



Delta Programme

Updated Delta Programme Knowledge Agenda



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This background document provides an up-to-date picture of the knowledge that is being developed and disseminated within the Delta Programme. This knowledge is of importance in the purview of the further elaboration and implementation of the Delta Decisions and Preferential Strategies. The knowledge issues constitute input for the knowledge programmes of the Ministry of Infrastructure and Water Management, Rijkswaterstaat, the provinces, the Foundation for Applied Water Research STOWA, the Royal Netherlands Meteorological Institute KNMI, Deltares research institute, and universities. Some of the issues are addressed under the National Water and Climate Knowledge and Innovation Programme (NKWK).

Several mutations have been effected vis-à-vis the previous knowledge agenda (Delta Programme 2017). Some knowledge topics have been combined, others have been separated; old knowledge topics have meanwhile been completed (C) or are still ongoing (O); and new knowledge issues have been put on the agenda (N). In addition, references to (old) knowledge topics from the Delta Programme 2017 knowledge agenda have been included. Now that knowledge development is gaining momentum and increasingly more results are becoming available, knowledge sharing activities show a significant rise vis-à-vis the Delta Programme 2017 knowledge agenda. These activities are presented in a second table under the heading of “knowledge sharing”.

Knowledge development

Knowledge topics	State of affairs - June 2018
Flood risk management (FRM)	
FRM-1: Long-term knowledge development - “technology” (N)	<p>In 2017, the Directorate-General for Water and Soil Affairs (DGWB) of the Ministry of Infrastructure and Water Management published a new knowledge agenda for flood risk management. This knowledge agenda flood risk management can be found here (in Dutch).</p> <p>The topics featuring within the “technology” theme of the flood risk management knowledge agenda have been incorporated into the new knowledge topics of FRM-1 up to and including FRM-4. The continued development of the flood defence system assessment and design tools requires additional expertise. DGWB is generating such expertise within the “Kennis voor Keringen” [Knowledge in the purview of Dykes] knowledge development programme. This fosters the effective assessment and improvement of flood defences in accordance with the new flood probabilities as set down in the Water Act. The main themes relate to piping, macrostability, cladding, hydraulic loads, failure paths, and engineering structures:</p> <ul style="list-style-type: none"> • Piping. Research into piping focuses on two goals: 1) gaining more clarity as regards the conditions that will minimise or preclude the occurrence of the piping mechanism, and as regards the areas in the Netherlands that are not, if at all, affected by piping; 2) at locations at which the piping mechanism is expected to occur, better tailoring of the computation rules and methods to reality. • Macrostability. The research conducted into macrostability in 2018 is focused on optimising the current approach as outlined in the Macrostability Schematisation Manual. The activities are mainly focused on determining strength properties based on soil drilling tests and being able to quantify subsoil heterogeneity. • Hydraulic loads. Hydraulic loads are driven by combinations of tidal action, wind, and waves. By way of models, these are converted into water levels and wave loads on the dykes. The study is aimed at a better description of the phenomena and the model conversions in order to generate more accurate predictions regarding hydraulic loads on dykes. • Failure paths. The failure paths study explores whether a description based on actually occurring events that lead to flooding – the so-called failure path – could lead to a significantly more accurate assessment and design of the dyke. On the basis of the results of this exploratory study, a decision will be made as to whether further development would make sense. • Engineering structures. With respect to many engineering structures, the failure risk requirements for non-closure have lost their validity following the introduction of the new standards. These will be updated.
FRM-2: Further development of Basic Tools (O)	<p>The set of Basic Tools (BTs) will be developed further in the period 2018–2022. The Basic Tools constitute the basis for the design tools (DTs) and the Statutory Assessment Tools (SATs). Wherever possible, the outcomes of the studies listed under FRM-1 will be incorporated in the Basic Tools.</p>

Knowledge topics	State of affairs - June 2018
FRM-3: “All Risks” research programme (N)	<p>The “All Risks” research programme studies the bottlenecks encountered in the implementation of the new standards into the Flood Protection Programme (FPP). The inter-disciplinary study comprises a mix of in-depth technological research (70%) and integrating research (30%). The technological research addresses topics such as new technologies to improve the reliability of flood defence systems. The integrating research focuses, inter alia, on landscape integration and legal aspects. Delft University of Technology is in charge of the programme. The Flood Protection Programme, the district water boards, and the Ministry of Infrastructure and Water Management are closely involved. For more information click here (in Dutch).</p>
FRM-4: General Explorations (GEs) (O)	<p>General Explorations (GEs) focus on the interconnectivity between the National Flood Protection Programme and the implementation of individual projects. This enables the development of cross-project innovations.</p> <p>One GE has already been completed (Central Holland GE). Six GEs are in progress: Piping, Macro-stability, Wadden Sea Dykes, Forelands, Overijsselse Vecht Flood Perspective System Elaboration, and Cables and Pipes. One GE is being set up, viz. Local Soil Dykes. The GEs have generated or will generate:</p> <ul style="list-style-type: none"> • New approaches and computation methods (piping workshop, updated macrostability strength, probabilistic height calculation) leading to a significant reduction of the flood risk management tasking; • Further development of technological innovations, resulting in significant cost savings, such as reducing the costs of sheet pile wall constructions following the Eemdijk tests; • Application of macrostability and piping product innovations in (pilot) projects; • Experiments with new flood risk management concepts, such as in the Wadden Sea Dykes GE (cf. WR-1, WR-2, and WR-3 for more information on the Wadden Sea Dykes GE); • Collaboration in the golden triangle, resulting in accelerated development and application of technological innovations. <p>This knowledge can be incorporated into the Statutory Assessment Tools or the Design Tools or be taken into account in the restructuring of the technical guidelines. The anchoring of innovations and the embedding of knowledge remains a point for attention. “Next Level Innovation” has been designated as one of the spearheads of the Flood Protection Programme schedule for 2018-2023; it involves the further implementation and embedding of knowledge developed within General Explorations conducted under the Flood Protection Programme.</p>

Knowledge topics	State of affairs - June 2018
Freshwater Supply (FS)	
FS-1: Water system expertise [Formerly ZWV1, ZWV2, and ZWV3]	<p>Rhine-Meuse Estuary System Analysis (C) The Rhine-Meuse estuary system analysis was completed at the end of 2017. The results will be disseminated, and any outstanding questions will be resolved in 2018. Reports on the system analysis are here online available (in Dutch).</p> <p>Smart water management (O) Under the National Water and Climate Knowledge and Innovation Programme, Rijkswaterstaat, the district water boards, STOWA, private parties, and knowledge institutes are collectively conducting research into smart water management. The study focuses on coherent measures aimed at preventing and containing water shortages and waterlogging through a more efficient use of the available capacities of the (regional and main) water systems. The study runs from 2016 to 2021. More information is available here and here (in Dutch).</p> <p>Integrated study into flood risk management and water level management in the IJsselmeer region (C) Information on the Integrated study into flood risk management and water level management in the IJsselmeer region is provided under IJM-2.</p> <p>Salt tolerance of crops (C) In 2015, Alterra launched a study into crop salt tolerance, in collaboration with Rijkswaterstaat, STOWA, the Ministry of Economic Affairs and Climate Policy, and the Ministry of Infrastructure and Water Management. In 2017, a supplementary literature study was conducted into salt tolerance in various crop growth stages. The report on this study is being finalised.</p>
FS-2: Dutch Hydrology Tools and further development of National Water Model (O)	The National Water Model (NWM) constitutes an important basis for the Delta Plan on Freshwater Supply (DPFS) (cf. DP-4). DPFS contributes to the establishment of the basic Freshwater Supply forecast. Findings from freshwater supply analyses underpin the continuous improvement of the Dutch Hydrology Tools (DHTs). The DHTs serve as the basis for the hydrological modelling of the DPFS in the National Water Model. Research into the improvement of the DHTs and the NWM will continue until 2023.
FS-3: Economic model tools [Formerly ZWV5]	<p>Nature Water Guide (O) The development of the Nature Water Guide commenced in 2014. These tools help to map out how changes in water management, prompted by climate scenarios and other management strategies, will impact nature. Such impact can be visualised on both a national and a regional scale. The first phase will be completed in 2018. Further improvement, particularly in the field of nutrient content and acidity of the soil, is scheduled for the period 2018-2019 (pending the availability of co-funding).</p> <p>Agriculture Water Guide (C) Several water managers, provinces, drinking water companies, agricultural organisations, and knowledge institutes are working on an Agriculture Water Guide. This Guide provides a simple method to calculate potential damage for various types of agriculture (dairy cattle, arable farming) caused by drought, water saturation or salinisation, under various meteorological conditions and climate scenarios. The water guide can also be used to determine the effectiveness of water management measures. The Agriculture Water Guide is being compiled in several stages. Phase 3 was launched in 2017 and is scheduled to be completed in 2018. More information on the Nature Water Guide and the Agriculture Water Guide is available here (in Dutch).</p> <p>Imprex (O) In 2016, Deltares and HKV joined the EU IMPREX project. One of the issues on which this research project focuses is the development and application of a risk-based approach to drought and water shortage. The results of the study will help to substantiate the decision-making process regarding water availability and will contribute to the development of the policy support instrument. The IMPREX project is scheduled to be completed by the end of 2019. For more information click here.</p>

Knowledge topics	State of affairs - June 2018
<p>FS-4: Hydrological and economic effectiveness of (regional) measures</p> <p>[Formerly ZWV7]</p>	<p><i>Freshwater Supply measures – regional scan (C)</i> The Freshwater Supply Measures Regional Scan was completed in November 2017. This tool maps out the regional impact of freshwater supply measures, the costs and benefits involved, and the side effects. More information is available here (in Dutch).</p> <p><i>Smarter Flushing (C)</i> The Smarter Flushing guidelines were presented at the end of 2017. These guidelines provide tools for district water boards to optimise their flushing management in the purview of water quality with a view to blue-green algae, salinisation et cetera. The Smarter Flushing guidelines comprise a practical reflection of the outcomes of the research that has been conducted over recent years. More information is available here (in Dutch).</p> <p><i>Longitudinal erosion control dams (O)</i> Information on longitudinal erosion control dams is provided under R-4.</p> <p><i>Lumbricus (O)</i> Information on Lumbricus is provided under ESS-1.</p> <p><i>Innovative climate adaptation pilots (O)</i> Innovative climate adaptation pilots are used to gain experience with the expansion of regional self-reliance by a more efficient utilisation of available water sources, improved and new ways of water storage and retention, and more efficient use and control of the water system. The time frame of the pilots is 2018-2019. More information on the various innovative climate adaptation pilots relating to freshwater supply is also provided under SWD-2, SWD-6, SWD-7, and RD-2 of this knowledge agenda. A detailed explanation of the various pilots can be found on the Delta Programme website (in Dutch).</p> <p><i>Additional innovative research programmes (O)</i> In addition to the climate adaptation pilots, the Delta Plan on Freshwater Supply is supporting two other innovative research programmes: 1) The “Taming Brackish Seepage” project expands expertise on freshwater-saltwater management in a deep polder featuring large volumes of brackish seepage (De Horstermeer), and on the effect of pumping up brackish groundwater. In addition, the project is aimed at exploring the options for purification of pumped up brackish water to supply Amsterdam with drinking water and for the processing of the residual concentrate after purification. The project will run up to and including 2020. More information on this project is available here (in Dutch). 2) The COASTAR (COastal Aquifer Storage And Recovery; cf. RD-2) project is exploring the options for large-scale use of the subsoil in low-lying sections of the Netherlands for freshwater storage and extraction. Phase 1, involving the detailed elaboration of the concept, was completed in 2016; cf. click here for more information (in Dutch). Phases 2 (feasibility), 3 (planning), and 4 (elaboration) are scheduled for 2018.</p>
<p>FS-5: Adaptive Delta management</p> <p>[Formerly ZWV4 and ZWV8]</p>	<p><i>Indicators and threshold values (C)</i> In 2015, Deltares developed a theoretical “indicators and threshold values” framework enabling timely anticipation in adaptation tracks. This framework has been applied in two pilot areas in elevated and low-lying parts of the Netherlands. In 2016, the method was elaborated further and in 2017, the results were set down in the initial version of a guideline/inspirational document for an indication system to be used under the Delta Plan on Freshwater Supply.</p> <p><i>Bottleneck Analysis and Freshwater Supply Strategy 2.0 (O)</i> The Bottleneck Analysis and Freshwater Supply Strategy 2.0 project is exploring bottlenecks in the – current and future – supply of and demand for freshwater. In addition, it is exploring measures to reduce such bottlenecks. The bottleneck analysis involves an economic analysis for which the economic tools will be set up in 2018. The outcomes of the bottleneck analysis and the ensuing dialogue with consumers will underpin the measures scheduled in phase 2 of the Delta Plan on Freshwater Supply (2020-2028).</p> <p><i>Policy support instrument (C)</i> The policy support instrument developed in 2016 supports administrators when making choices regarding optimisation options in the preparation for or prevention of water shortages. It thus contributes to ensuring a sustainable and effective freshwater supply. In addition, it serves to underpin decisions on the scheduling of measures under the Water Availability instrument and in the second phase of the Delta Programme (2021–2028). More information is available here (in Dutch).</p>

Knowledge topics	State of affairs - June 2018
Spatial Adaptation (SA) <i>[Formerly NH]</i>	
SA-1: Delta Plan on Spatial Adaptation knowledge strategy (N) <i>[Formerly NH]</i>	Within the Delta Plan on Spatial Adaptation (DPSA), a DPSA knowledge strategy will be developed in 2018. This knowledge strategy focuses on knowledge management and knowledge infrastructure to identify, collect, and schedule relevant knowledge issues. The strategy will be developed in coordination with the Veluweberaad (consisting of delegates from the provinces, municipalities, district water boards, district water boards, the Ministry of Infrastructure and Water Management, environmental services, and knowledge institutes), the National Climate Adaptation Strategy (NAS), and the NKWK Climate-proof Cities focus area.
SA-2: Delta Plan on Spatial Adaptation incentive programme (O) <i>[Formerly NH7]</i>	The fourth round of impact projects commenced in 2018. Its aim is to facilitate parties with the expertise required to set up concrete projects that serve as examples. The fourth round of impact projects supports the DPSA and is focused on conducting risk dialogues and drawing up a strategy. Key goals are raising awareness of the vulnerability to climate extremes and reducing such vulnerability through specific measures in consultation with relevant regional partners. For more information (in Dutch), click here .
SA-3: Delta Plan on Spatial Adaptation research <i>[Formerly NH2]</i>	<i>Groundwater level management (O)</i> In 2018, a study will be conducted into active groundwater level management in urban areas. On the basis of a 2017 research report on the feasibility of large-scale introduction of active groundwater level management and of stakeholder consultations, a concrete pilot will now be launched focused on the exploration of the effectiveness of this method. For more information (in Dutch), click here . <i>Monitoring of spatial adaptation (O)</i> The Netherlands Environmental Assessment Agency (PBL) is conducting a study into ways to monitor spatial adaptation. This study will generate indicators to monitor the output and outcome of the Delta Plan on Spatial Adaptation. <i>Climate-proof planning (O)</i> The DPSA has commissioned a study into the use of financial incentives by municipalities, district water boards, and provinces to encourage private parties to embrace climate-proof and water-resilient spatial planning. More information on this topic is available here (in Dutch).
SA-4: NKWK Climate-proof Cities – Knowledge agenda and research programme (O) <i>[Formerly NH1]</i>	Climate-proof Cities is one of the focus areas of the National Water and Climate Knowledge and Innovation Programme (NKWK). Within this focus area, a knowledge agenda has been drawn up featuring eleven themes in a progress document format. This knowledge agenda is regularly updated. The themes involve topics such as green-blue measures; costs, benefits & funding of adaptation measures; governance; groundwater; and subsoil. The progress document is available here (in Dutch). Since 2017, a research consortium within the NKWK Climate-proof Cities focus area has been implementing components of the Climate-proof Cities knowledge agenda. Its research is focused on damage caused by climate change; green-blue measures; and costs, benefits and funding of adaptation measures. For more information, click here (in Dutch).

Knowledge topics	State of affairs - June 2018
IJsselmeer Region (IJM)	
IJM-1: New IJsselmeer Region ordinance decree - flexible water level management	<p><i>Preparation: elaboration of directive criteria (C)</i></p> <p>The directive criteria for flexible water level management in the region surrounding Lake IJsselmeer were elaborated in 2017, in collaboration with the district water boards involved. After the criteria have been elaborated into implementation protocols (one year after the official adoption of the new IJsselmeer water level ordinance) and have been endorsed, water level management can be pursued in accordance with these implementation protocols.</p> <p><i>Monitoring and evaluation: learning while implementing flexible water level management (O)</i></p> <p>The subsequent phase involves learning while implementing. In order to learn from this new form of management, measuring data and practical experiences of the (water) managers are annually gathered in the IJsselmeer Region regional water managers council to be analysed and evaluated in interconnection. If so prompted, the criteria and thus the directive protocols can be adjusted. The gradual implementation of flexible water level management is expected to commence in 2020. The construction and completion of additional discharge capacity in the IJsselmeer Closure Dam may play a role in this process. Furthermore, the new IJsselmeer water level ordinance includes an evaluation of the actual environmental impact. The evaluation study focuses on measuring, calculating, and observing the actually occurring effects and on potential supplementary measures. The evaluation will be conducted no later than six years after this ordinance has come into force.</p>
[Formerly IJM1, IJM2, and IJM8]	<p>Click here for reports on the new IJsselmeer water level ordinance (in Dutch).</p>
IJM-2: Integrated study into flood risk management and water level management (L/A)	<p>The integrated study into flood risk management and water level management in the IJsselmeer Region is intended to provide greater insight into the interconnectivity between water discharge, flood protection, and water level management in the IJsselmeer Region. The results will constitute the knowledge basis for decisions regarding planning and management after 2050.</p> <p>In 2017, future water level management strategies were analysed, following an exploration of the water tasking, the development of a set of computation tools, and the performance of pilot calculations. These involved both hydrological calculations and calculations regarding the costs of dyke improvements and water discharge. The report on the outcomes was finalised in April 2018. In 2018, the Ministry of Infrastructure and Water Management, including Rijkswaterstaat, and the district water boards will discuss the results and the policy considerations ensuing from this report. Additional analyses will be conducted to support the consultations.</p>
[Formerly IJM9]	<p>The reports on phases 1 and 2 of this project are available here: Phase 1, Phase 2</p> <p>A report concerning phase 3 will be presented in the course of 2018.</p>
IJM-3: Study into backshore water storage (O)	<p>In recent years, Rijkswaterstaat has conducted experiments, in close collaboration with partners such as Deltares, Merovar Seafoods, the Dutch angling association Sportvisserij Nederland, and Zilt Proefbedrijf, involving water storage in two (secondary dyke) backshores, viz. the Koopmanspolder and the Wieringermeer. In these experiments, opportunities are explored for water storage behind the dykes in combination with selective water level management in the main water system (in this case, lake IJsselmeer).</p> <p>In recent years, opportunities for ecology and economic development, respectively, have arisen in the Koopmanspolder and Wieringermeer backshores. Opportunities for a third backshore (aimed at leisure activities and tourism) are currently being explored. In addition, upscaling options for the backshore concept will be further explored and elaborated in the years ahead. For more information, click here (in Dutch).</p>

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Rhine-Meuse Delta (RMD)	
RMD-1: Rhine tributaries discharge distribution (C) [Formerly RMD2]	<p>Delta Programme 2015 sets out that the central government is going to explore whether there is cause to change the discharge distribution among the Rhine tributaries after 2050 and to keep such an option open. A cost effectiveness analysis has been conducted to map out the costs entailed in a different discharge distribution (required dyke improvements and changes, if any, in the potential number of fatalities) and the impact on the flood risk.</p> <p>The study has shown that, on the basis of current knowledge and assumptions, there is no reason to change the discharge distribution after 2050. All the variants explored are either more expensive or involve the same expense as the reference situation (maintaining the current discharge distribution). However, the differences are small, considering the uncertainties in the study. Should arguments other than cost effectiveness arise in the future prompting a modification of the discharge distribution, then such modification will remain feasible. The sensitivity analysis involved in the study has shown that unexpected developments may occur between now and 2050 which would possibly render modification of the discharge distribution cost-effective. For example, the cost and risks entailed in a different discharge distribution could work out differently if the flood risk management standards were raised, or if the Rhine discharge volumes were to increase due to improved protection measures in Germany. Whether a modification of the discharge distribution would be cost-effective in these cases also depends on the necessity and costs of adaptations to the water control structures.</p> <p>More information regarding this study is provided in Chapter 2.1 of Delta Programme 2019.</p>
RMD-2: Reducing failure probability and partial closure of Maeslant storm surge barrier (C) [Formerly RMD3]	<p>The study into the reduction of the probability of failure and into the partial closure of the Maeslant storm surge barrier was completed in 2018. Partial closure is technically feasible. The options for partial operation of the Maeslant storm surge barrier, such as closing one of the two sector doors, will serve as a back-up measure to stem a maximum of water when the barrier needs to be closed. The outcomes have prompted Rijkswaterstaat to further explore, within the Delta Programme, which measures can be implemented in interconnection with the dyke security tasking in the hinterland.</p>
RMD-3: Trend in salinisation of Haringvliet as a result of re-opening sluices (O) [Formerly RMD4]	<p>In 2018, a monitoring programme will be launched to keep track of the salinisation of the Haringvliet when the sluices are re-opened. Based on the measuring results, a study into the impact of re-opening the sluices on the salinisation of the Haringvliet will commence after 2028.</p>
Coast (C)	
C-1: Coastal Genesis 2.0 (O) [Formerly Sand 1]	<p>Coastal Genesis 2.0 is a long-term research programme within which knowledge is developed to preserve the sandy coastline after 2020 and optimise its management with a view to flood risk management and factoring in aspects such as ecology. The Coastal Genesis 2.0 studies are conducted on a “learning by working” basis within the context of the National Water and Climate Knowledge and Innovation Programme in collaboration with various parties, among which knowledge institutes, private parties, and the central government (Rijkswaterstaat and the Ministry of Infrastructure and Water Management), for more information click here (in Dutch).</p> <p>The Coastal Genesis 2.0 studies focus on three knowledge issues:</p> <ol style="list-style-type: none"> 1) How much sand is needed in the long run to have the coast keep pace with the rising sea level? 2) Where and when must sand be deposited? 3) How can sand be deposited as efficiently as possible? <p>In 2020, Rijkswaterstaat will submit a policy recommendation, by way of an interim result, to the Directorate General for Water and Soil Affairs of the Ministry of Infrastructure and Water Management. This will be based on the following three focus areas:</p> <ol style="list-style-type: none"> 1) Long-term coastal research focused on additional monitoring and model development. This will generate greater insight into the operation of tidal inlet systems and the transfer of sediment in deeper water; in addition, it will ascertain and validate the boundaries of the coastal foundation and map out sea level rise and soil subsidence. 2) Monitoring of the pilot replenishment of the ebb-tide delta of the Ameland Inlet. 3) Ecological monitoring aimed at exploring the performance of the eco system in the tidal inlets and ebb-tide deltas, and at keeping track of the recovery process of benthic life following the pilot replenishment. <p>In order to ensure adequacy, an online data management system has been set up to provide access to the research data. More information on Coastal Genesis 2.0 is available here (in Dutch).</p>

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C-2: Sand Engine (O)	<p>In 2011, the Dutch coast south of The Hague – between Ter Heijde and Kijkduin – was nourished with a mega deposit of 21.5 million cubic metres of sand: the Sand Engine. The Sand Engine is a pilot project in the purview of sustainable and natural coastal maintenance, creating room for both nature and leisure facilities. As a result of natural processes, the Sand Engine sand is gradually moving along the Delfland coast, predominantly in a northern direction.</p> <p>The Ministry of Infrastructure and Water Management (including Rijkswaterstaat) is in charge of the Sand Engine knowledge development programme and has joined forces with the province of Zuid-Holland, universities, and knowledge institutes. The first official results were announced at the Sand Engine Conference of 2016:</p> <ul style="list-style-type: none"> • the Sand Engine life span is longer than foreseen; • dune formation is taking longer than expected; • flora: more plant species, more habitats; • fauna: greater diversity in birds and benthos; • leisure: fewer seaside visitors, more walkers and kite surfers. <p>The Sand Engine Monitoring and Evaluation Programme (MEP) will run up to and including 2021.</p>
Wadden Sea Region (WR)	
WR-1: Wadden Sea Dykes GE - Innovative dyke concepts (O) [Formerly W1]	<p>Within the Wadden Sea Dykes General Exploration (GE; cf. FRM-4 for general information on GEs), the innovative dyke concepts developed under the Delta Programme (such as “wide green dyke”, “double dyke” and “dyke with forelands”) are being explored in more detail by the Wetterskip Fryslân, Noorderzijlvest, and Hunze en Aa’s district water boards. This GE is a component of the national Flood Protection Programme (HWBP).</p> <p>In 2017, the plans for the various studies, pilots, and product innovations were completed. In 2018 and 2019, the research questions will be answered, and the results will be presented. Wherever possible, the (interim) results of the Wadden Sea Dykes GE will be incorporated into ongoing HWBP projects. This will enable immediate implementation of innovative concepts and monitoring of the results. More information is also provided under WR-2, WR-3, and WR-I (knowledge sharing). All twelve studies being conducted under the Wadden Sea Dykes GE are outlined here (in Dutch).</p>
WR-2: Wadden Sea Dykes GE – Management of mud-flats as a component of flood defence systems (O) [Formerly W2]	<p>Salt marshes Mud-flats situated in front of dykes can reduce hydraulic loads on such dykes. Factoring in salt marshes in flood risk management is being explored in three Wadden Sea Dykes GE studies:</p> <ol style="list-style-type: none"> 1) The study into the Hydraulic Boundary Conditions for Forelands; 2) The Dykes with Forelands study; 3) The construction of the Wide Green Dyke pilot. <p>Feedback on ongoing studies:</p> <ol style="list-style-type: none"> 1) The study into the Hydraulic Boundary Conditions for Forelands has been completed. The report will become available in 2018 (in Dutch). 2) In the Dykes with Forelands study, the Wetterskip Fryslân district water board will explore, in collaboration with the main stakeholders, how the results pertaining to Hydraulic Boundary Conditions (1) can be implemented in actual practice. 3) Preparations for the Wide Green Dyke pilot are underway. The Wide Green Dyke is a wide, gently sloping dyke whose thick layer of clay is covered with grass. Converting the existing dyke to a Wide Green Dyke requires 1.7 million m³ of clay. Only then will the dyke be capable of absorbing the wave forces without compromising the grass cover or the underlying layer of clay. The district water board will obtain the required clay from the vicinity of this dyke. Sludge is extracted from the fore-lying mud-flats, from the Breebaart polder, and from the Delfzijl Zeehavenkanaal. This sludge will mature into clay to be used for the construction of the dyke.
WR-3: Wadden Sea Dykes GE - Eems-Dollard flood risk management (O) [Formerly W4]	<p>Wherever possible, the dyke improvement tasking along the Eems-Dollard (entire section from Eemshaven to Germany) will be geared to improving the quality of the estuary. The focus will be on capturing sludge and sediment to be used in future dyke improvements. Three projects have been launched to this end that are directly related to coastal protection:</p> <ol style="list-style-type: none"> 1) The Wide Green Dyke pilot (cf. WR-2); this involves the use of three different sediment flows from the system to improve the dyke (levelling off the seaward slope). 2) Clay Maturation Plant, in which several sediment flows undergo various treatments to assess their suitability as a raw material for dyke clay. The clay maturation study commenced in May 2018. 3) The Double Dyke pilot, involving the construction of a second dyke behind the current dyke. Together, the two dykes constitute a flood defence system. The section between the dykes provides room for mud sedimentation and for innovative farming.

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WR-4: Wadden Sea Island integrated flood risk management strategy (C) [Formerly W3]	<p>The study into multi-layer flood risk management – an impact project of the Delta Plan on Spatial Adaptation – was completed in the spring of 2016. The study shows how residents of the Wadden Sea Islands are collectively responding to the initial impact of flooding and are accommodating flood risks. Together with the scenario study already finalised in 2015, this project has provided the know-how required to draw up integrated flood risk management strategies for each island. The results of the previous study will be used to further elaborate the integrated flood risk management strategy for the Wadden Sea Islands within the Wadden Sea Region Delta Programme. Any further knowledge issues that arise will be submitted to the Delta Programme knowledge agenda.</p>
Southwest Delta (SWD)	
SWD-1: Future design and management of Grevelingen (O) [Formerly SWD1,2]	<p>A risk dossier has been compiled in preparation for the restoration of limited tidal action in the Grevelingen and Volkerak-Zoommeer lakes (see SWD-2 for Volkerak-Zoommeer). The risk dossier constitutes the basis for the exploration of various substantive issues.</p> <p>With respect to the Grevelingen, the issues pertain to, inter alia, morphology and sediment distribution in lake Grevelingen and the Voordelta area, fish population, and the potential for shellfish harvesting. In addition, the optimisation of limited tidal action has been explored in collaboration with nature organisations. These studies constitute follow-ups to the Environmental Impact Assessment and the Nature Impact Study; they are geared to the knowledge requirements for the plan elaboration phase that is expected to commence in 2019.</p> <p>The elevation of shores and islands in the area will be measured in order to facilitate a proper estimate of the increase in and quality of intertidal areas upon the introduction of limited tidal action.</p> <p>In 2018, the knowledge issues pertaining to the Grevelingen will be coordinated further with regional knowledge institutes. Wherever possible, the issues will be tackled collectively. An important long-term question is to what extent the increasing sea level rise will continue to hamper the tenability and resilience of a freshwater system. To this end, the Southwest Delta knowledge community (see SWD-1) will be set up, focusing initially on the Grevelingen, Volkerak-Zoommeer, and Oosterschelde. For more information, see grevelingen en volkerak zoommeer and grevelingenmeer (in Dutch).</p>
SWD-2: Future design and management of Volkerak-Zoommeer (O) [Formerly SWD1,2]	<p>Follow-up research for lake Volkerak-Zoommeer (VZM) is focused on keeping tabs on water quality by annually monitoring the volumes and spread of the Quagga mussel and blue-green algal growth. Additional studies are being conducted into the further optimisation of the alternative freshwater supply around lake Volkerak-Zoommeer and the water supply via the Roode Vaart in West-Brabant, within the context of the innovative Freshwater Supply climate adaptation pilots (cf. FS-4). In 2017, model studies were conducted into the trend in water quality in the freshwater Volkerak-Zoommeer and into the viability of creating ecologically valuable freshwater-saltwater transitions in a saline lake VZM. The studies revealed that the current measurement and monitoring efforts do not warrant a full analysis of the trend in water quality. The parties involved are examining whether new technologies such as remote sensing and food web analyses can contribute to filling the knowledge gaps.</p> <p>The elevation of shores and islands in the area will be measured in order to facilitate a proper estimate of the increase in and quality of intertidal areas upon the introduction of limited tidal action.</p> <p>In 2018, the knowledge issues pertaining to lake VZM will be coordinated further with regional knowledge institutes. Wherever possible, the issues will be tackled collectively. To this end, the Southwest Delta knowledge community (see SWD-1) will be set up, focusing initially on the Grevelingen, Volkerak-Zoommeer, and Oosterschelde. For more information, see grevelingen en volkerak zoommeer and grevelingenmeer (in Dutch).</p>

Knowledge topics	State of affairs - June 2018
<p>SWD-3: MIRT Study into Oosterschelde integrated flood risk management / Roggenplaat shoal sand replenishment</p> <p>[Formerly SWD3]</p>	<p><i>MIRT Study into Oosterschelde integrated flood risk management (O)</i></p> <p>The MIRT Study into Oosterschelde integrated flood risk management has explored the challenges that the rising sea level entails for the Oosterschelde. The study has demonstrated that for the next decades, minor measures, such as raising the Roompot lock, will suffice to keep flood protection up to par. After 2050, adjustments to the storm surge barrier and dykes or improvement of the dyke forelands will be required. In the period 2020-2023, Rijkswaterstaat, the Scheldestromen district water board, and the province of Zeeland will explore which measures will be most effective and when such types of measures will be required.</p> <p>Completion of this MIRT Study does not conclude the research into the impact of climate change. If management continues as is, the Oosterschelde storm surge barrier will close more frequently after 2050. This will impact the landscape, nature, and shellfish harvesting, because shellfish depend on the dynamics and nutrient supply of the tide. Additional research is required into the impact of sea level rise on the landscape, nature, and functional uses. The latter study, entitled “Impact of Sea Level Rise and Oosterschelde Sand Deficit” will be conducted in 2018 and 2019. For more information, click here (in Dutch).</p> <p><i>Roggenplaat shoal sand replenishment (Oosterschelde) (O)</i></p> <p>The Roggenplaat shoal sand replenishment, scheduled for the winter of 2019-2020, involves the deposit of some 1.6 million m³ of sand from the Roompot channel. The deposit is a maintenance measure aimed at combating the effects of sand deficit; it is carried out under the Natura 2000 Delta Waters management plan. The behaviour of the deposit will be monitored until 2025; the results will underpin an effective design and implementation for a larger deposit on the Galgeplaat shoal (around 2025) in the context of the Oosterschelde sand deficit.</p>
<p>SWD-4: Future design and management of Westerschelde (O)</p> <p>[Formerly SWD4]</p>	<p>Flanders and the Netherlands have joined forces in the Flemish-Dutch Scheldt Commission to work on a knowledge agenda for the future aimed at an integrated and sustainable development of the Westerschelde; its goal is to reinforce the balance between nature, safety, and accessibility. At the end of 2018, the Scheldt Commission will take stock, in collaboration with the stakeholders, of the first research programme that has been conducted over the preceding four years. The results will subsequently be used to draw up the joint research agenda for the following years.</p> <p>In the specific context of the flood risk management issue, the Scheldt Commission is exploring the long-term trend in the sand balance of the Westerschelde including the estuary area. To this end, the Scheldt Commission working group on coastal safety is reviewing the resilience of existing Flemish and Dutch coastal safety strategies and is exploring ambitions and opportunities for collective follow-up research into the long-term safety, and for collective pilot projects. The results of these efforts will be available by the end of 2018; they will underpin the subsequent steps. More information is available here (in Dutch).</p>

Knowledge topics	State of affairs - June 2018
SWD-5: Future design and management in connection with freshwater supply [Formerly SWD5]	<p><i>Developments in Southwest Delta freshwater supply programme (O)</i> As a decision on lake Volkerak-Zoommeer (VZM) is still pending, the region needs to consider other ways to substantiate its freshwater supply programme. Depending on the decision by the Regional Consultative Body in 2018, new studies may be required. These may involve, e.g.:</p> <ol style="list-style-type: none"> 1) Assistance by consumers in information provision for operational management; 2) Use of up-to-date information in operational management (for example, Water Accounting and use of the Multiflex meter); 3) Relation between (vital) soil and availability of fresh water; 4) Water preservation in creek systems; 5) Updating research on availability of Water from the Wal and use of effluent from Bath sewage purification plant; 6) Monitoring of blue-green algal growth in lake VZM and relation to freshwater supply. <p><i>Ongoing freshwater supply studies (O)</i> Several issues are being addressed in ongoing freshwater supply programmes, such as Smart Water Management and Water Availability (cf. FS-1). For the Southwest Delta, such programmes are the Rhine-Meuse Estuary hotspot analysis and the Rietkreek pilot.</p> <p>Within the Rhine-Meuse Estuary hotspot analysis, a component of the freshwater supply bottleneck analysis (see FS-5), the region aims to answer the question as to whether a regional prioritisation scheme, focused on prioritising the supply of fresh water to functions in times of shortage, would be advisable or necessary. If such a scheme is deemed necessary, it will be elaborated and endorsed at the administrative level.</p> <p>In the Rietkreek pilot, the Brabantse Delta district water board and farmers are exploring options for water preservation and the joint optimisation of the regional water system. By no later than 2018, the parties will set down agreements on responsibilities for water availability in the area, based on this research. This pilot has suffered significant delay due to the lack of a decision on lake VZM and thus uncertainty regarding the future freshwater supply of the area.</p> <p>A general overview of the projects being carried out under the Delta Programme for the Southwest Delta is provided here (in Dutch).</p>
SWD-6: Testing ground / innovative freshwater pilots (O/C, depending on the pilot)	<p>In the Zeeland Freshwater Testing Ground, the parties involved are elaborating opportunities for enhancing the area's self-reliance by increasing the availability of fresh water and reducing saline areas' dependency on fresh water. To this end, pilots have been launched (innovative climate adaptation pilots; FS-4) involving the expansion of freshwater volumes in the soil and of the fresh rainwater lens. The Zeeland Freshwater Testing Ground is a dynamic testing ground. This entails that, depending on current issues, studies can be added or removed. Several studies have already been completed:</p> <ul style="list-style-type: none"> • E1 FRESHEM Freshwater-saltwater mapping (completed; see link below) • E2 GO-FRESH II subsoil water preservation • E4 Reprocessing (Regional Strategy for Mild Desalination) • E6 Salt management in the quest for salt-tolerant potatoes (in the Southwest Delta) • E10 Area Freshmaker Exploration <p>More information on FRESHEM is provided here (in Dutch).</p>

Knowledge topics	State of affairs - June 2018
SWD-7: Zeeuws-Vlaanderen Resilient Water System (N)	<p>The Zeeuws-Vlaanderen Resilient Water System is an integrated regional exploratory study into the potential optimisation of freshwater recycling among the various consumers and the interaction with other functions in the area (such as waterlogging, nature, and leisure activities). Two projects are directly related to the supply and availability of fresh water:</p> <p>1) In 2018-2020, a pilot will be carried out (in which Dow, Evides, and Scheldestromen district water board will participate) involving the use of a “constructed wetland” in combination with (mild) desalination for the production of industrial water from regional brackish water flows, particularly polder run-off, effluent from the municipality of Terneuzen, rainwater collected in the periphery of the Dow plant, and process water flows released. The pilot will be set up on the Evides premises south of the Dow premises. This pilot will build on the results of Testing Ground E4 (see SWD-6).</p> <p>2) For the Braakman-Zuid area, a feasibility study will be conducted (2019-2020) into the option of subsoil storage of excess rainwater (during the winter months) for summer use by the industry (Dow) and farmers. The study will be based on the FRESHM (E1 in SWD-6) results, existing soil maps, and results from earlier GO-FRESH projects (E2 in SWD-6).</p> <p>The research questions for both projects pertain to technical feasibility and efficiency, but also the identification and, wherever possible, mitigation of obstacles in legislation and regulations. For more information, click here (in Dutch).</p>
Rhine Estuary-Drechtsteden (RD)	
RD-1: Hollandsche IJssel flood risk management tasking (N)	<p>In 2018, as a follow-up to the Forelands General Exploration (GE) conducted under the National Flood Protection Programme (see FRM-4 for general information on GEs), Rijkswaterstaat and the Schieland en de Krimpenerwaard district water control board embarked on a study into options for the further improvement of the failure probability and closure level of the Hollandsche IJssel storm surge barrier, and their impact on the Hollandsche IJssel flood risk management tasking.</p>
RD-2: Climate-proof water supply (O/C, depending on the project) [Formerly RD3]	<p>The exploratory phase of the study into the expansion of the Central Netherlands Climate-proof Water Supply system was completed in 2016. This system involves the supply of fresh water to the western part of the Netherlands during periods of extreme drought and low river discharges. The exploration was intended to develop a preferential alternative for the capacity expansion to some 15 m³/s. The plan elaboration for the capacity expansion of the Leidsche Rijn/Oude Rijn, Enkele Wieriecke, and the canalised Hollandsche IJssel is in full swing.</p> <p>The exploratory study for the Irene Locks Bypass project commenced in 2016. This project is focused on a sufficient supply of fresh water in the Amsterdam-Rijnkanaal. The preferential alternative to the modification of the Princess Irene Locks was completed in 2017. The sober alternative is regarded as the preferred alternative: there will be no bypass, but the capacity of the water inlet system will be expanded. This will ensure a sufficient supply of fresh water in dry periods and will keep waiting times for the shipping sector within limits. The report on the preferential alternative is ready and has been discussed with the stakeholders.</p> <p>In the COASTAR project (cf. FS-4), several district water boards and the province of Zuid-Holland are exploring, inter alia, the options for brackish water extraction in deep polders in the purview of drinking water production. Other initiatives are mapping out alternative sources for drinking water production. For example, Waternet is exploring, in collaboration with the Amstel, Gooi en Vecht and Rijnland district water control boards, and the drinking water companies, whether the capture of brackish water seepage can be combined with the production of drinking water.</p>
RD-3: In-depth knowledge of main water systems (morphology, river bed erosion) (C) [Formerly RD5]	<p>Research into river morphology and the morphological impact of interventions is listed under R-3 and R-4.</p> <p>One of the (sub) studies relevant to the Rhine Estuary-Drechtsteden region involved the structural combating of river bed erosion in the Oude Maas, the Spui, the Kil, and the Noord. Deltares completed this morphology study in 2016; the study has generated knowledge on river bed development and recommendations for sediment management.</p>

Knowledge topics	State of affairs - June 2018
RD-4: Adaptation agenda for port areas outside the dykes (O/C) <i>[Formerly RD6]</i>	<p>The strategic adaptation agenda for port areas outside the dykes was completed in early 2018. The agenda sets out the measures to be taken in the purview of flood risk management in the areas outside the dykes of the Rhine Estuary-Drechtsteden region. Within this region, pilot areas have been designated and factsheets have been drawn up for the pilots. The factsheets provide information on the course to be steered in order to ensure the current and future flood protection of the pilot areas. In the years ahead, these factsheets will be regularly updated. Several impact analyses of port areas outside the dykes have been completed or are being finalised.</p>
RD-5: Flood impact containment (social disruption, vertical evacuation, vital infrastructure) (N/C) <i>[Formerly RD10]</i>	<p>In collaboration with the district water boards, Rijkswaterstaat, and the municipality, the Zuid-Holland Zuid Security Region is conducting a case study into improvement of flood disaster control through knowledge dissemination and development. The study will generate disaster control tools to be used in various phases of a disaster, from the development of a threat up to and including the restoration of a flooded area. One of the taskings involves the substantiation of “vertical evacuation”.</p> <p>The promising multi-layer flood risk management combination for the Eiland van Dordrecht has been elaborated in detail in the “Operationalisation of the strategy to enhance the coping capacity of Eiland van Dordrecht” MIRT Study. This Study was completed in early 2018. More information on this knowledge topic is available here (in Dutch).</p> <p>Impact analyses and evacuation strategies for Dordrecht and Alblasserwaard-Vijfheerenlanden have been or are being conducted/explored. In 2018, a similar process will commence for IJsselmonde and Hoeksche Waard.</p>
RD-6: Nieuwe Waterweg sea lock (C) <i>[Formerly RMD6]</i>	<p>In response to the Geurts motion (2014), Rijkswaterstaat has explored the advantages and disadvantages of a variant involving sea locks to close off the Nieuwe Waterweg. The outcomes of this study and the conclusions regarding the preferential strategy have been coordinated with the Delta Programme Rhine Estuary-Drechtsteden Steering Group and the Delta Programme Commissioner. In January 2016, they were forwarded to the House of Representatives by the Minister of Infrastructure and Water Management.</p>
Rivers (R)	
R-1: Integrated River Management programme (N)	<p>The Minister of Infrastructure and Water Management intends to set up, together with the Delta Programme partners (governments, business community, and NGOs) and the stakeholders involved, an Integrated River Management programme, to which end a sum has been set aside under the Delta Fund; see Paragraph 3.1 in Delta Programme 2019.</p> <p>The Integrated River Management programme is aimed at future-proofing the river system and developing a multi-use system that will ultimately perform well as such: no individual measures, but rather a logical set of coherent measures that is geared to the river’s behaviour and does justice to the various river functions.</p> <p>For the time being, the programme will focus on the upstream areas of the Rhine and Meuse. The programme comprises measures to be implemented in the section between the river dykes and the elevated grounds, which encroach upon the river, its adjacent floodplains, and the river-related functions. This calls for various types of measures, such as sediment management (dredging and deposits), floodplain management, and river management (such as river widening, longitudinal erosion control dams, system interventions). In addition, the programme will incorporate other measures ensuing from the national and regional river taskings. The measures will be defined in interconnection with other programmes, among which the National Flood Protection Programme, the Water Framework Directive, the Major Waters Strategy, and river widening. River widening will constitute the link in this respect.</p> <p>The Integrated River Management elaboration and design process will involve the identification of any new knowledge requirements. This could result in a new knowledge agenda.</p>

Knowledge topics	State of affairs - June 2018
R-2: Tale of the River, strategic river agenda and tributary-level vision (N)	<p>In 2017, the River Expertise Community of Practice (CoP; see R-1 for more information on the River Expertise CoP) presented its first report: the Tale of the River with a key message to the river managing authority (Rijkswaterstaat) and to other parties involved in river planning (the national government, provinces, municipalities, district water boards, and private parties). The Tale is a value-free account by experts. The key message comprises several directive guiding principles that, according to experts, must be central in river planning and management, reasoning on the basis of a river's behaviour and with a view to all the functions to be served. In 2018, this River Tale will be expanded to other water systems, viz. the Rhine-Meuse estuary and the Meuse. Other activities on the agenda for 2018 and the years ahead include 1) expanding the Tale to a more integrated account comprising all the societal functions (e.g., other interests/functions such as spatial quality, revitalising of industrial estates, urban development, agriculture, etc.) and 2) the quantification of active sediment management in relation to river bed erosion in the Rhine and Meuse.</p> <p>The guiding principles for river planning and design constitute the prelude to a new, integrated evaluation framework intended to ensure the continued proper performance of the river system as a whole. Proposals for planning, maintenance, and management must be assessed on the basis of this framework, as must third-party initiatives. The guiding principles can also serve to underpin the Integrated River Management programme (see R-1). Furthermore, the parties involved (such as Rijkswaterstaat and the provinces) can develop their visions on the basis of these Tales.</p> <p>In 2018, Rijkswaterstaat will draw up a strategic river agenda and elaborate it in a tributary-level vision.</p>
R-3: Large-scale morphological behaviour or river systems – understanding and predictability of large-scale long-term morphological behaviour [Formerly R1]	<p><i>NKWK Rivers (Rivers2Morrow)</i> (N/O)</p> <p>One of the focus areas of the National Water and Climate Knowledge and Innovation programme (NKWK) is Rivers. This focus area has set up a programme aimed at expanding the system expertise of lowland rivers in terms of hydraulics and morphology, but also ecology and governance. The study conducted within NKWK Rivers (entitled Rivers2Morrow) can be regarded as the follow-up to the RiverCare study (see R-5); it will use the insights into river system behaviour to improve river management and maintenance, and to better substantiate policy decisions. The study focuses on the understanding and predictability of large-scale system changes in the Rhine caused by changing boundary conditions. These changes are related to climate change, such as increased discharge, different discharge statistics, and a rising sea level, but also to the large-scale anthropogenic changes from the past. The programme also addresses the long-term behaviour of bifurcation points. In the near future, PhD candidates at three universities will embark on research into innovative technologies for measuring river bed transport (Wageningen University & Research Centre), and into the long-term response of the upper delta (Delft University of Technology) and the lower delta (Utrecht University) to climate change and sea level rise. The researchers will frequently draw on the expertise available at Deltares and specialised firms of consulting engineers.</p> <p><i>River bed erosion in lowland rivers</i> (N/O)</p> <p>Delft University of Technology has initiated a series of research projects to help gain more insight into the long-term morphological behaviour of the Rhine. In the NWO-TTW/Water2015 project “River bed erosion in lowland rivers”, research is being conducted into causes and mitigation of river bed erosion. Several parties, such as Rijkswaterstaat and Deltares, are involved in this research. Cf. the publication on “River bed erosion in the Rhine” (in Dutch).</p>

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<p>R-4: Large-scale morphological behaviour or river systems – influencing large-scale long-term morphological behaviour</p> <p>[Formerly R1]</p>	<p><i>Influencing large-scale long-term morphological behaviour (N)</i></p> <p>Active sediment management and river management (river widening, system interventions) enable the river bed to be raised to, and maintained at, the desired level. Expectations are that the elaboration of active sediment management and river management will generate new knowledge requirements that will be addressed by a new research programme. The focus will be on the active sediment management solution according to the circular economy principle, which ensures an optimum utilisation of the river’s “natural capital”. Cost-effective innovative measures are being considered, such as sediment management featuring a closed sediment cycle, by analogy with the Sand Engine.</p> <p><i>Longitudinal erosion control dams pilot (O)</i></p> <p>Rijkswaterstaat is conducting a pilot study involving longitudinal erosion control dams in the river bed of the River Waal near Tiel. As a result of the dams that have been constructed parallel to the banks, this section of the river now consists of two flow channels: a main navigation channel and a wide bank channel for other river functions such as nature. Several functions can thus co-exist without negatively impacting one another. The first results are positive. Many target fish species set out in the Water Framework Directive are increasing in population. High water levels are falling, because convex bank groynes have been removed altogether. River bed erosion in this section ceased in 2015; the river bed actually seems to be rising again. This also puts an end to the fall in low water levels ensuing from this river bed erosion. The conclusions of the pilot study will be available after 2019.</p> <p><i>RiverCare (O)</i></p> <p>Under the STW RiverCare perspective programme (cf. R-5), morphological research is being conducted into the effects of secondary channels and longitudinal erosion control dams, with the goal of minimising river bed management and maintenance. The research also addresses the effects of replenishment.</p>
<p>R-5: Morphological effects of Room for the River measures (NWO RiverCare) (O)</p>	<p>Under the NWO RiverCare perspective programme, 21 researchers are mapping out the effects of Room for the River projects. The programme was launched in 2013 and will terminate in 2019. The sub-project regarding erosion and sedimentation in secondary channels (important in the purview of management and maintenance planning) generates rules of thumb regarding the life span of secondary channels. Significant new insights have been gathered regarding river bank erosion mechanisms and how they impact morphology. Under the longitudinal erosion control dams project, a great deal of expertise has been amassed on morphological behaviour and the ecological added value of longitudinal erosion control dams. Researchers have studied, inter alia, the succession of floodplain vegetation (important in the purview of management and maintenance, and of high water levels) and the potential benefits of eco system services. A large proportion of this research is being conducted in close collaboration with Rijkswaterstaat, Deltares, and various firms of consulting engineers. More information is provided here (in Dutch) and in the knowledge database (in Dutch).</p>
<p>R-6: Sustainable Rhine delta bed (N)</p>	<p>Following the Rhine Delta Sustainable Navigable Depth project, the Rhine Delta Sustainable Bed MIRT Study has provided a more detailed picture of the bottlenecks caused by progressing river bed erosion. The Bed study has a wider scope than the Navigable Depth project; in addition to navigation, it also addresses the impact of river bed degradation on flood risk management, freshwater supply, nature, cables, and pipes. The legislation, guidelines, and standards available provide insufficient basis for assessing the severity of bottlenecks caused by progressing river bed erosion. The Bed study has mapped out the economic and ecological damage, as well as short-term and long-term solutions. A short-term bottleneck for shipping, under low water-level conditions, is the fixed layer of rubble (deposited at the end of the 1980s in the purview of improving navigability). This bottleneck must be resolved within ten years. Several solutions have been explored to this end, involving partial lowering of the fixed layer in combination with replenishment in the various Rhine tributaries. Supplementary long-term measures are also required, with a focus on the various river functions. These may involve soft measures in the form of sediment management (replenishment), hard measures such as the construction, management, and maintenance of hydraulic structures (groynes, longitudinal erosion control dams, fixed river bed layers) or combinations of both.</p>

Knowledge topics	State of affairs - June 2018
R-7: Basic River Bed Situation (N)	<p>The river bed situation dynamics in the Rhine and Meuse river systems (in the upstream areas and in the transitional areas) may produce bottlenecks in terms of the maintenance and sustainable performance of river functions. In the purview of a thorough assessment of a desirable river bed situation, an exploration has been launched into the definition of a Basic River Bed Situation. The goal is to define a reference situation (in the form of a band width) that describes the desirable situation of the river bed on the basis of the various river functions that impose requirements on the river bed situation. In addition to defining such a situation, the exploration is intended to support the management of the basic river bed situation with an indication instrument, by analogy with coastal management. In 2018, three cases were set up to work on the elaboration of the basic river bed situation, the bottlenecks for each function, and the (potential) functional conflicts. The aim is to further develop the basic river bed situation in the autumn of 2018 in a follow-up project, and to use the results in the elaboration of Integrated River Management (see R-1).</p>
R-8: Bifurcation points (C) [Formerly R2]	<p>In the period 2015-2017, the Directorate-General of Water and Soil Affairs (DGWB; formerly DGRW) of the Ministry of Infrastructure and Water Management and Rijkswaterstaat conducted a river management study into the effects of potential river-widening measures in the bifurcation points area. The study was completed in October 2017; the results were set down in a summary memorandum. The study has shown how interventions in the bifurcation points area can impact the discharge distribution and thus the water levels at various discharge volumes. Under the updated Preferential Strategies, sets of measures are being developed involving spatial interventions and dyke improvements. The elaboration of such sets for each river tributary call for an overall picture and an assessment of the impact on the entire Rhine tributary system. This study feeds the considerations underpinning the elaborations, thus generating an overall package of measures that maintains the agreed discharge distribution and is acceptable in terms of side effects. The main lessons to be taken into consideration are:</p> <ul style="list-style-type: none"> • The maximum variant of the IJsselpoort River Climate Adaptation Park will entail a more substantial reduction in water level yet will draw relatively more water towards the River IJssel. This will result in changes in the IJsselkop discharge distribution, higher water levels in the downstream section of the IJssel, and closure of the Hondsbroekse Pleij control structure. This effect cannot adequately be mitigated by other measures. • A combination of an adapted IJsselpoort River Climate Adaptation Park, measures in the Huissensche Waarden, and measures in Meinerswijk will preserve the discharge distribution as pursued by policy, whilst preserving the control scope of the Hondsbroekse Pleij control structure. Furthermore, this combination will reduce the water level of the Pannerdensch Kanaal and the Nederrijn and IJssel headwaters. • In the current situation, the floodplain interventions along the Bovenrijn and Waal, and the Ooij dyke relocation will draw relatively large volumes of water to the River Waal; these measures are only viable in a situation of long-term higher Rhine discharges. At 16,000 m³/s, these measures will not warrant the realisation of the discharge distribution as set down in policy. Even if the Pannerdensch Kop control structure is fully open, a relatively large volume of water will be discharged via the Waal. However, the measures would be compatible with an agreed discharge distribution for 17,000 m³/s, in which the River Lek is spared.

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R-9: Cross-border discharge (O) [Formerly R3]	<p data-bbox="552 416 657 443"><i>Rhine studies</i></p> <p data-bbox="552 443 1460 629">At the end of 2015, Dutch and North Rhine-Westphalian governments signed a collaborative agreement to launch a joint study into flood risk management of the border area. This study focuses on the application of the Dutch risk-based approach – as developed within the Delta Programme – for the cross-border dyke sections in the border area between the Netherlands and North Rhine-Westphalia. The study has mapped out the differences in approach and explored what the different strategies entail for the safety of residents on either side of the border, in order to properly coordinate future flood risk management measures. The results of this study will become available in 2018.</p> <p data-bbox="552 658 1460 844">GRADE/Rhine: according to the results obtained with the GRADE instruments (GRADE: Generator of Rainfall and Discharge Extremes) and potential emergency measures, the maximum discharge of 18,000 m³/s in 2100 turns out to be a reasonable upper limit. This upper limit is based on the insights into discharge increases, the impact of flooding in Germany, and the impact of German (preventative and emergency) measures. That is why this upper discharge limit will remain the point of departure for the Delta Programme. The upper limit is not all-decisive. Depending on the standard and the failure mechanism, the calculations will cover a range of discharge volumes. The recommendations by the Flood Risk Management Expertise Network (ENW) regarding GRADE will be implemented up to and including 2020; the recommendations are focused on generating lines of action for the Statutory Assessment Tools 2013. Additional efforts involve, inter alia, more accurate GRADE models of the flooding in Germany in the final section of the Rhine up to the border.</p> <p data-bbox="552 976 1460 1240">Twente University is conducting research (in combination with Utrecht University) into historical flooding of the Rhine basin. Insight into the scope of such flooding will enable expansion of the historical measurement series regarding Lobith discharge volumes (which now starts in 1901) further into the past. An analysis of this series will generate insight into discharge return frequencies, including flooding in Germany. This will enable validation of the GRADE results (a synthetic discharge series covering 50,000 years of discharges) and interpretation of the results generated by GRADE (relation between discharge volumes and return frequencies). The study will also generate expertise on flood patterns in Germany and in the areas located within the Dutch dykes (Rijnstrangen area), and how these will impact the maximum discharge volume to be achieved by the Netherlands. Up until now, the study has examined the floods of 1926 and 1809.</p> <p data-bbox="552 1270 1460 1402">In 2018, a study is intended to be launched into the impact of river-widening measures on the Lobith discharge capacity. The idea is that measures implemented in the Netherlands will also have an effect on Germany. This means that, in principle, more water can be discharged without immediately causing flooding, and that more water will reach the Netherlands. This also depends on the form of the discharge curve. This project will explore what exactly this entails and what the impact will be.</p> <p data-bbox="552 1431 657 1458"><i>Meuse studies</i></p> <p data-bbox="552 1458 1460 1581">GRADE/Meuse: the flood protection levels along the River Meuse differ widely. This means that discharge volumes will differ accordingly in terms of probabilities of occurrence. The Meuse discharge statistics have been recalculated using the GRADE method. The results are being discussed with the parties involved in the Meuse region, as are the further choices to be made regarding the scenarios and flows to be used for the 2018 design instruments.</p>

Knowledge topics	State of affairs - June 2018
Elevated Sandy Soils (ESS)	
ESS-1: Lumbricus (O) [Formerly HZ1]	In 2016, the NKWK Lumbricus programme was launched in the Freshwater Regions East and South. The programme involves comprehensive studies focused on the development of knowledge on the interconnectivity of the soil, freshwater supply, and the subsoil. Knowledge development and practical applications are paired with governance issues that are relevant to achieving climate resilience in the soil and water system. A specific feature of the Lumbricus programme is that the various individual initiatives and innovations are compiled into an integrated strategy that is field-tested in testing grounds. The programme will run up to and including 2020 and is co-funded under the Delta Plan on Freshwater Supply. More information is available here (in Dutch).
ESS-2: Exploratory study into options for subsoil water storage (N)	The provinces of Limburg and Noord-Brabant will embark on a study into the options for water storage in shallow subsoil, to be used in times of high water demands. Stockpiling water could bridge or help to bridge future phase differences between the demand for and supply of water, thus preventing drought damage and raising water supply security.
ESS-3: Study into the degree of target attainment in the Elevated Sandy Soils Delta Programme (N)	The partners in the Freshwater Region South aim to monitor target attainment (freshwater supply gains) of the Delta Programme Elevated Sandy Soils working programme, in addition to its financial progress. To this end, they have commissioned an agency to assess the extent to which the target has actually been attained, based on the assumptions and points of departure of the regional tender procedure.
ESS-4: Study into the options for reuse of sewage water purification plant effluent (N)	The Chemelot plant in Zuid-Limburg is highly dependent on the Julianakanaal to meet its water requirements. In order to safeguard current and future operational security, alternative water sources are being explored. A potential water source is sewage water purification plant effluent. The main goals of this project are: technological exploration of the possibilities and elaboration of an overall concept; assessment of the economic, societal, and legal feasibility; assessment of societal feasibility with stakeholders (Limburg district water board, Rijkswaterstaat, Province of Limburg, Waterleiding Maatschappij Limburg waterworks).
ESS-5: Study into the options for integration of measures (Water Framework Directive, Water Availability, and Spatial Adaptation) (N)	In anticipation of the next phase of the Water and Water Availability Framework Directive (to commence in 2021) and the Delta Plan on Spatial Adaptation, measures will be developed in the years ahead to help achieve these policy goals. The southern region is now developing initiatives to combine individual measures in order to achieve integrated goals. To this end, the Limburg district water board has set up a climate platform to discuss and assess the full scope of measures with all the partners (such as Limburg district water board, the province of Limburg, and municipalities).
ESS-6: Performance of groundwater systems in the sandy areas (N)	Within the European BINGO (Bringing INnovation to onGOing Water Management; research programme, studies are being conducted into more accurate estimation of current evaporation. This is important in the purview of estimating groundwater replenishment. The knowledge gained will enable estimation of the impact of climate change and the tasking involved in groundwater extraction for drinking purposes.
ESS-7: Optimisation of water supply (N)	The smart water management cooperative (see FS-1) of the East Netherlands Freshwater Region and the IJsselmeer Region is exploring the options for operational management. In addition, it is working on improving the substantiation of main water system water requirements.
ESS-8: Estimate of economic impact of climate change in sandy areas (N)	In the East Netherlands Freshwater Region, a case study is being carried out under the European IMPREX research project (see FS-3) in Haarlo and Olden Eibergen in the Berkel basin. The case study is focused on the impact of climate change and measures implemented in a groundwater system featuring drinking water extraction. The question is whether the IMPREX risk-based approach can be used in this situation. The risk-based approach provides tools for gaining insight into drought and the impact of drought. Another approach is the regional scan. The Supply Region is currently looking for an appropriate pilot area for this approach.
ESS-9: Freshwater supply in regional processes (N)	The East Netherlands freshwater supply realisation strategy was drawn up in 2017. This strategy addresses the availability of fresh water via integrated regional processes, in which regional partners are involved. This year, workshops will be organised for three regional processes, in which consumers and water managers collectively review the position of freshwater supply in their areas.

Knowledge topics	State of affairs - June 2018
Delta Programme Generic Topics (DP)	
DP-1: Accelerated rise in sea level (N)	<p>Recent insights indicate that Antarctic ice caps may melt more rapidly, an effect that, as yet, had not been taken into account in the scenarios and whose occurrence is not affected by compliance or non-compliance with the Paris climate agreements. In anticipation of a scientific conclusion by the Intergovernmental Panel on Climate Change (IPCC) in 2019 and the new KNMI climate scenarios in 2021, the Delta Programme commissioned a first exploratory study in 2018 into the potential impact of an accelerated Antarctic melt on the Dutch delta. More information on this study is provided in Chapter 2.1 and Background Document B of Delta Programme 2019.</p> <p>The first results of this study show that compliance with the Paris climate agreements will contain global warming to 2°C and limit accelerated sea level rise to 1 or possibly 2 metres by 2100. In a more extreme scenario, in which the Earth will warm by 4°C, the sea level may rise by 2 to possibly 3 metres by 2100. In both the first and the second scenarios, the (accelerated) sea level rise will continue after 2100.</p> <p>This initial exploration warrants the conclusion that the adopted Preferential Strategies will provide a solid basis for keeping the Dutch delta liveable and habitable, at least until 2050. In the period beyond 2050, accelerated sea level rise may have a considerable impact, inter alia, on flood risk management, the coastal foundation, the tidal waters, and freshwater supply in the western part of the Netherlands. In collaboration with the Ministry of Infrastructure and Water Management, Rijkswaterstaat, district water boards, and knowledge institutes, a knowledge agenda is being drafted, based on the findings of the IPCC, the KNMI, and this exploratory study, to further investigate the consequences of and uncertainties involved in accelerated sea level rise.</p>
DP-2: Analysis, Ambition, Action – Indicators for target attainment (O)	<p>In 2017 and 2018, Deltares, the Netherlands Environmental Assessment Agency, RHDHV, and Rijkswaterstaat worked on the development of a consistent set of indicators to map out target attainment in the fields of the Delta Programme themes of flood risk management, freshwater supply, and spatial adaptation. A report on the state of affairs is included in the Analysis, Ambition, Action background document, Background Document A to Delta Programme 2019.</p>
DP-3: Knowledge issues in the context of the first six-year review (N)	<p>In 2018, the area-based and theme-based sub-programmes will review which developments could prompt an amendment of the Delta Decisions and Preferential Strategies. In 2019, knowledge requirements related to such developments will be formulated. The research results will be used to develop proposals for potential amendments. The substantiation of proposed amendments is outlined in synthesis documents. In early 2020, the synthesis documents will be reviewed by an independent scientific cooperative.</p>
DP-4: National Water Model (O)	<p>The National Water Model (NWM) is a computer model that provides insight into current and future flood protection, freshwater supply distribution, and water quality in the Netherlands. The model calculates surface and groundwater flows. The model also calculates salinity and water temperature. In addition to the current picture, the model shows the expectations for the years 2050 and 2085. In 2018, the following issues will be tackled:</p> <ol style="list-style-type: none"> 1) Flood protection; adapting the instruments to calculations in the purview of the Statutory Assessment Tools 2023; 2) Freshwater supply; incorporation of new Delta Scenarios and recalculating basic forecasts for 2018 (on 100-year basis); 3) Water quality; presentation of a national set of water quality instruments by the end of 2018 and setting up pilots in collaboration with district water boards by linking the national set of water quality instruments to regional instruments.

Knowledge topics	State of affairs - June 2018
DP-5: Interim updating of Delta Scenarios (C)	<p>Under the authority of the Delta Plan on Freshwater Supply and the Staff of the Delta Programme Commissioner, Deltares has updated, improved, and supplemented the Delta Scenarios ahead of schedule, in collaboration with the Netherlands Environmental Assessment Agency PBL, the Netherlands Bureau for Economic Policy Analysis CPB, and the Royal Netherlands Meteorological Institute KNMI. The process involved the following components:</p> <ul style="list-style-type: none"> • Updating. Following the Delta Decisions, the PBL and CPB presented new WLO (Prosperity and Quality of the Living Environment) scenarios in 2015. The new scenarios are based on lower economic growth vis-à-vis the previous WLO scenarios; they provide an up-to-date picture of the spatial distribution in growth (and the trend in land use). The difference between growth areas and depopulating areas saw a particular rise. These new insights have been incorporated into new land use maps. • Improvement. In the particular purview of the new freshwater supply bottleneck analysis, assumptions regarding the developments in irrigation and market/price mechanisms during periods of drought have been improved. Furthermore, a more explicit distinction has been made between autonomous developments, such as private investments in irrigation, and developments ensuing from a strategy, such as increased flushing to combat salinisation. • Supplementation. The Paris climate agreements result in a scenario in which socio-economic growth goes hand in hand with limited climate change (the existing “Pressure” Delta Scenario) and specifically with spatial planning and land use geared to a reduction of CO₂ emissions. Points for attention include the reduction of peat oxidation in low-lying parts of the Netherlands (which will impact water management) and a reduced demand for cooling water. Elaboration of this new Delta Scenario, entitled “Pressure-Paris”, must concretise the associated land use and water taskings, and demonstrate whether and how the Preferential Strategies will warrant attainment of the targets.

Knowledge sharing

Knowledge topics	State of affairs – June 2018
Flood Risk Management (FRM)	
FRM-I: Technical Guidelines Database (N)	Knowledge on flood risk management can be set down in technical guidelines which will help flood defence system managers to assess and design flood defence systems. With effect from July 2018, the knowledge from these technical guidelines will be available in an online database (in Dutch) on the Helpdesk Water website. This database will continuously be updated. For each theme, the most up-to-date knowledge from the various guidelines will be collected.
FRM-II: Dijkwerkers Community (N)	The <i>Dijkwerkers</i> [Dyke Workers] is a community set up by the National Flood Protection Programme, comprising delegates from the Ministry of Infrastructure and Water Management, Rijkswaterstaat, district water boards, knowledge institutes, consultancies, engineering agencies, and dredgers, all of whom are active in the field of dykes. Within this community, knowledge on dykes is shared and various parties engage in collaboration. For more information, click here (in Dutch).
Freshwater Supply (FS)	
FS-I: Freshwater Information Day (O)	A Freshwater Supply Information Day is organised twice a year. These days are aimed, on the one hand, at sharing the knowledge developed within the Delta Plan on Freshwater Supply. On the other hand, the information days serve to collect knowledge requirements and explore options for setting up research alliances.
Spatial Adaptation (SA)	
SA-I: Delta Plan on Spatial Adaptation (DPSA) Knowledge Portal (O)	The Spatial Adaptation knowledge portal is continuously kept up-to-date with new knowledge and new developments that are relevant to the climate-proof and water-resilient spatial planning of the living environment. More information is provided here .
SA-II: Together Climate-proof Platform (N)	This platform was operationalised in 2018; it assists parties and professionals throughout the country who have questions regarding the practical application of climate-proof and water-resilient spatial planning. The platform refers them to practical experience and applicable expertise and tools.
SA-III: Climate Adaptation Advisory Team (component of the DPSA incentive programme) (N)	Under the Delta Plan on Spatial Adaptation, specific expertise on climate adaptation is provided to several local and regional governments who serve as examples to others. For more information, click here (in Dutch).
SA-IV: NKWK Climate-proof Cities Project Tour (O)	The NKWK Climate-proof Cities focus area organises field-trips to ongoing climate adaptation projects. It consolidates knowledge supply and demand, and enables the exchange of expertise and experience. For more information, click here (in Dutch).
Wadden Sea Region (WR)	
W-I: Sharing knowledge on innovative dyke concepts (O) <i>[Formerly W5]</i>	The Wadden Sea Dykes General Exploration has indicated the innovations being explored along the Wadden Sea on a map, along with locations at which pilots may be carried out. In all the studies, appropriate locations for the innovation are explored, both in the Wadden Sea area and in the rest of the Netherlands. In addition, the Wadden Sea Dykes General Exploration is organising various knowledge sharing activities to disseminate the expertise acquired on as wide a scale as possible in order to warrant its application. Cases in point are: theme-based afternoons, (executive) field trips, and the final conference in the autumn of 2019. To subscribe to the Wadden Sea Dykes General Exploration newsletter, click here (in Dutch).
W-II: Wadden Sea Community (N)	Following the study into the regional effectiveness, commissioned by the Delta Programme Commissioner, the organisations involved in the Wadden Sea Region Delta Programme have set up a community for this area by way of a pilot project. The Wadden Sea Community comprises parties that are closely involved with the Wadden Sea Region. The community is intended for, e.g., sharing knowledge, acquiring information, asking questions, and working in an integrated manner. To register for the community, click here (in Dutch).

Southwest Delta (SWD)	
SWD-I: Southwest Delta knowledge community (N)	The Southwest Delta knowledge community will be set up in 2018 with an initial focus on the Grevelingen, lake Volkerak-Zoommeer, and the Oosterschelde. The process will be supported by the Delta Platform (see SWD-V). The initial efforts will be expended by a core group, comprising Deltares, Wageningen Marine Research, Rijkswaterstaat, and Natuurmonumenten. There is a direct link with the monitoring control group (see SWD-III) in the region, and knowledge sharing will be supported by the Delta Expertise website (see SWD-IV).
SWD-II: Delta waters digital system reports (N)	The work on the (digital) Grevelingen system report will commence in 2018. This will serve as a national pilot to the drafting of six-year system reports on the delta waters. The system report will be drawn up under the direction of Rijkswaterstaat, in collaboration with knowledge institutes (Deltares, NIOZ, Wageningen Marine Research) that command data, information, and expertise on the delta water concerned and the adjoining shore areas and waters. The national Grevelingen pilot, for which an accurate picture of the expertise available is vitally important and urgent with a view to the plan elaboration of the Grevelingen Tides project, will be followed by the Oosterschelde system report.
SWD-III: Southwest Delta water and nature monitoring, research and expertise control group (N)	The Southwest Delta water and nature monitoring, research and expertise control group will commence its activities in 2018. The parties participating in this control group, among which Rijkswaterstaat, the Ministry of Agriculture, Nature and Food Quality, the Province of Zeeland (possibly supplemented by the provinces of Zuid-Holland and Brabant), Staatsbosbeheer, and the Scheldestromen district water board, perceive a great need for collaboration in monitoring and knowledge development. Joining forces will probably enable a more efficient monitoring structure. The parties also perceive gains from more effective sharing of (area-specific) expertise and drawing up a collective research agenda. The control group will thus coordinate area-specific knowledge management. Agenda members playing an advisory role in the control group are: University of Applied Sciences HZ Vlissingen, Deltares, Wageningen Marine Research, Wageningen Environmental Research, NIOZ, Natuurmonumenten, Het Zeeuwse Landschap.
SWD-IV: Delta Expertise website (N)	The Delta Expertise website compiles and disseminates knowledge and expertise in the field of delta life. The current focus is on knowledge relating to water system management, which in many reports covers a minimum period of 50 years. Sharing and disseminating research results not only enables governments to safeguard knowledge, but also benefits the education sector and actual practice. Responsibility for the content of a comprehensive well-filled Delta Expertise website is vested with the knowledge carriers. The Delta Expertise website anchors lessons learned, and supports the Southwest Delta knowledge community. More information is provided here (in Dutch).
SWD-V: Delta Platform (N)	<p>The Delta Platform is an initiative of the Delta Technology Centre of Expertise, a cooperative of HZ University of Applied Sciences, Van Hall Larenstein UAS, and Rotterdam UAS. Additional partners are Rijkswaterstaat, Utrecht University, Delft University of Technology, Wageningen Marine Research, Roosevelt University College, Scheldestromen district water board, the Province of Zeeland, the Province of Noord-Brabant, NIOZ, and Deltares.</p> <p>The Delta Platform aims to train today the delta professionals who will be in demand tomorrow. The platform links owners of complex delta issues with experts from universities of applied sciences, research universities, knowledge institutes, businesses, and governments. An integrated approach is generating new insights and expertise that immediately flow back into (delta) training programmes. The Delta Platform thus serves as a catalyst for international delta innovations and a living lab for researchers, teachers, and students. For more information, click here (in Dutch).</p>
Rivers (R)	
R-I: River Expertise Community of Practice (N)	<p>The River Expertise Community of Practice (CoP), also referred to as the River Expertise Platform, commenced its activities in January 2018. The goal of the River Expertise CoP is the development of knowledge needed to resolve the societal taskings of Rijkswaterstaat and its partners in the areas around the major rivers. The points of departure are a secure, sustainable, and practicable river system, and viable river management.</p> <p>The platform features two functionalities: A River Expertise Pool of Experts and a Rivers Programme Consultative Body.</p> <p>The Pool of Experts is responsible for the development and anchoring of system expertise: drawing up a transparent and integrated assessment framework; identifying bottlenecks; providing advice; and responding to societal river-related taskings.</p> <p>The Consultative Body engages in demand-driven knowledge development. It is responsible for answering knowledge questions from management, implementation, and policy preparation bodies. This reinforces the Rijkswaterstaat knowledge base. The Consultative Body puts general knowledge requirements on the overall Rijkswaterstaat agenda, schedules such knowledge requirements, and identifies knowledge gaps in the purview of university research. The Rivers Programme Consultative Body ensures that knowledge products are delivered and accessible to partners, and that results can be implemented.</p>

**Delta Programme Generic
Topics (DP)**

DP-I: Delta Facts
(N)

How do we protect the Netherlands against the impact of climate change and how do we respond to the effects of climate change, such as prolonged drought, extreme precipitation, high river discharges, and increasing salinisation? A great deal of knowledge has already been developed in this respect. The Foundation for Applied Water Research STOWA has developed Delta Facts to disseminate such knowledge. Delta Facts are online knowledge dossiers featuring a concise summary of the “state of the art” knowledge on a particular knowledge issue on the interface of water management and climate change. The Delta Facts are regularly updated and supplemented. More information is provided [here](#) (in Dutch).

Delta Programme

The Delta Programme is a national programme involving an innovative collaboration between the central government, the provinces, municipalities and district water boards, with input from NGOs, knowledge institutes, residents, and the business community. The aim is to protect the current and future generations of the Netherlands against flooding, to ensure a sufficient supply of fresh water, and to render our country climate-proof and water-resilient in order to prevent major damage. The collaboration is founded on the issues of Flood Risk Management, Freshwater Supply, and Spatial Adaptation and involves close interaction with the regions in which these themes are being elaborated in concrete terms.

The Delta Programme Commissioner submits an annual proposal for the Delta Programme to the Minister of Infrastructure and Water Management, fosters the implementation of the Delta Programme, and monitors its progress. The proposal also comprises three Delta Plans featuring all the measures and provisions scheduled: a Delta Plan on Flood Risk Management, a Delta Plan on Freshwater Supply, and a Delta Plan on Spatial Adaptation. Every year, the Delta Programme is presented to the States General on Prinsjesdag, the official opening of Parliament in September.

www.rijksoverheid.nl/deltaprogramma
www.deltacommissaris.nl

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