continue over multiple years.

along the Dollard, and the use of a double dyke with a saline transitional zone near the Eemshaven-Delfzijl dyke improvement. A careful approach has enabled preservation of the historical Norwegian stone dyke improvement of the historical Norwegian stone dyke improvement waters are lichen. In collaboration with the Major Waters Programme Strategy, the Lauwersmeer-Vierhuizergat and Koehool-Lauwersmeer dyke improvements are being developed in a manner that enhances both flood protection and the Wadden Sea and Eems-Dollard ecology.

For each Wadden island, an integrated flood risk management strategy is being drawn up, also covering long-term coastal management. The integrated strategies pertain to flood risk management (primary flood defences with sand replenishment, dynamic coastal management, mud-flat development, innovative dyke concepts); climate-adaptive and water-resilient spatial planning; and disaster control. Attention is also paid to "smart combinations", to the increased probability of flooding, and to risks for floodplain infrastructure. The aim is to have the integrated strategy for each island set down by 2025. An acceleration in sea level rise may turn the floodplain risks into bottlenecks. More drastic measures could be needed then.

Further research is required to determine whether drought and salinisation need to be addressed in the strategies for the Wadden islands. The results will be taken into account in the next six-year review.

6.7.3 Looking back: the milestones of the past six years

These are some of the results and milestones achieved with the implementation of the Delta Programme in the Wadden Region:

- A sand dyke has been constructed near the Prins
 Hendrik dyke on the island of Texel. As a result, the
 dyke now meets the flood protection standards again.
 It has enriched the Wadden Sea with a unique piece of
 floodplain nature: a beautiful sand area featuring dunes
 and mudflats. Scarce Texel farmland has been preserved.
- 2. In the Wadden Sea Dykes General Exploration, several innovative dyke concepts and dyke materials have been explored with the aim of having the primary flood defences meet the statutory standards. During the exploration, the results have already been implemented in regular dyke improvements. For example, in 2019, the Noorderzijlvest district water board realised a double dyke in the Eemshaven-Delfzijl dyke improvement project.
- 3. System knowledge on the Wadden Region and the functioning of the sand system has been pursued energetically. Sub-studies and field measurements

(Coastal Genesis 2.0) have generated more insight into the operation of tidal inlets. The Wadden Academy and the "Towards a Rich Wadden Sea" programme have published an outline paper⁵¹ containing linked growth data on the various Wadden Sea basins.

6.7.4 Agenda for the six years ahead

Projects, activities, and milestones

The next six years will see the roll-out of projects and activities aimed at the realisation of the Preferential Strategy for the Wadden Region.

The Lauwersmeer-Vierhuizergat dyke improvement offers several linkage opportunities: natural transitions between the Wadden Sea and the dyke, underwater nature, freshwater-saltwater gradients, and fish migration. Integrated implementation will bring flood protection up to par, whilst concurrently enhancing ecological water quality and Wadden Sea nature in this dyke zone. The project is expected to enter the realisation phase by 2023.

The Wetterskip Fryslân district water board is improving 47 kilometres of Wadden Sea dykes between the Koehool area (north of Tzummarum) and lake Lauwersmeer. The central government is making resources from the Major Waters Programme Strategy available in the purview of an integrated realisation, resulting in the desired flood protection and the enhancement of the ecological water quality and nature of the Wadden Sea. In this collaborative project, the water board and the central government are exploring options for the application of innovative dyke concepts, in combination with options for more natural transitions between land and water, freshwatersaltwater gradients, and fish migration. This exploration also addresses options for linkage with the water system measures of the Holwerd aan Zee project. The exploration and planning are expected to extend to 2023, whereupon implementation can commence.

Under the WAVE 2020 project, the three Security Regions in this area (Noord-Holland Noord, Fryslân, and Groningen) are conducting an impact analysis of flooding caused by dyke failure or by severe waterlogging. This analysis provides insight into the required spatial adaptation measures and into the short-term and long-term effects on the liveability of the affected area.

⁵º What is commonly known as Norwegian Stone are, in fact, Megalithic tombstones that were collected from Groningen and Drenthe farmlands after the Christmas flood of 1733, in order to strengthen the dykes.

⁵¹ Van der Spek Ad J.F. (2018) The development of the tidal basins in the Dutch Wadden Sea until 2100: the impact of accelerated sea-level rise and subsidence on their sediment budget – a synthesis. Netherlands Journal of Geosciences 97, 71-78.

<u>Click here</u> for the Dutch summary.

A full overview of projects and activities is contained in the Delta Plan on Flood Risk Management (3.4). The innovative concepts generated by the Wadden Sea Dykes General Exploration are implemented in dyke improvements wherever these are worthwhile.

The Agenda for the Wadden Region 2050 sets out a collective course and the corresponding agenda of the authorities, nature organisations, fishery organisations, and the collaborating ports of the Wadden Region. This regional agenda bundles existing ambitions, goals, and strategies of the central government and the region, finetunes them where possible, and identifies the main taskings and associated dilemmas that new developments entail for the Wadden Region. Wherever possible and required, the agenda features policy choices. This regional agenda thus constitutes the point of departure for policy and management, and a collective agenda for the choices and taskings facing the Wadden Region parties.

Expertise and research

The research regarding the Wadden Region in the period 2021-2026 is featured in the Delta Programme Knowledge Agenda. Key knowledge issues are:

- How does the rising sea level affect the primary flood defences? Changes in the Wadden Sea morphology may – apart from the rise in sea level – add to the wave load on the Wadden Sea dykes and the IJsselmeer Closure Dam.
- What is the impact of the rise in sea level in terms of the probability of failure, the management, the maintenance, and the replacement of the primary flood defences (after 2050)?

- What ecological foreland⁵² and natural sediment preserving processes can be used to limit wave development and thus foster the flood protection provided by the primary flood defences? What measures can be implemented to steer these processes? The same questions extend to ecological foreland management.
- Where can forelands support the stability of flood defences and reduce piping?
- What measures are required to enable the flood defences to cope with a sea level rise in excess of 2 metres in the distant future? Are such measures feasible? Or should we consider replacement of the primary flood defences or a different flood risk management strategy?
- What does the improvement of the flood defences to accommodate a 1 metre and 2 metre rise in sea level entail in terms of additional space requirements and the required spatial reservations ("hydraulic structures core zone", "undesired developments protection zone" and "profile of scope for future improvements")?⁵³
- What does a potential acceleration in sea level rise entail for the Fryslân and Groningen areas outside the dykes (specifically the islands of Vlieland and West-Terschelling)?
- How can flood risk management measures enhance the (natural) qualities of the Wadden Sea? And vice versa: how can nature measures foster flood risk managements?

6.8 Elevated Sandy Soils

6.8.1 Proposed amendments to the Preferential Strategy for the Elevated Sandy Soils

Preferential Strategy for the Elevated Sandy Soils

The Preferential Strategy for the Elevated Sandy Soils is structured on the proposed amendments to the Delta Decisions on Freshwater Supply and on Spatial Adaptation. The Delta Programme Commissioner proposes the following amendments to the Preferential Strategy for the Elevated Sandy Soils:

At the Elevated Sandy Soils, impetus will be given to the transition to active groundwater management, at the local and regional levels, and within the framework of a comprehensive climate adaptation strategy. The strategy aimed at rendering the area resilient against water shortages focuses on preservation, supply, and acceptance/adaptation.

The strategy involves a "collective, integrated, and areaspecific" approach. The water availability and spatial adaptation taskings are tackled in an interconnected manner.

The significance of the Delta Programme at the Elevated Sandy Soils

The Netherlands features elevated sandy soils in Drenthe, East-Overijssel, Gelderland, Utrecht, Noord-Brabant, and Limburg. These areas are typically criss-crossed with brook valleys. They encompass a mosaic of well-developed and capital-intensive farmlands, less capital-intensive farmland, and valuable wet and dry nature reserves. A large part of the Elevated Sandy Soils does not receive any or receives only a limited supply of fresh water from the main water system. Drinking water companies, foodstuff companies, other industries, and farmers use deep and shallow

⁵² Forelands are areas outside the dykes that fall beyond the managing body's official sphere of influence. The areas may involve built-up/ overgrown floodplains, but they can also be port moles, clay covers, or mudflats.

⁵³ These questions are addressed in the Resilient Wadden Study, conducted by the Wadden Academy (to be completed by early 2020).

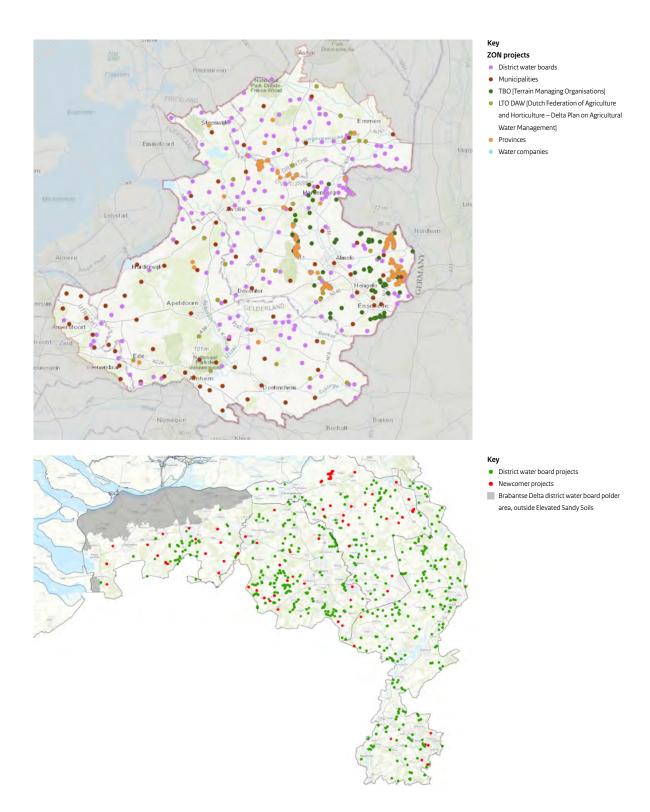


Figure 11 Projects and measures, Elevated Sandy Soils working programme 2016-2021

groundwater for their operational processes. The Elevated Sandy Soils have been struggling with dehydration for dozens of years. Rapid climate change will entail increased water shortages, lower groundwater levels, and brook valleys running dry. This will cause particular damage to agriculture, urban areas, and nature. Furthermore, water quality may deteriorate.

The Elevated Sandy Soils account for some 50 per cent of the Dutch surface area. They accommodate 45 per cent of the population and 40 per cent of the workforce; 40 per cent of the added value is established here. In addition, the Elevated Sandy Soils harbour 70 per cent of the National Parks, 55 per cent of the Natura 2000 areas, and 50 per cent of the National Landscapes.

6.8.2 Explanatory notes to the review

The main addition vis-à-vis the strategy set out in Delta Programme 2015 involves active groundwater management. This substantiates one of the recommendations of the Drought Policy Platform. The droughts of 2018 and 2019 had a major impact on the Elevated Sandy Soils.

Another adjustment is that the freshwater supply tasking and the spatial adaptation tasking will be addressed in interconnection. Over recent years, it has become increasingly clear that the impact of extreme weather on the Elevated Sandy Soils necessitates such an approach. Consequently, the regional administrative consultative bodies of Limburg and Noord-Brabant decided in 2020 to endorse a single strategy and a single approach covering both freshwater supply and climate adaptation (South Netherlands Climate Adaptation Implementation Programme).

With a view to achieving maximum synergy, the goals, instruments, and resources are centralised in area-specific dialogues. This brings far-reaching solutions, such as adaptation of land use, within reach as well. The area-specific approach is supported by solutions to generic bottlenecks that feature all across the Elevated Sandy Soils, such as level-driven drainage and soil measures in agriculture and horticulture; water preservation in rural areas; and rainwater infiltration in urban areas.

6.8.3 Looking back: the milestones of the past six years

These are some of the results and milestones achieved with the implementation of the Delta Programme at the Elevated Sandy Soils:

- Over the past six years, the provinces, district water boards, municipalities, and other partners have conducted more than 300 projects at the Elevated Sandy Soils South and East, aimed at expanding the groundwater supply and reducing water consumption.
- 2. In Gelderland, two key regional processes were launched in 2017 pertaining to the Baak brook estate zone and the Southern IJssel Valley. The results will become available in the next few years. In Overijssel, the Regge project near Enter was successfully completed. The province of Drenthe has been working on the preservation and restoration of moorland in the Bargeryeen area.
- 3. Rijkswaterstaat has brought the Noordervaart capacity up to par in the purview of letting water into the Brabant and Limburg canal system; the work is nearing completion. The district water boards have brought the associated regional water system up to par, in order to ensure that the water supplied can reach the "capillaries".
- 4. In the dry year of 2018, the nature, historical greenery, and crops of the Elevated Sandy Soils sustained extensive damage. The measures that were implemented turned out to be effective nonetheless, in both the South and the East. The many small-scale measures in nature reserves (such as filling in ditches and adapted weir management) and measures in the surrounding farmlands (such as level-driven drainage, water preservation in farmland ditches and brook restorations) mark the first steps towards system restoration. Without these measures, the damage would have been even greater.
- 5. In 2019, the parties in the Southern region decided to tackle the freshwater supply and spatial adaptation taskings in an integrated manner and to accommodate them in a single programme, under the auspices of the Meuse Regional Consultation Committee. In the Eastern region, collaboration is achieved through coordinated freshwater supply and spatial adaptation programmes in the Working Regions.

Examples of implementation projects at the Elevated Sandy Soils

- Irresistible Someren: the municipality of Someren has launched 45 projects, in collaboration with the Aa en Maas and Dommel district water boards, residents, and farmers, to climate-proof the municipality.
- Climate-adaptive Eikske: this neighbourhood in Landgraaf is being rendered climate-resilient through, e.g., a multi-functional greenery zone, disconnecting downspouts from the sewer system, rainwater infiltration, and an arborvitae forest which also serves to prevent heat stress. The freshwater gains amount to some 50,000 m³ per annum.
- Limburg sub-irrigation: sub-irrigation is the supplementation of groundwater and soil moisture underneath farmland through a level-driven drainage system ("sub-soil irrigation"). This prevents water losses through washing away or evaporation. A pilot study has shown that this will improve crop yield. The system will be used on a larger scale in the years ahead.
- Continuing to water: on behalf of three district water boards, the Southern Agriculture and Horticulture Organization has been working, together with entrepreneurs, on water preservation and water savings through the construction and management of level-driven drainage, soil and crop measures, raising awareness, monitoring, and communication. The aim is for 80 farmers to preserve 50,000 m³ annually.

In early 2021, decisions will be taken regarding the measures for phase 2 of the Delta Plan on Freshwater Supply. This set of measures, which is expected to comprise measures for the Elevated Sandy Soils, will be incorporated into Delta Programme 2022. Implementation of the measures is scheduled for the period 2022-2027. The partners have indicated which freshwater supply measures they intend to take in pursuit of the Delta Programme goals for 2050. In the purview of these measures, they will be providing 75 per cent co-funding in the six years ahead.

A full overview of activities and projects at the Elevated Sandy Soils is provided in the Delta Plan on Freshwater Supply (4.5) and the Delta Plan on Spatial Adaptation (5.5). The initiators of the projects and activities are capitalising on as many opportunities as possible in the pursuit of future-proof water systems, by tackling the three Delta Programme taskings in an interconnected manner and, wherever possible, by tying in with climate mitigation, the circular economy, and other transitions.

Expertise and research

The research regarding the Elevated Sandy Soils in the period 2021-2026 is featured in the Delta Programme Knowledge Agenda. The Southern and Eastern regions are addressing the issues in the TKI-KLIMAP knowledge programme (the follow-up to Lumbricus, the research programme focused on a climate-resilient soil and water system). The Southern and Eastern regions will be translating the KNMI scenarios and the national bottleneck analysis to the Elevated Sandy Soils region.

6.8.4 Agenda for the six years ahead

Projects, activities, and milestones

The next six years will see the roll-out of projects and activities aimed at the realisation of the Preferential Strategy for the Elevated Sandy Soils. The measures revolve around adaptation of the water system, water consumption, and land use. Some noteworthy milestones: Over recent years, the emphasis has been on seizing opportunities and on no-regret measures. In the period ahead, measures will be interlinked to enhance their effectiveness. Several dozens of larger, interconnected areas will be integrating their freshwater supply and spatial adaptation efforts. Water buffering at the Elevated Sandy Soils helps to combat drought and waterlogging, and enhances water quality. The efforts are being expended in dialogue with stakeholders; they are coordinated with other taskings, such as the energy transition, the agricultural transition, environmental policy, and taskings relating to the economy, liveability, and health.



This chapter provides insight into the financial security of the Delta Programme, by comparing the resources available in the Delta Fund to the expected financial scope of the Delta Programme taskings.

The Delta Programme features measures that are funded entirely or partially from the Delta Fund: the measures pertaining to flood risk management and freshwater supply for which the central government bears (partial) responsibility. In addition, the Delta Programme comprises measures for which the central government does not bear responsibility, such as measures involving the regional water system that are being implemented by provinces, district water boards and municipalities. Such measures are not funded from the Delta Fund.

The paragraphs below successively outline the developments in the Delta Fund, the resources contributed by the other Delta Programme partners, the (reviewed) financial taskings of the Delta Programme up to 2050, and the conclusions of the Delta Programme Commissioner regarding the financial security of the Delta Programme.

7.1 Developments in the Delta Fund

The Delta Fund contains financial resources which the central government has earmarked to fund investments in flood risk management, freshwater supply, and water quality, and the associated management and maintenance by the central government. The Delta Fund can also provide grants for measures in the fields of flood risk management, freshwater supply, and water quality implemented by other governments (see Article 7.22d, second paragraph, of the Water Act). The amendment to the Water Act providing for Delta Fund grants for measures and provisions to combat waterlogging came into force on 1 July 2020; it constitutes the legal basis for the temporary incentive scheme envisaged for 2021 and beyond.⁵⁴

Water quality only comes to the fore in this analysis where

there is a connection with the Delta Programme taskings (flood risk management and freshwater supply). The Delta Plan on Flood Risk Management (Paragraph 3.5), the Delta Plan on Freshwater Supply (Paragraph 4.5), and the Delta Plan on Spatial Adaptation (Paragraph 5.5) contain an overview of all the studies conducted and the concrete measures scheduled under the Delta Programme, including the budget allocated.

Delta Fund budgets

In the period 2021-2034, a sum of some EUR 18.6 billion will be available in the Delta Fund, which brings the annual budget to an average of EUR 1.3 billion. This is evident from Table 14, which reflects the itemised and total Delta Fund budgets for the budget year 2021 and the period 2021-2034. Figure 12 reflects the itemised development in the budgets for the years up to and including 2034.

Table 14 Delta Fund budgets in 2020 and totals based on Draft Budget 2020 (in millions of euros)

| | | 2021 | total (2021-2034) |
|----------|--|--------------|-------------------|
| Art. 1 | Flood risk management investments | 519,2 | 6.528,4 |
| Art. 2 | Freshwater supply investments | 19,3 | 83,5 |
| Art. 3 | Management, Maintenance, Replacement | 154,5 | 2.942,9 |
| Art. 4 | Experimentation | 42,7 | 929,7 |
| Art. 5 | Network-related costs and other expenditure of which non-allocated budget available for investment | 352,2 4,9 | 7.217,6 860,2 |
| Art. 6 | Contribution from other national budgets | - | - |
| Art. 7 | Water quality investments | 130,8 | 898,7 |
| Total De | lta Fund expenditure | 1.218,7 | 18.600,8 |

⁵⁴ <u>Government Gazette 2020, 73</u> (in Dutch).

Delta Fund budgets

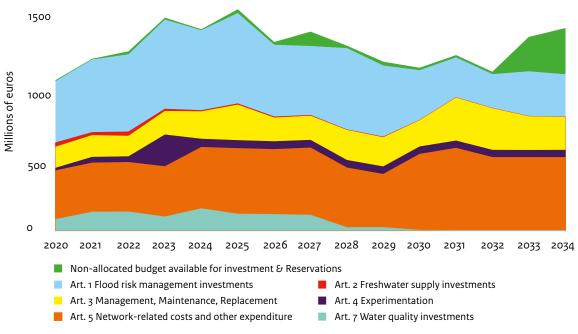


Figure 12 Delta Fund budgets, itemised and totals, based on 2021 Draft Budget

The figure above shows a peak in the budgets for the period 2023–2025, followed by a slight decrease in the Delta Fund expenditure in the subsequent years, until 2033. This pattern can be explained by the implementation of several major cash transfers to advance resources from the period 2029-2032. These cash transfers have provided more control over the budget overrun in the Flood Protection Programme (which will be expedited during this period), have freed up funds to launch IRM projects ahead of schedule, in accordance with the appeal of the Schonis motion⁵⁵, and have accommodated the policy reserves for the spatial adaptation incentive scheme with a realistic pattern of spending.

Non-allocated budget available for investment

In accordance with the structure agreed upon, this budget covers the Delta Fund as extended by another year, i.e., up to and including 2034. After deduction of ongoing commitments (primarily comprising management, maintenance and replacement; Rijkswaterstaat network expenses; and the central government's contribution to the Flood Protection Programme), this generates new scope for investment. In 2034, EUR 309 million will be available for water-related priority policy taskings. Furthermore, a proportion of the non-allocated budget will be added to ongoing policy reserves.

In the years ahead, these investment funds will be allocated

in an adaptive manner, based on ongoing processes such as the assessment of primary flood defences, the Integrated River Management programme, the Delta Plan on Freshwater Supply, and the Delta Strategy regarding Water Quality and Freshwater Supply. In the period 2021-2034, the non-allocated budget available for investment will total EUR 867 million. This sum includes risk reserves to a total of some EUR 341 million.

Reserves

Sub-item 5.04 of the Delta Fund – "Reserves" – covers estimated expenditure for future taskings, for which a project initiation decision is still pending. For the period up to and including 2034, the reserves specifically cover, subject to co-funding, the following items that are relevant to the Delta Programme: Regional flood defence systems managed by the central government (EUR 194 million); Integrated River Management (EUR 615 million); Freshwater Supply (EUR 444 million), comprising the second round of EUR 150 million for the 2022-2027 measures and a structural investment series of EUR 42 million per annum with effect from 2028); Major Waters Programme Strategy (EUR 469 million); a reservation for research (EUR 20 million); Spatial Adaptation (a total of EUR 215 million), comprising EUR 200 million for the incentive scheme, EUR 14 million for the Knowledge Programme, and EUR 1 million to supplement the ongoing Spatial Adaptation Incentive Programme); and the Statutory Assessment Framework 2035 (EUR 23 million). Further details regarding these reservations are provided in the Delta Fund budget.

⁵⁵ Schonis motion dated 1 July 2019, <u>Parliamentary Document 35140</u> no. <u>9</u> (in Dutch).

7.2 Resources from other partners

The central government is not the only authority to invest in the Delta Programme measures: the other government authorities are also contributing. The district water boards are investing in measures pertaining to the regional water system and account for 50 per cent (EUR 6 billion out of the EUR 12 billion) of the Flood Protection Programme funding. The district water boards, provinces, and municipalities are co-funding the implementation of measures scheduled under the Delta Plan on Spatial Adaptation and the Delta Plan on Freshwater Supply. Funding is also provided by the Ministry of Education, Culture and Science, under the Cultural Heritage, Flood Risk Management, Climate Adaptation, and Soil Subsidence Agenda (covering flood risk management, climate adaptation, and soil subsidence projects) and under the Heritage Deal (covering waterrelated projects).

District water boards

Investments

By keeping 3,200 kilometres of primary flood defences up to par, the district water boards are securing protection against flooding from the sea, the IJsselmeer lake, and the major rivers. The other 14,450 kilometres of flood defence systems managed by the district water boards keep water from other waterways at bay. In addition, the district water boards are responsible for the management of watercourses to a total length of 225,000 kilometres. With 5,700 pumping stations, tens of thousands of minor hydraulic structures, and a wide range of planning measures, the district water boards ensure a continuous and sufficient (not too much, not too little) supply of good-quality water. With 318 wastewater purification plants, the district water boards purify the water that the 7.9 million households and 1.9 million businesses in our country discharge into the sewer system. In addition, five district water boards in the western part of our country have the ancillary responsibility of managing 6,600 kilometres of roads and 1,000 kilometres of bicycle paths.

As a result of climate change, the rising sea level, soil subsidence, urbanisation, salinisation, stricter environmental standards, the necessary energy transition, and the closure of (raw material) cycles, this infrastructure calls for substantial investments on the part of the district water boards. The district water boards' investment agendas for the years ahead show that they will collectively be investing an annual average of EUR 1.7 billion in the period 2020-2023 (see Figure 13). Figure 14 reflects how this sum is distributed across the tasks.

Flood Protection Programme

Investments in flood defence systems account for the largest share in the overall district water board investment totals (see Figure 13). The bulk of the investments go to the primary flood defences. With effect from 2011, when the district water boards joined the Flood Protection Programme, funding the improvement of primary flood defences has been the shared responsibility of the district water boards and the central government. Since 2014, investments by the district water boards and the central government have been on a par. With effect from 2016, the sums have been subject to annual indexation; in 2020, the district water boards and the central government will each invest EUR 198 million.

Provinces

The provinces are contributing to the Delta Programme in various ways: by allocating staff to the various programme teams or within their own organisations, by co-funding sub-programmes, or by contributing to research or the implementation of measures. The provincial efforts are mainly focused on linking the various regional taskings to the Delta Programme taskings, e.g., the linkage between agriculture, nature, and freshwater supply, or linking dyke improvements to the enhancement of environmental quality.

Estimated investment expenditure

per annum, 2020-2023

- Flood defence systems, EUR 725 million
- Water systems, EUR 400 million
- Sewage purification, EUR 470 million
- Other, EUR 105 million

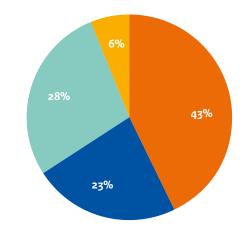


Figure 13 Average annual investment expenditure of the district water boards in the period 2020-2023, by task
Source: Association of Dutch Regional Water Authorities, June 2020

Gross investment expenditure 2020-2023

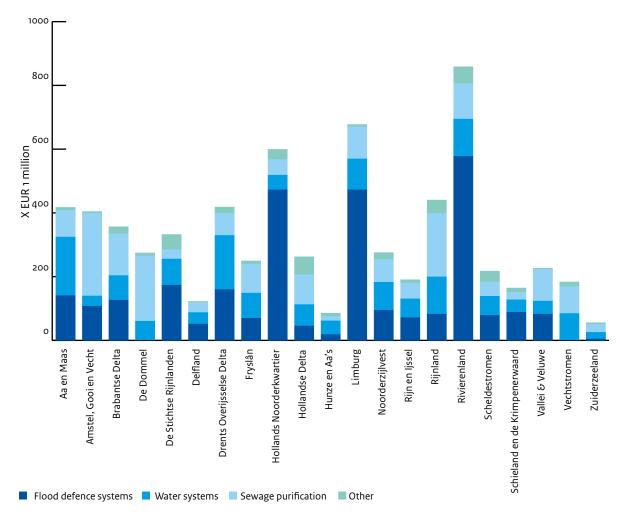


Figure 14 Intended total investment expenditure in the period 2020-2023, by district water board and by task

The scope of the provincial efforts – in terms of staffing and funding – differs from one region to the next and is related to the provincial priorities in the region concerned. Concrete examples are provided in Chapters 3 to 6. In flood risk management projects, the provinces are investing in linkage opportunities and area developments that enhance the spatial development and the spatial quality of the area concerned. For example, the province of Utrecht has rolled out the Beautiful and Safe Dykes programme, which pursues a comprehensive regional strategy. In collaboration with district water boards, municipalities, and regional partners, several themes such as nature, cultural history, traffic, and leisure activities are taken into account in the dyke improvement projects.

The provinces of Limburg and Noord-Brabant are closely involved in the preparations for dyke improvements and river widening along the river Meuse, in combination with the enhancement of spatial quality. The province of Gelderland is combining flood protection along the river IJssel with area development, in the MIRT Exploration regarding the IJsselpoort River Climate Adaptation Park. The province of Overijssel has conducted, in collaboration with the district water boards, a General Exploration into water system measures in the river Vecht basin, and is contributing to the relocation of IJssel dykes (Paddenpol). Within the framework of the Houtrib dyke improvement, the province of Flevoland is investing in the construction of a water sports beach near Lelystad. The province of

Fryslân is collaborating on the exploration regarding the Koehool-Lauwersmeer dyke section and on the elaboration of the Vlieland dyke improvement plan. In the province of Groningen, the Eemshaven-Delfzijl dyke improvement is being carried out as a multi-functional concept, involving the construction of a Double Dyke. The area between the two dykes will be used for nature development, silt traps, and "saline farming". In collaboration with 15 regional partners, the province of Noord-Holland has drawn up a regional programme for the Markermeer coast, prompted by the improvement of the Markermeer dykes, encompassing projects related to nature, leisure activities, tourism, and cultural history.

The provinces play a coordinating role in the Water Availability process. Several provinces have initiated regional processes in collaboration with district water boards and farmers (Dutch Federation of Agriculture and Horticulture LTO). In the province of Drenthe, area managers, the LTO Federation, the district water board, and the provincial authorities are working on the redevelopment of the Drostendiep river. This project will realise new goals of the Natuurnetwerk Nederland organisation and of the Water Framework Directive, in addition to water storage goals. The provinces are addressing water availability and water quality in an interconnected manner within groundwater protection areas and under the so-called drinking water regional dossiers and the related implementation programmes. Examples are the Overijssel Farmers for Drinking Water project, and the co-funding – with district water boards – of projects that also involve the implementation of freshwater supply measures. Furthermore, some provinces have invested in the Spaarwater climate adaptation pilot. At several locations, this pilot has explored ways to improve the freshwater supply to farmlands. Other ongoing programmes are focused on brook restoration measures, water preservation on sandy soils, the optimisation of water systems, and the future-proofing of the public drinking water supply, such as the review of the protection policy. The province of Noord-Brabant has set up a grant scheme for projects aimed at water saving or water retention. Under the Drought Policy Platform, the provinces have contributed to the substantiation of the policy recommendations regarding groundwater and vulnerable nature.

With respect to spatial adaptation, the strength of the provinces lies primarily in linking climate adaptation to such major spatial taskings as housing, the energy transition, and regional spatial planning. In addition, the provinces are mapping out, in collaboration with regional partners, spatial adaptation taskings on the basis of (regional) stress tests and setting down agreements on the measures required through risk dialogues. The

outcomes are set down in implementation agendas (cf. concrete examples in Chapter 5). For example, the province of Noord-Holland has incorporated an implementation programme for 2020-2023 in the memorandum on Noord-Holland Climate Adaptation: Building Blocks for a Provincial Strategy, and indicated how the coalition agreement resources earmarked for climate adaptation (EUR 5.1 million) will be spent. In 2019, the province of Noord-Holland made a subsidy available to all the Working Regions, to co-fund the national Climate Adaptation Process Support scheme. This subsidy is primarily intended to support the risk dialogues being conducted by the Working Regions. In the years ahead, the provinces – along with municipalities, district water boards, and the central government – will give additional impetus to climate adaptation efforts and the implementation of measures, as stipulated by the Administrative Agreement on Climate Adaptation.

Municipalities

The municipalities play multiple roles in coping with climate change. As policy makers and regulators, the municipal authorities are responsible for, e.g., embedding climate adaptation in the municipal Environmental Visions, (sector-specific) programmes, and environmental plans. In addition, they set down rainwater and groundwater strategies in sewerage plans. Rainwater is increasingly stored or discharged aboveground, for instance via wadis, green spaces, and roads designed for this purpose. In their capacity as owners, many municipalities are investing in the climate-proofing of societal real estate (such as schools) and of public space, for example, by creating differences in elevation or by creating more greenery and open water. Furthermore, many municipalities are assuming initiating roles, by taking the lead in new initiatives involving multiple parties, such as housing corporations and district water boards. In such cases, they may also act as co-funders, to give impetus to and sustain initiatives.

According to the Municipal Water Tasks Monitor, in 2020 the municipal revenue earmarked for urban water management totalled EUR 1.678 billion. Approx. one third of the expenditure concerns the cost of interest and repayment of loans for provisions established earlier. Slightly less than half is intended for the management of the sewer systems and other wastewater, groundwater, and rainwater facilities. The remainder is used for the payment of investments directly from the sewage charges, or to save for future replacement taskings.

7.3 Review of the financial tasking

In parallel to the review of the Delta Decisions and Preferential Strategies, the Delta Programme cost estimates have also been reviewed. The paragraphs below explain the review method and its points of departure, outline the amended cost estimates, and point out the differences with the previous cost estimates in Delta Programme 2015.

7.3.1 Methodology

The Delta Programme cost estimates have been reviewed by the Cost-Benefit Expertise Centre. The Delta Programme Commissioner has set up this Expertise Centre to provide transparent. uniform, and reliable financial-economic information to underpin the Delta Decisions and Preferential Strategies. Experts from Rijkswaterstaat, Wageningen University & Research Centre, the Netherlands Environmental Assessment Agency PBL, and Deltares research institute participate in the Expertise Centre.

An incremental approach was adopted to review the cost estimates. The programme estimates set down in Delta Programme 2015 constituted the point of departure. The Cost-Benefit Expertise Centre surveyed whether the experience since gained and new knowledge dictate amendment of the cost estimates. Account has been taken of changes in scheduled measures (measures removed or added), changes in the schedule, and new insights into the costs of measures. The reviewers also verified which measures have meanwhile been completed.

The Cost-Benefit Expertise Centre has not drawn up a new cost estimate for every individual measure. New insights and innovations were only taken into consideration if they could be substantiated and if they had a significant impact on the costs. The "Steam" climate scenario (W+) constituted the point of departure. A generic index was used to convert the costs of the measures to the 2020 price level.

The Flood Protection Programme accounts for a considerable proportion of the Delta Programme expenditure. At the request of the Delta Programme Commissioner, the Flood Protection Programme has conducted a study into new cost estimates for the entire programme up to 2050, taking account of the insights acquired in 2019. To this end, the estimates for the Delta Plan on Flood Risk Management ("Consequences Analysis") have been compared to the most recent insights of the Flood Protection Programme.

7.3.2 Points of departure

The Cost-Benefit Expertise Centre based its review on the same points of departure as were used for the 2015 cost estimates. These points of departure are based on the

standard cost estimate system used by Rijkswaterstaat but geared to the Delta Programme issues and focused on the pre-exploration phase. The goal is to ensure maximum uniformity and transparency in the cost substantiations. The estimates feature a large margin of uncertainty, ensuing from the multitude and diversity of the measures, the long lead time of the programme, and uncertainties regarding decisions on the actual implementation. The Cost-Benefit Expertise Centre assumes a bandwidth of +/- 50 per cent for the measures, i.e., similar to the estimates in, e.g., the pre-exploration phase of the Room for the River programme (2005). Consequently, the cost estimates cannot serve as the foundation for a fixed budget; however, they do provide insight into the question of whether the resources available for the realisation of the Delta Programme goals are sufficient.

The cost estimates encompass both the investment expenditure and the management and maintenance costs of the measures, because both expenditures are integral components of the Delta Fund. The total cost estimates consist of the sum of the cost estimates for the implementation of the Preferential Strategies for the individual sub-programmes. At the programme level, these costs have been supplemented with general risks (risks that cannot be allocated to a specific measure or sub-programme). The costs of the Preferential Strategy of a sub-programme have been calculated as the sum of the costs of the selected measures within such a strategy. With respect to topics for which a rough picture of the measures and their schedule has not yet been compiled, the budgetary framework is directive for the cost estimate.

7.3.3 Findings of the Delta Programme cost estimates review

The outcomes of the review of the Delta Decisions and Preferential Strategies is outlined in Chapter 2 of this Delta Programme 2021. The review has generated several proposals for policy amendments. Across the board, these amendments have a limited impact on the cost estimates.

The total costs of the Delta Programme over the period 2015-2050 are now estimated at EUR 25 billion, with a bandwidth of +/- 50 per cent. This is almost on a par with the estimates presented in Delta Programme 2016 and beyond. Some elements of the cost estimates have turned out higher, some have turned out lower; these variations appear to more or less counterbalance one another. The differences with the "old" cost estimates are specified in Paragraph 7.3.4.

The main findings with respect to each sub-programme are outlined below.

Flood Risk Management/Flood Protection Programme

The dyke improvement projects ensuing from the flood protection standards that came into force on 1 January 2017 are being realised by the Flood Protection Programme. At the request of the Delta Programme Commissioner, the Flood Protection Programme has conducted an analysis of the cost estimates for the entire programme up to 2050, taking account of the insights acquired in 2019 (the so-called "facts analysis⁵⁶"). To this end, the estimates regarding the Delta Plan on Flood Risk Management in DP 2015 have been compared to the most recent Flood Protection Programme insights.

As yet, the Flood Protection Programme is reckoning with fewer kilometres than the programme estimates are allowing for. The 2015 programme estimates are based on the so-called "consequences analysis" of the new standards, whereas the Flood Protection Programme has taken the data submitted by the managing authorities and the outcomes of the flood defence system assessments as its point of departure. The odds are that the number of kilometres covered by the Flood Protection Programme will increase over time. On the other hand, the number of kilometres may be overestimated in the consequences analysis, because the analysis was still based on the old National Flood Risk Analysis for the Netherlands system of failure probability per dyke ring, rather than flood probabilities per dyke section. Furthermore, the consequences analysis did not cover sea-facing dykes, the former primary flood defences category C. All in all, the analysis shows that overall, despite some different points of departure and new insights, the cost estimates that have been made in the purview of Delta Programme 2015 are sufficiently robust. Consequently, for the time being, there is no reason to adopt a different cost estimate.

Freshwater Supply

The droughts of 2018, 2019, and the spring of 2020 have added to the urgency of freshwater supply measures. The current implementation programme (Delta Plan on Freshwater Supply) runs until 2021 and will be extended by a second round. Many measures are being co-funded by the central government and regional managing authorities. The total scope of the freshwater investments is substantially larger than their claim on the Delta Fund. In the period up to and including 2023, the aggregate expenditure for freshwater supply measures scheduled in phase 1 of the Delta Plan (the first round) totals more than EUR 430 million, of which EUR 169 million will be financed from

the Delta Fund (see Table 14). In addition, a sum of EUR 150 million has been set aside in the Delta Fund to cover phase 2 of the Delta Plan on Freshwater Supply (2022-2027). Furthermore, the Minister of Infrastructure and Water Management intends to make an additional EUR 100 million available from the Delta Fund for the period 2022–2027⁵⁷. Along with additional regional co-funding, which would bring total co-funding by the regions to some EUR 540 million, this will enable the implementation of phase 2 measures with a total scope of more than EUR 800 million.

Spatial Adaptation

Delta Programme 2015 did not encompass any expenditure relating to spatial adaptation. In its 2021 budget, the central government has set aside EUR 200 million for a temporary incentive scheme. The total scope of the investments is three times higher, due to co-funding by local and regional governments.

Rivers

Within the framework of Integrated River Management (IRM), the taskings relating to flood risk management, freshwater supply, navigability, river management, and nature development are addressed in an interconnected manner. In 2022, the IRM programme will generate a new Preferential Strategy for the rivers Rhine and Meuse. As yet, the cost estimates are based on the resources set aside in the Delta Fund budget. Measures regarding navigability, nature, and river management are funded from separate budgets (not included in the Delta Fund), that may be combined with the IRM resources. Furthermore, several decisions taken in recent years have been incorporated, such as the Preferential Decision on Varik-Heesselt.

Rhine Estuary-Drechtsteden

Several interventions in the tidal rivers area will be postponed or scrapped (Avelingen river widening, Sleeuwijk secondary channel, Dordrecht storm surge barriers). The Hollandsche IJssel system analysis has resulted in the conclusion that investing in a reduction of the failure probability of the Hollandsche IJssel barrier will reduce the dyke improvement taskings. This will produce substantial cost savings.

IJsselmeer Region

In this area, measures have been implemented to enable flexible water level management. The study into the future IJsselmeer water level has revealed that an additional water level rise will not be necessary before 2050. The Delta Programme 2015 cost estimates had factored in the costs of further water level flexibilisation before 2050.

⁵⁶ Parliamentary Document 32698, no 47 (in Dutch).

⁵⁷ Parliamentary Document 27625, no 500 (in Dutch).

Southwest Delta

Lake Grevelingen will not be used for water storage. The investment in the Brouwersdam sluice will compromise the water quality and thus falls outside the scope of the Delta Programme. Although a decision on the future of Lake Volkerak-Zoommeer (freshwater or saline) is still pending, the costs of water supply via the Roode Vaart have been incorporated in the cost estimates. Additional costs have been included to cover research into the future of the Oosterschelde storm surge barrier (after 2050).

Wadden Region and the Coast

By the end of 2020, the Coastal Genesis programme will generate policy recommendations. Studies are being conducted into innovations in coastline care. As yet, the potential results are insufficiently specific to warrant amendment of the scope of Delta Programme 2015. Several pilots have been carried out, primarily in the Wadden Region.

State Flood Defences

Rijkswaterstaat has rolled out the State Flood Defences programme, whose costs have been incorporated into the cost estimates based on an initial expert opinion. The years ahead will see a more accurate cost estimate.

7.3.4 Differences with Delta Programme 2016 cost estimates

The reviewed cost estimate of EUR 25 billion is almost on a par with the cost estimates in place with effect from Delta Programme 2016. However, several components have been adjusted. The main adjustments are:

The cost estimate price level has been converted from 2013 to 2020 (+ EUR 2.2 billion). The price level underpinning the cost estimates has not been adjusted annually since 2015. The Delta Fund budgets, on the other hand, have been adjusted annually to reflect rising wages and prices. This makes it difficult to assess whether the budgets and the cost estimates are in balance. From now on, the overall

- cost estimate will be adjusted annually in accordance with the price level, at the discretion of the Delta Programme Commissioner (cf. Paragraph 7.4);
- Several spatial measures in the area around the major rivers, which were included in the previous cost estimate, have been omitted (e.g., the Varik-Heesselt flood channel). Furthermore, the previous cost estimate included the contributions from local and regional governments, apart from the contributions under the Dykes Funding Arrangement for dyke improvement costs that have been avoided. These developments together lower the cost estimate (by a total of EUR 3.2 billion). The IRM reservation in the Delta Fund budget raises the cost estimate (by EUR 1.7 billion);
- The additional ambitions regarding freshwater supply and the Spatial Adaptation incentive scheme have been taken into account in the cost estimate. Regional parties make a significant collective contribution to the total set of freshwater supply measures but this contribution does not go through the Delta Fund and should, therefore, not be considered in the assessment of the financial security of the Delta Programme in Paragraph 7.4 (total impact: EUR 0.5 billion).

The scope of several sub-programmes has changed, resulting in a lower cost estimate. The changes involve, e.g., the decision to refrain from effecting an additional water level rise in Lake IJsselmeer before 2050, the decision to refrain from launching large-scale sand replenishment pilots before 2028, and several spatial measures in the Rhine Estuary-Drechtsteden Region (total impact: - EUR 1.6 billion). The risk reserves have been updated and show a mutation of – EUR 0.9 billion;

The Delta Programme 2016 cost estimate included a sum to cover the improvement of the state flood defences, within the context of the dyke improvement tasking totalling some EUR 12 billion. This sum has now been included separately in the cost estimate (+ EUR 0.9 billion).

7.4 The financial security of the Delta Programme

The Delta Fund constitutes the financial foundation of the Delta Programme. It provides the resources for the future flood protection of our country and for securing a sufficient supply of fresh water. Assuming an annual extrapolation by EUR 1.4 billion, the Delta Fund will have some EUR 23.0 billion available for the period 2035-2050. Some of these resources will be available for projects that are being implemented under the Delta Programme. Part of this sum, however, is earmarked for purposes that are not covered by the Delta Programme, such as the maintenance budgets (item 3) and a large proportion of the network-related costs and other expenditure (item 5).

The tentative extrapolation in Figure 15 is based on the year 2034. In this respect, the Delta Programme Commissioner has assumed that the district water boards will continue the series earmarked for new flood protection measures after 2028, in accordance with the agreements between the central government and the district water boards, as anchored in the Water Act. The extrapolation shows that out of the approximately EUR 1.4 billion going around annually in the Delta Fund in the period 2035-2050, an annual sum of approximately EUR 0.8 billion will be needed for management, maintenance and replacement (item 3) and network-related and other expenses (item 5). In terms of investment budget, an annual sum of approximately EUR 0.7

billion will be available in the period 2035-2050; this involves the budget for the series available / earmarked for new flood protection measures by the district water boards (items 1 and 2) and the reserves relevant to the Delta Programme (item 5). The investment budget available in the period 2035-2050 would thus amount to approx. EUR 11.4 billion. In the period from 2015 up to an including 2034, approximately EUR 14.0 billion will be available for the Delta Programme. This means that, from the launch of the Delta Programme up to and including 2050, a total sum of some EUR 25.4 billion will be available to tackle the flood risk management and freshwater supply taskings of national importance. Added to this sum will be the funds that Delta Programme partners other than the central government and the district water boards, such as the provinces, are expected to provide.

The Delta Fund currently provides a sound financial basis for the Delta Programme taskings. However, several developments may entail budgetary consequences in the years ahead. For example, the corona crisis has not only impacted society but has also heavily affected the national budget. Other developments may put pressure on the budgetary scope of the Delta Programme, add to the taskings, or necessitate revision of the priorities. Such developments could, e.g., impact the Rijkswaterstaat

maintenance taskings whose budgetary consequences are currently being charted⁵⁸. The climate adaptation taskings are currently being mapped out on the basis of stress tests and risk dialogues. Furthermore, the experience gained during the significant droughts of recent years has prompted the exploration of measures aimed at economising on the use of water, more efficient water retention, and more efficient water distribution. Such measures transcend the current investment level. In the long run, the Delta Programme will have to be expanded with efforts required to keep pace with the consequences of the rising sea level. An effective delta strategy requires and will continue to require sufficient financial scope in the decades ahead.

The Delta Programme Commissioner has come to the conclusion that, based on the tentative extrapolation of the Delta Fund up to and including 2050 and the reviewed estimate of the overall costs of the Delta Programme, the taskings and the available resources are in balance. The financial security of the Delta Programme up to 2050 is currently up to par.

Tentative extrapolation of the Delta Fund

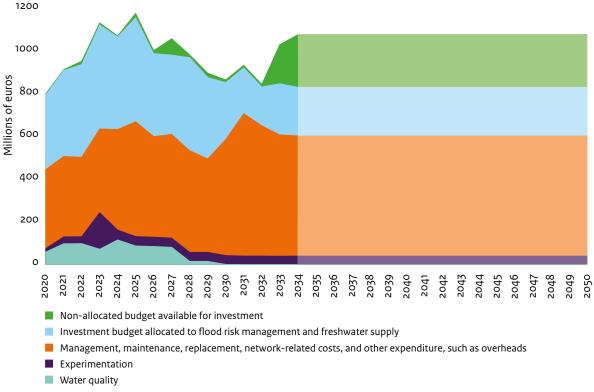


Figure 15 Tentative extrapolation of the Delta Fund

⁵⁸ Letter by the Minister of Infrastructure and Water Management dated 19 June 2020, <u>kamerstuk 35300-A-94</u>.



The Netherlands is the world's best protected delta and commands extensive expertise and experience, which the Delta Programme has helped to amass. At the international level, our country is thus regarded as a key knowledge partner when it comes to enhancing resilience against climate change, improving flood risk management, and securing freshwater supplies. With a view to preserving its capability of addressing the Delta Programme taskings, the Netherlands will continue to invest in knowledge, collaboration with private parties, and innovation.

8.1 International collaboration

Many countries are faced with an increasing risk of flooding, drought, waterlogging or water pollution resulting from such effects of climate change as a rising sea level and more extreme weather. The Netherlands is supporting other countries in tackling the complex and urgent issues that ensue. Such support is provided, e.g., through the Special Envoy for International Water Affairs for the Kingdom of the Netherlands. Every year, dozens of international missions and delegations visit our country. The lessons learned within the Delta Programme are shared with these visitors, tailored to their situation and befitting their culture, institutions, and policy.

Collaboration with Delta Countries

The Netherlands is explicitly collaborating with the governments of fifteen delta countries under the Partners for Water programme, a component of the Dutch International Water Ambition. The Dutch government (including the Ministry of Infrastructure and Water Management and the Staff of the Delta Programme Commissioner) provides advice to the international parties in such countries when so requested, specifically relating to the governance of water management in delta areas. Over recent years, the Staff has contributed to the development and implementation of delta plans in the Philippines (Manilla Bay Master Plan, delivery expected by early 2021), in Bangladesh (Bangladesh Delta Plan), and in Vietnam (Mekong Delta Plan).

Global Centre on Adaptation

On 25 January 2021, the Netherlands will host the Climate Adaptation Summit. The participants to this online meeting, among whom are government leaders, will discuss concrete ways to address climate adaptation across the globe. They will build on the efforts being expended by the Global Commission on Adaptation (GCA), which has been active since 2017 and one of whose members is the Dutch Minister of Infrastructure and Water Management. The Commission will present eight action tracks, including

proposals for action programmes and partnerships. The action tracks pertain to issues such as water, infrastructure, food, cities, nature-based solutions, and funding. The GCA is expected to be playing a key role in the elaboration of the agreements.

Water Action Track

The Water Action Track (WAT) has been set up to garner support and give impetus to a concrete implementation agenda aimed at increasing global climate resilience in the period up to 2030. The WAT focuses on the expediting, upscaling, and funding of climate resilience across the globe. In the Year of Action (2020), the World Bank, the World Resources Institute, the Global Centre on Adaptation, the Netherlands and 25 other partners committed to the goals that have been set down, and made pledges regarding their realisation. Such pledges involve conducting research and securing WAT coverage for programmes focusing on river systems and coasts, cities, and dry areas, and for COVID-19 green recovery. The Dutch approach, developed under the Delta Programme, will provide major building blocks for the WAT. Dutch expertise and experience will be shared through international platforms, coalitions, and regional meetings. The efforts are largely dictated by specific knowledge questions from foreign partners.

International collaboration in the Sea Level Rise Knowledge Programme

Sea level rise is affecting not only the Netherlands. Other densely populated deltas around the world are equally vulnerable and need to cope with the uncertainties at play. For that reason, within the framework of the Sea Level Rise Knowledge Programme (see Paragraph 2.4), the Netherlands is seeking to join forces with other countries, the Global Commission on Adaptation, and the Dutch Special Envoy for International Water Affairs. Collaboration with the countries around the North Sea is vital, for example, with respect to sea level rise measurements. Collaboration with other countries is also important, for

example, with regard to coping with uncertainties and exploring adaptive strategies. Collaboration with Flanders and England has been fleshed out to the most concrete extent; collaboration is also being sought with Germany and Denmark (Wadden Sea).

Europe and the Benelux

In December 2019, the new European Commission presented the Green Deal. The climate adaptation strategy that was announced is also relevant to the Delta Programme. The Benelux has already seen close collaboration on cross-border climate adaptation efforts for several years, specifically in the fields of public health, transport, and energy. In October 2019, the Benelux forwarded a letter to the Committee of Ministers regarding the importance of mainstreaming climate adaptation and disaster risk reduction in cross-border collaborations.

International River Commissions

Freshwater supply is an issue that extends beyond the Dutch borders. The international freshwater supply strategies are specifically agendised and elaborated in the international River Commissions for the Rhine, Meuse, and Scheldt.

International collaboration in the Rhine catchment area

On 13 February 2020, the Dutch Minister of Infrastructure and Water Management chaired the sixteenth Ministers Conference of the International Commission for the Protection of the Rhine (ICPR) in Amsterdam. This conference saw the endorsement of the new Rhine 2040 programme, subtitled "The Rhine and its Catchment: Sustainably Managed and Climate-resilient". Political agreements have been made regarding several issues, which are reflected in the Rhine 2040 programme. One of its objectives is to reduce water pollution: a 30 per cent reduction in micropollutants, such as medicine residues, industrial substances, and pesticides. Furthermore, agreements have been made with France regarding the three remaining fish migration bottlenecks in the German-French Upper Rhine; fish passages will be constructed near the weirs.

Low discharge is a relatively new topic that has been submitted by the Netherlands, prompted by the outcomes of the Drought Policy Platform. In the Rhine 2040 programme, this topic has been included as a separate theme, in addition to such existing themes as ecology, chemical water quality, and flood risk management. Collective assessment criteria and solution criteria are being pursued. The efforts must ultimately result in a collective approach to coping with the effects of low discharge events in the entire Rhine catchment area. The strategies will be elaborated in more detail in close cooperation with the Delta Plan on Freshwater Supply.

The Rhine countries have agreed on a 15 per cent reduction in flood risks by 2040, compared to 2020, for example, by taking retention measures to reduce flood levels in upstream areas. The Netherlands has set down the minimum goals of providing basic flood protection by 2050 and of meeting the flood standards by then. Under the reduction target, the Rhine countries have also agreed on continued investments in flood risk management for the next twenty years.

International collaboration in the Meuse catchment area

Low discharge is part and parcel of a rain river, and a recurrent phenomenon in the Dutch Meuse catchment area. In the Netherlands and Flanders, low discharge regularly causes problems for shipping and water intake for the drinking water supply, even during normal summers. This is because the Meuse is a rain-dependent river, which divides over four flows of water: the Albert Canal in Flanders. the Zuid-Willemsvaart in Flanders and Noord-Brabant, the Grensmaas, and the Juliana Canal. Low discharge entails very small discharge volumes in the individual flows. The economy of the downstream areas is dependent on the availability of water and is vulnerable to water shortages. In 1995, the Netherlands and Flanders concluded a Meuse Discharge Treaty with a view to equal distribution of river discharges in periods of low discharge. Another aim is to have a minimum of 10 m³/s flow to the Grensmaas or the Common Meuse, in order to prevent the Natura 2000 areas from running dry. Flanders has set up an investment programme for water-efficient sluice gates and re-pumping plants, in order to sustain the Meuse Discharge Treaty agreements even in times of extremely low discharge levels. This investment programme has not been fully implemented yet.

Wallonia has taken the initiative of making agreements with Flanders and the Netherlands regarding the low discharge management of a new lock for the shipping trade in Wallonia, including the hydropower plant near Ternaaien (branching off to Zuid-Willemsvaart). Management by Wallonia may affect the distribution of water between Flanders and the Netherlands, compromising the Flemish water share in particular.

The German Meuse catchment area features large storage reservoirs in the Eiffel, which resolve many problems. In 2018, however, water levels in these reservoirs plummeted. The other upstream parts of the Meuse catchment area are less prone to water shortages because these tend to run (nearly) dry more frequently, whilst storage reservoirs serve as buffers.

Reducing the adverse impact of low discharge falls under the mandate of the International Meuse Commission (IMC). The international section of the catchment management plan for the International Meuse (2015) identifies the tasks of the IMC climate working groups that are related to (extremely) low discharge issues.

In 2019, the Water Framework Directive working group embarked on a report on the impact of low discharge situations on the state of surface bodies of water along the borders (water quality) and their impact on user functions. The Action Plan regarding extremely low discharge in the international Meuse will probably be published in December 2020. In addition, collaboration with Germany – in particular, North Rhine-Westphalia and the Ruhr and Eiffel Wasserverband – will be substantiated further under the Permanent Border Waters Commission, to address issues such as future water shortages and imminent changes in German water management.

International collaboration in the Scheldt catchment area

In June 2016, the delegation leaders of the Ghent Scheldt Treaty decided on the schedule for the period 2016-2021. A first step is the exchange of national strategies to prevent water shortages. Subsequently, an action plan will be drawn up regarding low discharge management in the Scheldt catchment area. This must generate an approved strategy. The process also encompasses an assessment of the need for low discharge communications similar to the Meuse approach.

In 2017, 2018, and 2019, Flanders was faced with severe drought issues in the Scheldt catchment area. Flanders has developed an emergency strategy and requested the Netherlands to participate in the elaboration process of the Flemish Water Shortage Assessment Framework (comparable to the Dutch prioritisation scheme). In 2020, this will be substantiated by the Dommel district waterboard and the National Water Distribution Coordination Commission. The Corona crisis has delayed the process.

Freshwater supply has been incorporated as one of the themes of the Agenda for the Future of the Flemish-Dutch Scheldt Commission. Two aspects are relevant: the ecological importance for the river, and regional freshwater supply in the border area of Zeeuws-Vlaanderen, Oost-Vlaanderen, and West-Vlaanderen.

International collaboration for the Wadden Sea

Since 1978, the governments of Denmark, Germany, and the Netherlands have been collaborating on the protection of the Wadden Sea as a single ecological entity. To this end, they have joined forces in the Trilateral Wadden Sea Cooperation (TWSC). The Dutch government authorities involved are the Ministry of Economic Affairs and Climate Policy; the Ministry of Agriculture, Nature and Food Quality; and the Ministry of Infrastructure and Water Management. The former two Ministries are in charge of the efforts. Rijkswaterstaat is participating in consultative groups. The Guiding Principle is "to achieve, as far as possible, a natural and sustainable ecosystem in which natural processes proceed in an undisturbed way". The collaboration is supported by the Common Wadden Secretariat (CWSS) and directed by the common Wadden Sea Board.

Since 1960, the Netherlands and Germany have been collaborating on the Eems estuary, under the Eems-Dollard Treaty. This collaboration is substantiated through the permanent Dutch-German Border Waters Commission (Eems Commission), which meets at least once a year. In 1996, the Treaty was expanded with stipulations regarding water and nature management in the Eems estuary (Eems-Dollard environmental protocol). Article 2 of this protocol sets out the tasks that have been assigned to the Border Waters Commission; since 2000, these have included tasks related to the implementation of the Water Framework Directive.

8.2 Expertise, private sector, and innovation

The water-related taskings of the Delta Programme require close collaboration between authorities, research institutes, and businesses, e.g., to explore new types of measures and technologies to resolve water issues faster, more effectively, and in a more appealing manner. The Delta Programme Knowledge Agenda 2021 provides an updated overview of the knowledge issues and, if applicable, the partnerships addressing the issues. Another goal is the exploration of and accustomization to new forms of collaboration and co-production, among authorities and stakeholders, but also among NGOs and business partners. Key prerequisites in this respect are: proper coordination between commissioning parties (authorities) and businesses; an effective exchange of questions and solutions; and ensuring the implementation of good ideas. The National

Water and Climate Knowledge and Innovation Programme encompasses several focus areas that offer opportunities for such a form of collaboration, e.g., the focus areas of Marker Wadden, Coastal Genesis, Rivers, Climate-proof Cities, and Water&Energy/Aquathermics. The Programme's customary annual conference has been cancelled on account of the Corona measures; another conference is scheduled for the spring of 2021.

Adequately tackling water taskings increasingly calls for an approach that is integrated with other societal developments and transitions, such as developments in agriculture (coping with drought, cattle breeding), the housing tasking, the demand for sustainable energy, and restoration of biodiversity. Tying in with such developments

opens up mutual opportunities for innovative solutions with added value for society. This demands collaboration between authorities, research institutes, and businesses from as early a stage as possible, a stage that still offers room for the consideration of different types of solutions rather than design variants for a solution that has already been decided on. The Knowledge and Innovation Contracts of the Top Sector Water and Maritime offer new opportunities to this end. In the next few months, the National Water and Climate Knowledge and Innovation Programme and the Top Sector Water & Maritime will be jointly identifying the topics to be addressed and ways to substantiate this improved and intensified form of collaboration between authorities, research institutes, and the business community.



List of Background Documents and maps

Background Document A

Delta Programme Signal Group recommendations, 2018 and 2019 (in Dutch)

Background Document B

Review committee advisory letter and Delta Programme Commissioner's response (in Dutch)

Background Document C

Delta Programme review methods (in Dutch)

Background Document D

Advisory report by the Physical Environment Consultative Body and Delta Programme Commissioner's response (in Dutch)

Background Document E

<u>Delta Programme Knowledge Agenda</u> (in Dutch)

Background Document F

<u>Progress report: working on freshwater supply in the delta – looking back on 2019 and looking ahead to 2020 – 2021</u> (in Dutch)

Background Document G

Progress report regarding Approach to national vital and vulnerable functions (in Dutch)

Background Document H

Synthesis documents regarding review of Delta Decisions and Preferential Strategies

- 1: Flood risk management (in Dutch)
- 2: Freshwater supply (in Dutch)
- 3: Spatial adaptation (in Dutch)
- 4: IJsselmeer Region (in Dutch)
- 5: Rhine-Meuse Delta (in Dutch)
- 6: Rhine Estuary-Drechtsteden Region (in Dutch)
- 7: Southwest Delta (in Dutch)
- 8: Sand and Coast (in Dutch)
- 9: Wadden Region (in Dutch)

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Map 2 Preferential Strategy for the IJsselmeer Region

Map 3 Preferential Strategy for the Rhine Estuary-Drechtsteden Region

Map 4 Rhine and Meuse IRM inspiration map

Map 5 Preferential Strategy for the Southwest Delta

Map 6 Preferential Strategy for the Coast

Map 7 Preferential Strategy for the Wadden Region

Colophon

Delta Programme 2021 is a publication of the Ministry of Infrastructure and Water Management, the Ministry of Agriculture, Nature and Food Quality, and the Ministry of the Interior and Kingdom Relations.

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- Grave weir and sluice complex, July 2020: Daniel Kuipers, Delta3
- De Doorbraak brook, water management+, Twente, June 2020: Jos van Alphen
- Nieuwe Driemanspolder, water storage in combination with nature and leisure activities between Zoetermeer, The Hague-Leidschenveen, and Leidschendam-Voorburg, June 2020: Tommy Bolleboom
- Lauwersmeer dyke, dyke improvement, Friesland, June 2020: Kees van der Veen
- Elevated Sandy Soils, steel planking against drought, Asten (Drenthe), June 2020: Jac van Tuijn
- · Sterrenburg park, climate-proof meeting place and playground, July 2019, Dordrecht: Bert Schaeffer
- Kinderdijk-Schoonhovense Veer dyke improvement: Cees van der Wal
- Torrential rain in Tilburg, June 2020: Branko de Lang, ANP
- Zernike Campus climate-adaptive testing ground, Groningen, 2019: Richard Walters
- Climate-proof garden fence to combat waterlogging, Limburg, September 2019: Thomas Klomp

Maps

| 1 | Preferential Strategy for Freshwater Supply | MUST |
|---|--|------|
| 2 | Preferential Strategy for the IJsselmeer Region | MUST |
| 3 | Preferential Strategy for the Rhine Estuary-Drechtsteden Region, | MUST |
| | basis information from Defacto | |
| 4 | Rhine and Meuse IRM inspiration map | MUST |
| 5 | Preferential Strategy for the Southwest Delta | MUST |
| 6 | Preferential Strategy for the Coast | MUST |
| 7 | Preferential Strategy for the Wadden Region | MUST |
| | | |

The Netherlands is a low-lying country with an abundance of water. The national Delta Programme is in place to protect the Netherlands from flooding, to ensure a sufficient supply of fresh water, and to contribute to rendering the Netherlands climate-proof and water-resilient. The national Delta Programme website outlines the progress being made in the execution of the work on our delta.

The national Delta Programme involves concerted efforts by the central government, the provinces, municipalities, and district water boards, with active participation from research institutes, NGOs, residents, and businesses.

WWW.DELTAPROGRAMMA.NL

DELTA PROGRAMME

GIVING IT
OUR ALL
FOR A
SAFE AND
LIVEABLE
DEITA

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